Adult Literacy Fundamental Mathematics: Book 5 - 2nd Edition

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To the Learner

Welcome to *Adult Literacy Fundamental Mathematics: Book 5*.

You have the skills you need to be a strong student in this class. Your instructor knows this because you have passed the Adult Literacy Fundamental Mathematics Level 4 class, or you have been assessed into this level.

Adult math learners have many skills. They have a lot of life experience. They also use math in their everyday lives. This means that adult math learners may already know some of what is being taught in this book. Use what you already know with confidence!

How to Use This Book

This textbook has:

- A **Table of Contents** listing the units, the major topics, and the subtopics.
- A **Glossary** giving definitions for mathematical vocabulary used in the course.
- A **Grades Record** to keep track of your marks.
- Many **Exercises** to practice what you learned. Some are quite short, but others have a great number of questions. You do not have to do every single question!
    - Do as many questions as you feel are necessary for you to be confident in your skill. It is best to do all the word problems.
    - If you leave out some questions, try doing every second or every third question. Always do some questions from the end of each exercise because the questions usually get harder at the end. You might use the skipped questions for review before a test.
    - If you are working on a difficult skill or concept, do half the exercise one day and finish the exercise the next day. That is a much better way to learn.
- **Self-tests** at the end of most topics have an "Aim" at the top. If you do not meet the aim, talk to your instructor, find what is causing the trouble, and do some more review before you go on.

- A **Review and Extra Practice** section is at the end of each unit. If there is an area of the unit that you need extra practice in, you can use this. Or, if you want, you can use the section for more review.
- A **Practice Test** is available for each unit. You may:

    - Write the practice test after you have studied the unit as a practice for the end-of-chapter test, OR
    - You might want to write it before you start the unit to find what you already know and which areas you need to work on.
- **Unit Tests** are written after each unit. Again, you must reach the Aim before you begin the next unit. If you do not reach the aim, the instructor will assist you in finding and practising the difficult areas. When you are ready, you can write a B test to show that you have mastered the skills.
- A **Final Test** is to be written when you have finished the book. This final test will assess your skills from the whole book. You have mastered the skills in each unit and then kept using many of them throughout the course. The test reviews all those skills.

Grades Record

You have also been given a sheet to write down your grades. After each test, you can write in the mark. This way you can keep track of your grades as you go through the course. This is a good idea to use in all your courses.

Grade Record – Book 2

Unit	Practice Test	Date of Test A	Test A	Date of Test B	Test B
Example	✔	*September 4, 2020*	*25/33*	*September 7, 2020*	*25/33*
1					
2					
3					
4					
5					
Final Test					

How to Deal with Math Anxiety

Emotions and Learning

Emotions, or what we feel about something, play a big part in how we learn. If we are calm, we learn well. If we are afraid or stressed, we do not learn as well.

Many people are afraid of math. They fear making a mistake. “Math anxiety” is the fear of math. People who suffer from math anxiety may get headaches, sick stomachs, cold hands, or they may just sweat a lot or just feel scared. Math anxiety can happen for a few different reasons:

- Feeling anxious when writing tests
- Negative experiences in a past math class
- Embarrassment in a past math class
- Social pressures and expectations to not like math or not do well in math
- The want to get everything right
- Negative self-message (“I don’t know how to do it,” or “I hate math”)

Math anxiety is a learned habit. If it is learned, it can be unlearned. Most math anxiety comes from bad memories while learning math. It may be from doing badly on a test or asking a question then being made fun of. These bad memories can make learning math hard.

Everyone can learn math. There is no special talent for math. There are some people who are better at math than others, but even these people had to learn to be good at math.

Do You Suffer from Math Anxiety?

Read the list below and put a check mark beside the ones you feel when thinking about or doing math.

- Are your palms moist?
- Is your stomach fluttering?
- Do you feel like you can’t think clearly?
- Do you feel like you would rather do anything else than learn math?
- Are you breathing faster than normal?
- Is your heart pounding?
- Do you feel cold?
- Do you feel sweaty?

If you answered yes to two or more of these items, you may have math anxiety.

If you have math anxiety, a first step to understanding it is to look at where it all started.

Make a list of your experiences with learning math. Think back to the first math experiences you had and write about them. Think about learning math in school from the younger grades to the higher grades and write about your experiences and feelings. Include this class and how you are feeling right now about learning math.

Beside each experience, write if it was a positive or negative experience.

Look at the examples below to give you an idea:

Positive or negative?	**Math experience**
Negative	My teacher in elementary school lined the whole class up in a row and made us play a multiplication game. I could see which question was mine, and I didn't know the answer so I had to figure it out on my fingers before my turn came up. I got the answer right, but I was so nervous that I would be teased because I didn't know the answer off the top of my head. I still don't know my times tables.
Positive	In high school, I could use a calculator to figure out the simple multiplication problems, and then I could figure out the tougher problems without worrying about knowing my times tables.
Negative	Now that I am upgrading my math, I feel nervous every time I even think about opening the book. I want to get all the answers right, and I know that I won't be able to. I really need everything to be right so that I know that I am getting it.

Once you have made a list of experiences, go over the stories with your instructor, or by yourself and try to find some common themes.

- Can you see when you felt anxiety?
- Can you see why you are now anxious about math?
- Is there any experience you could use now to help you feel calmer about math?

Hopefully by examining the beginnings of the anxiety, you can feel more in control of it.

How to Deal with Math Anxiety

Anyone can feel anxiety that will slow down learning. The key to learning is to be the "boss" of your anxiety. Here are an overview of some strategies that may help deal with your anxiety:

- Use breathing exercises
- Think positive math messages
- Know your textbook

- Understand test-taking anxiety

Remember, learning to deal with your math anxiety may take some time. It took you a long time to learn math anxiety, so it will take some time to overcome it.

Use Breathing Exercises

One way to be the “boss” is to relax. Try this breathing exercise.

Breathing Exercise

Start by breathing slowly to the count of four. It may help to close your eyes and count.

Now hold your breath for four counts and then let your breath out slowly to the count of four.

The counting is silent and should follow this pattern: “Breath in, two, three, four. Hold, two, three, four. Breath out, two, three, four. Wait, two, three, four.”

With practice, the number of counts can be increased. This is an easy and good way to relax.

Now, try this exercise quietly and repeat it five times slowly.

Each time you feel anxious about learning, use the breathing exercise to help calm yourself. Ask yourself if what you tried worked. Do you feel calmer?

Think Positive Math Messages

Another way to be the “boss” is to give yourself positive math messages.

Read and think about the positive math messages listed below. Do you say any of those things to yourself?

- If the answer is yes, then great, keep doing that.
- If your answer is no, try to add this little mental trick to your day. The result will probably be that you start to see math as something you can do and that you may even like!

I like math.

I am good at math.

I understand math.

I can relax when I am studying math.

I am capable of learning math.

Math is my friend.

My math improves every day.

I am relaxed, calm and confident when I study math.

I understand math when I give myself a chance.

Math is creative.

Pick three statements that you like and say them to yourself as much as you can in each day. You can also write the statements out on paper and post them around your house so that you read them throughout the day.

Know Your Textbook

Look at the Table of Contents in the front of your textbook. It tells you what you will be learning. You may see some things that you already know, some things that you may have forgotten, and some things that are new to you.

Flip the pages. You can see that the textbook is split into units. Each unit is something to learn.

Each unit has exercises to do. Notice the answers are at the end of the exercise. You can check your answers as soon as you are done. You can also check your answer before moving on if are not sure if you are doing the question right.

At the end of each unit is a self-test. It is a chance for you to see how well you have learned the skills in the unit. If you do well, you can move on. If you don't do well, you can go back and practice those skills.

Knowing your textbook gives you a good skill. If you get frustrated, you can use the Table of Contents to go back and find some help.

Understand Test-Taking Anxiety

There are four reasons people are anxious when writing tests. Any of the four reasons listed below might be the reason a person might feel anxious in a test-taking situation.

1. Not feeling prepared for the test
2. Not sure how to write the test in the best way
3. Feeling too much mental pressure
4. Poor health habits before writing a test

Here is an explanation of each reason and how to work your way out of the anxiety you may feel during tests.

1. Not feeling prepared for the test

Many students feel anxiety about taking math tests because they do not feel prepared for the test. To feel prepared, a student needs to have studied the work and know that they can do the problems they will be given. Get help from your classmates, friends, or your instructor to find out how you can improve your study habits.

Getting ready for a test starts on the first day of class. Everything you do in class and at home is part of that getting ready.

- **Always do as many exercises as you need to help you understand.** Once you understand, do ten more questions, then you will know for sure that you really understand.
- **Always correct your exercises.** It is good to know that you are understanding and getting the questions right. It is also good to know if you are not understanding and need some help.
- **Always do the self-tests.** The self-tests can show things that you are not sure of.
- **Always do the review.** Review is part of this book. It is a chance to go over all the things you have learned in a unit before moving on. It prepares you for what will be on the test.
- **Always do a practice test.** A practice test gives you a chance to see how many questions and what kind of questions are on the test.

2. Not sure how to write the test in the best way

Here are some strategies students should know about how to write a test to do the best as possible on it:

- Before the Test

    1. **Arrive early.** Get out all the supplies you need to do the test (pencils, ruler, calculator, watch, etc.).
    2. **Be comfortable, but alert.** Choose a good spot in the room, and make sure you have enough space to work. Maintain a comfortable posture in your seat, but don't "slouch."
    3. **Stay relaxed and confident.** Keep a good attitude. If you find yourself anxious, take several slow, deep breaths to relax. Don't talk about the test to other students just before entering the room: their anxiety can be contagious.

- During the test.

    1. **Look over the test**. Take a look at the whole test before starting. This takes very little time. Use a highlighter to highlight the questions that you know you can do easily, note key terms, mark the test with comments that come to mind. As you work, put a star beside any questions that you would like to go over again when you finish the test.
    2. **Relax.** Before starting the test, imagine yourself somewhere where you are calm and confident. Go there in your mind. Focus on how good you feel and how in control you are. If you become anxious during the test, in your mind go to the

calming place. Focus on how calm you feel. Then go back to your test.

3. **Read the directions carefully.** This may be obvious, but it will help you avoid careless errors.
4. **Answer questions in a strategic order.**
    - Answer the easy questions first. This will help to build confidence and score points. It may also help you make connections with more difficult questions.
    - Then answer the difficult questions. Work on these harder questions with all the energy of the easier ones.
5. **Review your answers.** Resist the urge to leave as soon as you are done writing. Spend as much time as you can going over your test to see if you:
    - Answered all the questions.
    - Wrote the answers in right.
    - Did not make simple mistakes.

3. Feeling too much mental pressure

There are many reasons why a student may feel mental pressure when writing a test. Listed below are a few main reasons:

- Negative beliefs about one's math abilities
- Low self-esteem when it comes to math
- Too high expectations of success
- Fear that failure or low grades will affect the future
- Feelings of pressure of not wanting to let down family members

When students feel this kind of pressure, it is very hard to feel calm and relaxed about a test. The key to success in a math test is to keep the anxiety at a manageable level. You can do this in two ways:

1. **Change negative self-talk.** Any time a negative thought creeps into your head, it will make it harder to stay positive and relaxed about your test. If you have a negative thought like "I can't do it", try to replace it with a positive thought like "I can do this".
2. **Use relaxing and calming techniques.** Use the calming breathing mentioned earlier in this section. This will help you keep calm. Also, do not study in the last half hour before the test. You will be calmer by spending time relaxing and breathing deeply in that last half hour.

4. Poor health habits before writing a test

When your body and mind are healthy, you will have a better chance of doing well on a test. Eat well, drink plenty of water and get daily exercise. The better you feel, the better you can perform (and a test is a performance!).

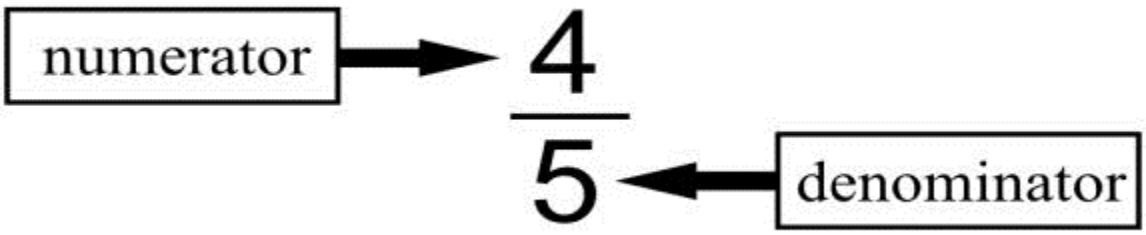
Unit 1: Common Fractions

Topic A: Introducing Common Fractions

This unit gives you the background details that you need for working with **common fractions**.

Parts of Common Fractions

Common fractions are written with two numbers, one above the other, with either a straight or slanted line in between. The straight-line style is the one used most.



The **denominator** is the bottom number. It tells how many equal parts are in the whole thing. The **numerator** is the top number. It tells how many of the equal parts we are dealing with.

Example A

The whole thing is the bunch of bananas. The whole thing has 5 equal parts (the bananas). The denominator is **5**.

How many bananas have been eaten? **1**

What fraction of the bananas have been eaten? $\frac{1}{5}$ of bananas.

Example B

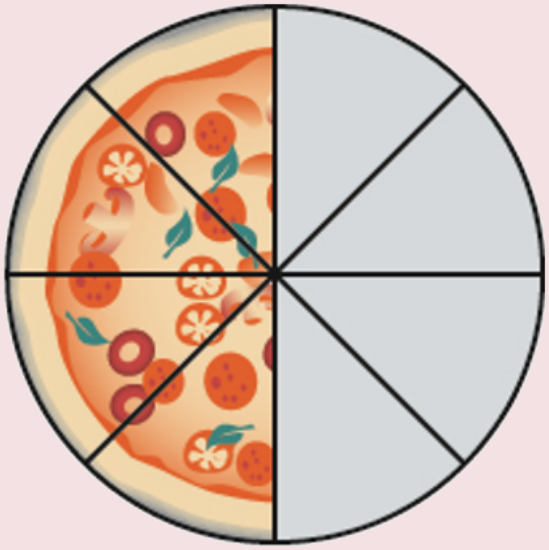
The whole thing is a carton of one dozen eggs. One dozen has 12 equal parts, so if we are talking about the carton, the denominator is **12**.

How many eggs are still in the carton? **7**

What fraction of the eggs are left? $\frac{7}{12}$ of the eggs.

A fraction is always looking at things as **parts of a whole**. In the previous example of the eggs, the **whole** is 12 eggs. The **part** is the 7 eggs that are left. 7 is part of the whole of 12.

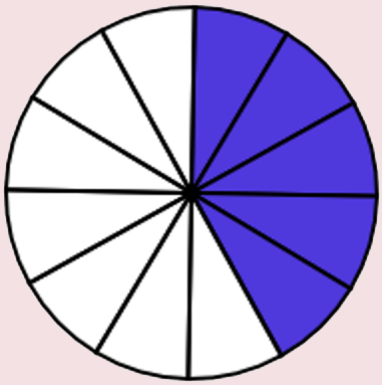
Example C



This pizza is **one whole** pizza. The pizza is cut into 8 pieces. This means the whole is 8. How many parts are left? (The pieces that are shaded are the ones left.) Write a fraction of how many pieces of pizza are left.

The amount left over can be shown as a fraction: $\frac{4}{8}$

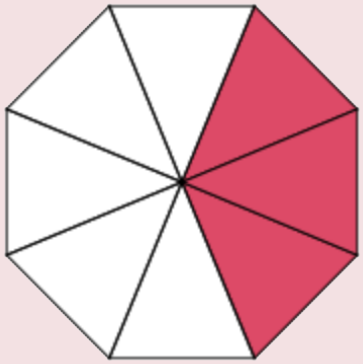
Example D



It is Peter's 82nd birthday. There were 7 people, including Peter, at the party. Everyone wants a small piece of cake, so Kathleen cut the cake into 12 equal parts. This means the **whole** is 12. There will be some left over.

The amount left over can be shown as a fraction: $\frac{5}{12}$

Example E



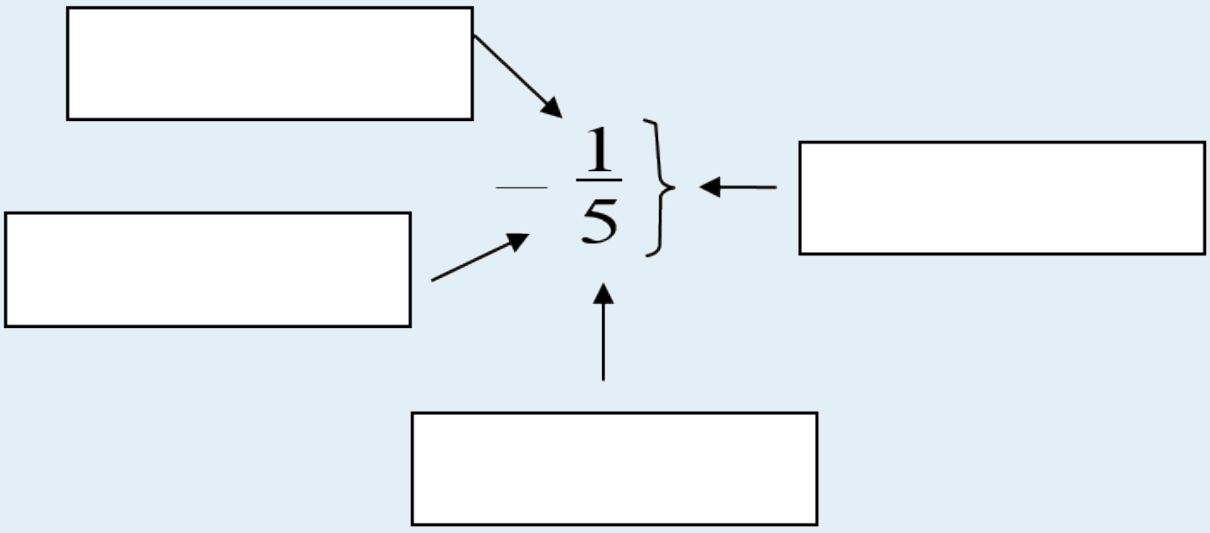
Sue made a strawberry pie to share with her family of 5. The pie was cut into 8 equal parts. This means the **whole** is 8. The kids are excited because there will be parts left over.

The fraction showing what amount of pie is left is: $\frac{3}{8}$

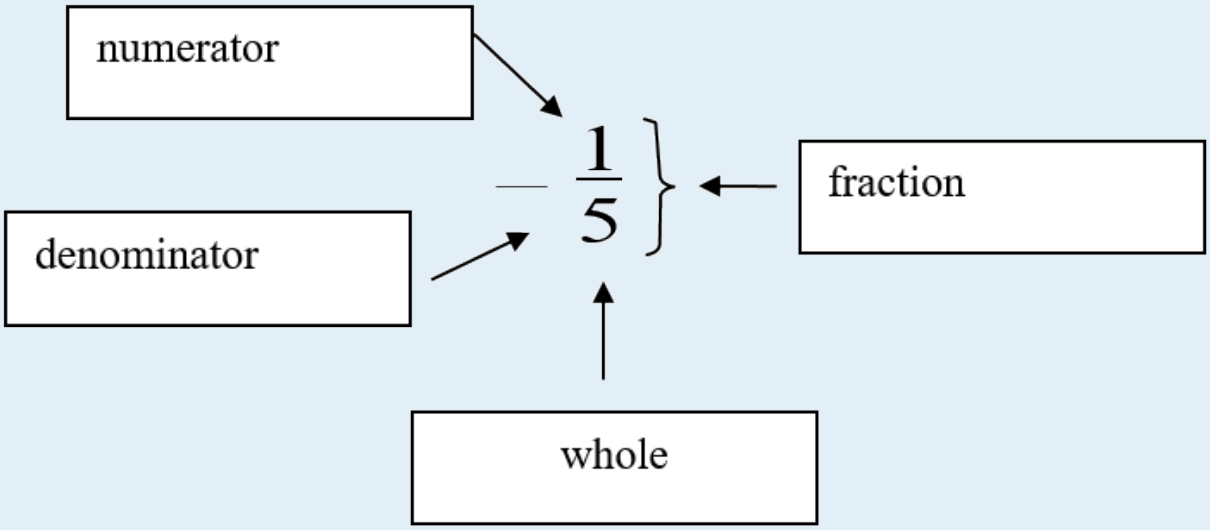
Exercise 1

Look at the fraction below. Fill in the blank labels with the four **terms** you are given:

- **Numerator**
- **Denominator**
- **Whole**
- **Fraction**



Answers to Exercise 1



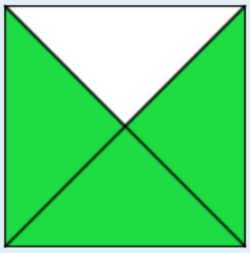
Writing Common Fractions

Exercise 2

Each shape drawn here is a whole. The shapes have been divided into parts.

1. Ask yourself, “How many equal parts in the whole?” That number is the denominator.
2. Count the number of parts that are shaded; that is the numerator.
3. Write the common fraction to describe the shaded portion of each shape.

Here is an example:



i. How many parts make the whole? **4**

ii. How many parts are shaded? **3**

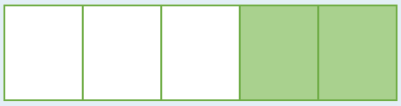
iii. Fraction: $\frac{3}{4}$

a. 

i. How many parts make the whole?

ii. How many parts are shaded?

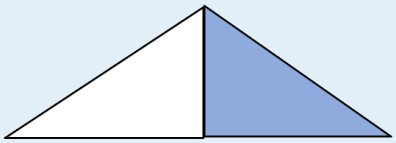
iii. Fraction:

b. 

i. How many parts make the whole?

ii. How many parts are shaded?

iii. Fraction:

c. 

i. How many parts make the whole?

ii. How many parts are shaded?

iii. Fraction:

Answers to Exercise 2

a. Square.

i. 4

ii. 3

iii. $\frac{3}{4}$

b. Rectangle.

i. 8

ii. 5

iii. $\frac{5}{8}$

c. Rectangle.

i. 5

ii. 2

iii. $\frac{2}{5}$

d. Triangle.

i. 2

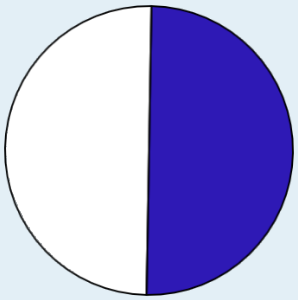
ii. 1

iii. $\frac{1}{2}$

Exercise 3

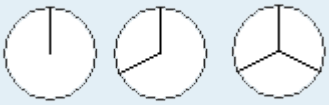
Now draw some fractions.

Example: Draw the fraction $\frac{1}{2}$ in a circle:



a. Draw $\frac{1}{4}$ in a circle:

b. Draw $\frac{1}{3}$ in a circle (here is a hint below):



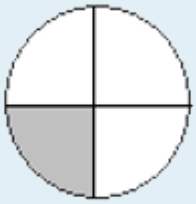
c. Draw $\frac{1}{2}$ in the rectangle:

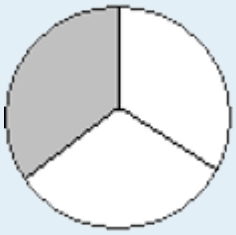
d. Draw $\frac{2}{4}$ in the rectangle:

e. Draw $\frac{4}{8}$ in the rectangle:

f. What do you see in common with the three last boxes you just drew?

Answers to Exercise 3

a. 

b. 

c. 

d. 

e. 

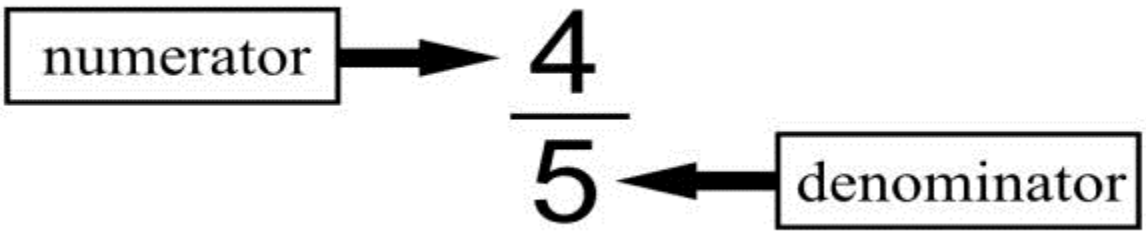
f. All the shaded spaces are equal

Reading Common Fractions

You can read fractions in a few different ways:

- $\frac{1}{2}$ can be called:
    - One over two
    - One half
- $\frac{1}{4}$ can be called:
    - One over four
    - One fourth
    - One quarter
- $\frac{3}{4}$ can be called:
    - Three over four
    - Three fourths
    - Three quarters
- $\frac{1}{3}$ can be called:
    - One over three
    - One third

Did you notice that the fractions with a denominator of four have an extra name? Do they seem familiar? No other fractions have a third name.



Remember: The numerator is read as a number.

The denominator is read with a special ending on the end of the numeral. The ending is usually **th** or **ths** as it was in decimals, but sometimes we use a different word. (These are called **ordinal numbers**).

How to read denominators

If the denominator is…	Read…
2	half
3	third
4	fourth or quarter
5	fifth
6	sixth
7	seventh
8	eighth
9	ninth
10	tenth
22	twenty-second

Add the “s” if the numerator is 2 or more. So $\frac{2}{3}$ is read “two-thirds.”

Note that the usual practice is to put a hyphen (-) between the words when you write them out.

- $\frac{1}{2}$ is usually read “one-half.”
- $\frac{2}{2}$ is read “two-halves.”
- $\frac{3}{4}$ is read as “three-quarters” or “three-fourths.”

Exercise 4

Look back again at Exercise 2 and write down the word names for your answers.

Example: $\frac{3}{4}$ – three quarters or three-fourths

a. $\frac{3}{4}$
b. $\frac{5}{8}$
c. $\frac{2}{5}$
d. $\frac{1}{4}$
e. $\frac{2}{4}$
f. $\frac{1}{3}$

Answers to Exercise 4

a. Three quarters or three-fourths
b. Five-eighths
c. Two-fifths
d. One quarter or one-fourth
e. Two quarters or two-fourths
f. One-third

Applying Common Fractions

We make common fractions out of many things in our lives. For example,

- I got 13 out of 15 on my English test. The score is $\frac{13}{15}$.
- The baseball pitcher struck out 2 of the 6 batters in the inning. $\frac{2}{6}$ of the batters were struck out.
- Three of the eggs in that dozen are cracked. $\frac{3}{12}$ of the eggs are cracked.
- Finish your vegetables. I gave you just 8 pieces of carrot, and you have only eaten 4 of them! $\frac{4}{8}$ of the carrots are eaten.

Exercise 5

Answer the questions using a common fraction.

a. Jill walks for 20 minutes of the 30 minute lunch break. What fraction of her lunch break does Jill walk?

Answer: $\frac{20}{30}$

b. The test was scored out of 25. Kim got 20 marks. Write his score.

c. The restaurant has 12 tables. Each waiter looks after 6 of them. What fraction of the tables does each waiter look after?

d. The new litter of puppies is a big one—10 pups. Three of the pups have floppy ears. What fraction of the puppies have floppy ears?

e. Beryl planted 3 dozen tulip bulbs last fall. A mole ate one dozen of them before they flowered. That mole is in trouble!! What fraction of the tulips did the mole eat?

f. Kay's raisin cookie recipe uses 5 cups of flour altogether. Kay always puts in 2 cups of whole wheat flour and 3 cups of white flour. What fraction of the flour that she uses is whole wheat?

Answers to Exercise 5

a. $\frac{20}{30}$

b. $\frac{20}{25}$

c. $\frac{6}{12}$

d. $\frac{3}{10}$

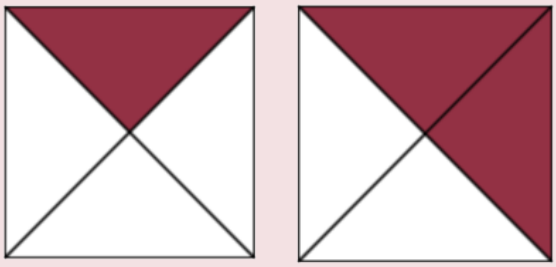
e. $\frac{1}{3}$

f. $\frac{2}{5}$

These common fractions that you have been writing are called proper fractions. **Proper fractions** are fractions where the numerator is smaller than the denominator.

How Do We Compare Common Fractions?

Example F

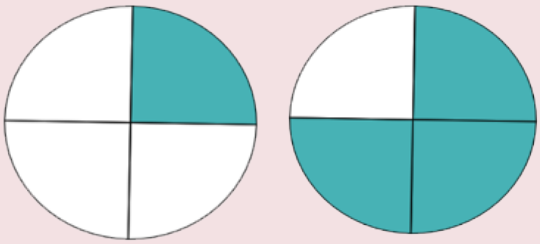


1. Which square has more shaded parts?
   The second square has more shaded parts.
2. Which is larger: $\frac{1}{4}$ or $\frac{2}{4}$?
   $\frac{2}{4}$ is larger because it fills in more parts of the square.

Review:

- Greater than > Less than
- Less than < Greater than

Example G



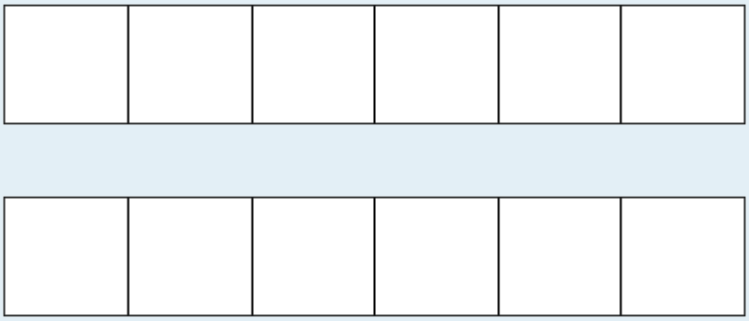
1. Which circle is shaded more? (***Hint:*** Look at the squares above to help answer this question.)

2. Write the fractions for both drawings: $\frac{1}{4} and \frac{3}{4}$
3. Which fraction is larger? Place a symbol (< or >) in the space above to show your answer.
   $\frac{1}{4} < \frac{3}{4}$

Exercise 6

Compare fractions.

a.

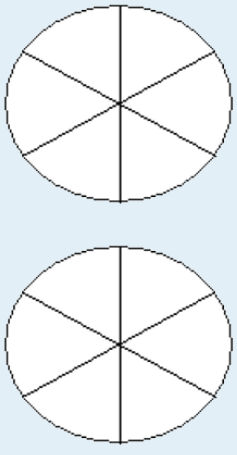


i. Shade $\frac{2}{6}$ and $\frac{5}{6}$.

ii. Circle the fraction that is larger.

iii. Write a mathematical sentence stating which fraction is larger (use < or >).

b.

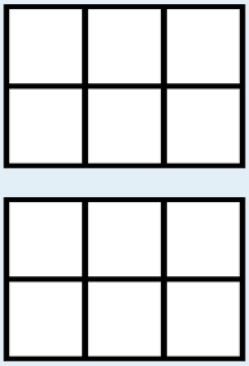


i. Shade $\frac{4}{6}$ and $\frac{3}{6}$.

ii. Circle the fraction that is larger.

iii. Write a mathematical sentence stating which fraction is larger (use < or >).

c.



i. Shade $\frac{2}{6}$ and $\frac{1}{6}$.

ii. Circle the fraction that is larger.

iii. Write a mathematical sentence stating which fraction is larger (use < or >).

Answers to Exercise 6

a. $\frac{2}{6} < \frac{5}{6}$

b. $\frac{4}{6} > \frac{3}{6}$

c. $\frac{2}{6} > \frac{1}{6}$

When comparing fractions: As the numerator gets larger and the denominator stays the same, the fraction gets larger.

Example: $\frac{3}{10} < \frac{7}{10}$

Exercise 7

Use the < or > symbols to show which fraction is larger.

a. $\frac{3}{4}$ _____ $\frac{1}{4}$

b. $\frac{5}{6}$ _____ $\frac{1}{6}$

c. $\frac{9}{10}$ _____ $\frac{1}{10}$

d. $\frac{3}{8}$ _____ $\frac{5}{8}$

Answers to Exercise 7

a. >

b. >

c. >

d. <

Exercise 8

Show which is larger by using < or >.

a. One-fourth _____ Three-fourths

b. Five-sixths _____ Four-sixths

c. Five-ninths _____ Two-ninths

d. Seven-sevenths _____ Three-sevenths

Answers to Exercise 8

a. <

b. >

c. >

d. >

Exercise 9

Compare fractions with the same denominator. Put the fractions in order from smallest to largest.

a. $\frac{3}{4}, \frac{1}{4}, \frac{2}{4}$

b. $\frac{6}{7}, \frac{2}{7}, \frac{3}{7}, \frac{1}{7}, \frac{5}{7}, \frac{4}{7}$

c. $\frac{50}{361}, \frac{23}{361}, \frac{7}{361}, \frac{360}{361}, \frac{274}{361}, \frac{158}{361}$

Answers to Exercise 9

a. $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}$

b. $\frac{1}{7}, \frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$

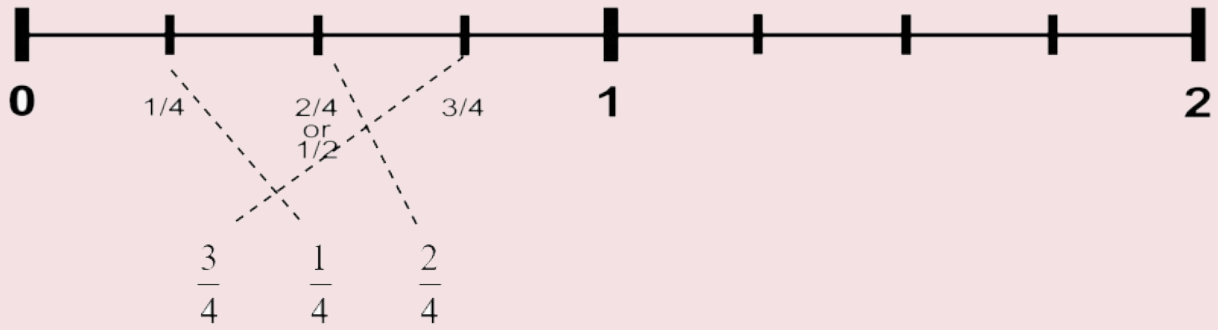
c. $\frac{7}{361}, \frac{23}{361}, \frac{50}{361}, \frac{158}{361}, \frac{274}{361}, \frac{360}{361}$

Using a Number Line to Compare Fractions

Using a number line is another way to look at how numbers compare to each other. Fractions can also be plotted on a number line. The number line is numbered 0 to 2. The section between 0 and 1 is split into fractions.

Example H

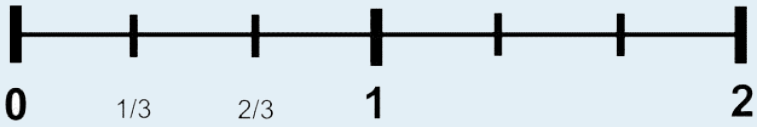
Draw a line to connect the fractions listed to the fractions on the number line.



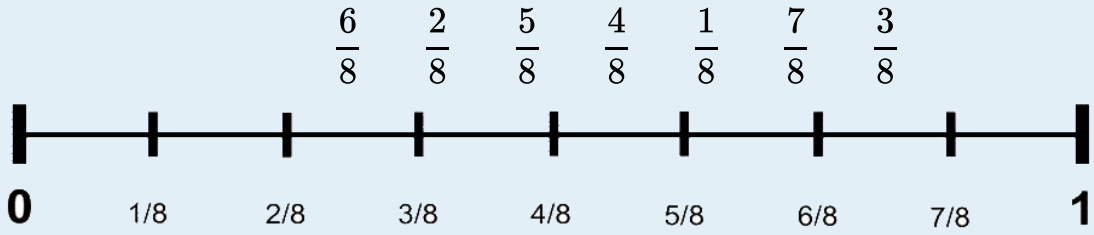
Exercise 10

Draw a line between the following fractions and the fractions on the number line.

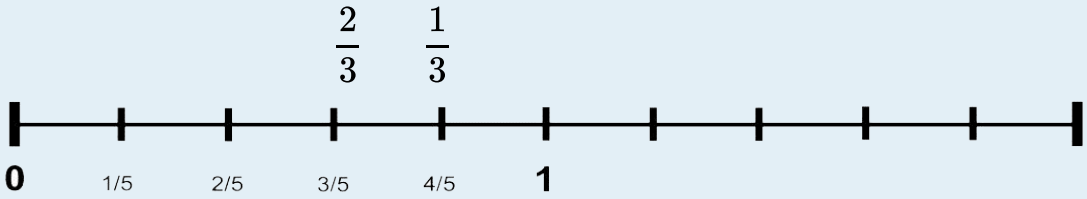
a. $\frac{2}{3}$ $\frac{1}{3}$



b.



c.



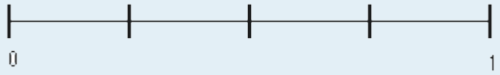
d. Complete the rule for comparing fractions. Circle the correct word.As the numerator gets ***bigger / smaller*** and the denominator stays the same, the fraction gets ***bigger / smaller / stays the same***.

Check your answers for Exercise 10 with your instructor.

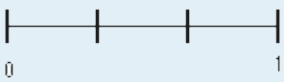
Exercise 11

Write the fractions on the number lines in order.

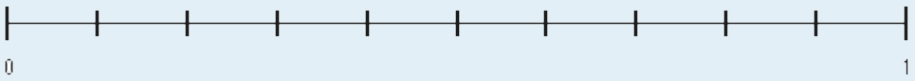
a. $\frac{1}{2}$ $\frac{1}{4}$ $\frac{3}{4}$



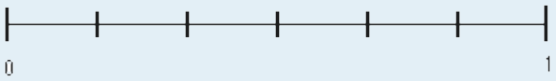
b. $\frac{2}{3}$ $\frac{1}{3}$



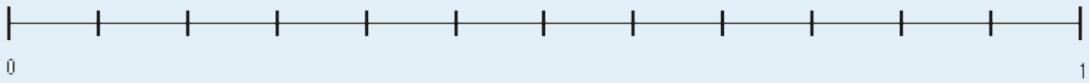
c. $\frac{3}{10}$ $\frac{7}{10}$ $\frac{5}{10}$ $\frac{8}{10}$ $\frac{1}{10}$



d. $\frac{5}{6}$ $\frac{2}{6}$ $\frac{3}{6}$ $\frac{1}{6}$



e. $\frac{7}{12}$ $\frac{5}{12}$ $\frac{3}{12}$ $\frac{10}{12}$ $\frac{1}{12}$



Answers to Exercise 11

a. $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$

b. $\frac{1}{3}, \frac{2}{3}$

c. $\frac{1}{10}, \frac{3}{10}, \frac{5}{10}, \frac{7}{10}, \frac{8}{10}$

d. $\frac{1}{6}, \frac{2}{6}, \frac{3}{6}, \frac{5}{6}$

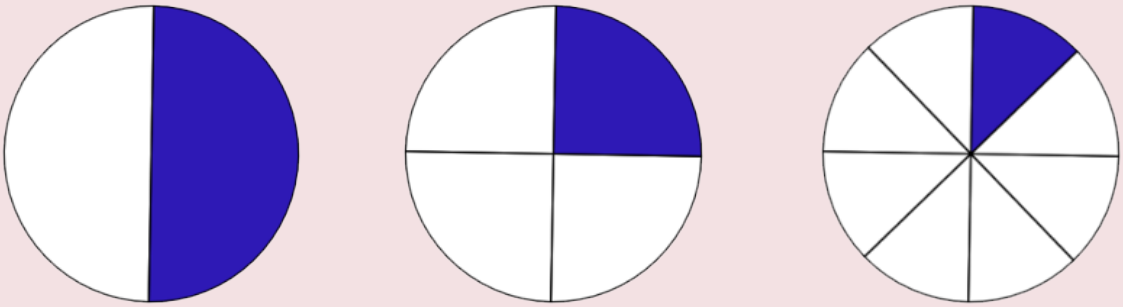
e. $\frac{1}{12}, \frac{3}{12}, \frac{5}{12}, \frac{7}{12}, \frac{10}{12}$

Comparing Fractions With Different Denominators

You now know how to compare fractions with the same denominator, but how do you do it when the denominators of two fractions are different?

Example I

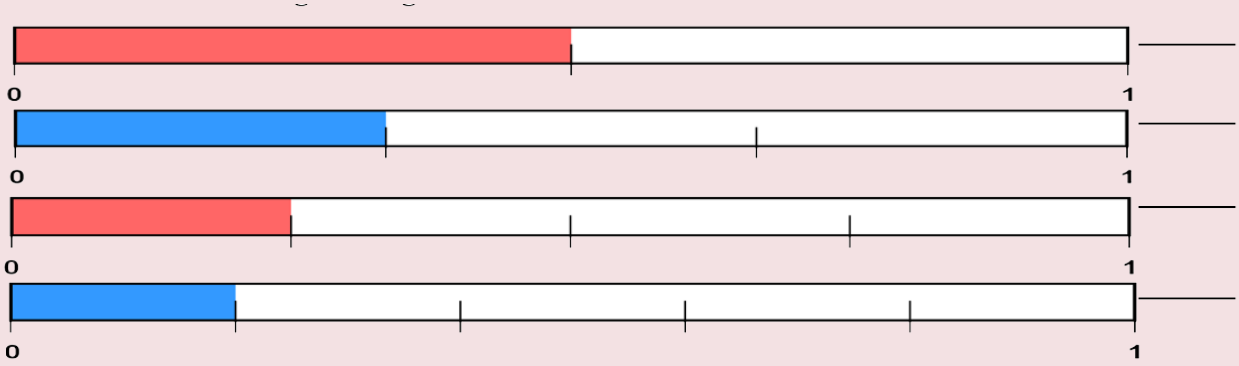
Let's look at some circles:



a. Write a fraction for each circle above: $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$

b. Which is the largest of the three fractions: $\frac{1}{2}$

Look at the following rectangles:



a. Write in the fraction for each shaded part: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

b. Write the fractions in order from the largest to the smallest: $\frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}$

Exercise 12

Look back on the last three fraction drawing sets and compare the following fractions with < or >.

a. $\frac{1}{2}$ _____ $\frac{1}{8}$

b. $\frac{1}{6}$ _____ $\frac{1}{2}$

c. $\frac{1}{4}$ _____ $\frac{1}{3}$

d. $\frac{1}{3}$ _____ $\frac{1}{8}$

Answers to Exercise 12

a. >

b. <

c. <

d. >

Topic A: Self-Test

Mark /16 Aim 13/16

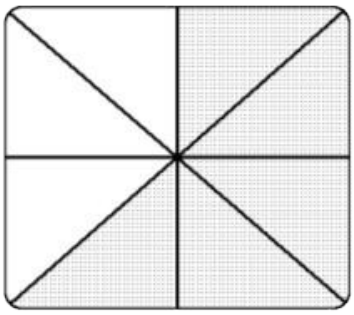
A. Write a common fraction to describe:

i. the shaded part of each whole thing.

ii. the unshaded part of each whole thing.

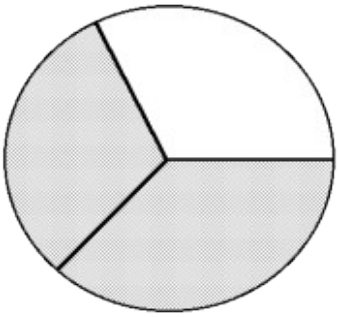
(6 marks)

a.



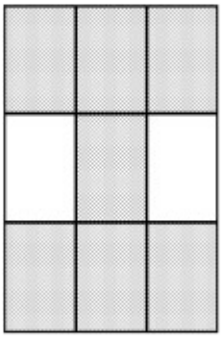
i. Shaded:

ii. Unshaded:

b. 

i. Shaded:

ii. Unshaded:

c. 

i. Shaded:

ii. Unshaded:

B. Draw the following fractions (2 marks).

a. $\frac{3}{4}$

b. $\frac{1}{5}$

C. Write the word name for the following fractions (3 marks).

a. $\frac{3}{4}$

b. $\frac{1}{5}$

c. $\frac{3}{7}$

D. Answer the question using a common fraction (2 marks).

a. The government has ordered the closing of 24 beds at the local hospital. The townspeople are angry because the hospital only has 100 beds in all. What fraction of the hospital beds are being closed?

b. The young man ordered six roses for his girlfriend. He asked for five red ones and a special yellow rose. What fraction of the roses are red?

E. Compare the following fractions, use < or > (3 marks).

a. $\frac{4}{5}$ _____ $\frac{3}{5}$

b. $\frac{12}{23}$ _____ $\frac{20}{23}$

c. $\frac{1}{3}$ _____ $\frac{2}{3}$

Answers to Topic A Self-Test

A. Write a common fraction based on the picture.

a. Square

i. $\frac{5}{8}$

ii. $\frac{3}{8}$

b. Circle

i. $\frac{2}{3}$

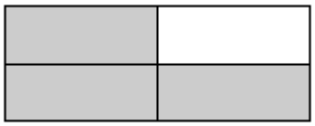
ii. $\frac{1}{3}$

c. Rectangle

i. $\frac{7}{9}$

ii. $\frac{2}{9}$

B. Draw the following fractions.

a. 

b. 

C. Write the word name for the following fractions.

a. Three quarters *or* Three fourths

b. One fifth

c. Three sevenths

D. Answer the question using a common fraction.

a. $\frac{24}{100}$

b. $\frac{5}{6}$

E. Compare the following fractions, use < or >.

a. >

b. <

c. <

Topic B: Common Fractions

There are three types of fractions:

- **Proper fractions** are part of the whole thing.
- **Improper fractions** are equal to 1 or are greater than 1.
- **Mixed numbers** are greater than one.

In a **proper fraction**, the numerator is smaller than the denominator. Proper fractions are less than one.

- $\frac{3}{4} < 1$
- $\frac{2}{5} < 1$
- $\frac{9}{10} < 1$
- $\frac{4}{7} < 1$

In **improper fractions**, the numerator is the same or larger than the denominator.

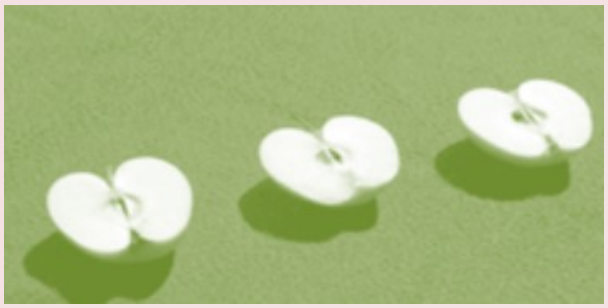
- $\frac{4}{4} = 1$
- $\frac{3}{3} = 1$
- $\frac{8}{3} > 1$
- $\frac{9}{7} > 1$

In **mixed numbers**, a whole number and a proper fraction are used together.

- $1\frac{1}{2} > 1$
- $4\frac{3}{7} > 1$
- $3\frac{2}{5} > 1$
- $1\frac{9}{10} > 1$

Here are some pictures to visualize mixed numbers:

Example A



You want to give three small children only $\frac{1}{2}$ an apple each. You need three half apples. You can write that as $\frac{3}{2}$ (three-halves). How will you get $\frac{3}{2}$ of an apple?

You must use **more than one apple**.

$$\frac{3}{2} = 1\frac{1}{2} \text{ apples}$$

This is one whole apple and $\frac{1}{2}$ of another one.

Example B

10 pieces of pizza are shown. Each pizza was cut into 8 pieces, so the fraction can be written as $\frac{10}{8}$. This is an **improper fraction**; it can also be written as a **mixed number:** $1\frac{2}{8}$. This is 1 whole pizza, and $\frac{2}{8}$ of another one.

Exercise 1

Answer these questions.

a. 

i. How many pieces of apple are shown?

ii. Each apple was cut into 4 pieces, so the denominator is _____.

iii. Write the improper fraction that describes the photo.

iv. The photo shows _____ whole apple and _____ of a second apple.

v. Write the mixed number that describes the apple.

b. 

i. How many pieces of pizza are shown?

ii. Each pizza was cut into 8 pieces, so the denominator is _____.

iii. Write the improper fraction that describes the photo.

iv. The photo shows _____ whole pizzas and _____ of a third pizza.

v. Write the mixed number that describes the pizza.

Answers to Exercise 1

a. Apples.

i. 7

ii. 4

iii. $\frac{7}{4}$

iv. $1 \text{ and } \frac{3}{4}$

v. $1\frac{3}{4}$

b. Pizza.

i. 21

ii. 8

iii. $\frac{21}{8}$

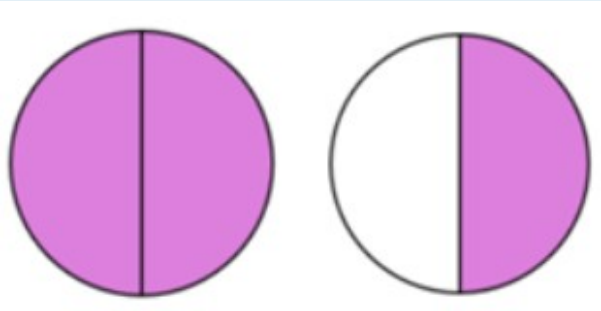
iv. $2 \text{ and } \frac{5}{8}$

v. $2\frac{5}{8}$

Exercise 2

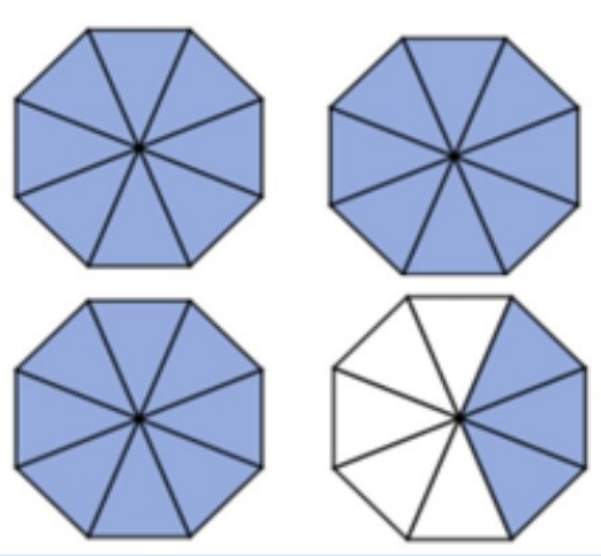
Write the **improper fraction** and the **mixed number** that describe the shaded part in each drawing. First decide on the denominator. The denominator is what one whole thing has been divided into.

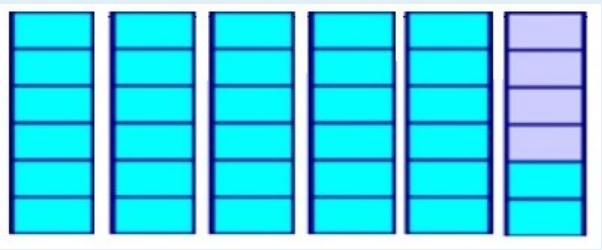
a.

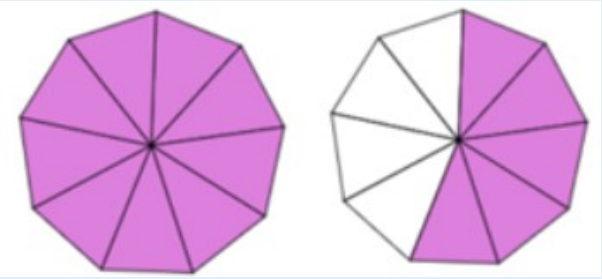


Answer: $\frac{3}{2} = 1\frac{1}{2}$

b.



c. 

d. 

e. 

Answers to Exercise 2

b. $\frac{27}{8} = 3\frac{3}{8}$

c. $\frac{32}{6} = 5\frac{2}{6}$

d. $\frac{14}{9} = 1\frac{5}{9}$

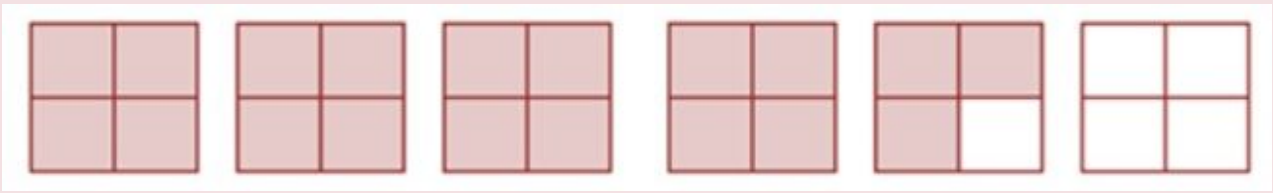
e. $\frac{11}{4} = 2\frac{3}{4}$

Now it is your turn to draw some **mixed numbers**. The following is an example of how to do that.

Example C

Shade in this fraction: $4\frac{3}{4}$

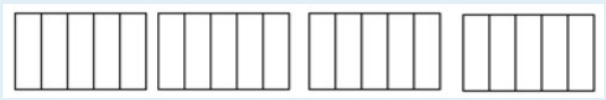
(Note: you will not need to use all the squares drawn below.)



Exercise 3

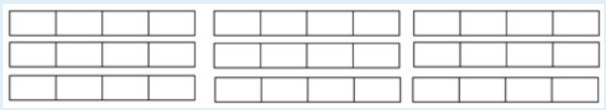
Shade the following mixed fractions in the given shapes.

a. $2\frac{3}{5}$



b. $3\frac{2}{3}$

c. $5\frac{1}{4}$



d. $1\frac{1}{2}$

Draw the following mixed fractions:

e. $4\frac{1}{2}$

g. $2\frac{2}{3}$

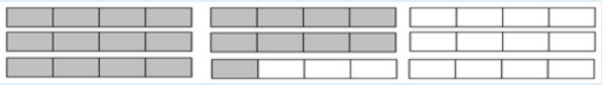
f. $3\frac{4}{5}$

h. $5\frac{3}{4}$

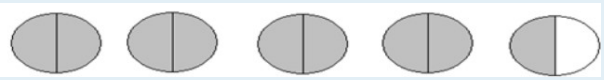
Answers to Exercise 3

a.

b. 

c. 

d. 

e. 

f. 

g. 

h. 

Writing Improper Fractions as Mixed Numbers

In the last exercise you were able to write (rename) an improper fraction as a mixed number by looking at the drawing – you could see how many whole things were represented. You could see that if the denominator was 3, every time you had $\frac{3}{3}$  that was one whole. If the denominator was 6, every time you had $\frac{6}{6}$  that was one whole, and so on. An improper fraction is written (renamed) as a mixed number by **dividing** the **numerator** by the **number of parts in the whole** (the **denominator**).

To write (rename) an improper fraction as a mixed number, **divide** the **numerator** by the **denominator**.

Example D

Write $\frac{8}{5}$ as a mixed number.

First, write as a long division problem or as a short division question.

$$\text{denominator}\overline{)\text{numerator}} = 5\overline{)8}$$

$$\text{numerator} \div \text{denominator} = 8 \div 5$$

Second, divide. Write the remainder as a fraction, using the same denominator.

1. The 1 becomes the whole number.
2. Use the **remainder** (3) as the numerator
3. Use the divisor (5) as the denominator.

$$\begin{array}{r} 1 \\ 5\overline{)8} \\ \underline{-5} \\ \text{R } 3 \end{array} \quad \text{or} \quad 8 \div 5 = 1 \text{ R } 3$$

$$\frac{8}{5} = 1\frac{3}{5}$$

Example E

Write $\frac{16}{4}$ as a mixed number.

$4\overline{)16}$ or $16 \div 4$

$$\begin{array}{r} 4 \\ 4\overline{)16} \\ \underline{-16} \\ 0 \end{array} \quad \text{or} \quad 16 \div 4 = 4$$

$$\frac{16}{4} = 4$$

Exercise 4

Rewrite each improper fraction as an equivalent mixed number or whole number.

a. $\frac{9}{2} =$

b. $\frac{11}{10} =$

c. $\frac{20}{4} =$

d. $\frac{17}{6} =$

e. $\frac{13}{3} =$

f. $\frac{20}{10} =$

g. $\frac{7}{4} =$

Answers to Exercise 4

a. $4\frac{1}{2}$

b. $1\frac{1}{10}$

c. 5

d. $2\frac{5}{6}$

e. $4\frac{1}{3}$

f. 2

g. $1\frac{3}{4}$

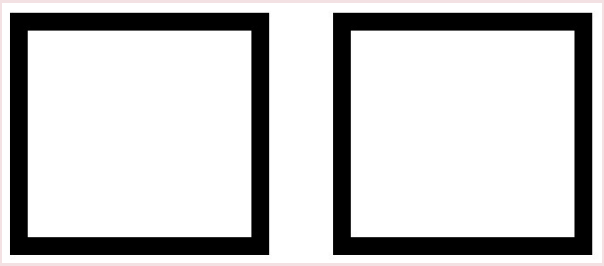
Renaming Mixed Numbers as Improper Fractions

This process will be used when you multiply and divide common fractions and when you "borrow" in subtraction.

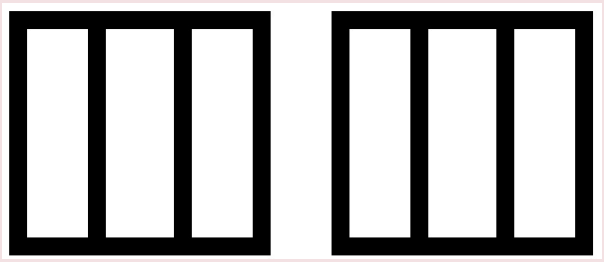
Example F

Take the whole number 2.

Here are 2 equal shapes.



The shapes are each divided into 3 parts (thirds).



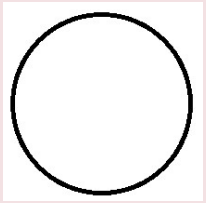
How many thirds are there? 6 thirds.

$$2 = \frac{6}{3}$$

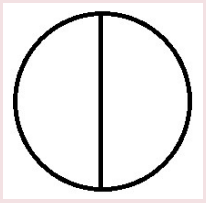
Example G

Take the whole number 1.

Draw one shape (a circle or a box).



Now divide the shape into half.



How many halves are there? $1 = \frac{2}{2}$

Have you found the shortcut?

The shortcut to rename a whole number as an improper fraction is to **multiply** the **whole number by the denominator**.

- $2 = \frac{\ }{4}$ Each whole number has 4 equal parts (4 quarters) in it,
  - so $2\ (\text{whole numbers}) \times 4\ (\text{parts}) = 8\ \text{parts}$
  - so $2 = \frac{8}{4}$
- $6 = \frac{\ }{2}$ Each whole number has 2 equal parts (2 halves),
  - so $6\ (\text{whole numbers}) \times 2\ (\text{parts}) = 12\ \text{parts}$
  - so $6 = \frac{12}{2}$
- $8 = \frac{\ }{3}$
  - $8 \times 3 = 24$
  - so $8 = \frac{24}{3}$

Until you are comfortable, draw a little sketch like you did in the example.

Exercise 5

Rename each whole number as an improper fraction using the denominator shown.

a. $6 = \frac{24}{4}$, $2 = \frac{\ }{3}$, $4 = \frac{\ }{3}$, $8 = \frac{\ }{10}$

b. $7 = \frac{\ }{3}$, $1 = \frac{\ }{4}$, $6 = \frac{\ }{10}$, $5 = \frac{\ }{6}$

Answers to Exercise 5

a. $\frac{24}{4}, \frac{6}{3}, \frac{12}{3}, \frac{80}{10}$

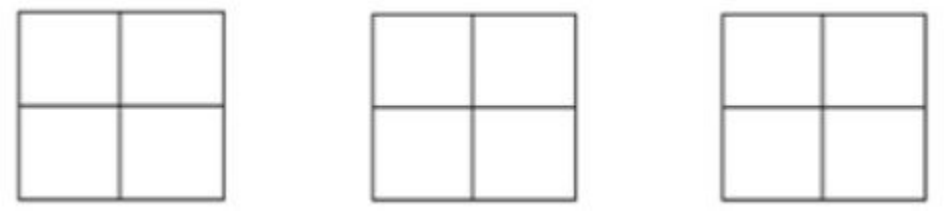
b. $\frac{21}{3}, \frac{4}{4}, \frac{60}{10}, \frac{30}{6}$

Now let's take this idea further. How can you rename a **mixed number** as an improper fraction?

Example H

Take the mixed number $2\frac{1}{4}$. This is two whole things and **part of a third** whole thing.

Here are three equal shapes divided into fourths.



Shade in two whole shapes $\frac{9}{4}$ and $\frac{1}{4}$ of the third shape.

How many fourths have you shaded in all? **9** fourths

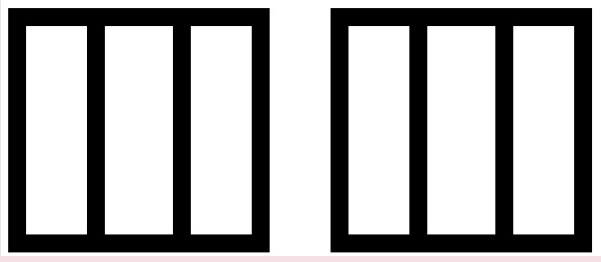
$$2\frac{1}{4} = \frac{9}{4}$$

Example I

Take the mixed number $1\frac{2}{3}$. This is one whole thing and part of a second whole thing.

Draw two equal shapes and divide them into thirds.

Shade in one whole shape $\frac{3}{3}$ and $\frac{2}{3}$ of the second shape.



How many thirds have you shaded in all? ___ thirds

$$1\frac{2}{3} = \frac{}{3}$$

To rename a mixed number as an improper fraction, multiply the whole number by the denominator of

the fraction and then add this to the numerator. Write the **total** as the new numerator over the denominator.

$$3\frac{1}{4} = \frac{}{4} \qquad 3 = \frac{12}{4}, \text{ so } = 3\frac{1}{4} = \frac{12}{4} + \frac{1}{4} = \frac{13}{4}$$

$$2\frac{1}{2} \qquad 2 \times 2 = \frac{4}{2} + \frac{1}{2} = \frac{5}{2}$$

Exercise 6

Rename each mixed number as an improper fraction.

a. $2\frac{4}{5} = \frac{14}{5}$

b. $8\frac{3}{8} = \frac{67}{8}$

c. $6\frac{5}{8} = \frac{}{8}$

d. $5\frac{1}{2} = \frac{}{2}$

e. $8\frac{4}{5} =$

f. $6\frac{1}{8} =$

g. $5\frac{3}{6} =$

h. $2\frac{7}{8} =$

i. $1\frac{8}{10} =$

j. $3\frac{6}{8} =$

Answers to Exercise 6

a. $\frac{14}{5}$

b. $\frac{67}{8}$

c. $\frac{53}{8}$

d. $\frac{11}{2}$

e. $\frac{44}{5}$

f. $\frac{49}{8}$

g. $\frac{33}{6}$

h. $\frac{23}{8}$

i. $\frac{18}{10}$

j. $\frac{30}{8}$

To Say or Write a Mixed Number

If you want to say these strange looking fractions out loud, do as follows.

Write or say: the whole number + and + the fraction

- $3\frac{2}{5}$ = three and two fifths
- $5\frac{1}{6}$ = five and one sixth

Exercise 7

Write the following fractions as words.

a. $2\frac{1}{8}$

b. $4\frac{3}{4}$

c. $1\frac{1}{2}$

d. $3\frac{3}{4}$

Answers to Exercise 7

a. Two and one eighth

b. Four and three fourths (or four and three quarters)

c. One and one half

d. Three and three fourths (or three and three quarters)

Topic B: Self-Test

Mark /12 Aim 9/12

A. Write the improper fraction and the mixed number that describe the shaded part of the drawings in each question (4 marks).

a. 

b. 

B. Rename each improper fraction as an equivalent mixed number or whole number (4 marks).

a. $\frac{9}{4} =$

b. $\frac{12}{3} =$

c. $\frac{5}{3} =$

d. $\frac{7}{2} =$

C. Rename as improper fractions (4 marks).

a. $3\frac{1}{2} =$

b. $4\frac{3}{8} =$

c. $1\frac{7}{8} =$

d. $2\frac{5}{6} =$

Answers to Topic B Self-Test

A. Write the improper fraction and the mixed number that describe the shaded part of the drawings in each question.

a. $\frac{10}{3} = 3\frac{1}{3}$

b. $\frac{7}{4} = 1\frac{3}{4}$

B. Rename each improper fraction as an equivalent mixed number or whole number.

a. $2\frac{1}{4}$

b. 4

c. $1\frac{2}{3}$

d. $3\frac{1}{2}$

C. Rename as improper fractions.

a. $\frac{7}{2}$

b. $\frac{35}{8}$

c. $\frac{15}{8}$

d. $\frac{17}{6}$

Topic C: When to Use a Fraction or a Decimal

Sometimes you need to decide to write or say a number as a fraction or a decimal. We usually choose the most common method which is usually the easiest way to say something. It may seem to you that nothing is easy at this moment, so here are some tips.

Money

When we talk about money, we almost always talk about a part of a dollar.

Example: Two dollars and fifteen cents is two whole dollars and fifteen parts of one more dollar.

\$2.15 or $\$2\frac{15}{100}$ – which of these ways of writing money is more common or easier to you?

We usually write or talk about money in decimals:

- **Example 1:** \$2.50 (two dollars and fifty cents) instead of $\$2\frac{1}{2}$ (two and a half dollars)
- **Example 2:** \$0.50 (fifty cents) instead of $\$\frac{1}{2}$ (half a dollar)
- **Example 3:** \$67.30 (sixty seven dollars and thirty cents) instead of \$67 (sixty seven dollars and thirty hundredths cents)

But: There is one place where we talk about money as a fraction: The quarter!

A quarter equals \$0.25, but we often say “it costs a quarter” as much as we say “it costs 25 cents.”

Really, if we were speaking correctly, it would be a quarter of a dollar, but it gets shortened. Also, we still write \$0.25 or 25¢, not $\$\frac{25}{100}$ or $\$\frac{1}{4}$.

For Other Things: What is Easiest

In most other ways of talking and writing, fractions and decimals are expressed in what seems easiest. This means that you get to say the number in the way you like best.

Example: Saying “six point four grams” may be faster and easier than saying “six and two fifths grams.”

But, saying $\frac{3}{4}$ of a tank of gas makes more sense than saying 0.75 of a tank of gas.

Exercise 1

Circle the way that you think a number should be said out loud.

Read the numbers out loud with a friend to help hear them. Remember, that sometimes your answers will be different from the ones in the answer key because you have a different opinion, and that is OK.

a. \$12.25 or $\$12\frac{1}{4}$

b. 51.4 cm or $51\frac{2}{5}$ cm

c. One million two hundred thousand dollars or one point two million dollars

d. 563.56 km or $563\frac{56}{100}$ km

e. $5\frac{7}{10}$ L or 5.7 L

f. I ran a tenth of a kilometre or I ran zero point one kilometres

g. It weighs five and a half grams or It weighs five point five grams

h. $\$39\frac{99}{100}$ or \$39.99

Answers to Exercise 1

a. \$12.25

b. 51.4 cm

c. One point two million dollars

d. 563.56 km

e. 5.7 L

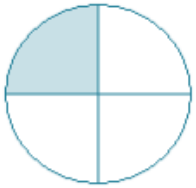
f. I ran a tenth of a kilometre

g. Both

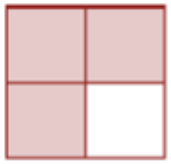
h. \$39.99

Unit 1 Review

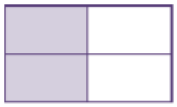
1. Write fractions from the pictures.

a. 

b. 

c. 

d. 

e. 

f. 

2. Draw your own fractions.

a. $\frac{2}{5}$

b. $\frac{3}{4}$

c. $\frac{4}{9}$

d. $\frac{1}{6}$

e. $\frac{1}{3}$

f. $\frac{7}{10}$

3. Write the following fractions in words.

a. $\frac{1}{2}$

b. $\frac{1}{4}$

c. $\frac{3}{4}$

e. $\frac{1}{3}$

d. $\frac{21}{25}$

f. $\frac{5}{6}$

4. Answer the questions using a common fraction.

   a. Suzie jogged 20 minutes out of 1 hour. What fraction of the hour did she jog? (Remember, 1 hour = 60 minutes.)

   b. Oliver planted 30 garlic cloves in September. 25 shoots have come up in the spring. What fractions of garlic bulbs did not grow a shoot?

   c. The class usually had 8 students, but 6 did not come on Monday. What fraction of students did not come?

   d. Stephen made 60 Easter cookies. His brother ate 3, his mom ate 3 more. What fraction of cookies were eaten by Stephen's family?

   e. Save On Foods grocery store sold 300 dozen eggs in one week. They had 450 dozen in stock. What fraction of the stock was sold?

   f. The test was out of 32. Sasha got 30 marks. What was her score?

5. Compare the following fractions:

   a. $\frac{3}{4} \_\_ \frac{1}{4}$

   b. $\frac{9}{10} \_\_ \frac{3}{10}$

   c. $\frac{1}{5} \_\_ \frac{3}{5}$

   d. $\frac{3}{8} \_\_ \frac{7}{8}$

e. seven tenths ___ three tenths

f. one quarter ___ three quarters

g. four fifths___ three fifths

h. one twelfth ___ eleven twelfths

6. Identify each fraction by writing: **proper fraction, improper fraction,** or **mixed number** to each fraction.

a. $\frac{1}{2}$

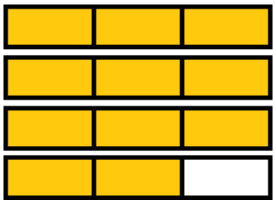
b. $\frac{100}{47}$

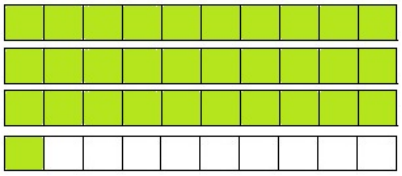
c. $\frac{5}{6}$

d. $\frac{51}{2}$

e. $42\frac{1}{4}$

7. Fill in the missing parts of the chart:

Improper Fraction	**Mixed Number**	**Drawing**
		
$\frac{29}{6}$		
	$2\frac{3}{4}$	

		
$\frac{9}{2}$		
	$3\frac{1}{3}$	

8. Rename each improper fraction into a mixed number or a whole number.

a. $\frac{9}{5} =$

b. $\frac{7}{2} =$

c. $\frac{11}{2} =$

d. $\frac{14}{5} =$

e. $\frac{4}{3} =$

f. $\frac{11}{6} =$

g. $\frac{7}{3} =$

h. $\frac{8}{4} =$

9. Rename each whole number as an improper fraction. Use the denominator given to you.

a. $6 = \frac{}{3}$

b. $5 = \frac{}{2}$

c. $3 = \frac{}{7}$

d. $7 = \frac{}{3}$

e. $8 = \frac{}{7}$

f. $1 = \frac{}{3}$

g. $2 = \frac{}{10}$

10. Rename each mixed number as an improper fraction.

a. $6\frac{7}{8} =$

b. $2\frac{1}{2} =$

c. $15\frac{4}{5} =$

d. $20\frac{3}{7} =$

e. $18\frac{1}{2} =$

f. $5\frac{9}{11} =$

Answers to Review

1. Write fractions from the pictures.

a. $\frac{1}{4}$

b. $\frac{2}{3}$

c. $\frac{3}{4}$

d. $\frac{1}{2}$

e. $\frac{2}{4}$

f. $\frac{4}{6}$

g. $\frac{8}{10}$

2. Draw your own fractions.
3. Write the following fractions in words.

a. One half
b. One fourth or one quarter
c. Three fourths or three quarters
d. Twenty-one twenty fifths
e. One third
f. Five sixths

4. Answer the questions using a common fraction.

a. $\frac{20}{60}$
b. $\frac{5}{30}$
c. $\frac{6}{8}$
d. $\frac{6}{60}$
e. $\frac{300}{450}$
f. $\frac{30}{32}$

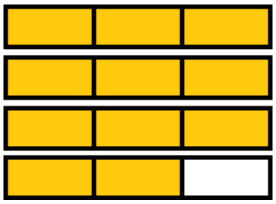
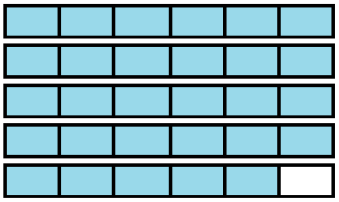
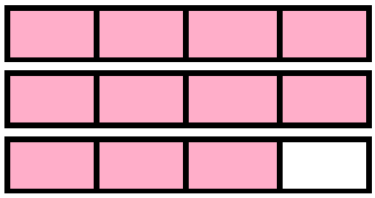
5. Compare the fractions.

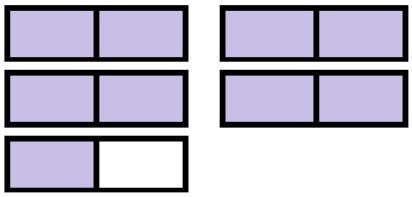
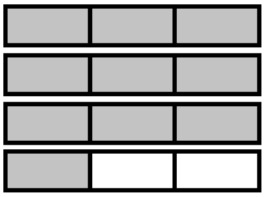
a. >
b. >
c. <
d. <
e. >
f. <
g. >
h. <

6. Identify each type of fraction.

a. proper fraction
b. improper fraction
c. proper fraction
d. improper fraction
e. mixed number

7. Fill in the missing parts of the chart.

Improper Fraction	**Mixed Number**	**Drawing**
$\frac{11}{3}$	$3\frac{2}{3}$	
$\frac{29}{6}$	$4\frac{5}{6}$	
$\frac{11}{4}$	$2\frac{3}{4}$	

$\frac{31}{10}$	$3\frac{1}{10}$	
$\frac{9}{2}$	$4\frac{1}{2}$	
$\frac{10}{3}$	$3\frac{1}{3}$	

8. Rename each improper fraction into a mixed number or a whole number.

a. $1\frac{4}{5}$

b. $3\frac{1}{2}$

c. $5\frac{1}{2}$

d. $2\frac{4}{5}$

e. $1\frac{1}{3}$

f. $1\frac{5}{6}$

g. $2\frac{1}{3}$

h. 2

9. Rename each whole number as an improper fraction.

a. $\frac{28}{3}$

b. $\frac{10}{2}$

c. $\frac{21}{7}$

d. $\frac{21}{3}$

e. $\frac{56}{7}$

f. $\frac{3}{3}$

g. $\frac{20}{10}$

10. Rename each mixed number as an improper fraction.

a. $\frac{55}{8}$

b. $\frac{5}{2}$

c. $\frac{79}{5}$

d. $\frac{143}{7}$

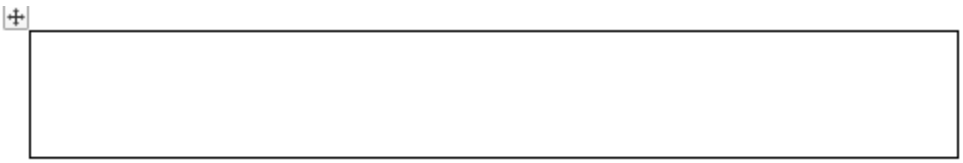
e. $\frac{37}{2}$

f. $\frac{64}{11}$

Unit 2: Equivalent Fractions

Topic A: Equivalent Fractions

Start from the left side of each drawing and shade in the fraction shown.



This shape is the whole thing

Shade $\frac{1}{2}$

Shade $\frac{2}{4}$

Shade $\frac{3}{6}$

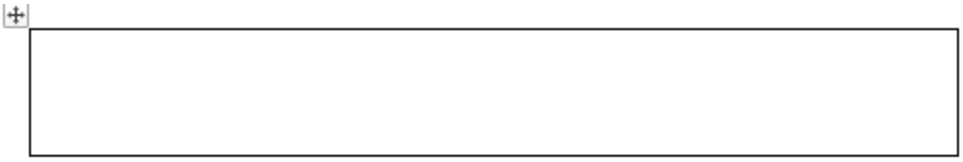
Shade $\frac{4}{8}$

Shade $\frac{5}{10}$

Did you notice that the amount you shaded was the same in each drawing?

The fractions that you were asked to shade are **equivalent fractions**. Equivalent fractions **are fractions that are equal**.

Now shade the fractions asked for in these drawings, the same way.



This shape is the whole thing

Shade $\frac{1}{3}$

Shade $\frac{2}{6}$

Shade $\frac{3}{9}$

Shade $\frac{4}{12}$

Shade $\frac{5}{15}$

These above examples are all equivalent fractions.

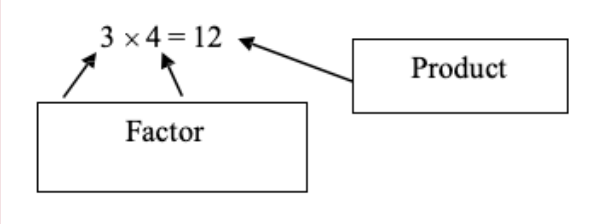
$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{5}{15}$$

To work with common fractions, it is often necessary to use an equivalent fraction in place of the fraction that is given. There are several processes to learn which will help you to find equivalent fractions.

Factors

Factors are the numbers which are multiplied together to make a **product**. An understanding of factors is needed to express fractions in lowest **terms**.

Example A



We say, “The factors of 12 are 3 and 4.”

Does 12 have any other factors?

What other numbers can be multiplied together to equal 12?

- $1 \times 12 = 12$ or $12 \times 1 = 12$
- $2 \times 6 = 12$ or $6 \times 2 = 12$
- $3 \times 4 = 12$ or $4 \times 3 = 12$

The factors of 12 are 1, 2, 3, 4, 6, 12.

Example B

Find the factors of 10.

- $1 \times 10 = 10$
- $2 \times 5 = 10$

The factors of 10 are 1, 2, 5, 10.

Example C

Find the factors of 9.

- $1 \times 9 = 9$
- $3 \times 3 = 9$

The factors of 9 are 1, 3, 9.

Exercise 1

Find all the factors

a. The factors of 16: $1 \times 16 = 16; 2 \times 8 = 16; 4 \times 4 = 16$ The factors of 16 are 1, 2, 4,

8, 16.

b. The factors of 4: $1 \times 4 = 4; 2 \times 2 = 4$ The factors of 4 are 1, 2, 4.

c. The factors of 8: _____

d. The factors of 20: _____

e. The factors of 5:_____

f. The factors of 15:_____

g. The factors of 21:_____

h. The factors of 6:_____

i. The factors of 25:_____

Answers to Exercise 1

c. 1, 2, 4, 8

d. 1, 2, 4, 5, 10, 20

e. 1, 5

f. 1, 3, 5, 15

g. 1, 3, 7, 21

h. 1, 2, 3, 6

i. 1, 5, 25

Some numbers **only have two factors, 1 and the number itself.** These numbers are called **prime numbers**. Look at the chart for some prime numbers.

Table for Prime numbers and factors

Prime Numbers	Factors
1	1,1
2	1,2
3	1,3
5	1,5
7	1,7
11	1,11
13	1,13
17	1,17
19	1,19
23	1,23
29	1,29

Add other prime numbers to the chart as you find them.

Reminder: Prime numbers only have two, prime factors.

Finding Common Factors

A **common factor** is a number used to reduce the numerator and denominator.

Example D

What are the common factors for $\frac{4}{6}$?

- Find the factors of 4 and 6.

- The factors of 4 are 1, 2, 4.
- The factors of 6 are 1, 2, 3, 6.

What factors do 4 and 6 have in common?

- 4: 1, 2, 4
- 6: 1, 2, 3, 6

The common factors of 4 and 6 are **1 and 2**

For the above equation, the factors are 1 and 2; however, 1 is not used as a **common factor**. This is because 1 is a factor of all **whole numbers**.

Example E

What are the common factors for $\frac{6}{15}$?

- Find the factors of 6 and 15.
  - The factors of 6 are 1, 2, 3,6
  - The factors of 15 are 1, 3,5,15.

What factors do 6 and 15 have in common?

- 6: 1, 2, 3,6
- 15: 1, 3,5,15

The common factor of 6 and 15 is 3

Example F

Find the common factors of $\frac{16}{24}$?

- Find the factors of 16 are 1, 2, 4, 8, 16
- The factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24
- The common factors of 16 and 24 are: 2, 4, 8
- 8 is called the **greatest common factor (GCF)** of 16 and 24 because it is the largest of all the

common factors

Exercise 2

Find the **Common Factors for each set of numbers.** Then identify the **Greatest Common Factor (GCF)**.

a. 10, 15
   - Factors of 10: 1, 2, 5, 10
   - Factors of 15: 1, 3, 5, 15
   - Common factors: 5
   - Greatest common factor: 5

b. 4, 16
   - Factors of 4: 1, 2, 4
   - Factors of 16: 1, 2, 4, 8, 16
   - Common factors: 2, 4
   - Greatest common factor: 4

c. 9,12
   - Factors of 9:
   - Factors of 12:
   - Common factors:
   - Greatest common factor:

d. 20, 30
   - Factors of 20:
   - Factors of 30:
   - Common factors:
   - Greatest common factor:

e. 18, 12
   - Factors of 18:
   - Factors of 12:
   - Common factors:
   - Greatest common factor:

f. 24, 32
   - Factors of 24:
   - Factors of 32:
   - Common factors:
   - Greatest common factor:

g. 8, 12
   - Factors of 8:
   - Factors of 12:
   - Common factors:
   - Greatest common factor:

h. 6, 9
   - Factors of 6:
   - Factors of 9:
   - Common factors:
   - Greatest common factor:

i. 9,15
   - Factors of 9:
   - Factors of 15:
   - Common factors:
   - Greatest common factor:

Answers to Exercise 2

a. 10, 15
   - Factors of 10: 1, 2, 5, 10
   - Factors of 15: 1, 3, 5, 15
   - Common factors: 5
   - Greatest common factor: 5

b. 4, 16
   - Factors of 4: 1, 2, 4
   - Factors of 16: 1, 2, 4, 8, 16
   - Common factors: 2, 4
   - Greatest common factor: 4

c. 9,12
   - Factors of 9: 1, 3, 9
   - Factors of 12: 1, 2, 3, 4, 6, 12
   - Common factors: 3
   - Greatest common factor: 3

d. 20, 30
   - Factors of 20: 1, 2, 4, 5, 10, 20
   - Factors of 30: 1, 2, 3, 5, 6, 10, 15, 30
   - Common factors: 2, 5, 10
   - Greatest common factor: 10

e. 18, 12
   - Factors of 18: 1, 2, 3, 6, 9, 18
   - Factors of 12:, 1, 2, 3, 4, 6, 12
   - Common factors: 2, 3, 6
   - Greatest common factor: 6

f. 24, 32
   - Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24
   - Factors of 32:, 1, 2, 4, 8, 16, 32
   - Common factors: 2, 4, 8
   - Greatest common factor: 8

g. 8, 12
   - Factors of 8: 1, 2, 4, 8
   - Factors of 12: 1, 2, 3, 4, 6, 12
   - Common factors: 2, 4
   - Greatest common factor: 4

h. 6, 9
   - Factors of 6: 1, 2, 3, 6
   - Factors of 9: 1, 3, 9
   - Common factors: 3
   - Greatest common factor: 3

i. 9, 15
   - Factors of 9: 1, 3, 9
   - Factors of 15: 1, 3, 5, 15
   - Common factors: 3
   - Greatest common factor: 3

Expressing Fractions in Lower Terms

Express means **to say it or write it.**

Lower terms means to express equivalent fractions with smaller (lower) denominators.

Look back to page 62. The equivalent fraction in lowest terms is $\frac{1}{2}$.

The words **simplify** and **reduce** are another way to say "**express fractions in lower (or lowest) terms**."

To express a fraction in lowest terms, do this:

Step 1: Find the greatest common factor (GCF) of the numerator and denominator.

- $\frac{4}{12}$ The factors of 4 are 1, 2, 4
- The factors of 12 are 1, 2, 3, 4, 6, 12

The GCF is 4.

Step 2: Divide the numerator and the denominator by the greatest common factor.

- $\frac{4}{12}\ \frac{\div 4}{\div 4} = \frac{1}{3}$
- $\frac{4}{12} = \frac{1}{3}$

Example G

$\frac{6}{9}$

The factors of 6 are 1, 2, 3 , 6.
The factors of 9 are 1, 3 , 9.

The GCF is 3.

- $\frac{6}{9}\frac{\div 3}{\div 3} = \frac{2}{3}$
- $\frac{6}{9} = \frac{2}{3}$

Example H

$$\frac{15}{24}$$

The factors of 15 are 1, 3,5,15
The factors of 24 are 1, 3, 4, 6, 8, 24.

The GCF is 3.

- $\frac{15}{24}\frac{\div 3}{\div 3} = \frac{5}{8}$
- $\frac{15}{24} = \frac{5}{8}$

There are several reasons lower terms are used:

- The math is usually easier with lower numbers.
- Is it easier to think of $\frac{1}{2}$ an apple or $\frac{15}{30}$ of an apple? ($\frac{1}{2}$ = $\frac{15}{30}$)
- Do you want to think about $\frac{155}{620}$ of your pay cheque or $\frac{1}{4}$ of your pay cheque? ($\frac{1}{4}$ = $\frac{155}{620}$)
- Always express fractions in lowest terms!

Dividing both the numerator and denominator **by the GCF** will give an equivalent fraction in lower terms.

Exercise 3

Express each fraction in **lowest terms.** (The directions could also say, “Simplify each fraction,” or “Reduce these fractions”).

a. $\frac{2}{4}\frac{\div 2}{\div 2} = \frac{1}{2}$, $\frac{3}{9}\frac{\div}{\div}$ = _____

b. $\frac{2}{12}\frac{\div 2}{\div 2} = \frac{1}{6}$, $\frac{3}{15}\frac{\div}{\div}$ = _____

c. $\frac{5}{10}\frac{\div}{\div}$ = _____ $\frac{4}{24}\frac{\div}{\div}$ = _____

d. $\frac{10}{25}\frac{\div}{\div}$ = _____ $\frac{9}{12}\frac{\div}{\div}$ = _____

e. **Make sure that you write in the GCF you are dividing with. Do not skip this step until you are absolutely sure you can do it correctly in your head each time.**

(Good mathematicians know when to skip steps and when not to… sometimes easy steps are never skipped by good mathematicians).

f. $\frac{3}{30}$ = _____ $\frac{6}{10}$ = _____

g. $\frac{9}{24}$ = _____ $\frac{18}{27}$ = _____

h. $\frac{4}{16}$ = _____ $\frac{3}{12}$ = _____

i. $\frac{15}{24}$ = _____ $\frac{15}{25}$ = _____

j. $\frac{2}{32}$ = _____ $\frac{6}{20}$ = _____

Answers to Exercise 3

a. $\frac{1}{2}, \frac{1}{3}$

b. $\frac{1}{6}, \frac{1}{5}$

c. $\frac{1}{2}, \frac{1}{6}$

d. $\frac{2}{5}, \frac{3}{4}$

e. $\frac{1}{10}, \frac{3}{5}$

f. $\frac{3}{8}, \frac{2}{3}$

g. $\frac{1}{4}, \frac{1}{4}$

h. $\frac{5}{8}, \frac{3}{8}$

i. $\frac{1}{16}, \frac{3}{10}$

Expressing Fractions in Higher Terms

Higher Terms are needed when you add and subtract fractions with different denominators.

You have learned that **dividing** both the numerator and denominator of a fraction by a common factor

gives an equivalent fraction in lower terms. You know that dividing and multiplying are opposite operations, so this next rule will match the one you just learned for reducing:

Multiplying both the **numerator and denominator** of a fraction by the same number (a **common factor)** will give an **equivalent fraction** in **higher terms**.

Example I

$$\frac{3}{5}\left(\frac{\times 2}{\times 2}\right) = \frac{6}{10}$$

$$\frac{3}{5} = \frac{6}{10}$$

Example J

$$\frac{1}{2}\left(\frac{\times 8}{\times 8}\right) = \frac{8}{16}$$

$$\frac{1}{2} = \frac{8}{16}$$

Example K

$$\frac{2}{3}\left(\frac{\times 3}{\times 3}\right) = \frac{6}{9}$$

$$\frac{2}{3} = \frac{6}{9}$$

Are the Fractions Equivalent?

If the denominators are the same, you can easily judge if the fractions are equivalent by comparing the numerators.

Compare $\frac{4}{5}$ and $\frac{3}{5}$: $\frac{4}{5} \neq \frac{3}{5}$ ($\neq$ means 'not equal')

Compare $\frac{12}{20}$ and $\frac{12}{20}$: $\frac{12}{20} = \frac{12}{20}$

If the denominators are different, you **might be able to rewrite one or more of the fractions so they have the same denominator.**

Compare $\frac{4}{5}$ and $\frac{6}{10}$: $\frac{6}{10}\ \frac{\div 2}{\div 2} = \frac{3}{5}$ So: $\frac{4}{5} \neq \frac{3}{5}$

Compare $\frac{12}{16}$ and $\frac{5}{8}$: $\frac{5}{8}\ \frac{\times 2}{\times 2} = \frac{10}{16}$ So: $\frac{12}{16} \neq \frac{10}{16}$

or you could do this: $\frac{12}{16}\ \frac{\div 2}{\div 2} = \frac{6}{8}$ So: $\frac{6}{8} \neq \frac{5}{8}$

A quick method is to **cross multiply**:

1. multiply the numerator of one fraction by the denominator of the second fraction
2. multiply the numerator of the **other** fraction by the denominator of the **first** fraction These are called the *cross-products*.
   If the cross products are the same, then the fraction is equivalent.

Look at the examples:

Example L

Compare $\frac{4}{7}$ and $\frac{5}{9}$

- Multiply the numerator 4 by the denominator 9

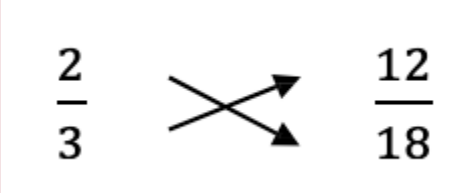
- $4 \times 9 = 36$

- Multiply the denominator 7 by the numerator 5
  - $7 \times 5 = 35$
- The products 36 and 35 **are not** the same.

Therefore $\frac{4}{7} \neq \frac{5}{9}$

Example M

Compare $\frac{2}{3}$ and $\frac{12}{18}$



- $2 \times 18 = 36$
- $3 \times 12 = 36$
- The products 36 and 36 **are** the same

Therefore $\frac{2}{3} \neq \frac{12}{18}$

Example N

Compare $\frac{24}{40}$ and $\frac{4}{10}$

- $24 \times 10 = 240$

- $40 \times 4 = 160$
- The products 240 and 160 **are not** the same.

Therefore $\frac{24}{40} \neq \frac{4}{10}$

Exercise 4

State if each pair is **equivalent (=)** or **not equivalent** (≠). Use whichever method you wish to find the answer.

a. $\frac{5}{6}$ = _____ $\frac{30}{60}$

b. $\frac{12}{24}$ = _____ $\frac{1}{2}$

c. $\frac{6}{7}$ = _____ $\frac{7}{8}$

d. $\frac{2}{3}$ = _____ $\frac{12}{18}$

e. $\frac{1}{3}$ = _____ $\frac{24}{72}$

f. $\frac{3}{4}$ = _____ $\frac{15}{20}$

g. $\frac{12}{14}$ = _____ $\frac{6}{7}$

h. $\frac{4}{10}$ = _____ $\frac{20}{50}$

i. $\frac{5}{10}$ = _____ $\frac{7}{14}$

Answers to Exercise 4

a. ≠

b. =

c. ≠

d. =

e. =

f. =

g. =

h. =

i. =

Rounding Common Fractions to Whole Numbers

When rounding to a whole number, if a fraction is less than do not change the whole number:

Examples:

- $2\frac{4}{7} \approx 2$
- $23\frac{1}{3} \approx 23$
- $\frac{1}{4} \approx 0$
- $5\frac{3}{8} \approx 5$

If the fraction is $\frac{1}{2}$ or more, consider the fraction as **another one** which must be added to the whole number:

Examples:

- $2\frac{1}{2} \approx 3$
- $6\frac{7}{8} \approx 7$
- $15\frac{4}{5} \approx 16$
- $\frac{3}{4} \approx 1$

If you are not sure if a fraction is more or less than $\frac{1}{2}$, you can compare it to $\frac{1}{2}$, by making equivalent fractions with a common denominator.

Reminder: greater > smaller

Example O

Round $\frac{2}{3}$ to a whole number.

Is $\frac{2}{3} > \frac{1}{2}? \longrightarrow \frac{2}{3} = \frac{4}{6}$ and $\frac{1}{2} = \frac{3}{6}$

YES! $\frac{2}{3} > \frac{1}{2}$ so $\frac{2}{3} \approx 1$

Example P

Round $2\frac{4}{7}$ to a whole number.

Is $\frac{4}{7} > \frac{1}{2}? \longrightarrow \frac{4}{7} = \frac{8}{14}$ and $\frac{1}{2} = \frac{7}{14}$

YES! $\frac{4}{7} > \frac{1}{2}$ so $2\frac{4}{7} \approx 1$

Exercise 5

Round to the nearest whole number

a. $\frac{4}{5} \approx 1$

b. $2\frac{1}{3} \approx 2$

c. $18\frac{1}{2} \approx$ _____

d. $3\frac{7}{8} \approx$ _____

e. $9\frac{9}{10} \approx$ _____

f. $\frac{1}{8} \approx$ _____

g. $4\frac{1}{6} \approx$ _____

h. $12\frac{7}{9} \approx$ _____

i. $6\frac{3}{5} \approx$ _____

j. $20\frac{3}{7} \approx$ _____

k. $\frac{13}{15} \approx$ _____

l. $99\frac{2}{3} \approx$ _____

Answers to Exercise Five

c. 19
d. 4
e. 10
f. 0
g. 4
h. 13
i. 7
j. 20
k. 1
l. 100

Topic A: Self-Test

Mark /25 Aim 20/25

A. Define (3 marks)

a. equivalent _____

b. prime number _____

c. greatest common factor (GCF) _____

B. Complete the chart (5 marks)

	Factors	**Common Factors**	**Greatest Common Factor**
12 **18**			
15 **30**			
7 **28**			
6 **16**			
18 **27**			

C. Express in lowest terms. (6 marks)

a. $\frac{10}{15}$ = _____.

b. $\frac{14}{16}$ = _____.

c. $\frac{8}{12}$ = _____.

D. State if each pair of fractions is equivalent (=) or not equivalent ( ). (6 marks)

a. $\frac{5}{9}$ _____ $\frac{15}{27}$

b. $\frac{3}{7}$ _____ $\frac{15}{35}$

E. Round to the nearest whole number (5 marks)

a. $4\frac{5}{8} \approx$ _____

b. $19\frac{4}{10} \approx$ _____

c. $\frac{1}{2} \approx$ _____

d. $6\frac{3}{4} \approx$ _____

e. $\frac{1}{3} \approx$ _____

Answers to Topic A Self-Test

A. Check your definitions in the glossary

B. Complete the chart

	Factors	**Common Factors**	**Greatest Common Factor**
12 **18**	… of 12 are 1, 2, 3, 4, 6, 12 … of 18 are 1, 2, 3, 6, 9, 18	2, 3, 6	6
15 **30**	… of 15 are 1, 3, 5, 15 … of 30 are 1, 2, 3, 5, 6, 10, 15, 30	3, 5, 15	15
7 **28**	… of 7 are 1, 7 … of 28 are 1, 2, 4, 7, 14, 28	7	7
6 **16**	… of 6 are 1, 2, 3, 6 … of 16 are 1, 2, 4, 8, 16	2	2
18 **27**	… of 18 are 1, 2, 3, 6, 9, 18 … of 27 are 1, 3, 9, 27	3, 9	9

C. **Express in lowest terms.**

a. $\frac{2}{5}$

b. $\frac{7}{8}$

c. $\frac{2}{3}$

D. **State if each pair of fractions is equivalent (=) or not equivalent ( ).**

a. =

b. =

c. ≠

d. ≠

E. **Round to the nearest whole number.**

a. 5

b. 19

c. 1

d. 7

e. 0

Unit 2 Review

1. Find all the factors for each number. If a number is a prime number, write “prime” next to it.
    a. 4 _____
    b. 10 _____
    c. 21 _____
    d. 6 _____
    e. 2 _____
    f. 16 _____
2. Find the factors, common factors and the **G**reatest **C**ommon **F**actor **(GCF)**.

Factors Activity

	Factors	**Common Factors**	**GCF**
$\frac{2}{8}$			
$\frac{8}{16}$			
$\frac{24}{32}$			
$\frac{9}{12}$			
$\frac{5}{15}$			
$\frac{25}{30}$			
$\frac{4}{12}$			

3. Express each fraction **in lowest terms**. Remember: be sure to write the greatest common factor (**GCF**) you are dividing with.

    a. $\frac{6}{9}$ = b. $\frac{6}{18}$ = c. $\frac{12}{28}$ =

d. $\frac{15}{30}$ =

e. $\frac{4}{24}$ =

f. $\frac{10}{18}$ =

4. Circle the fractions that are in lowest terms.

a. $\frac{1}{2}$

b. $\frac{3}{6}$

c. $\frac{4}{5}$

d. $\frac{3}{9}$

e. $\frac{4}{8}$

f. $\frac{5}{10}$

5. Find all the fractions that are **not already** in lowest terms and reduce them. Write "lowest terms" next to those already reduced.

a. $\frac{4}{8}$ =

b. $\frac{2}{5}$ =

c. $\frac{8}{12}$ =

d. $\frac{15}{35}$ =

e. $\frac{42}{80}$ =

f. $\frac{6}{36}$ =

g. $\frac{9}{15}$ =

6. State if each pair of fractions is equivalent (=) or not equivalent (≠).

a. $\frac{4}{5}$ _____ $\frac{7}{8}$

b. $\frac{10}{12}$ _____ $\frac{5}{6}$

c. $\frac{5}{15}$ _____ $\frac{1}{3}$

d. $\frac{6}{7}$ _____ $\frac{36}{41}$

e. $\frac{3}{5}$ _____ $\frac{15}{25}$

7. Round to the nearest whole number

a. $1\frac{1}{4}$ =

b. $4\frac{3}{4}$ =

c. $6\frac{4}{5}$ =

d. $3\frac{1}{4}$ =

e. $12\frac{8}{9}$ =

Answers to Unit 2 Review

1. Find all the factors for each number, some of the numbers are prime numbers, write "prime" next to it.

a. 1,2,4
b. 1,2,5,10
c. 1,3,7,21
d. 1,2,3,6
e. 1,2, prime
f. 1,2,4,8,16

2. Find the factors, common factors and the **G**reatest **C**ommon **F**actor **(GCF).**

Greatest Common Factors (GCF)

	Factors	**Common Factors**	**GCF**
$\frac{2}{8}$	1,2 1,2,4,8	1,2	2
$\frac{8}{16}$	1,2,4,8 1,2,4,8,16	2,4,8	8
$\frac{24}{32}$	1,2,3,4,6,8,12,24 1,2,4,8,16,32	2,4,8	8
$\frac{9}{12}$	1,3,9 1,2,3,4,6,12	3	3
$\frac{5}{15}$	1,5 1,3,5,15	5	5
$\frac{25}{30}$	1,5,25 1,2,3,5,6,10,15,30	5	5
$\frac{4}{12}$	1,2,4 1,2,3,4,6,12	24	4

3. Express each fraction **in lowest terms**. Remember: be sure to write the **GCF** you are dividing with.

a. $\frac{2}{3}$
b. $\frac{1}{3}$
c. $\frac{3}{7}$
d. $\frac{1}{2}$
e. $\frac{1}{6}$
f. $\frac{7}{8}$
g. $\frac{5}{9}$

4. **Circle the fractions that are in lowest terms.**

1. $\frac{1}{2}$
2. $\frac{4}{5}$

5. **Find** all the fractions that **are not** already **in lowest terms and reduce them.** Write "lowest terms" next to those already reduced.

a. $\frac{1}{2}$

b. lowest terms

c. $\frac{2}{3}$

d. lowest terms

e. $\frac{(3)}{(7)}$

f. $\frac{21}{40}$

g. $\frac{1}{6}$

h. $\frac{3}{5}$

6. **State if each pair of fractions is equivalent (=) or not equivalent (≠).**

1. ≠
2. =
3. =
4. ≠
5. =

7. **Round to the nearest whole number.**

1. 1
2. 5
3. 7
4. 3
5. 13

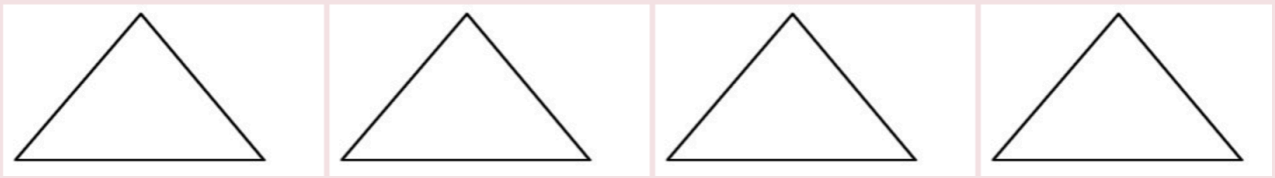
Unit 3: Multiplying & Dividing Fractions

Topic A: Multiplying Fractions

Example A

What is $\frac{1}{4}$ of 4? (HINT: Replace the word **of** with a **× sign**)

Here are four equal shapes:



Shade in $\frac{1}{4}$ of the shapes.

You should have one shape shaded.

You have just done this multiplication question:

$$\frac{1}{4} \times 4 = 1 \text{ or } \frac{1}{4} \text{ of } 4 = 1$$

Example B

What is $\frac{2}{5}$ of 5?

Draw 5 equal shapes:

Shade in $\frac{2}{5}$ of the shapes.

You should have shaded in two shapes.

$$\frac{2}{5} \times 5 = 2 \text{ or } \frac{2}{5} \text{ of } 5 = 2$$

Example C

What is $\frac{1}{2}$ of 10?

Here are 10 equal shapes:

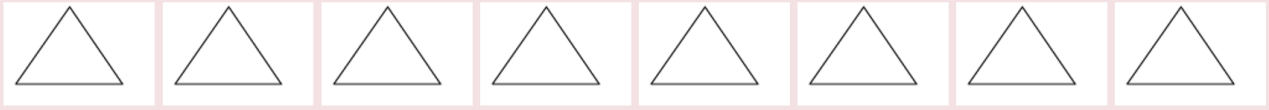
Shade in $\frac{1}{2}$ of the shapes.

Did you shade 5?

$$\frac{1}{2} \times 10 = 2 \textbf{ or } \frac{1}{2} \text{ of } 10 = 5 \text{ of 10 = 5}$$

Example D

What is $\frac{1}{4}$ of 8?



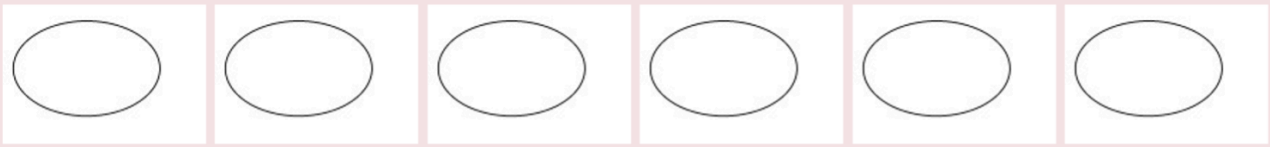
Shade in $\frac{1}{4}$ of the shapes.

First, divide the 8 shapes into 4 equal groups.

Now shade 1 group. $\frac{1}{4} \times 8 = 2$ or $\frac{1}{4} \text{ of } 8 = 2$

Example E

What is $\frac{2}{3}$ of 6?



Shade in $\frac{2}{3}$ of the shapes.

First, divide the 6 shapes into 3 equal groups.

Now shade 2 group. $\frac{2}{3} \times 6 = 4$

These examples calculate a **fraction of a whole number.** Some everyday examples, with the answers, are listed:

A. I burned $\frac{1}{2}$ of the hamburger patties. There were 8 patties. How many patties were burned? $\frac{1}{2}$ of 8 patties = $\frac{1}{2} \times 8 = 4$ burned patties.

B. Mary only finished $\frac{3}{4}$ of the test. The test had 20 questions. How many questions did Mary do? $\frac{3}{4}$ of test = $\frac{3}{4}$ of 20 questions = $\frac{3}{4} \times 20 = 15$ questions.

C. $\frac{1}{5}$ of the employees have been laid off. There are 50 employees. How many have been laid off? $\frac{1}{5}$ of 50 employees = $\frac{1}{5} \times 50 = 10$ employees laid off.

D. We spend $\frac{1}{4}$ of our monthly take-home pay on rent. Our take-home pay is $1600. How much is the rent? $\frac{1}{4}$ of pay = $\frac{1}{4}$ of $1600 = $\frac{1}{4} \times \$1600 = \$400$ on rent

Exercise 1

Write the multiplication equation you would use to find the fraction of the whole number. You do not have to calculate the answers.

a. More than $\frac{1}{3}$ of the students are single parents. There are 27 students. How many students are single parents?

b. We have ten houses on our street $\frac{2}{5}$ of the houses have cedar shake roofs. How many houses have cedar shake roofs?

c. The guinea hen hatched 16 chicks. The ravens snatched $\frac{3}{8}$ of the chicks. How many chicks did the ravens take?

Answers to Exercise 1

a. $\frac{1}{3} \times 27 = 9$ b. $\frac{2}{5} \times 10 = 4$ c. $\frac{3}{8} \times 16 = 6$

Now let's look at multiplying a fraction by a whole number

- $4 \times \frac{1}{3} =$
- $3 \times \frac{4}{5} =$
- $22 \times \frac{1}{4} =$

The order of writing the multiplication equation will not change the product, but it does change how we understand what the numbers mean. Again, look at the examples:

Example F

$4 \times \frac{1}{2}$ means you have four halves.

Imagine tomatoes cut in half and you have 4 halves.

How many tomatoes would you have altogether?

4 halves = 2 tomatoes

$$4 \times \frac{1}{2} = 2$$

Example G

$3 \times \frac{1}{4}$ means that you have $\frac{1}{4}$ of something three times. Imagine that you spent $\frac{1}{4}$ of an hour exercising in the morning, $\frac{1}{4}$ of an hour exercising after lunch, and $\frac{1}{4}$ of an hour exercising in the evening.

How long did you exercise?

$$3 \times \frac{1}{4} \text{ hour} = \frac{3}{4} \text{ hour} = \text{three quarters of an hour}$$

Here are some everyday examples of multiplying a fraction by a whole number:

0. There are six boxes of cereal open in the cupboard and each one is 1/3 full.
   It is the same as having _____ full boxes of cereal. $6 \times \frac{1}{3}$ box of cereal = $\frac{6}{3}$ = 2 boxes of cereal
1. We have three packs of ground beef that are $\frac{1}{2}$ full. How much meat is there altogether?
   $3 \times \frac{1}{2}$ pack of meat = $\frac{3}{2}$ = $1\frac{1}{2}$ packs of meat.
2. How much gas do we have for the motorboat? There are 4 jerry cans (cans for carrying gas), each about $\frac{1}{4}$ full. $4 \times \frac{1}{4}$ cans of gas = $\frac{4}{4}$ = 1 can of gas.

Exercise 2

Write the multiplication equation you would use to multiply a fraction by a whole number. You do not have to calculate the
answer.

a. I should buy more shampoo, but this bathroom has five bottles of the stuff lying around! Each bottle is about $\frac{1}{8}$ full. How much shampoo is there altogether?

b. When we double a recipe, we multiply each ingredient by 2. Double a recipe that uses $\frac{1}{4}$ teaspoon of nutmeg. How much nutmeg is needed?

Answers to Exercise 2

a. $5 \times \frac{1}{8} = \frac{3}{4}$

b. $\frac{1}{4} \times 2 = \frac{1}{2}$

Multiplying a Whole Number and a Proper Fraction

Any whole number can be written with a denominator of 1. (This does not change the value of the whole number because a number divided by one is still the same whole number in the end.)

- 1= $\frac{1}{1}$
- 2 = $\frac{2}{1}$
- 3= $\frac{3}{1}$
- 4= $\frac{4}{1}$
- 100 = $\frac{100}{1}$
- and so on.

To multiply a whole number and a fraction, do this:

Step 1: Write the whole number as a fraction with a denominator of 1.

Step 2: Multiply the numerator by the numerator.

Step 3: Multiply the denominator by the denominator.

Step 4: Simplify the product

Example H

$\frac{4}{6} \times 6 =$

Step 1: Write the whole number with a denominator of 1.

$\frac{4}{5} \times \frac{6}{1} =$

Step 2: Multiply the numerators.

$\frac{4}{5} \times \frac{6}{1} = \frac{24}{\quad}$

Step 3: Multiply the denominators

$\frac{4}{5} \times \frac{6}{1} = \frac{24}{5}$

Step 4: Write your answer in lowest terms

Since $\begin{array}{r} 4 \\ 5\overline{)24} \\ \underline{20} \\ 04 \end{array}$ $\frac{24}{5} = 4\frac{4}{5}$ Then $\frac{4}{6} \times 6 = 4\frac{4}{5}$

Example I

Step 1:

$\frac{1}{2} \times 3 =$

Step 2 & 3:

$\frac{1}{2} \times \frac{3}{1} =$

$\frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$

Step 4: Write your answer in lowest terms

Since $\begin{array}{r} 1 \\ 2\overline{)3} \\ \underline{-2} \\ 1 \end{array}$ $\frac{3}{2} = 1\frac{1}{2}$ Then $\frac{1}{2} \times 3 = 1\frac{1}{2}$

Example J

$\frac{2}{3} \times 4 =$

- $\frac{2}{3} \times \frac{4}{1} = \frac{8}{3} = 2\frac{2}{3}$

- $$\begin{array}{r} 2 \\ 3\overline{)8} \\ -6 \\ \hline 2 \end{array}$$

Example K

$7 \times \frac{3}{4} =$

- $\frac{7}{1} \times \frac{3}{4} = \frac{21}{4} = 5\frac{1}{4}$
- $$\begin{array}{r} 5 \\ 4\overline{)21} \\ -20 \\ \hline 01 \end{array}$$

Exercise 3

Multiply these fractions. Write your answers in lowest terms.

a. $\frac{3}{5} \times 10 =$

$\frac{3}{5} \times \frac{10}{1} = \frac{30}{5} = 6$

$$\begin{array}{r} 6 \\ 5\overline{)30} \\ -30 \\ \hline 0 \end{array}$$

b. $8 \times \frac{1}{10} =$

$\frac{8}{1} \times \frac{1}{10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$

c. $\frac{2}{3} \times 9 =$

d. $4 \times \frac{1}{6} =$

e. $1 \times \frac{3}{8} =$

f. $\frac{1}{2} \times 5 =$

g. $5 \times \frac{2}{3} =$

h. $\frac{1}{2} \times 8 =$

i. $6 \times \frac{1}{5} =$

j. $\frac{3}{2} \times 12 =$

k. $\frac{3}{8} \text{of} 4 =$

l. $\frac{7}{8} \text{ of } 3 =$

Answers to Exercise 3

a. 6

b. $\frac{2}{3}$

c. $\frac{3}{8}$

d. $2\frac{1}{2}$

e. $3\frac{1}{3}$

f. 4

g. $1\frac{1}{5}$

h. 18

i. $1\frac{1}{2}$

j. $2\frac{5}{8}$

Multiplying Common Fractions Together

To multiply common fractions, multiply the numerator times the numerator and then the denominator times the denominator and simplify the answer. (Write the answer in lowest terms.)

The method is easy, but let’s take a look at what you’re doing.

Example L

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{2}$ of $\frac{1}{2}$ =

Take an apple and cut it in half

Now cut one of the halves in half. What fraction of the whole apple do you get?

You get $\frac{1}{4}$ of the apple. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

Example M

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{2}$ of $\frac{1}{2}$ =

You borrowed 3⁄4 of a bag of cement from your neighbor. You used 1⁄3 of the cement and gave the bag back to him. How much of your neighbour's bag of cement did you use?

$\frac{3}{4}$ of a bag

$\frac{2}{4}$ of a bag

Use $\frac{1}{3}$ of this

$\frac{1}{3}$ of $\frac{3}{4} = \frac{1}{4}$ of the bag used

Used $\frac{1}{4}$ of a bag

Example N

You are making a marinade to tenderize that cheap steak you bought. It calls for $\frac{2}{3}$ cup of beer. You only need $\frac{1}{2}$ of the amount the recipe makes and it would be a shame to waste the beer. How much beer is needed?

$\frac{1}{2}$ of $\frac{2}{3}$

$\frac{1}{3}$ of a cup

$\frac{1}{2}$ of $\frac{2}{3}$ cup of beer = $\frac{1}{2}$ of $\frac{2}{3}$ cup of beer = $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{2}{6} \frac{\div 2}{\div 2} = \frac{1}{3}$ cup of beer.

Exercise 4

Multiply these fractions. Write the answers in lowest terms

a. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

b. $\frac{1}{2} \times \frac{4}{2} =$

c. $\frac{3}{5} \times \frac{2}{4} =$

d. $\frac{2}{5} \times \frac{3}{5} =$

e. $\frac{5}{6} \times \frac{1}{4} =$

f. $\frac{5}{10} \times \frac{1}{4} =$

g. $\frac{1}{4} \times \frac{1}{8} =$

h. $\frac{8}{10} \times \frac{2}{3} =$

Answers to Exercise 4

b. 1

c. $\frac{3}{10}$

d. $\frac{6}{25}$

e. $\frac{5}{24}$

f. $\frac{1}{8}$

g. $\frac{1}{32}$

h. $\frac{8}{15}$

Simplify Before Multiplying

Review Factors and Expressing Fractions in Lower Terms in Topic B. Multiplication of common fractions can be made much easier if you simplify before you multiply. In a multiplication question any numerator and any denominator may be divided by a common factor. This is sometimes called cancelling.

Step 1: Look to see if any numerator and any denominator have **C**ommon **F**actors. Choose the **G**reatest **C**ommon **F**actor.

Step 2: Divide that numerator and that denominator by the **G**reatest **C**ommon **F**actor (**GCF**). Be sure to cross out the old numerals and put in the **lower terms**.

Step 3: Multiply the numerators (Be sure to use the lower term!) and then the denominators.

Step 4: Simplify.

Example O

$\frac{3}{4} \times \frac{1}{6}$

Step 1: Numerator 3 and denominator 6 have a common factor of 3.

Step 2: $\frac{\cancel{3}\,1}{4} \times \frac{1}{\cancel{6}\,2}$ $3 \div 3 = 1$ and $6 \div 3 = 2$

Step 3: $\frac{\cancel{3}\,1}{4} \times \frac{1}{\cancel{6}\,2} = \frac{1}{8}$

Step 4: The answer is already in lowest terms.

Example P

$\frac{3}{4} \times \frac{8}{9} =$

Step 1: Numerator 3 and denominator 9 have a common factor of 3, AND numerator 8 and denominator 4 have common factors of 2 and 4. The G.C.F. is 4.

Step 2: $\frac{\cancel{3}\,1}{\cancel{4}\,1} \times \frac{\cancel{8}\,2}{\cancel{9}\,3}$ 3 ÷ 3 = 1, 9 ÷ 3 = 3, 8 ÷ 4 = 2, and 4 ÷ 4 = 1

Step 3: = $\frac{\cancel{3}\,1}{\cancel{4}\,1} \times \frac{\cancel{8}\,2}{\cancel{9}\,3} = \frac{2}{3}$

Step 4: The answer is already in lowest terms.

Example Q

$\frac{3}{8} \times 12 =$

- $\frac{3}{8} \times \frac{12}{1}$ (Numerator 12 and denominator 8 have a G.C.F. of 4)
- $\frac{3}{\cancel{8}\,2} \times \frac{\cancel{12}\,3}{1} = \frac{9}{2} = 4\frac{1}{2}$

It is easier to simplify (or cancel) before you multiply because the numbers are smaller and the factors easier to find.

You may make fewer multiplying mistakes, too.

Exercise 5

Find the products. Simplify before multiplying when possible.

a. $\frac{5}{6} \times \frac{4}{5} = \frac{\cancel{5}^{1}}{\cancel{6}_{3}} \times \frac{\cancel{4}^{2}}{\cancel{5}_{1}} = \frac{2}{3}$

b. $\frac{3}{5} \times \frac{5}{9} = \frac{\cancel{3}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{5}^{1}}{\cancel{9}_{3}} = \frac{1}{3}$

c. $\frac{3}{16} \times \frac{8}{9} =$

d. $\frac{2}{5} \times \frac{5}{8} =$

e. $\frac{4}{21} \times \frac{7}{8} =$

f. $\frac{9}{10} \times \frac{2}{3} =$

g. $\frac{2}{5} \times \frac{10}{7} =$

h. $\frac{3}{4} \times \frac{1}{12} =$

A multiplication question may have more than two fractions to be multiplied, such as

$$\frac{2}{3} \times \frac{9}{10} = \frac{5}{8} = \frac{3}{8}$$

Cancel any numerator with any denominator and then multiply all numerators together and then all denominators together. Study this worked example:

Numerator 2 and denominator 8 have a common factor of 2, numerator 9 and denominator 3 have a common factor of 3, AND numerator 5 and denominator 10 have a common factor of 5:

$$\frac{\cancel{2}^{1}}{\cancel{8}_{4}} \times \frac{\cancel{9}^{3}}{\cancel{10}_{2}} \times \frac{\cancel{5}^{1}}{\cancel{3}_{1}} = \frac{3}{8}$$

i. $\frac{8}{9} \times \frac{3}{4} =$

j. $\frac{1}{2} \times \frac{2}{5} \times \frac{5}{7} =$

k. $\frac{3}{5} \times \frac{2}{3} \times \frac{1}{2} =$

l. $2 \times \frac{3}{4} \times \frac{5}{12} =$

m. $\frac{4}{9} \times \frac{3}{5} \times \frac{15}{16} =$

n. $\frac{2}{3} \times \frac{3}{4} \times \frac{8}{9} =$

Answers to Exercise 5

c. $\frac{1}{6}$

d. $\frac{1}{4}$

e. $\frac{1}{6}$
f. $\frac{3}{5}$
g. $\frac{4}{7}$
h. $\frac{1}{16}$
i. $\frac{2}{3}$
j. $\frac{1}{7}$
k. $\frac{1}{5}$
l. $\frac{5}{8}$
m. $\frac{1}{4}$
n. $\frac{4}{9}$

Multiplying Mixed Numbers

Review Renaming Mixed Numbers as Improper Fractions in Unit One. To multiply with a mixed number, follow these steps:

Step 1: Rename any mixed numbers as improper fractions.

Step 2: Write any whole number by itself as an improper fraction with a denominator of 1.

Step 3: Rewrite the question with the new improper fraction(s).

Step 4: Simplify (cancel).

Step 5: Multiply the numerator by the numerator.

Multiply the denominator by the denominator.

Step 6: The answer will often be an improper fraction. Rename improper fractions as mixed numbers, and be sure any fraction is in lowest terms.

Example R

$2\frac{3}{4} \times \frac{1}{3} =$

Step 1: $2\frac{3}{4} = \frac{11}{4}$

Step 2: No whole numbers by themselves.

Step 3: Question is rewritten as $\frac{11}{4} \times \frac{1}{3}$

Step 4: Simplify – the fraction has no common factors. Can't simplify.

Step 5: $\frac{11}{4} \times \frac{1}{3} = \frac{11}{12}$

Step 6: Already in lowest terms.

Example S

$1\frac{1}{5} \times 2\frac{2}{3}$

Step 1: $1\frac{1}{5} = \frac{6}{5}$ and $2\frac{2}{3} = \frac{8}{3}$

Step 2: No whole numbers by themselves.

Step 3: Question is rewritten as $\frac{6}{5} \times \frac{8}{3}$

Step 4 & 5: $\frac{\cancel{6}\,2}{5} \times \frac{8}{\cancel{3}\,1} = \frac{16}{5}$ (an improper fraction)

Step 6: $\frac{16}{5} = 3\frac{1}{5}$

$$\begin{array}{r} 3 \\ 5\overline{)16} \\ \underline{15} \\ 01 \end{array}$$

$1\frac{1}{5} \times \frac{2}{2}3 = 3\frac{1}{5}$

Example T

$4 \times 2\frac{5}{6}$

Step 1 and 2: $4 = \frac{4}{1}$ and $2\frac{5}{6} = \frac{17}{6}$

Step 3: The question is rewritten as $\frac{4}{1} \times \frac{17}{6}$

Step 4, 5 and 6: $4 \times 2\frac{5}{6} = \frac{\cancel{4}\,2}{1} \times \frac{17}{\cancel{6}\,3} = \frac{34}{3} = 11\frac{1}{3}$

Remember to only skip steps when you are totally confident in your method.
Writing out the steps will help you to get the answer right more often.

Exercise 6

Find the products

a. $2\frac{1}{2} \times 6 = \frac{7}{\cancel{2}1} \times \frac{\cancel{6}3}{1} = 21$

b. $3 \times \frac{1}{5} = \frac{3}{1} \times \frac{6}{5} = \frac{18}{5} = 3\frac{3}{5}$

c. $\frac{3}{14} \times 2\frac{1}{6} \times 12 =$

d. $3 \times 4\frac{1}{3} =$

e. $1\frac{2}{5} \times 15 =$

f. $3\frac{3}{8} \times 8 =$

g. $4 \times 2\frac{1}{2} =$

h. $2\frac{1}{4} \times 8 =$

Answers to Exercise 6

c. $5\frac{4}{7}$

d. 13

e. 21

f. 27

g. 10

h. 18

Exercise 7

This is extra practice if you feel you need it.

a. $1\frac{1}{2} \times \frac{2}{3} =$

b. $1\frac{1}{4} \times 3\frac{1}{2} =$

c. $\frac{1}{3} \times 5\frac{1}{2} =$

d. $1\frac{1}{6} \times 1\frac{5}{7} =$

e. $\frac{1}{2} \times 2\frac{1}{2} =$

f. $7\frac{1}{4} \times 3\frac{1}{3} =$

g. $7\frac{1}{3} \times \frac{3}{8} =$

h. $2\frac{1}{4} \times 3\frac{1}{2} =$

Answers to Exercise 7

a. 1

b. $4\frac{3}{8}$

c. $1\frac{5}{6}$

d. 2

e. $1\frac{1}{4}$

f. $24\frac{1}{6}$

g. $2\frac{3}{4}$

h. $7\frac{7}{8}$

Problems using Multiplication of Common Fractions

The following exercise gives some typical word problems for multiplication of fractions. The type of wording is similar for decimals and common fractions.

Remember this important word:

A fraction **of** some number means to **multiply**

Example:

$\frac{2}{3}$ of her money means $\frac{2}{3} \times$ amount of the money

$\frac{1}{4}$ of the children means $\frac{1}{4}$ × number of children

These techniques may help you through the problem-solving steps when you're working with common fractions:

- Look for key words
- Look for familiar patterns in the wording.
- Round fractions to whole numbers to estimate and to try to make sense of the problem.
- Draw a sketch or diagram of what the problem is describing

List key words which point to multiplication:

Exercise 8

a. Maria was angry with her children because they had eaten 2/3 of the 24 cupcakes she had made to take to a meeting. How many cupcakes did the kids eat?

b. Double this recipe for Awesome Chocolate Chip Cookies.

- $\frac{2}{3}$ cup Butter
- $\frac{2}{3}$ Peanut Butter
- $\frac{5}{8}$ White sugar
- $\frac{5}{8}$ Brown sugar
- 2 Eggs
- $1\frac{3}{4}$ tsp Vanilla
- $1\frac{1}{2}$ cup Flour
- 1 cup Rolled Oats
- 1 tsp Baking soda
- $\frac{1}{4}$ tsp Salt
- $\frac{7}{8}$ Chocolate chips

Cream butter and peanut butter well, blend in sugar. Beat in eggs and vanilla. Add dry ingredients, blending very thoroughly. Add chocolate chips and mix. Drop by spoonful onto cookie sheet; cookies will flatten during cooking. Bake in 350 F. oven for 10 to 12 minutes.

c. Marni is trying to gradually cut down the amount of coffee she drinks. Right now she allows herself $\frac{3}{4}$ of a cup of coffee at breakfast, $\frac{3}{4}$ cup at morning break time, and $\frac{3}{4}$ cup at lunch and another 3/4 cup after dinner. How many cups of coffee is she drinking per day right now?

d. Sam's truck uses $\frac{1}{3}$ of a tank of gas every time he drives to his girlfriend's house. His tank holds 75 litres. How many litres of gas does he use to drive to his girlfriend's place?

e. If you do math for 1 $\frac{1}{2}$ hours every day you are at school, how many hours do you spend on math per month if you come to school twenty days in a month?

f. David was complaining that his car insurance was the same price as $\frac{7}{8}$ of the cost of his car! His car cost $1200. What did he pay for car insurance?

g. Justine was building a dog shed. She spent $\frac{1}{3}$ of an hour on the project every evening for 8 days in a row. How much time did she spend on the project?

Answers to Exercise 8

a. 16 cupcakes

b. Awesome Chocolate Chip Cookies (Doubled)

- $1\frac{1}{3}$ cup Butter
- $1\frac{1}{3}$ cup Peanut Butter
- $1\frac{1}{4}$ cup White Sugar
- $1\frac{1}{4}$ cup Brown Sugar
- 4 Eggs
- $3\frac{1}{2}$ teaspoons Vanilla
- 3 cups Flour
- 2 cups Rolled Oats
- 2 teaspoons Baking Soda
- $\frac{1}{2}$ teaspoon Salt
- $1\frac{3}{4}$ cup Chocolate Chips

c. 3 cups

d. 25 L

e. 30 hours

f. $1050.00

g. 2 hours

Topic A: Self-Test

Mark /20 Aim 16 / 20

A. **Find the products. 10 marks**

a. $\frac{1}{4} \times \frac{3}{8} =$

b. $\frac{3}{8} \times \frac{5}{6} =$

c. $\frac{7}{9} \times \frac{3}{14} =$

d. $\frac{1}{4} \times 12 =$

e. $5 \times \frac{4}{9} =$

f. $1\frac{1}{4} \times \frac{4}{5} =$

g. $\frac{3}{5} \times 7\frac{2}{9} =$

h. $6 \times 1\frac{2}{3} =$

i. $1\frac{1}{2} \times 1\frac{3}{5} =$

j. $2\frac{7}{8} \times 1\frac{9}{10} =$

B. **Solve the following word problems. 10 Marks**

a. Frank is hosting a big party. He needs to multiply his favorite tomato sauce by five to make enough to serve his guests. Five times this recipe for him. **4 Marks**

- $1\frac{1}{2}$ Tbsp Olive Oil;
- 1 Onions;
- $\frac{1}{2}$ tsp salt;
- 2 bay leaves;
- 6 garlic cloves;
- $\frac{1}{3}$ tsp red chili flakes;
- $1\frac{3}{4}$ diced tomatoes;
- $1\frac{1}{4}$ brown sugar;

b. Joey practices of an hour each day. How much time does he spend practicing each week? **2 Marks**

c. A Haida longhouse measures 15 $\frac{1}{4}$ m by 18 $\frac{1}{3}$ m. What area of land does it cover? **2 Marks**

d. Find the area of the rectangle. **2 Marks**

$\frac{2}{5}$ cm

$1\frac{3}{4}$ cm

Answers to Topic A Self Test

A.

a. $\frac{3}{32}$

b. $\frac{5}{16}$

c. $\frac{1}{6}$

d. 3

e. $2\frac{3}{32}$

f. 1

g. $4\frac{1}{3}$

h. 10

i. $2\frac{2}{5}$

j. $5\frac{37}{80}$

B. a.

1. $7\frac{1}{2}$ Tbsp Olive Oil;
2. 5 Onions;
3. $2\frac{1}{2}$ tsp salt;
4. 10 bay leaves;
5. 30 garlic cloves;
6. $1\frac{2}{3}$ tsp red chili flakes;
7. $8\frac{3}{4}$ diced tomatoes;
8. $6\frac{1}{4}$ brown sugar;

b. $5\frac{1}{4}$

c. $279\frac{7}{12}$ m^2 in area

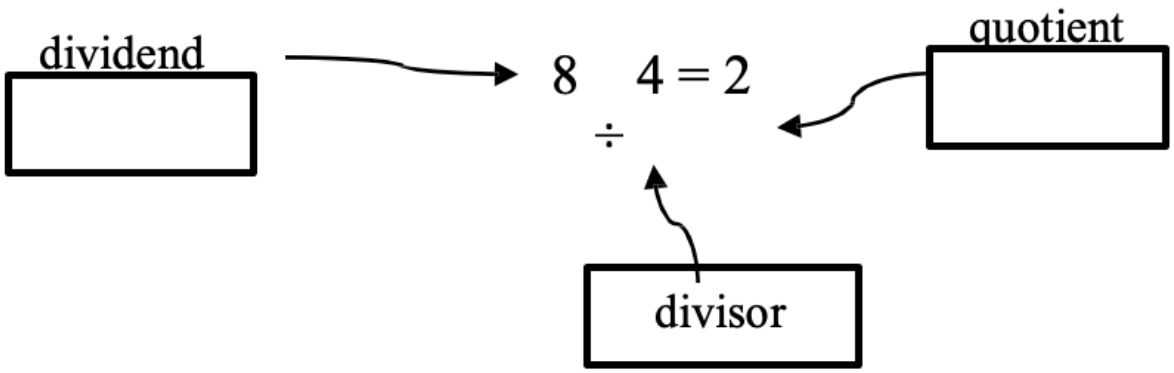
d. $\frac{7}{10}$ cm

Topic B: Dividing Common Fractions

Think over what you know about dividing:

When we **divide**, we take the total amount and separate (divide it) into equal parts or groups.

Remember:



Example A

$8 \div 4 =$

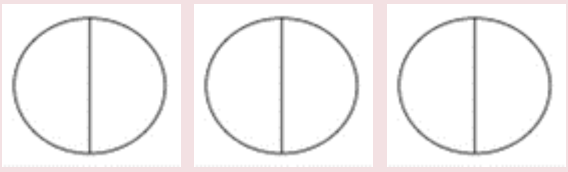
- The total amount is 8.
- The **divisor** is 4. How many groups of 4 are in 8? Yes, 2.
- $8 \div 4 = 2$

Example B

$3 \div \frac{1}{2} =$

- The total amount is 3.

- The total amount is $\frac{1}{2}$. How many $\frac{1}{2}$'s are in 3?



- There are 6 halves.
- $3 \div \frac{1}{2} = 6$

Example C

$2 \div \frac{2}{3}$

- The total amount is 2.
- The total amount is $\frac{2}{3}$. How many $\frac{2}{3}$s are in 2?
- Use different colours to shade in each group of two that you can find.

- $2 \div \frac{2}{3} = 3$

Example D

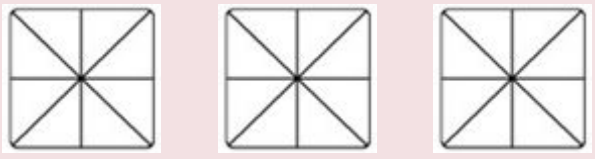
$1 \div \frac{1}{4}$

- The total amount is 1. Divisor is $\frac{1}{4}$
- How many $\frac{1}{4}$s in 1?
- Draw a shape. Divide it into quarters. How many $\frac{1}{4}$s are there?
- There are 4 quarters.
- $1 \div \frac{1}{4} = 4$

Example E

$3 \div \frac{3}{8} =$

- How many $\frac{3}{8}$ in 3.
- Use different colors to shade in each group of 3 that you can find.



- Did you find 8 groups of $\frac{3}{8}$? $3 \div \frac{3}{8} = 8$

Division of fractions by a fraction is difficult to picture, probably because it is not often used in everyday life. Here are some everyday examples for you to think about.

A. You have half a dollar. Someone asks you to change it for quarters. How many quarters are there in half a dollar?
$\frac{3}{8} \div \frac{1}{4} = 2$ 2 quarters in one half a dollar

B. It takes $\frac{1}{4}$ hour to solve a math problem. How many problems can you solve in $\frac{3}{4}$ of an hour?

$\frac{3}{4} \div \frac{1}{4} = 3$ 3 problems in one $\frac{3}{4}$ of an hour

Reciprocals

Dividing by a number is the same as multiplying by its **reciprocal**. We use reciprocals when we divide fractions. Two numbers are reciprocals if they have a product of 1.

To find the reciprocal of a fraction, turn the fraction upside down (flip it over). This is called “inverting the fraction.”

> Some people remember this by thinking of reciprocals as “refliprocals”!

Table of Fractions and Reciprocals

Fraction	Reciprocal
$\frac{1}{2}$	$\frac{2}{1}$
$\frac{3}{4}$	$\frac{4}{3}$
$\frac{7}{8}$	$\frac{8}{7}$
$\frac{2}{3}$	$\frac{3}{2}$
$\frac{1}{4}$	$\frac{4}{1}$

To find the reciprocal of a whole number:

1. Rename the whole number as a fraction with a denominator of 1.
2. Invert the fraction
3. Check the reciprocal by multiplying the fraction by the reciprocal. The product will be one.

Table of products of whole numbers with fractions and reciprocals

Whole Number	Fraction	Reciprocal	Check
3	$\frac{3}{1}$	$\frac{1}{3}$	$\frac{\cancel{3}\,1}{1} \times \frac{1}{\cancel{3}\,1} = 1$
6	$\frac{6}{1}$	$\frac{1}{6}$	$\frac{\cancel{6}\,1}{1} \times \frac{1}{\cancel{6}\,1} = 1$
10	$\frac{10}{1}$	$\frac{1}{10}$	$\frac{\cancel{10}\,1}{1} \times \frac{1}{\cancel{10}\,1} = 1$

To find the reciprocal of a mixed number

1. Rename the mixed number as an improper fraction.
2. Invert the fraction

Table of mixed numbers their fractions and reciprocals

Mixed Number	Fraction	Reciprocal	Check
$1\frac{1}{2} =$	$\frac{3}{2}$	$\frac{2}{3}$	$\frac{\cancel{3}\,1}{\cancel{2}\,1} \times \frac{\cancel{2}\,1}{\cancel{3}\,1} = \frac{6}{6} = 1$
$2\frac{1}{3}$	$\frac{7}{3}$	$\frac{3}{7}$	$\frac{\cancel{7}\,1}{\cancel{3}\,1} \times \frac{\cancel{3}\,1}{\cancel{7}\,1}\frac{1}{1} = 1$
$4\frac{3}{8}$	$\frac{35}{8}$	$\frac{8}{35}$	$\frac{\cancel{35}\,1}{\cancel{8}\,1} \times \frac{\cancel{8}\,1}{\cancel{35}\,1} = 1$

Exercise 1

Write the reciprocal of these numbers.

a. $\frac{2}{5}$ The reciprocal is $\frac{5}{2}$

b. $\frac{5}{8}$

c. $\frac{1}{2}$

d. $5 = \frac{5}{1}$ The reciprocal is $\frac{1}{5}$

e. 9

f. 2

g. $2\frac{1}{2} = \frac{5}{2}$ The reciprocal is $\frac{2}{5}$

h. $1\frac{1}{4}$

i. $8\frac{1}{3}$

Answers to Exercise 1

b. $\frac{8}{5}$

c. 2

d. $\frac{1}{9}$

e. $\frac{1}{2}$

f. $\frac{4}{5}$

g. $\frac{3}{25}$

Multiplying by the Reciprocal

To divide fractions, multiply by the reciprocal of the divisor.

- **Step 1:** Rewrite the division question.
    - Rename all mixed numbers as improper fractions.
    - Give any whole numbers a denominator of 1
- **Step 2:** Change the ÷ sign to a × sign.
    - Invert (turn upside down) the divisor to make the reciprocal.
    - Remember the divisor is always the number after the sign.
- **Step 3:** Simplify (cancel) and then multiply to find the answer.
- **Step 4:** Write the answer in lowest terms.

Example F

$$\frac{3}{4} \div \frac{1}{2} =$$

Step 1: No whole numbers or mixed numbers.

Step 2: $\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times \frac{2}{1} =$

Step 3 and 4: $\frac{3}{\cancel{4}\,2} \times \frac{\cancel{2}\,1}{1} = \frac{3}{2} = 1\frac{2}{1}$

Example G

$$\frac{7}{8} \div \frac{1}{4} =$$

Step 1: No whole numbers or mixed numbers.

Step 2: $\frac{7}{8} \div \frac{1}{4} = \frac{7}{8} \times \frac{4}{1} =$

Step 3 and 4: $\frac{7}{\cancel{8}\,2} \times \frac{\cancel{4}\,1}{1} = \frac{7}{2} = 3\frac{1}{2}$

Example H

$$5 \div \frac{2}{3} =$$

Step 1: $5 \div \frac{2}{3} = \frac{5}{1} \div \frac{2}{3} =$

Step 2: $\frac{5}{1} \times \frac{3}{2} =$

Step 3 and 4: $\frac{5}{1} \times \frac{3}{2} = \frac{15}{2} = 7\frac{1}{2}$

Example I

$3\frac{1}{2} \div 2\frac{3}{4} =$

Step 1: $3\frac{1}{2} \div 2\frac{3}{4} = \frac{7}{2} \div \frac{11}{4}$

Step 2: $\frac{7}{2} \times \frac{11}{4} =$

Step 3 and 4: $\frac{7}{\cancel{2}1} \times \frac{\cancel{4}2}{11} = \frac{14}{11} = 1\frac{3}{11}$

Exercise 2

Divide these fractions using the steps you have just learned.

a. $\frac{\frac{4}{9} \div 4 =}{\frac{4}{9} \div \frac{4}{1} = \frac{4}{9} \times \frac{1}{4} = \frac{\cancel{4}1}{9} \times \frac{1}{\cancel{4}1} = \frac{1}{9}}$

b. $\frac{7}{2} \div \frac{3}{5} =$

c. $\frac{5}{8} \div \frac{7}{16} =$

d. $\frac{2}{3} \div \frac{8}{9} =$

e. $\frac{1}{5} \div \frac{1}{2} =$

f. $\frac{5}{6} \div \frac{5}{3} =$

g. $\frac{1}{3} \div \frac{3}{8} =$

h. $\frac{6}{7} \div \frac{1}{6} =$

Answers to Exercise 2

b. $5\frac{5}{6}$

c. $1\frac{3}{7}$

d. $\frac{3}{4}$

e. $\frac{2}{5}$

f. $\frac{1}{2}$

g. $\frac{8}{9}$

h. $5\frac{1}{7}$

Exercise 3

If you need more practice, try a few more of these division questions. If you are not having any trouble, go on to Exercise Four, which has mixed numbers in it.

Divide these fractions using the steps you have just learned.

a. $\frac{1}{2} \div \frac{1}{8} = \frac{1}{2} \times \frac{8}{1} = \frac{1}{\cancel{2}1} \times \frac{\cancel{8}4}{1} = \frac{4}{1} = 4$

b. $\frac{8}{9} \div \frac{3}{2} =$

c. $\frac{3}{4} \div \frac{3}{4} =$

d. $\frac{5}{6} \div \frac{3}{3} =$

e. $\frac{1}{3} \div \frac{3}{4} =$

f. $\frac{2}{3} \div \frac{1}{2} =$

Answers to Exercise 3

b. $\frac{16}{27}$

c. 1

d. $1\frac{5}{6}$

e. $\frac{4}{9}$

f. $1\frac{1}{3} = \frac{4}{3}$

Exercise 4

More practice: You might want to save some of this exercise to do as review before a test.

a. $8 \div \frac{1}{2} =$

b. $2\frac{2}{5} \div \frac{1}{8} =$

c. $\frac{1}{6} \div \frac{1}{5} =$

d. $\frac{1}{8} \div \frac{1}{5} =$

e. $\frac{3}{5} \div \frac{1}{4} =$

f. $2\frac{4}{5} \div \frac{1}{5} =$

g. $\frac{2}{5} \div \frac{1}{2} =$

h. $\frac{1}{4} \div \frac{2}{3} =$

i. $2\frac{3}{4} \div 1\frac{7}{8} =$

j. $5\frac{1}{10} \div 3\frac{3}{10} =$

k. $1\frac{5}{9} \div 3\frac{1}{3} =$

l. $\frac{1}{2} \div \frac{3}{8} =$

Answers to Exercise 4

a. 16

b. $19\frac{1}{5}$

c. $\frac{5}{6}$

d. $\frac{5}{8}$

e. $2\frac{2}{5}$

f. 14

g. $\frac{4}{5}$

h. $\frac{3}{8}$

i. $1\frac{7}{15}$

j. $1\frac{6}{11}$

k. $\frac{7}{15}$

l. $1\frac{1}{3}$

Problems Which Use Division of Common Fractions

Look for word patterns and key words in the division problems. Thinking about the problems using whole numbers instead of fractions may sometimes help you to recognize the division pattern. Start your division equation with the **dividend**. The dividend is the total.

These key words often point to division:

- separated split cut shared
- What is cost per…? **unit pricing**
- What is distance per…? average (speed, cost, weight, time)

Exercise 5

a. Every fall three friends get together to make antipasto. Last year they filled $4\frac{1}{2}$ ice cream buckets

with antipasto and then shared it equally. How many buckets of antipasto did each person get?

b. A pick-up truck load of split wood is $\frac{1}{2}$ cord of wood. If you shared a full truck load of wood with a neighbour, how much of a cord of firewood would you each get?

c. The distance from Trail, BC to Vancouver, BC is 640 km via the Crowsnest Highway. The trip can be made in $7\frac{1}{2}$ hours in good weather. What average speed must be maintained?

d. The sweater that Janet is knitting has a complicated pattern. It takes her $3\frac{3}{4}$ hours to finish 15 rows. How long does each row take?

e. Marian had $\frac{12}{3}$ lemon pies left which she wanted to share equally amongst 10 people. How much of a pie will each person be given?

f. Jack wants to cut his piece of trim for his square windows into 4 equal parts. The trim is $2\frac{2}{5}$ metres long. What will the measurement be of each piece?

g. Tony is sewing 3 identical pairs of pants for his son's dance performance. He bought metres of material. He uses up all of the material; how much material was used for each pair of pants?

h. Joy has a $7\frac{1}{4}$ m long stick. She needs to split it into $\frac{1}{3}$ m pieces. How many pieces can she get? (**Remember:** your answer will be given with the **unit** of 'pieces' not metres!)

Answers to Exercise 5

a. $1\frac{1}{2}$ buckets

b. $\frac{1}{4}$ cord

c. $85\frac{1}{3}$ km/h (85.3 km/h)

d. $\frac{1}{4}$ hour or 15 minutes

e. $\frac{1}{6}$ pie

f. Each piece is $\frac{3}{5}$ metres long.

g. He uses $\frac{7}{9}$ metre for each pair.

h. She will get 21 pieces.

Topic B: Self-Test

Mark /10 Aim 8/10

A. Divide and be sure the answers are in lowest terms. (8 marks)

a. $\frac{3}{4} \div \frac{1}{4} =$

b. $\frac{1}{4} \div 1\frac{1}{4} =$

c. $\frac{5}{8} \div \frac{15}{16} =$

d. $6 \div \frac{7}{9} =$

e. $\frac{5}{11} \div 11 =$

f. $9\frac{3}{4} \div 2 =$

g. $3 \div \frac{1}{3} =$

h. $3\frac{3}{7} \div 2\frac{5}{14} =$

B. Word Problem (2 marks).

A. Joe is a school janitor. It takes him $\frac{3}{4}$ of an hour to clean one classroom. How many classrooms does he clean in his $7\frac{1}{2}$ hour shift?

Answers to Topic B Self-Test

A.

a. 3

b. $\frac{5}{14}$

c. $\frac{2}{3}$

d. $7\frac{5}{7}$

e. $\frac{5}{121}$

f. $4\frac{7}{8}$

g. $\frac{9}{13}$

h. $1\frac{5}{11}$

B.

a. 10 classrooms

Unit 3 Review

1. Write the multiplication equation you would use to find the fraction of the whole number. You do not have to calculate the answers.
    a. More than $\frac{1}{3}$ of the children at the day care are sick today. There are 15 children in the day care. How many children are sick?
    b. Rich answered $\frac{7}{8}$ of the questions on the test. The test had 48 questions. How many questions did Rich complete?
    c. Canada Post delivered more than 11.6 billion pieces of mail across Canada in 2008. They have a target of getting $\frac{96}{100}$ letters delivered on time. How many letters got delivered on time in 2008?
    d. We spend $\frac{1}{6}$ of our monthly income on food. Our take home pay is $1400. How much do we spend on groceries each month?
2. Write the multiplication equation you would use to multiply a fraction by a whole number. You do not have to calculate the answer.
    a. We want to buy a good bottle of wine for dinner, but there are 4 bottles of wine from last night that are not used up yet. Let's take each $\frac{1}{6}$ bottle of wine that is left over and have that at dinner tonight. How much wine will we have?
    b. There are four boxes of cereal open in the cupboard and each one is $\frac{3}{4}$ full. How many full boxes would there be if they were all put together?
    c. Double a recipe that needs $\frac{1}{3}$ tsp of cinnamon.
    d. Mark is a frequent coffee drinker at the local coffee shop. He has a punch card, and gets a hole punched out each time he buys a coffee. Once he has a card with 14 holes punched out, he gets a free coffee. He keeps losing his card and getting a new one. He has found them all, and he now has 3 cards, each with $\frac{2}{3}$ of the holes punched out. Does he have enough holes punched out to get a free coffee?
3. Multiply these fractions:
    a. $7 \times \frac{2}{3} =$
    b. $3 \times \frac{2}{5} =$

c. $\frac{2}{3} \times 14 =$

d. $\frac{3}{8} \times 4 =$

e. $5 \times \frac{1}{5} =$

f. $3 \times \frac{3}{4} =$

g. $\frac{3}{2} \times 20 =$

h. $\frac{3}{8} \times 20 =$

4. Multiply these fractions:

a. $\frac{1}{6} \times \frac{1}{4} =$

b. $\frac{5}{10} \times \frac{1}{3} =$

c. $\frac{1}{4} \times \frac{1}{7} =$

d. $\frac{7}{10} \times \frac{2}{3} =$

5. Multiply these fractions. Simplify before multiplying, where possible.

a. $\frac{2}{5} \times \frac{15}{7} \times \frac{3}{4} \times \frac{1}{9} =$

b. $\frac{8}{9} \times \frac{1}{4} =$

c. $\frac{3}{5} \times \frac{2}{9} \times \frac{1}{2} =$

6. Multiply these fractions. Simplify before multiplying, where possible.

a. $7\,\frac{1}{3} \times \frac{3}{7} =$

b. $3\frac{1}{4} \times 3\frac{1}{2} =$

c. $2\frac{1}{5} \times \frac{5}{6} =$

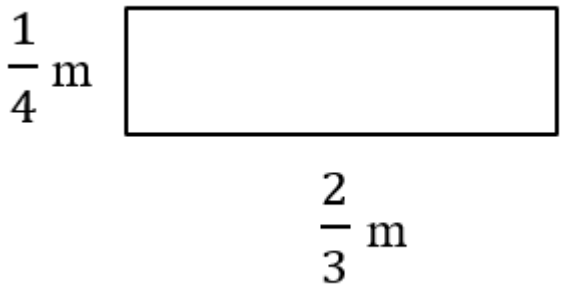
d. $9 \times \frac{2}{3} =$

7. Solve the following word problems:

   a. A recipe calls for $\frac{2}{3}$ of a cup of sugar. How much sugar should be used if only $\frac{1}{2}$ of the recipe is being made?

   b. The Wrights sold their house for $240 000. The real estate company that helped them sell their house gets $\frac{3}{20}$ of this amount. How much money did the Wrights have to pay the real estate company?

   c. Find the **area** of the rectangle.



d. Each turn of a screw sinks it $\frac{1}{2}$ of a centimetre deeper into the wood. Find out how deep the screw is after 7 turns.

e. $\frac{3}{4}$ of 48 students in the gym are girls. How many girls are in the gym?

8. Divide these fractions. Simplify before multiplying, where possible.

a. $\frac{7}{2} \div \frac{3}{4} =$

b. $\frac{5}{8} \div \frac{7}{24} =$

c. $\frac{2}{3} \div \frac{7}{9} =$

d. $\frac{1}{5} \div \frac{1}{4} =$

9. Divide these fractions. Simplify before multiplying, where possible.

a. $2\frac{4}{5} \div \frac{1}{5} =$

b. $\frac{2}{5} \div \frac{1}{2} =$

c. $\frac{1}{4} \div \frac{2}{3} =$

d. $2\frac{3}{4} \div \frac{7}{8} =$

e. $5\frac{1}{10} \div 3\frac{3}{10} =$

10. Solve the following word problems:

a. If you want to share $3\frac{1}{3}$ cups of juice between 4 children, how much juice does each child get?

b. Aaron ran $24\frac{3}{4}$ km in 3 days. How many kilometres did he run each day?

c. Jordan is selling falafel balls at Smithers Mid-Summer Music Festival this summer. She made $48\frac{3}{4}$ kg of falafel mix. How many $\frac{1}{16}$ kg falafel balls can she make?

d. Sophie had $75\frac{1}{4}$ cm piece of wood trim. She wants to cut it into $2\frac{1}{2}$ cm pieces. How many pieces can she get?

Answers to Unit 3 Review

1. Find the products.

   a. $\frac{1}{3} \times \frac{15}{1}$

   b. $\frac{7}{8} \times \frac{48}{1}$

   c. $\frac{96}{100} \times \frac{11.1 \text{ billion}}{1}$

   d. $\frac{1}{6} \times \frac{1400}{1}$

2. Find the products.

   a. $4 \times \frac{1}{6}$

   b. $4 \times \frac{3}{4}$

   c. $2 \times \frac{1}{3}$

   d. $3 \times \frac{2}{3}$

3. Find the products.

   a. $4\frac{2}{3}$

   b. $1\frac{1}{5}$

   c. 7

   d. $1\frac{1}{2}$

   e. 1

   f. $2\frac{1}{4}$

   g. 30

   h. $7\frac{1}{2}$

4. Find the products.

a. $\frac{1}{24}$

b. $\frac{1}{6}$

c. $\frac{1}{28}$

d. $\frac{7}{15}$

5. Find the products.

a. $\frac{6}{7}$

b. $\frac{1}{12}$

c. $\frac{2}{9}$

d. $\frac{1}{15}$

6. Find the products.

a. $3\frac{1}{7}$

b. $11\frac{3}{8}$

c. $1\frac{5}{6}$

d. 6

7. Find the products.

a. $\frac{1}{3}$ cup sugar

b. \$ 36 000

c. $\frac{1}{6}$ m

d. $3\frac{1}{2}$ cm

e. 36 students

8. Find the products.

a. $4\frac{2}{3}$

b. $2\frac{1}{7}$

c. $\frac{6}{7}$

d. $\frac{4}{5}$

e. $\frac{1}{2}$

9. Find the products.

a. 14

b. $\frac{4}{5}$

c. $\frac{3}{8}$

d. $1\frac{7}{15}$

e. $1\frac{6}{11}$

10. Find the products.

a. $\frac{5}{6}$

b. $8\frac{1}{4}$ km in one day

c. 780 balls of falafel

d. $21\ \frac{1}{2}$

It is now test time!

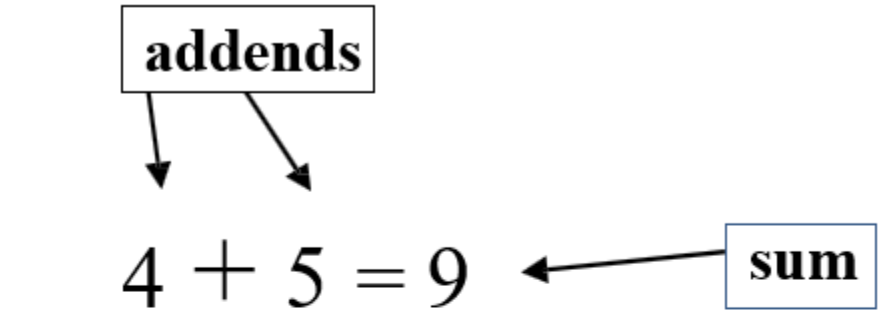
Please get the **practice test** from your instructor. Once you are ready, you can get the **Unit 3 test** from your instructor.

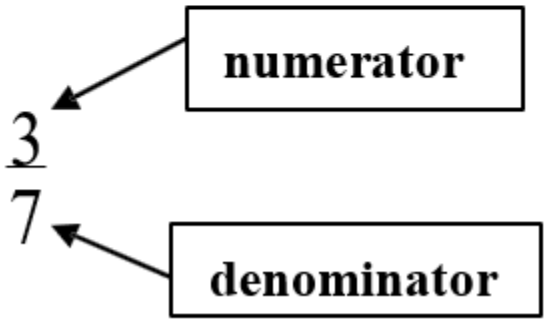
Good luck!

Unit 4: Adding & Subtracting Common Fractions

Topic A: Adding Common Fractions

Vocabulary Review:



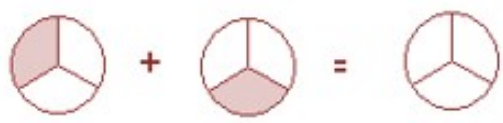


Like Fractions: Fractions that have the same denominator

Example: $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$, etc.

Adding and subtracting fractions has some different rules from multiplying and dividing.

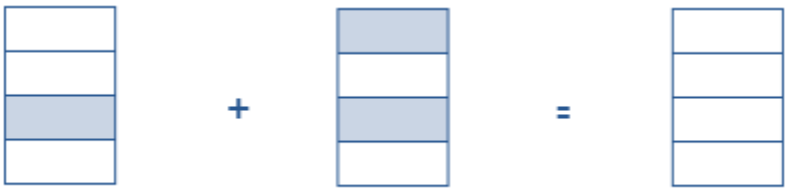
There are two cakes that are left over. There is 1 piece of each cake left. If you were to put all the pieces left onto one plate, how much cake would you have?



Shade in your answer here

If you made your plate like this: then you are right!

Try this example:



The answer is:

What you are doing is adding two <u>like</u> fractions.

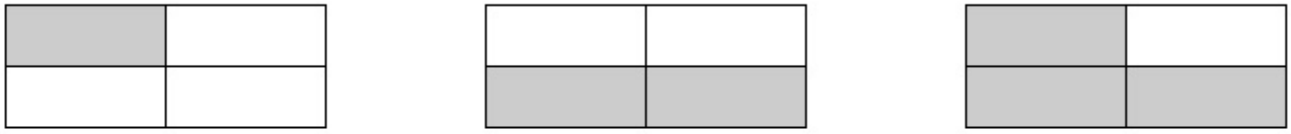
- You are moving pieces of fractions that are the same size into one whole shape. The pieces do not change size, so the denominator must stay the same size.
- When adding two fractions, your answer is a fraction.

Look back at the two examples.

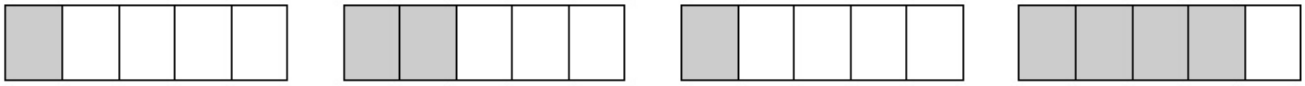
When you add fractions, does the denominator or the numerator stay the same?

Common fractions must have the same denominator when you add them together. **Add the numerators** and keep the denominators the same.

Look at the next two examples:



$$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$$

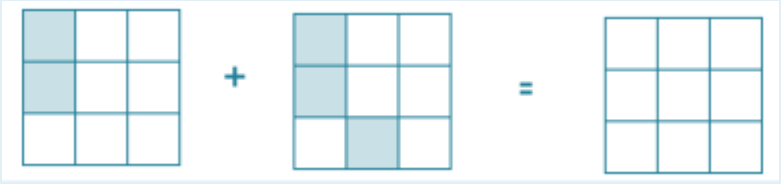


$$\frac{1}{5} + \frac{2}{5} + \frac{1}{5} = \frac{4}{5}$$

Exercise 1

Try a few for yourself

a.



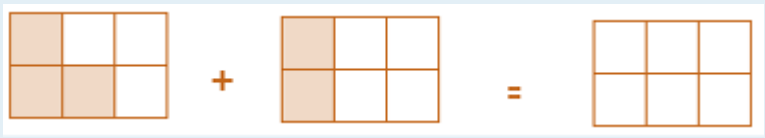
$$\frac{2}{9} + \frac{3}{9} = \frac{}{9}$$

b.

$$\frac{2}{4} + \frac{1}{4} = \frac{}{4}$$

c.

$$\frac{1}{3} + \frac{1}{3} = \frac{}{3}$$

d. 

$$\frac{3}{6} + \frac{3}{6} = \frac{}{6}$$

e. 

$$\frac{3}{8} + \frac{4}{8} = \frac{}{8}$$

Answers to Exercise 1

a. $\frac{5}{9}$

b. $\frac{3}{4}$

c. $\frac{2}{3}$

d. $\frac{5}{6}$

e. $\frac{7}{8}$

Exercise 2

Now find the answers to the additions without diagrams.

a. $\frac{2}{4} + \frac{1}{4} = \frac{}{4}$

b. $\frac{1}{3} + \frac{1}{3} = \frac{}{3}$

c. $\frac{1}{5} + \frac{1}{5} = \frac{}{5}$

d. $\frac{2}{11} + \frac{7}{11} = \frac{}{11}$

Answers to Exercise Two

a. $\frac{3}{4}$

b. $\frac{2}{3}$

c. $\frac{2}{5}$

d. $\frac{9}{11}$

Exercise 3

Add these common fractions.

a. $\frac{1}{5} + \frac{2}{5} =$

b. $\frac{3}{6} + \frac{2}{6} =$

c. $\frac{3}{7} + \frac{2}{7} =$

d. $\frac{3}{10} + \frac{6}{10} =$

e. $\frac{14}{20} + \frac{3}{20} =$

f. $\frac{7}{37} + \frac{19}{37} =$

Answers to Exercise 3

a. $\frac{3}{5}$

b. $\frac{5}{6}$

c. $\frac{5}{7}$

d. $\frac{9}{10}$

e. $\frac{17}{20}$

f. $\frac{26}{37}$

Sometimes the **sum** of a fraction will need to be reduced (take a look at this example to remind yourself how to do this).

Example A

$$\frac{2}{8} + \frac{2}{8} = \frac{4}{8} \rightarrow \frac{\div 4}{\div 4} = \frac{1}{2}$$

Example B

$$\frac{3}{4}+\frac{3}{4}=\frac{6}{4}\rightarrow\frac{6}{4}\frac{\div 2}{\div 2}=\frac{3}{2}=1\frac{1}{2}$$

Exercise 4

Find the sums to the following additions. Make sure your answer is in the lowest terms.

a. $\frac{1}{4}+\frac{1}{4}=$

b. $\frac{1}{3}+\frac{1}{3}=$

c. $\frac{3}{10}+\frac{2}{10}=$

d. $\frac{7}{25}+\frac{8}{25}=$

e. $\frac{3}{5}+\frac{1}{5}=$

f. $\frac{9}{27}+\frac{12}{27}=$

Answers to Exercise 4

a. $\frac{1}{2}$

b. $\frac{2}{3}$

c. $\frac{1}{2}$

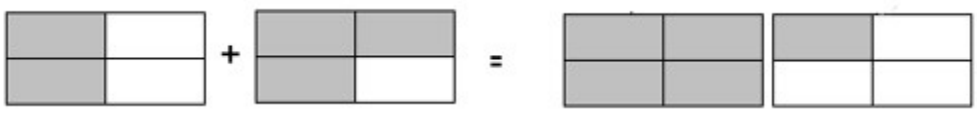
d. $\frac{3}{5}$

e. $\frac{4}{5}$

f. $\frac{7}{9}$

So far all your answers have been less than one (a **proper fraction**). Sometimes adding fractions can result in more than one whole.

Look at this example:



$$\frac{2}{4}+\frac{3}{4}=\frac{4}{4}\text{and}\frac{1}{4}\quad(\text{or}\left(\frac{5}{4}\right))$$

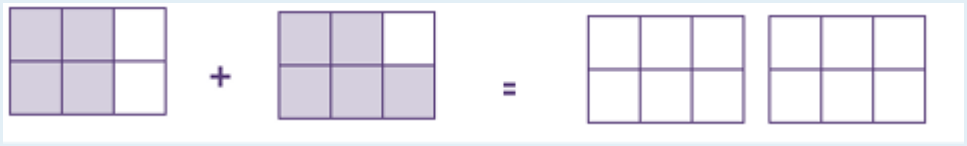
There are not enough parts in the first square to hold all your shaded parts, so you need to draw a second square to hold the extra shaded parts.

You would also have to convert this answer from an improper fraction to a mixed number:

$$\frac{5}{4} = 1\frac{1}{4}$$

Exercise 5

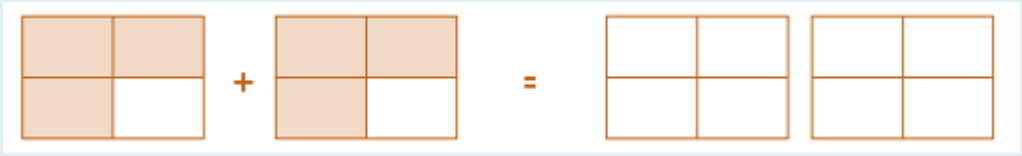
Try these additions. Remember to always reduce!

a. 

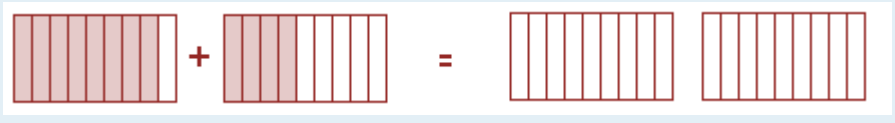
$$\frac{4}{6} + \frac{5}{6} =$$

b. 

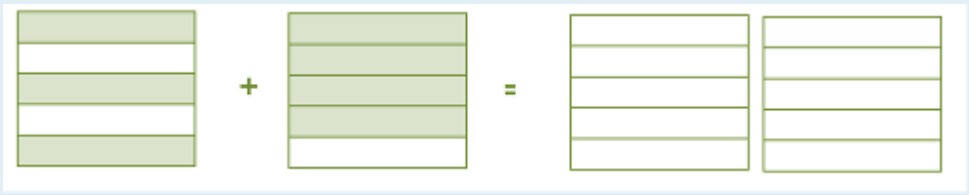
$$\frac{6}{8} + \frac{3}{8} =$$

c. 

$$\frac{3}{4} + \frac{3}{4} =$$

d. 

$$\frac{8}{9} + \frac{4}{9} =$$

e. 

$$\frac{3}{5} + \frac{4}{5} =$$

Answers to Exercise 5

a. $1\frac{1}{2}$

b. $1\frac{1}{8}$

c. $1\frac{1}{2}$

d. $1\frac{1}{3}$

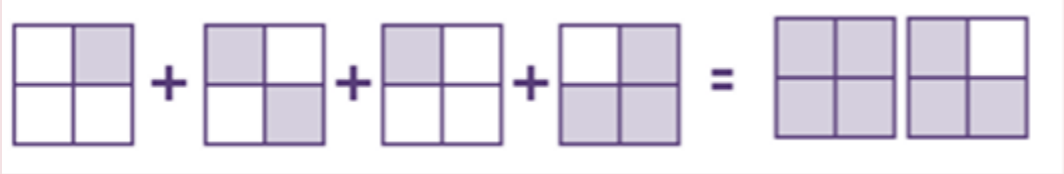
e. $1\frac{2}{5}$

Example C

Sometimes you will have to add 3 or more fractions together.

$$\frac{2}{3} + \frac{1}{3} + \frac{2}{3} = \frac{5}{3} = 1\frac{2}{3}$$

Example D



$$\frac{1}{4}+\frac{2}{4}+\frac{1}{4}+\frac{3}{4}=\frac{7}{4}$$

Exercise 6

Add these common fractions. Be sure your answers are in lowest terms.

a. $\frac{2}{3}+\frac{1}{3}=\frac{3}{3}=1$

b. $\frac{7}{10}+\frac{3}{10}=$

c. $\frac{3}{5}+\frac{2}{5}=$

d. $\begin{array}{r} \frac{3}{4} \\ +\ \frac{1}{4} \\ \hline \end{array}$

e. $\begin{array}{r} \frac{5}{6} \\ +\ \frac{5}{6} \\ \hline \end{array}$

f. $\begin{array}{r} \frac{4}{8} \\ +\ \frac{3}{8} \\ \hline \end{array}$

g. $\begin{array}{r} \frac{1}{8} \\ +\ \frac{3}{8} \\ \hline \end{array}$

h. $\begin{array}{r} \frac{2}{5} \\ \frac{3}{5} \\ +\ \frac{3}{5} \\ \hline \end{array}$

i. $\begin{array}{r} \frac{3}{6} \\ \frac{1}{6} \\ +\ \frac{1}{6} \\ \hline \end{array}$

Answers to Exercise 6

b. 1

c. 1

d. 1

e. $1\frac{2}{3}$

f. $\frac{7}{8}$

g. $\frac{1}{2}$

h. $1\frac{3}{5}$

i. $\frac{5}{6}$

Adding Mixed Numbers

To add mixed numbers

- Be sure the denominators are the same.
- Add the common fractions.
- Add the whole numbers.Simplify the common fraction.

Example E

$$\begin{array}{r} 3\frac{1}{8} \\ +\ 2\frac{3}{8} \\ \hline \end{array}$$

- $5\frac{4}{8} = 5\frac{1}{2}$
- $\frac{4}{8} = \frac{4}{8}\left(\frac{\div 4}{\div 4}\right) = \frac{1}{2}$

Example F

$$\begin{array}{r} 12\frac{1}{3} \\ +\ 6\frac{1}{3} \\ \hline 18\frac{2}{3} \end{array}$$

Exercise 7

Add the following numbers. Reduce the answers to lowest terms.

a.
$$\begin{array}{r} 6\frac{1}{12} \\ +\ 8\frac{5}{12} \\ \hline \end{array}$$

$$14\frac{6}{12} = 14\frac{1}{2}$$

b.
$$\begin{array}{r} 22\frac{1}{6} \\ +\ 14\frac{6}{12} \\ \hline \end{array}$$

c.
$$\begin{array}{r} 8\frac{1}{4} \\ +\ 3\frac{1}{4} \\ \hline \end{array}$$

d.
$$\begin{array}{r} 18\frac{1}{2} \\ +\ 10 \\ \hline \end{array}$$

e.
$$\begin{array}{r} 4\frac{1}{10} \\ +\ \frac{3}{10} \\ \hline \end{array}$$

Answers to Exercise 7

b. $36\ \frac{1}{3}$

c. $11\ \frac{1}{2}$

d. $28\ \frac{1}{2}$

e. $4\ \frac{2}{5}$

Exercise 8

Add these numbers. Give your answers in lowest terms.

a.
$$\begin{array}{r} 6\frac{4}{5} \\ +\ 3\frac{2}{5} \\ \hline \end{array}$$

$$9\frac{6}{5} = 10\frac{1}{5}$$

b.
$$\begin{array}{r} 9\frac{1}{3} \\ +\ 2\frac{2}{3} \\ \hline \end{array}$$

c.
$$\begin{array}{r} 3\frac{3}{8} \\ +\ 12\frac{7}{8} \\ \hline \end{array}$$

d.
$$\begin{array}{r} 100\frac{7}{10} \\ +\ 50\frac{5}{10} \\ \hline \end{array}$$

e.
$$\begin{array}{r} 3\frac{4}{7} \\ +\ 6\frac{5}{7} \\ \hline \end{array}$$

f.
$$\begin{array}{r} 8\frac{4}{5} \\ +\ \frac{4}{5} \\ \hline \end{array}$$

Answers to Exercise 8

b. 12

c. $16\ \frac{1}{4}$

d. $151\ \frac{1}{5}$

e. $10\ \frac{2}{7}$

f. $12\ \frac{3}{5}$

If you are not comfortable with this work so far, talk to your instructor and get some more practice before you go ahead.

The next question is:

What happens when two fractions in an addition (the **addends**) do not have the same **denominator**? If the addends do not have a common denominator, you will need to find equivalent fractions to make the addends have a common denominator.
Read on to find out how!

Multiples and Least Common Multiples (LCM)

When you learned the multiplication tables you learned the **multiples** of each number. Multiples are the answers when you multiply a whole number by 1, 2, 3, 4, 5, 6, 7, and so on.

The multiples of 2	The multiples of 6
$2 \times 1 = \mathbf{2}$	$6 \times 1 = \mathbf{6}$
$2 \times 2 = \mathbf{4}$	$6 \times 2 = \mathbf{12}$
$2 \times 3 = \mathbf{6}$	$6 \times 3 = \mathbf{18}$
$2 \times 4 = \mathbf{8}$	$6 \times 4 = \mathbf{24}$
$2 \times 5 = \mathbf{10}$	$6 \times 5 = \mathbf{30}$
$2 \times 6 = \mathbf{12}$	$6 \times 6 = \mathbf{36}$
$2 \times 7 = \mathbf{14}$	$6 \times 7 = \mathbf{42}$
$2 \times 8 = \mathbf{16}$	$6 \times 8 = \mathbf{48}$
$2 \times 9 = \mathbf{18}$	$6 \times 9 = \mathbf{54}$
$2 \times 10 = \mathbf{20}$	$6 \times 10 = \mathbf{60}$
$2 \times 11 = \mathbf{22}$	$6 \times 11 = \mathbf{66}$
$2 \times 12 = \mathbf{24}$	$6 \times 12 = \mathbf{72}$

and you can keep going as high as you want.

The multiples of 2 are **2, 4, 6, 8, 10, 12, 14,** and so on. & The multiples of 6 are **6, 12, 18, 24, 30, 36,** and so on.

Exercise 9

List the first ten multiples of each number. This chart may be useful to you later.

a. 2 **Multiples** *2, 4, 6, 8, 10, 12, 14, 16, 18, 20*

b. 3

c. 4

d. 5

e. 9

f. 10

g. 11

h. 12

Answers to Exercise 9

b. 3, 6, 9, 12, 15, 18, 21, 24, 27, 30
c. 4, 8, 12, 16, 20, 24, 28, 32, 36, 40
d. 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
e. 9, 18, 27, 36, 45, 54, 63, 72, 81, 90
f. 10,20,30,40,50,60,70,80,90,100
g. 11, 22, 33, 44, 55, 66, 77, 88, 99, 110
h. 12,24,36,48,60,72,84,96,108,120

This is a quick method to find the least common multiple (LCM).

least means smallest
common means shared
multiple means the answers when you multiply by 1, 2, 3, etc.

Example G

What is the least common multiple (LCM) of 3 and 5?

- Multiples:
  - Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30
  - Multiples of 5: 5, 10, 15, 20, 25, 30…

The least common multiple of 3 and 5 is 15.

Example H

What is the LCM of 3 and 4?

- Multiples:
  - Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30…
  - Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32 ….
- The least common multiple of 3 and 4 is 12.

Example I

What is the LCM of 4 and 8?

- Multiples:
  - Multiples of 4: 4, 8, 12, 16, 20…
  - Multiples of 8: 8, 16, 24, 32, 40…
- The least common multiple of 4 and 8 is 8.

Hint: Always check to see if the larger number is a multiple of the smaller number. If it is, then the larger number is the Least Common Multiple (LCM).

- LCM of 3 and 6 is 6
- LCM of 2 and 4 is 4
- LCM of 5 and 15 is 15

Exercise 10

Find the Least Common Multiple of these pairs of numbers. Use your chart from Exercise Nine to help you. You may want to add the multiples of other numbers to that chart.

a. 3,6
b. 2,5
c. 12, 3
d. 6, 12
e. 5, 4
f. 4, 8
g. 8, 16
h. 4, 7
i. 25, 5
j. 2, 9
k. 6, 10
l. 8, 12

Answers Exercise 10

a. 6
b. 10
c. 12
d. 12
e. 20
f. 8
g. 16
h. 28
i. 25
j. 18
k. 30
l. 24

Now that you know how to find an LCM, you can apply this knowledge to adding and subtracting fractions.

Least Common Denominator (LCD)

To find the Least Common Denominator of common fractions: **find the least common multiple of the denominators**.

Example J

What is the least common denominator of $\frac{1}{2}$ and $\frac{3}{4}$?

The denominators are 2 and 4.

The **least common multiple** of 2 and 4 is **4**.

So the **least common denominator (LCD)** for $\frac{1}{2}$ and $\frac{3}{4}$ is **4**.

Example K

What is the **LCD** of $\frac{3}{4}$ and $\frac{2}{3}$?

The denominators are 4 and 3.

The **least common multiple** of 4 and 3 is **12**.

So the **least common denominator** for $\frac{3}{4}$ and $\frac{2}{3}$ is **12**.

Exercise 11

Find the Least Common Denominator (LCD) for these pairs of fractions.

	Fractions	Denominators	Least Common Denominators
a)	$\frac{5}{8}, \frac{2}{3}$	8, 3	24
b)	$\frac{1}{5}, \frac{1}{10}$		
c)	$\frac{1}{3}, \frac{3}{4}$		
d)	$\frac{2}{3}, \frac{1}{5}$		
e)	$\frac{5}{8}, \frac{1}{16}$		

Answers to Exercise 11 (only least common denominator is given)

b. 10
c. 12
d. 15
e. 16

You know how to find the least common denominator **(LCD).** The next step is to make **equivalent fractions** using the **LCD**.

Step 1: Find the least common denominator.

$$\begin{array}{rr} & \frac{3}{4} \\ + & \frac{1}{3} \\ \hline \end{array}$$

LCD of 4 and 3 is 12.

Step 2: Write an = sign after each fraction, followed by the common denominator.

$$\begin{array}{rr} & \frac{3}{4} = \frac{\quad}{12} \\ + & \frac{1}{3} = \frac{\quad}{12} \\ \hline \end{array}$$

Step 3: Rename the fractions as equivalent fractions with the **LCD**.

$$\frac{3}{4} = \frac{}{12}$$

4 times what = 12?

$$4 \times 3 = 12$$

If the denominator was multiplied by 3, the numerator must be multiplied by 3.

$$\frac{3}{4} \frac{\times 3}{\times 3} = \frac{9}{12}$$

Now rename the other fraction.

$$\frac{1}{3} = \frac{}{12}$$

3 times what = 12?

$$3 \times 4 = 12$$

If this denominator was multiplied by 4, this numerator must be multiplied by 4.

$$\frac{1}{3} \frac{\times 4}{\times 4} = \frac{4}{12}$$

Now rename the other fraction.

Step 4: The question now looks like this and can be added.

$$\begin{array}{rrcl} & \frac{3}{4} & = & \frac{9}{12} \\ + & \frac{1}{3} & = & \frac{4}{12} \\ \hline & \frac{13}{12} & = & 1\frac{1}{12} \end{array}$$

Example L

$$\frac{1}{4} + \frac{3}{8} =$$

Step 1 and 2: Find the least common denominator

$$\begin{array}{rr} & \frac{1}{4} = \frac{}{8} \\ + & \frac{3}{8} = \frac{}{8} \\ \hline \end{array}$$

Step 3: Rename as equivalent fractions

$$\begin{array}{rr} & \frac{1}{4}\left(\frac{\times 2}{\times 2}\right) = \frac{2}{8} \\ + & \frac{3}{8}\left(\frac{\times 1}{\times 1}\right) = \frac{3}{8} \\ \hline \end{array}$$

Step 4: Add and simplify the answer.

$$\begin{array}{rr} & \frac{1}{4}\left(\frac{\times 2}{\times 2}\right) = \frac{2}{8} \\ + & \frac{3}{8}\left(\frac{\times 1}{\times 1}\right) = \frac{3}{8} \\ \hline & \frac{5}{6} \end{array}$$

Exercise 12

Add these common fractions. Express the answer in lowest terms.

a. $$\begin{array}{rr} & \frac{1}{2}\left(\frac{\times 4}{\times 4}\right) = \frac{4}{8} \\ + & \frac{3}{8}\left(\frac{\times 1}{\times 1}\right) = \frac{3}{8} \\ \hline & \frac{7}{8} \end{array}$$

b. $$\begin{array}{rr} & \frac{1}{4}\left(\frac{\times 2}{\times 2}\right) = \frac{2}{8} \\ + & \frac{3}{8}\left(\frac{\times 1}{\times 1}\right) = \frac{3}{8} \\ \hline & \frac{5}{8} \end{array}$$

c. $$\begin{array}{rr} & \frac{1}{5} \\ + & \frac{1}{10} \\ \hline \end{array}$$

d. $$\begin{array}{rr} & \frac{5}{16} \\ + & \frac{1}{4} \\ \hline \end{array}$$

e. $$\begin{array}{rr} & \frac{1}{3} \\ + & \frac{7}{12} \\ \hline \end{array}$$

f. $$\begin{array}{rr} & \frac{2}{3} \\ + & \frac{1}{6} \\ \hline \end{array}$$

g. $$\begin{array}{rr} & \frac{3}{10} \\ + & \frac{2}{5} \\ \hline \end{array}$$

h. $$\begin{array}{rr} & \frac{1}{12} \\ + & \frac{1}{4} \\ \hline \end{array}$$

Answers to Exercise 12

c. $\frac{3}{10}$

d. $\frac{9}{16}$

e. $\frac{11}{12}$

f. $\frac{5}{6}$

g. $\frac{7}{10}$

h. $\frac{1}{3}$

How did you do? If you are struggling with this process, speak to your instructor for help.

Exercise 13

More practice. Do only as many as you think you need.

a.
$$\begin{aligned} \frac{2}{3}\left(\frac{\times 4}{\times 4}\right) &= \frac{8}{12} \\ \frac{1}{2}\left(\frac{\times 6}{\times 6}\right) &= \frac{6}{12} \\ + \quad \frac{3}{4}\left(\frac{\times 3}{\times 3}\right) &= \frac{9}{12} \\ \hline \frac{23}{12} &= 1\frac{11}{12} \end{aligned}$$

b.
$$\begin{aligned} \frac{5}{24}\left(\frac{\times 1}{\times 1}\right) &= \frac{5}{24} \\ \frac{1}{3}\left(\frac{\times 8}{\times 8}\right) &= \frac{8}{24} \\ + \quad \frac{3}{8}\left(\frac{\times 3}{\times 3}\right) &= \frac{9}{24} \\ \hline \frac{22}{24} &= 1\frac{11}{12} \end{aligned}$$

c.
$$\begin{array}{r} \frac{5}{12} \\ \frac{5}{6} \\ + \quad \frac{3}{4} \\ \hline \end{array}$$

d.
$$\begin{array}{r} \frac{3}{10} \\ \frac{3}{4} \\ + \quad \frac{4}{5} \\ \hline \end{array}$$

e.
$$\begin{array}{r} \frac{1}{2} \\ \frac{2}{5} \\ + \quad \frac{7}{10} \\ \hline \end{array}$$

f.
$$\begin{array}{r} \frac{5}{6} \\ \frac{3}{4} \\ + \quad \frac{1}{3} \\ \hline \end{array}$$

g.
$$\begin{array}{r} \frac{7}{16} \\ +\quad \frac{3}{4} \\ \hline \end{array}$$

h.
$$\begin{array}{r} \frac{4}{5} \\ +\quad \frac{1}{3} \\ \hline \end{array}$$

Answers to Exercise 13

c. 2

d. $1\frac{17}{20}$

e. $1\frac{3}{5}$

f. $1\frac{1}{12}$

g. $1\frac{3}{16}$

h. $1\frac{2}{15}$

Addition questions are often written with the fractions side by side instead of one fraction above the other. For example:

$$\frac{2}{3} + \frac{5}{8} =$$

You may solve as shown in this example or rewrite the question with the fractions one above the other.

$$\frac{2}{3} + \frac{5}{8} = \frac{2}{3}\frac{\times 8}{\times 8} + \frac{5}{8}\frac{\times 3}{\times 3} = \frac{16}{24} + \frac{15}{24} = \frac{31}{24} = 1\frac{7}{24}$$

or

$$\begin{array}{rl} \frac{2}{3}\left(\frac{\times 8}{\times 8}\right) & = \frac{16}{24} \\ \frac{5}{8}\left(\frac{\times 3}{\times 3}\right) & = \frac{15}{24} \\ \hline \frac{31}{24} & = 1\frac{7}{24} \end{array}$$

Exercise 14

Find the sum. Do enough questions to be confident in your skill.

$$\frac{1}{2}+\frac{1}{6}=$$

a. $\frac{1}{2}\left(\frac{\times 3}{\times 3}\right)+\frac{1}{6}=$

$$\frac{3}{6}+\frac{1}{6}= \quad \frac{4}{6}=\frac{2}{3}$$

b. $\frac{1}{4}+\frac{7}{8}=$

c. $\frac{1}{5}+\frac{3}{5}=$

d. $\frac{1}{12}+\frac{2}{3}=$

e. $\frac{1}{3}+\frac{2}{3}=$

f. $\frac{1}{6}+\frac{3}{8}=$

g. $\frac{3}{4}+\frac{1}{2}=$

h. $\frac{1}{3}+\frac{5}{8}=$

Answers to Exercise 14

b. $1\frac{1}{8}$

c. $\frac{4}{5}$

d. $\frac{3}{4}$

e. 1

f. $\frac{13}{24}$

g. $1\frac{1}{4}$

h. $\frac{23}{14}$

You already know how to add mixed numbers which have the same (like) denominators.

To add mixed numbers with different denominators, you must:

- Find the least common denominator (LCD) for the fractions.

- Rename the fractions as equivalent fractions using the LCD
- Be sure to bring the whole number across the equal sign when you rename.
- Add the fractions.
- Add the whole numbers.
- Simplify the answer.
- Remember that if the sum of the fractions is an improper fraction, you must rename it as a mixed number that is added to the whole number in your answer.

Example M

$$\begin{array}{rl} & 3\frac{3}{4}\left(\frac{\times 5}{\times 5}\right) = 3\frac{15}{20} \\ + & 6\frac{1}{5}\left(\frac{\times 4}{\times 4}\right) = 6\frac{4}{20} \\ \hline & = 9\frac{19}{20} \end{array}$$

Example N

$$\begin{aligned} 3\frac{3}{4}\left(\frac{\times 3}{\times 3}\right) &= 3\frac{3}{12} \\ 8\frac{2}{3}\left(\frac{\times 4}{\times 4}\right) &= 8\frac{8}{12} \\ +\quad 2\frac{1}{2}\left(\frac{\times 6}{\times 6}\right) &= 2\frac{6}{12} \\ \hline \\ &= 13\frac{17}{12} \end{aligned}$$

$\frac{17}{12}$ is an improper fraction so we simplify it: $\frac{17}{12} = 1\frac{5}{12}$

Therefore, the answer becomes:

$$13\frac{17}{12} = 13 + 1\frac{5}{12} = 14\frac{5}{12}$$

Exercise 15

Add. Express the sums in lowest terms.

a.
$$\begin{aligned} 1\frac{3}{8}\left(\frac{\times 1}{\times 1}\right) &= 1\frac{3}{8} \\ +\quad 1\frac{1}{4}\left(\frac{\times 2}{\times 2}\right) &= 1\frac{2}{8} \\ \hline \\ & 2\frac{5}{8} \end{aligned}$$

b. $$\begin{array}{r} 3\frac{1}{5} \\ +\ 2\frac{3}{10} \\ \hline \end{array}$$

c. $$\begin{array}{r} 6\frac{2}{15} \\ +\ 1\frac{3}{10} \\ \hline \end{array}$$

d. $$\begin{array}{r} 8\frac{1}{4} \\ +\ 4\frac{1}{3} \\ \hline \end{array}$$

e. $$\begin{array}{r} 5\frac{2}{3} \\ +\ 6\frac{1}{4} \\ \hline \end{array}$$

f. $$\begin{array}{r} 116\frac{5}{8} \\ +\ 9\frac{1}{24} \\ \hline \end{array}$$

Answers to Exercise 15

b. $5\frac{1}{2}$

c. $7\frac{13}{30}$

d. $12\frac{7}{12}$

e. $11\frac{11}{12}$

f. $125\frac{2}{3}$

Exercise 16

Add. Express the sums in lowest terms.

a. $$\begin{array}{rcl} 4\frac{1}{2}\left(\frac{\times 6}{\times 6}\right) & = & 4\frac{6}{12} \\ +\ 2\frac{1}{3}\left(\frac{\times 4}{\times 4}\right) & = & 2\frac{4}{12} \\ \hline & & 6\frac{10}{12} = 6\frac{5}{6} \end{array}$$

b. $3\frac{2}{3} + 1\frac{1}{2}$

c. $6\frac{1}{2} + 4\frac{1}{4}$

d. $2\frac{1}{8} + 4\frac{3}{16}$

e. $2\frac{1}{5} + 3\frac{2}{3}$

f. $3\frac{3}{8} + 2\frac{3}{4} + 1\frac{1}{2}$

g. $4\frac{3}{4} + 2\frac{1}{5} + 4\frac{1}{2}$

Answers to Exercise 16

b. $5\frac{1}{6}$

c. $10\frac{3}{4}$

d. $6\frac{5}{16}$

e. $12\frac{7}{15}$

f. $7\frac{5}{8}$

g. $11\frac{9}{20}$

Problems Using Addition of Common Fractions

Exercise 17

Solve these problems.

a. The bathroom shelf is crowded with hand lotion bottles, each with a little lotion left inside. Everyone always likes to try the new bottle before the old one is emptied! One bottle is $\frac{1}{3}$ full, another is $\frac{1}{4}$ full, one is only $\frac{1}{8}$ full and one is still $\frac{1}{2}$ full. How much lotion is in the bottles altogether?

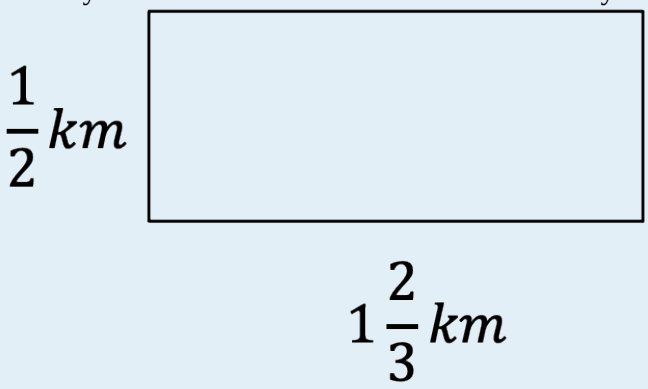
b. Sometimes Joan thinks she will go crazy when she packs the lunches for her family. Little Sarah has decided she only wants $\frac{3}{4}$ of a sandwich, Megan wants $\frac{1}{4}$ of a sandwich, Joan's husband takes $1\frac{1}{2}$ sandwiches, and their son, who does heavy work, takes 3 sandwiches! How many sandwiches does Joan make?

c. Dave paid the babysitter for the week. The sitter worked $3\frac{3}{4}$ hours on Monday, $4\frac{1}{4}$ hours on Tuesday and $6\frac{1}{2}$ hours on Friday. How many hours did the babysitter work looking after Dave's children that week?

d. Quite a lot of watermelon was left after the watermelon-eating contest: $1\frac{1}{2}$ watermelons on one table, $2\frac{3}{4}$ of a watermelon on another table and $\frac{5}{8}$ of a watermelon on the third table. The organizers want to know exactly how much was left over so they will not buy so much next year. Calculate the amount of watermelon left over.

e. Jeanette has a novel to read for English. She read $\frac{1}{2}$ of the book on the weekend, only had time to read $\frac{1}{8}$ of the book on Monday and another $\frac{1}{4}$ on Wednesday. How much of the book has she read?

f. Dion walks around this route each day for exercise. How far does he walk each day? Is this a



perimeter or area question?

g. How many metres of baseboard are needed for a rectangular room $4\frac{1}{2}$ m by $3\frac{1}{5}$m? Deduct 1 m for the doorway. (TIP: Draw a picture)

h. Sana is going to frame a large piece of art with a wooden frame. The art piece is $1\frac{1}{10}$ m by $\frac{3}{5}$ m. How much framing material should she buy?

i. Find the perimeter of the following figure.

j. Find the perimeter of a picture frame if one side is 12 1/10 cm and the other side measures 14 1/5 cm.

k. Find the perimeter of this triangle.

Answers to Exercise 17

a. 1 5/24 bottles total
b. 5 1/2 sandwiches
c. 14 1/2 hours
d. 4 7/8 watermelons
e. 7/8 of the book
f. He walks 4 1/3 km each day, perimeter
g. 14 2/5 m of material
h. 3 2/5 m of material
i. 15 2/3 cm
j. 52 3/5 cm k) 17 11/24 cm

Topic A: Self-Test

Mark /14 Aim 11/14

A. Add and express the answers in lowest terms (6 marks).

a. $\begin{array}{r} \frac{1}{4} \\ +\ \frac{3}{4} \\ \hline \end{array}$

c. $\begin{array}{r} \frac{3}{8} \\ +\ \frac{3}{4} \\ \hline \end{array}$

b. $\begin{array}{r} 1\frac{3}{5} \\ +\ 3\frac{4}{5} \\ \hline \end{array}$

d. $\begin{array}{r} 2\frac{1}{6} \\ +\ 3\frac{5}{12} \\ \hline \end{array}$

e. $$\begin{array}{r} 6\frac{3}{4} \\ +\ 2\frac{1}{2} \\ \hline \end{array}$$

f. $$\begin{array}{r} 6\frac{7}{8} \\ +\ 9\frac{1}{3} \\ \hline \end{array}$$

B. Word Problems (8 marks).

a. The flight from Vancouver to Sandspit took $1\frac{1}{4}$ hours. The wait in Sandspit was $1\frac{1}{2}$ hours and the flight from there to Ketchican, Alaska was $\frac{3}{4}$ of an hour. How long did it take to make the trip from Vancouver, BC to Ketchican, Alaska?

b. Dave built $\frac{1}{8}$ of the fence around his house on Monday, $\frac{1}{4}$ of it on Tuesday and another $\frac{1}{4}$ on Wednesday. How much of the fence has he built?

c. John bought snacks in bulk for the class party. His items weighed $\frac{2}{5}$ kg of chips, $\frac{3}{5}$ kg of peanuts, $\frac{1}{2}$ kg of cheese and $1\frac{1}{4}$ kg of fresh veggies. How much did all his snacks weigh?

d. Clarence is making a frame for his favourite photo. The frame needs to be $\frac{1}{8}$ m by $\frac{5}{6}$ m. How much material should he buy?

Answers to Topic A Self-Test

a. 1

b. $5\frac{2}{5}$

c. $1\frac{1}{8}$

d. $5\frac{7}{12}$

e. $9\frac{1}{4}$

f. $16\frac{5}{24}$

a. $3\frac{1}{2}$ hr

b. $\frac{5}{8}$ of the fence

c. $2\frac{3}{4}$ kg of food

d. $1\frac{11}{12}$ m of material

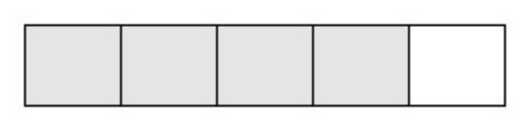
Topic B: Subtracting Common Fractions

Good News!

There is only one new thing to learn in this topic. Everything else uses skills and knowledge you already have.

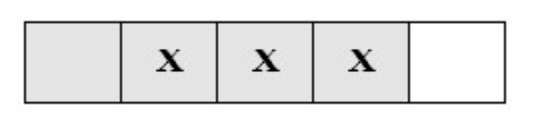
Let's look at subtraction:

Example A



The shaded part $\left(\frac{4}{5}\right)$ is the amount that you are starting with.

Now cross out (pretend you are *taking away*) 3 shaded parts $\left(\frac{3}{5}\right)$.



Example B

Draw a pizza.

- Slice it into 8 equal pieces.

- Draw pieces of pineapple on 5 pieces.
- What fraction of the pizza has pineapple? $\frac{5}{8}$
- Cross out 2 pineapple pieces to show they have been eaten.
- How much of the pineapple pizza is left?

$$\begin{array}{rll} & \frac{5}{8} & \text{(amount you started with)} \\ - & \frac{2}{8} & \text{(amount eaten, "taken away")} \\ \hline & \frac{3}{8} & \text{of the pizza is left with pineapple on it} \end{array}$$

Common fractions must have the same denominator when you subtract one from the other. **Subtract the numerators** and keep the same denominators.

Exercise 1

Subtract to find the **difference**.

TIP: Express the difference in lowest terms.

a. $$\begin{array}{rl} & \frac{3}{5} \\ - & \frac{1}{5} \\ \hline & \frac{2}{5} \end{array}$$

b. $$\begin{array}{rl} & \frac{7}{8} \\ - & \frac{3}{8} \\ \hline & \frac{4}{8} = \frac{1}{2} \end{array}$$

c. $\begin{array}{r} \frac{2}{3} \\ -\ \frac{1}{3} \\ \hline \end{array}$

f. $\begin{array}{r} \frac{3}{4} \\ -\ \frac{1}{4} \\ \hline \end{array}$

d. $\begin{array}{r} \frac{5}{9} \\ -\ \frac{2}{9} \\ \hline \end{array}$

g. $\begin{array}{r} \frac{3}{2} \\ -\ \frac{1}{2} \\ \hline \end{array}$

e. $\begin{array}{r} \frac{6}{7} \\ -\ \frac{1}{7} \\ \hline \end{array}$

Answers to Exercise 1

c. $\frac{1}{3}$

d. $\frac{1}{3}$

e. $\frac{5}{7}$

f. $\frac{1}{2}$

g. $\frac{2}{2} = 1$

You know how to find the **least common denominator (LCD)** and to **rewrite fractions in an equivalent form** using the **LCD**.

You must use those skills when you wish to subtract fractions with different denominators.

Example C

$$\frac{4}{5} - \frac{3}{10} =$$

Denominators are 5 and 10. The least common multiple is 10, so the least common denominator is 10.

$$\begin{aligned} \frac{4}{5}\left(\frac{\times 2}{\times 2}\right) &= \frac{8}{10} && \text{Write equivalent fractions using the LCD} \\ -\quad \frac{3}{10} &= \frac{3}{10} && \text{Subtract the numerators} \\ \hline = \frac{5}{10}\left(\frac{\div 5}{\div 5}\right) &= \frac{1}{2} && \text{Simplify the answer.} \end{aligned}$$

Exercise 2

Subtract and simplify the answers.

a. $$\begin{array}{r} \frac{5}{6} \\ -\ \frac{2}{3} \\ \hline \frac{1}{6} \end{array}$$

b. $$\begin{array}{r} \frac{5}{6} \\ -\ \frac{2}{3} \\ \hline \frac{1}{6} \end{array}$$

c. $$\begin{array}{r} \frac{1}{4} \\ -\ \frac{1}{12} \\ \hline \end{array}$$

d. $$\begin{array}{r} \frac{7}{10} \\ -\ \frac{3}{5} \\ \hline \end{array}$$

e. $\begin{array}{r} \frac{15}{16} \\ -\ \frac{5}{8} \\ \hline \end{array}$

f. $\begin{array}{r} \frac{7}{16} \\ -\ \frac{1}{4} \\ \hline \end{array}$

g. $\begin{array}{r} \frac{3}{8} \\ -\ \frac{1}{4} \\ \hline \end{array}$

h. $\begin{array}{r} \frac{5}{6} \\ -\ \frac{1}{2} \\ \hline \end{array}$

i. $\begin{array}{r} \frac{7}{8} \\ -\ \frac{1}{2} \\ \hline \end{array}$

j. $\begin{array}{r} \frac{5}{8} \\ -\ \frac{1}{3} \\ \hline \end{array}$

k. $\begin{array}{r} \frac{2}{3} \\ -\ \frac{1}{8} \\ \hline \end{array}$

l. $\begin{array}{r} \frac{5}{12} \\ -\ \frac{1}{4} \\ \hline \end{array}$

m. $\begin{array}{r} \frac{1}{2} \\ -\ \frac{1}{6} \\ \hline \end{array}$

o. $\begin{array}{r} \frac{1}{8} \\ -\ \frac{1}{16} \\ \hline \end{array}$

n. $\begin{array}{r} \frac{3}{4} \\ -\ \frac{1}{10} \\ \hline \end{array}$

p. $\begin{array}{r} \frac{4}{5} \\ -\ \frac{1}{2} \\ \hline \end{array}$

Answers to Exercise 2

c. $\frac{1}{6}$

d. $\frac{1}{10}$

e. $\frac{5}{16}$

f. $\frac{3}{16}$

g. $\frac{1}{8}$

h. $\frac{3}{8}$

i. $\frac{7}{24}$

j. $\frac{13}{24}$

k. $\frac{1}{6}$

l. $\frac{1}{3}$

m. $\frac{13}{20}$

n. $\frac{1}{16}$

o. $\frac{3}{10}$

Subtracting mixed numbers is very similar to adding mixed numbers.

- Find the least common denominator if the fractions do not have the same denominator already.
- Rename the fractions as equivalent fractions using the **LCD. Don’t forget to keep whole number with the problem.**

- Subtract the second denominator from the first. Keep the same denominator. Subtract the whole numbers.
- Simplify the answer.

Example D

$$\begin{array}{rrcl} & 4\frac{1}{2}\left(\frac{\times 3}{\times 3}\right) & = & 4\frac{3}{6} \\ - & 3\frac{1}{6} & = & 3\frac{1}{6} \\ \hline & & & 1\frac{2}{6} = 1\frac{1}{3} \end{array}$$

Example E

$$\begin{array}{rrcl} & 12\frac{3}{4}\left(\frac{\times 3}{\times 3}\right) & = & 12\frac{9}{12} \\ - & \frac{2}{3}\left(\frac{\times 4}{\times 4}\right) & = & \frac{8}{12} \\ \hline & & & 12\frac{1}{12} \end{array}$$

Exercise 3

Work through all these questions carefully.

a. $16\frac{2}{3} = 16\frac{16}{24}$
$-\ 4\frac{3}{8} = 4\frac{9}{24}$

$12\frac{7}{24}$

b. $9\frac{7}{12}$
$-\ 9\frac{5}{12}$

c. $6\frac{3}{4}$
$-\ 2\frac{1}{3}$

d. $22\frac{5}{6}$
$-\ 18\frac{2}{5}$

e. $3\frac{7}{8}$
$-\ 2\frac{3}{4}$

f. $1\frac{7}{100}$
$-\ \frac{1}{2}$

g. $9\frac{1}{4}$
$-\ 7$

h. $1\frac{5}{8}$
$-\ \frac{1}{3}$

i.
$$\begin{array}{r} 19\frac{5}{6} \\ -\ 11\frac{5}{12} \\ \hline \end{array}$$

Answers to Exercise 3

b. $\frac{1}{6}$

c. $4\frac{5}{12}$

d. $4\frac{13}{30}$

e. $1\frac{1}{8}$

f. $1\frac{1}{5}$

g. $2\frac{1}{4}$

h. $1\frac{7}{24}$

i. $8\frac{5}{12}$

Subtracting Mixed Numbers from Whole Numbers

This is the start of a new process! You already have all the skills to do this, but the process is new.

Example F

Let's look at some apples.

You have 3 whole apples and you want to give your son 1 apple and your daughter half an apple. How will you do this?

Yes! You will cut one apple in half.

Now you have $2\frac{2}{2}$ apples. And you can easily give away $1\frac{1}{2}$ of them. Cross out $1\frac{1}{2}$ apples in the drawing. How much is left?

Here is the arithmetic for what you just did.

$$3 = 2\frac{2}{2} - \frac{1}{2} = 1\frac{1}{2}$$

$1\frac{1}{2}$ apples are left

Example G

Here are 6 cans of pop to share among your friends.

4 people want a whole can, but one person is on a diet and only wants $\frac{1}{4}$ of a can. How much pop will be left?

What will you do? You will open a can and think of that can as $\frac{4}{4}$.

You have $5\frac{4}{4}$ cans of pop and you can give out 4 whole cans and $\frac{1}{4}$ can of pop. Cross out the 4 whole cans and $\frac{1}{4}$ of a can in the drawing.

How many cans are left?

Here is the arithmetic:

$$\begin{array}{rr} 6 = & 5\frac{4}{4} \\ - & 1\frac{1}{4} \\ \hline & 1\frac{3}{4} \end{array}$$

Example H

Draw five apple pies. Plan to give away $3\frac{2}{3}$ of the pies. How many pies are left?

To do that, cut one pie into thirds. Then cross out 2 whole pies and $\frac{2}{3}$. Here is the arithmetic.

$$\begin{array}{rr} 5 = & 4\frac{3}{3} \\ - & 3\frac{2}{3} \\ \hline & 1\frac{1}{3} \quad \text{pies left} \end{array}$$

Remember $1 = \frac{1}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \frac{6}{6} = \frac{7}{7} = \frac{8}{8} = \frac{9}{9} = \frac{10}{10}$ and so on.

To subtract a mixed number from a whole number

Step 1: "Borrow" one from the whole number.

Step 2: Rename the one as an improper fraction with the same denominator as the fraction you are taking away. **(Remember to change the whole number to one less.)**

Step 3: Subtract the mixed numbers.

Example I

$18 - 12\frac{3}{4} =$

"Borrow" 1 from 18 and change to $\frac{4}{4}$.

$$\begin{array}{rr} \cancel{18}\,17 = & 17\frac{4}{4} \\ - & 12\frac{3}{4} \\ \hline & 5\frac{1}{4} \end{array}$$

Try it yourself:

$1 - \frac{4}{5} =$

Exercise 4

Subtract and express in lowest terms. **TIP:** Remember to change your whole number to a mixed numeral.

a. $5 = 4\frac{2}{2}$
$-\ 1\frac{1}{2}$
$2\frac{1}{2}$

b. 9
$-\ 4\frac{3}{10}$

c. 12
$-\ 11\frac{5}{8}$

d. 25
$-\ 20\frac{1}{4}$

e. 3
$-\ 2\frac{2}{3}$

f. 8
$-\ \frac{3}{4}$

g. 32
$-\ 28\frac{1}{2}$

h. 5
$-\ 3\frac{1}{3}$

i. $8 - 4\frac{4}{9}$

Answers to Exercise 4

b. $4\frac{7}{10}$

c. $\frac{3}{8}$

d. $4\frac{3}{4}$

e. $\frac{1}{3}$

f. $7\frac{1}{4}$

g. $3\frac{1}{2}$

h. $1\frac{2}{3}$

i. $3\frac{5}{9}$

Renaming to Subtract Mixed Numbers

Example J

Look at the $3\frac{1}{4}$ chocolate bars.

You need to give $2\frac{3}{4}$ chocolate bars to the kids on the soccer team. How will you do this?

You will have to cut up one of the whole chocolate bars into 4 pieces, or $\frac{4}{4}$.

Now you have 2 whole bars, $\frac{4}{4}$ of a bar and $\frac{1}{4}$ of a bar which equals $2\frac{5}{4}$ of a bar. It will be easy to give away (subtract) $2\frac{3}{4}$ bars. Cross out $2\frac{3}{4}$ bars. How much is left?

Here is the arithmetic:

$$3\frac{1}{4} - 2\frac{3}{4} =$$

$$\begin{array}{rrrl} 3\frac{1}{4} = & 2\frac{4}{4} + \frac{1}{4} = & 2\frac{5}{4} & \\ & - & 2\frac{3}{4} & \\ \hline & & \frac{2}{4} & = \frac{1}{2} \text{ chocolate bar left} \end{array}$$

Example K

Look at the 5 cherry pies.

You promised to send $3\frac{5}{8}$ pies to the spring party at the school. What will you do? Cut one of the pies into eighths.

Do that, and the cross out $3\frac{5}{8}$ pies. How much pie is left?

$$\begin{array}{rrrl} 5\frac{1}{8} = 4\frac{8}{8} + \frac{1}{8} = & 4\frac{9}{8} & & \\ & - & 3\frac{5}{8} & \\ \hline & & 1\frac{4}{8} & = 1\frac{1}{2} \text{ pies left} \end{array}$$

Renaming a mixed number so you can subtract

Step 1: Check to see if renaming is needed. That is, check that the fraction in the mixed number you are starting with is less than the fraction you want to take away.

$$4\frac{1}{3} - 2\frac{2}{3} = \quad (\ \frac{1}{3} \text{ is less than } \frac{2}{3}\ )$$

Step 2: "Borrow" one from the whole number TIP: Remember to change the whole number to 1 less.
Step 3: Rename the "borrowed" one as an improper fraction with the same denominator as the other fractions.

$$4\frac{1}{3} = 3\frac{3}{3} + \frac{1}{3}$$

$\frac{3}{3}$ is the 1 that you borrowed from the four.

Step 4: Add the renamed one to the fraction that is part of the same mixed number.

$$3\frac{3}{3} + \frac{1}{3} = 3\frac{4}{3}$$

Step 5: Subtract as usual, expressing your answer in lowest terms.

$$\begin{array}{rr} & 4\frac{1}{3} = \quad 3\frac{4}{3} \\ - & 2\frac{2}{3} = \quad 2\frac{2}{3} \\ \hline & \quad 1\frac{2}{3} \end{array}$$

Example L

$5\frac{2}{3} - 2\frac{4}{5}$

Step 1: $\frac{2}{5}$ is less than $\frac{4}{5}$

Step 2 and 3: Borrow one.

$5\frac{2}{5} = 4\frac{5}{5} + \frac{2}{5} = 4\frac{7}{5}$

Step 4 and 5:

$$\begin{array}{rrrl} 5\frac{2}{5} = & 4\frac{5}{5} + \frac{2}{5} = & 4\frac{7}{5} \\ - & 2\frac{4}{5} = & 2\frac{4}{5} \\ \hline & & 2\frac{3}{5} \end{array}$$

Example M

$$1\frac{2}{4} - \frac{3}{4}$$

Step 1: $\frac{2}{4}$ is less than $\frac{3}{4}$ so we need to rename to subtract.

Step 2, 3, 4 and 5:

$$\begin{array}{rrrl} 1\frac{2}{4} = & \frac{4}{4} + \frac{2}{4} = & \frac{6}{4} \\ - & \frac{3}{4} = & \frac{3}{4} \\ \hline & & \frac{3}{4} \end{array}$$

Exercise 5

Subtract. Be sure the answers are in lowest terms.

a.
$$\begin{array}{rrrl} 20\frac{1}{4} = & 19\frac{5}{4} & \\ - & 10\frac{3}{4} & \\ \hline & 9\frac{2}{4} & = 9\frac{1}{2} \end{array}$$

b.
$$\begin{array}{rr} & 3\frac{1}{3} \\ - & 1\frac{2}{3} \\ \hline & \end{array}$$

c. $56\frac{2}{5} - 20\frac{4}{5}$

d. $8\frac{1}{3} - 1\frac{2}{3}$

e. $4\frac{1}{5} - 2\frac{3}{5}$

f. $5\frac{2}{7} - 1\frac{3}{7}$

g. $12\frac{5}{9} - 10\frac{7}{9}$

h. $9\frac{3}{5} - \frac{4}{5}$

i. $15\frac{3}{8} - 14\frac{7}{8}$

Answers to Exercise 5

b. $1\frac{2}{3}$

c. $35\frac{3}{5}$

d. $6\frac{2}{3}$

e. $1\frac{3}{5}$

f. $3\frac{6}{7}$

g. $1\frac{7}{9}$

h. $8\frac{4}{5}$

i. $\frac{1}{2}$

Here is the last step for subtraction of fractions. Mixed numbers to be subtracted often do not have the same denominators-they are **unlike fractions**.

You must

- Write equivalent fractions using the LCD.
- Decide if you need to "borrow" or rename before you subtract.
- Subtract and simplify the answer.

Example N

$4\frac{1}{3} - 2\frac{5}{6} =$

$$\begin{array}{rl} 4\frac{1}{3} = 4\frac{2}{6} = 3\frac{6}{6} + \frac{2}{6} = & 3\frac{8}{6} \\ - & 2\frac{5}{6} \\ \hline & 1\frac{3}{6} = 1\frac{1}{2} \end{array}$$

Example O

$9\frac{1}{10} - 4\frac{1}{4} =$

$$\begin{array}{rrrr} 9\frac{1}{10} = & 9\frac{2}{20} = & 8\frac{20}{20} + \frac{2}{20} = & 8\frac{22}{20} \\ - \quad 4\frac{1}{4} = & & 4\frac{5}{20} = & 4\frac{5}{20} \\ \hline & & & 4\frac{17}{20} \end{array}$$

Exercise 6

Subtract. Be sure the answers are in lowest terms.

a. $$\begin{array}{rrrr} & 9\frac{3}{8} = & 9\frac{3}{8} = & 8\frac{11}{8} \\ - \quad 7\frac{1}{2} = & 7\frac{4}{8} = & 7\frac{4}{8} \\ \hline & & & 1\frac{7}{8} \end{array}$$

c. $$\begin{array}{r} 15\frac{1}{6} \\ - \quad 12\frac{7}{8} \\ \hline \end{array}$$

b. $$\begin{array}{r} 7\frac{1}{16} \\ - \quad 4\frac{1}{8} \\ \hline \end{array}$$

d. $$\begin{array}{r} 20\frac{2}{6} \\ - \quad 16\frac{2}{3} \\ \hline \end{array}$$

e. $$\begin{array}{r} 6\frac{3}{5} \\ - \quad 4\frac{1}{4} \\ \hline \end{array}$$

f. $$\begin{array}{r} 9\frac{1}{4} \\ -\ 7\frac{3}{8} \\ \hline \end{array}$$

h. $$\begin{array}{r} 18\frac{1}{6} \\ -\ 12\frac{2}{3} \\ \hline \end{array}$$

g. $$\begin{array}{r} 5\frac{1}{3} \\ -\ 2\frac{1}{2} \\ \hline \end{array}$$

Answers to Exercise 6

b. $2\frac{15}{16}$

c. $2\frac{7}{24}$

d. $3\frac{2}{3}$

e. $2\frac{7}{20}$

f. $1\frac{7}{8}$

g. $2\frac{5}{6}$

h. $5\frac{1}{2}$

Exercise 7

A Subtraction Review.

a. $$\begin{array}{r} \frac{5}{8} \\ -\ \frac{1}{4} \\ \hline \end{array}$$

b. $$\begin{array}{r} 8\frac{3}{4} \\ -\ 4\frac{1}{3} \\ \hline \end{array}$$

c. $$\begin{array}{r} 13\frac{1}{3} \\ -\ 12\frac{5}{6} \\ \hline \end{array}$$

f. $$\begin{array}{r} 7 \\ -\ 1\frac{7}{8} \\ \hline \end{array}$$

d. $$\begin{array}{r} 7\frac{1}{3} \\ -\ 4\frac{5}{6} \\ \hline \end{array}$$

g. $$\begin{array}{r} 19\frac{2}{3} \\ -\ 18 \\ \hline \end{array}$$

e. $$\begin{array}{r} 9\frac{1}{5} \\ -\ 6\frac{1}{3} \\ \hline \end{array}$$

h. $$\begin{array}{r} \frac{5}{8} \\ -\ \frac{1}{2} \\ \hline \end{array}$$

Answers to Exercise 7

a. $\frac{3}{8}$

b. $4\frac{5}{12}$

c. $\frac{1}{2}$

d. $2\frac{1}{2}$

e. $2\frac{13}{15}$

f. $5\frac{1}{8}$

g. $1\frac{1}{3}$

h. $\frac{1}{8}$

Problems Using Subtraction of Common Fractions

Subtraction problems may ask you to:

- find the difference between two amounts.
    - "how much more is…"
    - "how much less is…"
- take away, give away, or lose.
- decide how much is left or how much remains.

Read over the subtraction problems that you did in Unit Two with decimals. The wording and problem situations will be similar.

Drawing a sketch and estimating the answer using whole numbers may also be helpful.

Exercise 8

a. The New Earth Diaper Company stocks went from $5\frac{7}{8}$ to $7\frac{3}{8}$ this week. How much did the stocks increase in value?

b. Jean is knitting an afghan which will be made from 5 long pieces. She has finished $3\frac{2}{3}$ of the pieces. How many pieces does she still have to knit?

c. Dave said he worked in the garden for $6\frac{1}{4}$ hours, but his wife saw him snoozing under a tree for $1\frac{1}{2}$ hours! How long did Dave really work?

d. Maureen left $\frac{2}{3}$ of a big lasagne casserole in the fridge hoping it would be enough for a quick dinner that night. But alas, when she got home, only $\frac{1}{4}$ of the big lasagne casserole remained. How much of the lasagne was eaten while she was out?

e. In the first half of 1992, the Bank of Canada Prime Rate dropped steadily. It started the year at $8\frac{1}{2}$ % and was at a low $6\frac{3}{4}$% in July. How many percentage points did the prime rate drop? (Note: treat the % just like a unit in this problem.)

f. Mark is $1\frac{3}{4}$ metres tall. His partner is $1\frac{1}{3}$ metres tall. How much taller is Mark than his partner?

g. A teenager can drink $3\frac{3}{4}$ litres of water each day. If this teenager drinks $2\frac{1}{2}$ litres of water by lunch, how much more water will he drink in the day?

h. Joan bought $13\frac{1}{2}$ metres to do her sewing project. She has used $8\frac{1}{5}$ metres so far. How much

material does she have left?

Answers to Exercise 8

a. $1\frac{1}{2}$ or \$1.50

b. $1\frac{1}{3}$ pieces

c. $4\frac{3}{4}$ hours

d. $\frac{5}{12}$ of the lasagna

e. $1\frac{3}{4}$ percentage points

f. $\frac{5}{12}$ metres taller

g. $1\frac{1}{4}$ litres left to drink

h. $5\frac{3}{10}$ metres left

Topic B Self-Test

Mark /15 Aim 12/15

A. Subtract these fractions. Simplify the answers when necessary (15 marks).

a. $\begin{array}{r} \frac{7}{8} \\ -\ \frac{1}{8} \\ \hline \end{array}$

c. $\begin{array}{r} \frac{7}{8} \\ -\ \frac{3}{16} \\ \hline \end{array}$

b. $\begin{array}{r} \frac{11}{15} \\ -\ \frac{4}{15} \\ \hline \end{array}$

d. $\begin{array}{r} \frac{2}{3} \\ -\ \frac{1}{6} \\ \hline \end{array}$

e. $\begin{array}{r} \frac{4}{7} \\ -\ \frac{1}{14} \\ \hline \end{array}$

f. $\begin{array}{r} \frac{4}{5} \\ -\ \frac{3}{8} \\ \hline \end{array}$

g. $\begin{array}{r} 4 \\ -\ 2\frac{1}{2} \\ \hline \end{array}$

h. $\begin{array}{r} 5 \\ -\ 4\frac{7}{8} \\ \hline \end{array}$

i. $\begin{array}{r} 10\frac{3}{5} \\ -\ 3\frac{3}{10} \\ \hline \end{array}$

j. $\begin{array}{r} 7\frac{1}{5} \\ -\ 3\frac{4}{5} \\ \hline \end{array}$

k. $\begin{array}{r} 12\frac{1}{8} \\ -\ 11 \\ \hline \end{array}$

l. $\begin{array}{r} 9\frac{1}{5} \\ -\ \frac{1}{4} \\ \hline \end{array}$

m. $\begin{array}{r} 5\frac{1}{4} \\ -\ 1\frac{2}{3} \\ \hline \end{array}$

n. $\begin{array}{r} 10\frac{1}{2} \\ -\ 2\frac{2}{5} \\ \hline \end{array}$

o. $\begin{array}{r} 6\frac{2}{3} \\ -\ 4\frac{3}{8} \\ \hline \end{array}$

Answers to Topic B Self-Test

a. $\frac{3}{4}$

b. $\frac{7}{15}$

c. $\frac{11}{16}$

d. $\frac{1}{2}$

e. $\frac{1}{2}$

f. $\frac{17}{40}$

g. $1\frac{1}{2}$

h. $\frac{1}{8}$

i. $7\frac{3}{10}$

j. $3\frac{2}{5}$

k. $1\frac{1}{8}$

l. $8\frac{19}{20}$

m. $3\frac{7}{12}$

n. $8\frac{1}{10}$

o. $2\frac{7}{24}$

Topic C: Problems Using Common Fractions

Review again the five steps for problem solving.

Step 1: Read, **find** the **question**.

Step 2: Get the **necessary information** from the problem.

Step 3: Decide on the **arithmetic operation**.

Step 4: Estimate the answer, using rounded numbers. **Does the answer to the problem seem sensible?**

Step 5: Solve the problem using the **actual numbers**. Check. Is the answer close to the estimate?

Fraction problems with mixed numbers are easily estimated by rounding the fraction to the nearest whole number.

If the problem uses **proper fractions** it is **harder to estimate the answer** using a rounded number because proper fractions will round off to either 0 or 1, which isn't too useful. However, to figure out the operation to use (Step 3), it sometimes helps to **substitute whole numbers** for the proper fraction; this may help you to make sense of the problem. Drawing a sketch might also be helpful.

Exercise 1

Decide on the arithmetic operation (+ , −, × , ÷) and then solve

a. The following recipe for Macaroni and Cheese is very tasty. It feeds six people. Look at the recipe and then complete the chart according to these questions.

   i. You want to make enough macaroni and cheese for 9 people. That is $\frac{9}{6}$ $(1\frac{1}{2})$ of the recipe.

   ii. Figure out all the quantities. Figure out the quantities for 3/4 the recipe, so it is the right amount for 3 people.Tasty Macaroni and Cheese

Ingredients for 6 people	**Quantities for 9 people ($1\frac{1}{2}$ x)**	**Quantities for 3 people ($\frac{1}{2}$ x)**
$1\frac{3}{4}$ cup elbow macaroni		
$\frac{3}{4}$ cup chopped onion		
$\frac{1}{2}$ cup chopped green pepper		
10 sliced mushrooms		
3 tbsp. butter or margarine		
$1\frac{1}{2}$ tbsp. flour		
1 tsp. dry mustard		
$\frac{3}{4}$ tsp. salt		
$\frac{1}{4}$ tsp. oregano		
$2\frac{1}{2}$ cups milk		
$2\frac{1}{2}$ cups shredded cheddar cheese		
$\frac{1}{2}$ cup fine dry breadcrumbs		

b. Jack spent his school day this way: $1\frac{1}{4}$ hours on English, $1\frac{3}{4}$ hours on math, $\frac{1}{2}$ hour on science and 2 hours on lunch and coffee breaks. How long was his school day?

c. The canoe trip usually takes $4\frac{1}{4}$ hours for the 34 kilometre trip. What is the average time per kilometre?

d. The “Walkyerbunsoff” Club members walk $4\frac{3}{4}$ kilometres around the shopping mall six mornings a week.

i. How far do they walk each week?

ii. How far do they walk in one year if they keep the same schedule? (52 weeks = 1 year)

e. The test has 30 multiple choice questions to be completed in $\frac{3}{4}$ of an hour. How much time can be spent on each question? (It might be easier to work with minutes. 1 hour = 60 minutes, so $\frac{3}{4}$ of an hour =? minutes.)

f. The gas tank was filled before the family left Hazelton. When they pulled into Prince Rupert that afternoon, the gas gauge showed they had used $\frac{5}{8}$ of the gas.

i. What fraction of the gas was left?

ii. The full gas tank holds 54 litres. How many litres of gas did they use in the trip from Hazelton to Prince Rupert?

g. About $\frac{2}{5}$ of the population of our city has an Italian background. The population is 6500. How many people in our city have an Italian background?

h. The four children carefully planted 3 rows of corn together and promised to share the work and the corn. Only $2\frac{1}{4}$ rows of corn came up. How much of a row does each child need to look after?

i. Gail was supposed to babysit for $2\frac{3}{4}$ hours, but she didn't feel well so her sister Debbie said she would come for $\frac{1}{2}$ of the time. How long did each sister babysit?

j. The stocks closed at $6\frac{1}{8}$ on Monday. On Tuesday they fell $\frac{1}{4}$. What was the value of the stocks at closing on Tuesday?

k. The same stocks had a good day on Wednesday. They rose $\frac{3}{4}$ from the Tuesday closing price (see question j). What was the value of the stocks at closing on Wednesday?

l. Victor and his family heat their house with wood. Last year, they cut and hauled $12\frac{1}{2}$ cords of wood from the bush. At $\frac{1}{2}$ cord per pick-up truck load, how many trips did they have to make with their one truck?

m. Canadian Mortgage Housing Corporation (CMHC) suggests that when you buy a home, the cost of the house should be no more than 2 1/2 times your annual income. Between them, John and Pam Miller have a gross annual income of $68 000. About how much would CMHC say they should spend on a house?

n. The loaded logging trucks cover 38 1/2 km from the logging site down the steep logging roads to the highway in 1 1/4 hours. What is their average speed in kilometres per hour?

Answers to Exercise 1

a. Tasty Macaroni and Cheese

Ingredients for 6 people	Quantities for 9 people ($1\frac{1}{2}$ x)	Quantities for 3 people ($\frac{1}{2}$ x)
$1\frac{3}{4}$ cup elbow macaroni	$2\frac{5}{8}$ cups	$\frac{7}{8}$ cup
$\frac{3}{4}$ cup chopped onion	$1\frac{1}{8}$ cup	$\frac{3}{8}$ cup
$\frac{1}{2}$ cup chopped green pepper	$\frac{3}{4}$ cup	$\frac{1}{4}$ cup
10 sliced mushrooms	15	5
3 tbsp. butter or margarine	$4\frac{1}{2}$ tbsp.	$1\frac{1}{2}$ tbsp.
$1\frac{1}{2}$ tbsp. flour	$2\frac{1}{4}$ tbsp.	$\frac{3}{4}$ tbsp.
1 tsp. dry mustard	$1\frac{1}{2}$ tsp.	$\frac{1}{2}$ tsp.
$\frac{3}{4}$ tsp. salt	$1\frac{1}{8}$ tsp.	$\frac{3}{8}$ tsp.
$\frac{1}{4}$ tsp. oregano	$\frac{3}{8}$ tsp.	$\frac{1}{8}$ tsp.
$2\frac{1}{2}$ cups milk	$3\frac{3}{4}$ cups	$1\frac{1}{4}$ cups
$2\frac{1}{2}$ cups shredded cheddar cheese	$3\frac{3}{4}$ cups	$1\frac{1}{4}$ cups
$\frac{1}{2}$ cup fine dry breadcrumbs	$\frac{3}{4}$ cup	$\frac{1}{4}$ cup

b. $5\frac{1}{2}$ hours

c. $\frac{1}{8}$ hours/km or $7\frac{1}{2}$ min/km

d. answers

i. $28\frac{1}{2}$ km

ii. 1482 km

e. $1\frac{1}{2}$ minutes/question

f. answers

i. $\frac{3}{8}$ tank

ii. $33\frac{3}{4}$

g. 2600 people

h. $\frac{3}{4}$ of a row

i. $1\frac{3}{8}$ hours

j. $5\frac{7}{8}$

k. $6\frac{5}{8}$

l. 25 trips

m. $170 000

n. 31 km/h

Unit 4 Review

1. Add these common fractions, make sure to reduce your answer to the lowest terms.

   a. $\frac{1}{3} + \frac{1}{3} =$

   b. $\frac{3}{7} + \frac{2}{7} =$

   c. $\frac{4}{5} + \frac{1}{5} =$

   d. $\frac{3}{8} + \frac{1}{8} =$

   e. $\frac{4}{8} + \frac{2}{8} =$

   f. $\frac{1}{12} + \frac{3}{12} =$

   g. $\frac{3}{7} + \frac{5}{7} =$

   h. $\frac{7}{21} + \frac{7}{21} =$

2. Add these common fractions, make sure to reduce your answer to lowest terms.

   a. $\frac{1}{3} + \frac{3}{6} =$

   b. $\frac{1}{2} + \frac{2}{5} =$

   c. $\frac{1}{4} + \frac{1}{3} =$

   d. $\frac{3}{5} + \frac{3}{4} =$

   e. $\frac{3}{7} + \frac{6}{8} =$

   f. $\frac{1}{2} + \frac{13}{16} =$

   g. $\frac{1}{8} + \frac{1}{3} =$

   h. $\frac{3}{4} + \frac{8}{9} =$

3. Add. Express the sum in lowest terms.

   a. $6\frac{3}{5} + 2\frac{3}{7} =$

   b. $3\frac{1}{4} + 4\frac{1}{2} =$

   c. $3\frac{3}{8} + 4\frac{1}{4} =$

   d. $8\frac{1}{5} + 1\frac{2}{7} =$

   e. $1\frac{14}{15} + 3\frac{1}{3} =$

   f. $4\frac{2}{3} + 1\frac{1}{4} =$

   g. $12\frac{1}{2} + 1\frac{1}{3} =$

   h. $9\frac{2}{5} + 1\frac{7}{10} =$

   i. $9\frac{4}{5} + 3\frac{1}{7} =$

   j. $2\frac{1}{5} + 7\frac{4}{15} =$

4. Subtract. Express your answers in lowest terms.

a. $\begin{array}{r} \frac{2}{5} \\ -\ \frac{1}{5} \\ \hline \end{array}$

c. $\begin{array}{r} \frac{2}{3} \\ -\ \frac{1}{3} \\ \hline \end{array}$

b. $\begin{array}{r} \frac{5}{8} \\ -\ \frac{1}{8} \\ \hline \end{array}$

d. $\begin{array}{r} \frac{5}{12} \\ -\ \frac{3}{12} \\ \hline \end{array}$

5. Subtract and express your answer in lowest terms

a. $\begin{array}{r} \frac{17}{22} \\ -\ \frac{6}{22} \\ \hline \end{array}$

d. $\begin{array}{r} \frac{9}{10} \\ -\ \frac{4}{5} \\ \hline \end{array}$

b. $\begin{array}{r} \frac{3}{4} \\ -\ \frac{1}{2} \\ \hline \end{array}$

e. $\begin{array}{r} \frac{1}{2} \\ -\ \frac{3}{8} \\ \hline \end{array}$

c. $\begin{array}{r} \frac{3}{4} \\ -\ \frac{1}{12} \\ \hline \end{array}$

f. $\begin{array}{r} \frac{15}{16} \\ -\ \frac{3}{8} \\ \hline \end{array}$

g. $\begin{array}{r} \frac{9}{16} \\ -\ \frac{1}{8} \\ \hline \end{array}$

h. $\begin{array}{r} \frac{1}{6} \\ -\ \frac{1}{12} \\ \hline \end{array}$

6. Subtract. Be sure to reduce your answers to lowest terms.

a. $\begin{array}{r} 20\frac{2}{4} \\ -\ 10\frac{3}{4} \\ \hline \end{array}$

d. $\begin{array}{r} 4\frac{1}{5} \\ -\ 1\frac{2}{5} \\ \hline \end{array}$

b. $\begin{array}{r} 1\frac{2}{3} \\ -\ \frac{5}{6} \\ \hline \end{array}$

e. $\begin{array}{r} 5\frac{1}{3} \\ -\ \frac{2}{3} \\ \hline \end{array}$

c. $\begin{array}{r} 4 \\ -\ \frac{1}{5} \\ \hline \end{array}$

f. $\begin{array}{r} 9\frac{3}{5} \\ -\ 4\frac{4}{5} \\ \hline \end{array}$

7. Subtract the following fractions. Express your answer in lowest terms.

a. $\begin{array}{r} 15\frac{1}{6} \\ -\ 3\frac{2}{5} \\ \hline \end{array}$

b. $\begin{array}{r} 7 \\ -\ 4\frac{1}{3} \\ \hline \end{array}$

c. $9\frac{1}{4} - 7\frac{5}{8}$

g. $18\frac{1}{6} - 14\frac{2}{9}$

d. $13\frac{1}{4} - 3\frac{4}{9}$

h. $4\frac{3}{5} - 3\frac{3}{4}$

e. $13 - 1\frac{1}{5}$

i. $22 - 1\frac{7}{12}$

f. $7\frac{1}{3} - 4\frac{5}{6}$

j. $19\frac{1}{8} - 14\frac{1}{3}$

8. Solve the following problems.

   a. Cheryl walks for $\frac{1}{2}$ of an hour on Tuesdays and Thursdays, and $\frac{2}{3}$ of an hour on Mondays and Wednesdays. On Fridays, Saturdays and Sundays, she walks for $1\frac{1}{4}$ hours each day. How much time does she walk each week?

   b. The car trip took $2\frac{2}{3}$ hours for 300km. What was the average speed (in km per hour)?

   c. The kids spent each day of their summer vacation in the lake! They would play in the water for $\frac{3}{4}$ of an hour in the morning, $\frac{2}{3}$ of an hour after lunch, and then $1\frac{1}{2}$ hours before dinner. How many hours did they

spend in the water during their 14 day vacation?

d. A freight truck has $26\frac{1}{4}$ kg of paper, $4\frac{3}{6}$ kg of pencils, $37\frac{1}{3}$ kg of file folders. How much weight was it carrying?

e. A flight from Fort Nelson to Vancouver takes $2\frac{5}{6}$ of an hour. If the plane has been flying for $1\frac{1}{4}$ of an hour, how much longer will the flight be?

f. According to Statistics Canada, Terrace's annual rain fall is $970\frac{6}{25}$ mm, and Smithers' annual rainfall is $513\frac{1}{4}$ mm, how much more rain does Terrace get than Smithers each year?

g. A park is 121/2 km wide and 251/3 km long. What is the area of the park?

Answers to Unit 4 Review

1.
a. $\frac{2}{3}$
b. $\frac{5}{7}$
c. 1
d. $\frac{1}{2}$
e. $\frac{3}{4}$
f. $\frac{1}{3}$
g. $1\frac{1}{7}$
h. $\frac{2}{3}$

2.
a. $\frac{5}{6}$
b. $\frac{9}{10}$
c. $\frac{7}{12}$
d. $1\frac{7}{20}$
e. $1\frac{5}{28}$
f. $1\frac{5}{16}$
g. $\frac{11}{24}$
h. $\frac{59}{72}$
i. $1\frac{29}{63}$
j. $\frac{47}{60}$

3.
a. $9\frac{1}{35}$
b. $7\frac{3}{4}$
c. $7\frac{5}{8}$
d. $9\frac{17}{35}$
e. $5\frac{4}{15}$
f. $5\frac{11}{12}$
g. $13\frac{5}{6}$
h. $11\frac{1}{10}$
i. $12\frac{33}{35}$
j. $9\frac{7}{15}$

4.
a. $\frac{1}{5}$
b. $\frac{1}{2}$
c. $\frac{1}{3}$
d. $\frac{1}{6}$

5.
a. $\frac{1}{2}$
b. $\frac{1}{4}$
c. $\frac{2}{3}$
d. $\frac{1}{10}$
e. $\frac{1}{8}$
f. $5\frac{9}{16}$
g. $5\frac{7}{16}$
h. $\frac{1}{12}$

6.
a. $9\frac{3}{4}$
b. $\frac{5}{6}$
c. $3\frac{4}{5}$
d. $2\frac{4}{5}$
e. $4\frac{2}{3}$
f. $4\frac{4}{5}$

7.
a. $11\frac{23}{30}$
b. $2\frac{2}{3}$
c. $1\frac{5}{8}$
d. $9\frac{29}{36}$
e. $11\frac{4}{5}$
f. $2\frac{1}{2}$
g. $3\frac{17}{18}$
h. $\frac{17}{20}$
i. $20\frac{5}{12}$
j. $4\frac{19}{24}$

8.
a. Cheryl walked $6\frac{1}{12}$ hours each week.
b. The average was $112\frac{1}{2}$ km/hour
c. $40\frac{5}{6}$ hours in the lake
d. $68\frac{1}{12}$ kg
e. $1\frac{7}{12}$ hours left on the flight
f. Terrace gets $456\frac{99}{100}$ cm more rain per year than Smithers.
g. $316\frac{2}{3}$ km2

It is now test time!

Please get the practice test from your instructor.

Once you are ready, you can get the Unit 4 test from your instructor.

Good luck!

Unit 5: Common Fractions & Decimals

Topic A: Common Fractions & Decimals

The amount represented by a fraction may be expressed as a common fraction, a decimal, or as a percent.

We choose common fractions, decimals, or percents for convenience and to fit the standard way of doing things.

Common fractions are used:

- For everyday conversation about parts of the whole thing: $\frac{1}{2}$ cup of coffee, $\frac{1}{4}$ of an hour, $\frac{3}{4}$ tank of gas
- With amounts in the Imperial System of measurement, which is standard in the United States and still used by some people in Canada: $3\frac{1}{4}$ feet, $\frac{5}{8}$ inches, $12\frac{3}{4}$ miles, $6\frac{1}{4}$ pounds, $1\frac{1}{2}$ teaspoons
- For stock market reports and stock values
- For the score on the top of a test (which is usually changed to a percent)

Decimals are used

- With money ($12.23)
- With the metric system of measurement (1.5 metres, 7.25 litres, 29.75 kilometres, 0.5 centimetres, 9.2 grams, 75.5 kilograms, etc.)
- Whenever there is a lot of arithmetic calculation to be done
- For calculators and computers

Percents are used

- For reporting statistics
- For bank rates and interest charges such as mortgage rates for reading a grade on a test

Writing Decimals as Common Fractions

Remember this skill?

- $0.48 = \frac{48}{100}$
- $3.542 = 3\frac{542}{1000}$

Common fractions should always be in lowest terms.

- $0.48 = \frac{48}{100}\left(\frac{\div 4}{\div 4}\right) = \frac{12}{25}$
- $3.542 = 3\frac{542}{1000}\left(\frac{\div 2}{\div 2}\right) = 3\frac{271}{500}$

This list of factors may help you to simplify the fractions.

The factors of **10** are 1, 2, 5, 10

The factors of **100** are 1, 2, 4, 5, 10, 20, 25, 50, 100

The factors of **1000** are 1, 2, 5, 8, 10, 20, 25, 50, 100, 125, 200, 250, 500, 1000

Remember: the whole number in a mixed decimal stays a whole number in a mixed fraction.

Exercise 1

Write these decimals as common fractions expressed in lowest terms.

a. $16.04 = 16\frac{4}{100}\left(\frac{\div 4}{\div 4}\right) = 16\frac{1}{3}$

b. $0.085 = \frac{85}{1000}\left(\frac{\div 5}{\div 5}\right) = \frac{17}{200}$

c. 3.48 =

d. 12.075 =

e. 6.25 =

f. 0.14 =

g. 12.125 =

h. 1.75 =

Answers to Exercise 1

c. $3\frac{12}{25}$

d. $12\frac{3}{40}$

e. $6\frac{1}{4}$

f. $\frac{7}{50}$

g. $12\frac{1}{8}$

h. $1\frac{3}{4}$

Some Tricky Conversions

Do you remember that there are some fractions that do not convert into decimals perfectly? The reason they do not is because they have a repeating decimal.

Some are:

- $\frac{1}{6} = 0.1\overline{6}$
- $\frac{2}{3} = 0.\overline{6}$
- $\frac{1}{9} = 0.\overline{1}$
- $\frac{1}{3} = 0.\overline{3}$
- $\frac{5}{6} = 0.8\overline{3}$

It is not possible to convert $\frac{1}{6}$ (which is really $0.1666666666666\overline{6}$) into a fraction.

One way to deal with this problem is to memorize common ones like the above examples.

Writing Common Fractions as Decimals

As you know, common fractions with denominators of 10, 100, 1 000, or 10 000 are easily written as decimals.

- $\frac{3}{10} = 0.3$
- $\frac{21}{100} = 0.21$
- $\frac{69}{1000} = 0.069$

But if the denominator is not a 10, 100, etc., you may be able to change a common fraction to an equivalent fraction with a denominator of 10, 100, 1 000, or 10 000 which can then be written easily as a decimal. For example,

- $\frac{3}{5}\left(\frac{\times 2}{\times 2}\right) = \frac{6}{10} = 0.6$
- $\frac{1}{2}\left(\frac{\times 2}{\times 2}\right) = \frac{5}{10} = 0.5$
- $\frac{4}{25}\left(\frac{\times 2}{\times 2}\right) = \frac{16}{100} = 0.16$

Exercise 2

Write as decimals.

a. $\frac{1}{2} = \frac{5}{10} = 0.5$

b. $\frac{2}{5}$

c. $\frac{7}{10}$

d. $\frac{4}{5}$

e. $\frac{21}{1000}$

f. $\frac{8}{25}$

Answers to Exercise 2

b. 0.4

c. 0.7

d. 0.8

e. 0.021

f. 0.32

The following is a review of how to change a fraction to a decimal when it is not easy to make the denominator:

The line in a common fraction can be thought of as a divided by sign ÷
To change a common fraction to a decimal, do this:

numerator ÷ denominator = the decimal equivalent

Example A

$\frac{3}{4}$ Think $3 \div 4$

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ \underline{28\downarrow} \\ 20 \\ \underline{20} \\ \end{array}$$

- $\frac{3}{4} = 0.75$

Example B

$\frac{3}{8}$ Think $3 \div 8$

- $$\begin{array}{r} 0.375 \\ 8\overline{)3.000} \\ \underline{24\downarrow} \\ 60 \\ \underline{56\downarrow} \\ 40 \\ \underline{40} \end{array}$$
- $\frac{3}{8} = 0.375$

Example C

$\frac{1}{3}$ Think $1 \div 3$

- $$\begin{array}{r} 0.333 \\ 3\overline{)1.000} \\ \underline{9\downarrow} \\ 10 \\ \underline{0\downarrow} \\ 10 \end{array}$$
- $\frac{1}{3} = 0.333$

Exercise 3

Use the division method to write these common fractions as decimals.

a. $\frac{1}{2} = 2\overline{)1.0}$ → 0.5, -1.0, 0

$\frac{1}{2} = 0.5$

b. $\frac{1}{4}$

c. $\frac{2}{5}$

d. $\frac{6}{12}$

e. $\frac{1}{8}$

f. $\frac{3}{8}$

g. $\frac{2}{3}$

h. $\frac{19}{20}$

Answers to Exercise 3

b. 0.25
c. 0.4
d. 0.5
e. 0.125
f. 0.375
g. 0.6
h. 0.95

The whole number in a mixed fraction stays a whole number in a mixed decimal. Rewrite the whole number to the left of the decimal. Then change the common fraction to a decimal.

- $4\frac{3}{4} = 4.75$
- Think $\frac{3}{4} = 3 \div 4 = 0.75$
- $16\frac{1}{2} = 16.5$
- Think $\frac{1}{2} = 1 \div 2 = 0.5$

Exercise 4

Complete the chart of equivalent common fractions and decimals. Use this chart as a reference for yourself in later work. Look for patterns that develop and note them in the margin.

Chart of common fractions and decimals to complete

Common Fraction	Decimal
$\frac{1}{8}$	
$\frac{2}{8} = \frac{1}{4}$	
$\frac{3}{8}$	
$\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$	
$\frac{5}{8}$	
$\frac{6}{8} = \frac{3}{4}$	
$\frac{7}{8}$	
$\frac{8}{8} = \frac{4}{4} = \frac{2}{2} = 1$	
$\frac{1}{12}$	
$\frac{2}{12} = \frac{1}{6}$	
$\frac{4}{12} = \frac{2}{6} = \frac{1}{3}$	
$\frac{6}{12} = \frac{3}{6} = \frac{1}{2}$	
$\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$	
$\frac{10}{12} = \frac{5}{6}$	

Common Fraction	Decimal
$\frac{12}{12} = \frac{6}{6} = \frac{3}{3}$	
$\frac{1}{20}$	
$\frac{2}{20} = \frac{1}{10}$	
$\frac{2}{10} = \frac{1}{5}$	
$\frac{4}{10} = \frac{2}{5}$	
$\frac{6}{10} = \frac{3}{5}$	
$\frac{8}{10} = \frac{4}{5}$	
$\frac{10}{10} = \frac{5}{5} = 1$	

Answers to Exercise 4

Chart of common fractions and decimals completed

Common Fraction	Decimal
$\frac{1}{8}$	.0125
$\frac{2}{8} = \frac{1}{4}$	0.25
$\frac{3}{8}$	0.375
$\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$	0.5
$\frac{5}{8}$	0.625
$\frac{6}{8} = \frac{3}{4}$	0.75
$\frac{7}{8}$	0.875
$\frac{8}{8} = \frac{4}{4} = \frac{2}{2} = 1$	1.0
$\frac{1}{12}$	$0.08\overline{3}$
$\frac{2}{12} = \frac{1}{6}$	$0.1\overline{6}$
$\frac{4}{12} = \frac{2}{6} = \frac{1}{3}$	$0.\overline{3}$
$\frac{6}{12} = \frac{3}{6} = \frac{1}{2}$	0.5
$\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$	$0.\overline{6}$
$\frac{10}{12} = \frac{5}{6}$	$0.8\overline{3}$

Common Fraction	Decimal
$\frac{12}{12} = \frac{6}{6} = \frac{3}{3}$	1.0
$\frac{1}{20}$	0.05
$\frac{2}{20} = \frac{1}{10}$	0.1
$\frac{2}{10} = \frac{1}{5}$	0.2
$\frac{4}{10} = \frac{2}{5}$	0.4
$\frac{6}{10} = \frac{3}{5}$	0.6
$\frac{8}{10} = \frac{4}{5}$	0.8
$\frac{10}{10} = \frac{5}{5} = 1$	1.0

You may work with problems and real-life situations that use one decimal and one common fraction. Rewrite the fractions so both are decimals or both are common fractions. Choose the form that will give the answer the way it should be written.

Example D

Ted worked $3\frac{3}{4}$ hours at \$8.25 per hour. **How much did he earn? (Round to the nearest cent.)**

The answer will be money which should be written using decimals, so work in the decimal form.

Rewrite $3\frac{3}{4}$ hours as 3.75 hours.

Ted earned $3.75 \times \$8.25 = \$30.94$

Example E

Jane cycled 49.4 km in $2\frac{1}{2}$ hours. **What was her average speed?**

The answer will be in km/hr. Metric measurements are written with decimals, so work in decimals.

Rewrite $2\frac{1}{2}$ hours as 2.5 hours and solve the problem.

$49.4 \div 2.5 = 19.76$ km/hr.

Topic A: Self-Test

Mark /11 Aim 9/11

A. Complete the chart (7 marks).

Chart of common fractions and decimals to complete

Common Fraction	**Decimal**
$\frac{1}{4}$	
	0.125
	0.3
$\frac{3}{4}$	
	0.875
$\frac{3}{5}$	
$\frac{6}{6}$	

B. Answer the following word problems (4 marks).

a. Joseph worked hours a day, 5 days a week. He gets paid $9.35 per hour. How much does he get paid a week?

b. Giang ran a 42.195 km marathon in hours. What was her average speed rounded to two decimal places?

Answers to Self Test A.

A.

Chart of common fractions and decimals completed

Common Fraction	Decimal
$\frac{1}{4}$	0.25
$\frac{1}{8}$	0.125
$\frac{1}{3}$	0.3
$\frac{3}{4}$	0.75
$\frac{7}{8}$	0.875
$\frac{3}{5}$	0.6
$\frac{6}{6}$	1

B.

a. $268.81

b. 9.93 km/hr

Topic B: Comparing Fractions & Decimals

In Unit 2 you compared simple fractions to simple fractions such as $\frac{1}{2}\_\_\_\_\_\frac{1}{3}$

Now, you are going to be asked to compare fractions with larger and less common denominators such as $\frac{7}{8}$ and $\frac{17}{28}$

Find the equivalent fractions of both the fractions and then compare.

$$\frac{1}{2}\left(\frac{\times 3}{\times 3}\right) = \frac{3}{6} \text{ and } \frac{1}{3}\left(\frac{\times 2}{\times 2}\right) = \frac{2}{6} \text{ so } \frac{3}{6} \geq \frac{2}{6}$$

$$\frac{7}{8}\left(\frac{\times 7}{\times 7}\right) = \frac{49}{56} \text{ and } \frac{17}{28}\left(\frac{\times 2}{\times 2}\right) = \frac{34}{56} \text{ so } \frac{49}{56} \geq \frac{34}{56}$$

Exercise 1

Change the fractions to have the same denominators. Decide which is larger. Use > , < , = to mark your answer. There is space below each problem to work out your equivalent fractions.

a. $\frac{1}{4}\_\_\_\_\_\frac{3}{5}$

b. $\frac{5}{8}\_\_\_\_\_\frac{3}{4}$

c. $\frac{1}{5}\_\_\_\_\_\frac{2}{3}$

d. $\frac{2}{3}\_\_\_\_\_\frac{3}{4}$

e. $\frac{49}{56}\_\_\_\_\_\frac{3}{4}$

f. $\frac{75}{90}\_\_\_\_\_\frac{10}{11}$

g. $\frac{33}{70}\_\_\_\_\_\frac{1}{2}$

h. $\frac{1}{3}\_\_\_\_\_\frac{1}{9}$

Answers to Exercise One

a. <

b. <

c. <

d. <

e. >

f. <

g. <

h. >

Comparing Fractions to Decimals and Decimals to Fractions

Now that you know how to convert between fractions and decimals, you are also going to be able to compare them.

Example A

Which is larger: $\frac{3}{8}$ or 0.125?

1. Decide to convert either the fraction into a decimal, or the decimal into a fraction. Let's pick converting the fraction into a decimal.
2. Do the conversion $\frac{3}{8}$ = $\begin{array}{r} 0.375 \\ 8\overline{)3.000} \\ \underline{24\downarrow} \\ 60 \\ \underline{56\downarrow} \\ 40 \\ \underline{40} \\ \end{array}$ = 0.375
3. Compare $0.375 \underline{\quad>\quad} 0.125$
4. Write a math sentence to show your answer: $\frac{3}{8} \underline{\quad>\quad} 0.125$

Example B

Which is larger $\frac{7}{8}$ or 0.6?

1. Pick which you will convert, the decimal into the fraction, or the fraction into the decimal. **Let's pick converting the decimal this time.**
2. Convert 0.6= $\frac{6}{10}\left(\frac{\div 2}{\div 2}\right) = \frac{3}{5}$

3. Compare $\frac{7}{8}\frac{3}{5} \longrightarrow \frac{7}{8}\left(\frac{\times 5}{\times 5}\right) = \frac{35}{40}\frac{3}{5}\left(\frac{\times 8}{\times 8}\right) = \frac{24}{40}$
4. Write a math sentence to show your answer $\frac{3}{8} \_\_\_ 0.6$

TIP: You may find that converting the fractions to the decimals could speed things up.

Exercise 2

Compare

a. 0.25 _____ $\frac{1}{5}$

b. $\frac{1}{8}$ _____ 0.8

c. $\frac{1}{6}$ _____ 0.125

d. 0.2 _____ $\frac{3}{10}$

e. 0.3725 _____ $\frac{2}{3}$

f. $\frac{2}{5}$ _____ 0.5

g. 0.3725 _____ $\frac{1}{5}$

Answers to Exercise Two

a. >

b. <

c. >

d. <

e. <

f. <

g. >

Exercise 3

Compare the following numbers to each other. Use > or < .

a. 0.345 _____ $\frac{6}{7}$

b. $\frac{1}{1051}$ _____ 0.0032

c. $0.52 \_\_\_\_\_ \frac{2}{3}$

d. $0.6894 \_\_\_\_\_ \frac{103}{278}$

e. $\frac{1}{72} \_\_\_\_\_ \frac{2}{3}$

Answers to Exercise Three

a. >

b. <

c. >

d. <

e. <

Topic B Self-Test

Mark /18 Aim 15 / 18

A. Write as common fractions in lowest terms. (4 marks)

a. 3.6

b. 8.125

c. 0.75

d. 0.45

B. Write as decimals. Round your answers to 3 decimal places. (4 marks)

a. $\frac{3}{5}$

b. $\frac{6}{100}$

c. $\frac{3}{8}$

d. $\frac{5}{7}$

C. Compare the following fractions and decimals, use < , or >. (6 marks)

a. $0.862 \_\_\_\_\_ \frac{6}{7}$

b. $\frac{3}{14} \_\_\_\_\_ 0.35$

c. $\frac{1}{10} \_\_\_\_\_ 0.007$

d. $0.3 \_\_\_\_\_ \frac{20}{26}$

e. $0.5 \_\_\_\_\_ \frac{10}{21}$

f. $\frac{89}{90} \_\_\_\_\_ 0.473$

g. $\frac{1}{3}$ _____ $\frac{1}{9}$

D. Problems. 4 marks

a. May babysat for $4\frac{1}{4}$ hours. She is paid $4.75 an hour. How much did she earn?

b. Diane bought 1.5 litres of milk. Her thirsty kids drank half of it as soon as she got home. How much milk is left?

Answers to Topic B Self-Test

A.
a. $3\frac{10}{21}$
b. $8\frac{1}{8}$
c. $\frac{3}{4}$
d. $\frac{9}{20}$

B.
a. 0.3
b. 0.06
c. 0.375
d. 0.174

C.
a. >
b. <
c. >
d. <
e. >
f. >

D.
a. $20.19
b. 0.75 L

Unit 5 Review

1. Write as common fractions in lowest terms.

   a. 3.5
   b. 8.625
   c. 0.25
   d. 0.375
   e. 4.125
   f. 10.4
   g. 2.6
   h. 3.05

2. Write as decimals. Round your answers to 3 decimal places.

   a. $\frac{2}{3}$
   b. $\frac{12}{100}$
   c. $\frac{5}{8}$
   d. $\frac{6}{7}$
   e. $\frac{3}{8}$
   f. $\frac{1}{6}$
   g. $\frac{17}{25}$
   h. $\frac{5}{6}$
   i. $\frac{1}{5}$
   j. $\frac{1}{3}$

3. Compare the following fractions to fractions, use <, or >.

   a. $\frac{1}{4}$ $\frac{6}{7}$
   b. $\frac{3}{14}$ $\frac{7}{49}$
   c. $\frac{1}{10}$ $\frac{6}{30}$
   d. $\frac{9}{13}$ $\frac{20}{26}$
   e. $\frac{1}{3}$ $\frac{10}{21}$
   f. $\frac{8}{9}$ $\frac{6}{7}$

4. Compare the following fractions to decimals. Use >, <, or =.

   a. $0.8, \frac{6}{7}$
   b. $\frac{3}{7}, 0.52$
   c. $\frac{1}{5}, 0.20$
   d. $0.125, \frac{5}{8}$

e. $0.63,\ \frac{7}{25}$

f. $\frac{65}{90}, 0.4$

g. $0.45,\ \frac{19}{27}$

h. $0.99,\ \frac{1}{5}$

i. $0.39,\ \frac{6}{7}$

j. $0.375,\ \frac{6}{7}$

Answers to Unit 5 Review

1.
a. $3\frac{1}{2}$
b. $8\frac{5}{8}$
c. $\frac{1}{4}$
d. $\frac{3}{8}$
e. $4\frac{1}{8}$
f. 10 2
g. $2\frac{3}{5}$
h. $3\frac{1}{20}$

2.
a. 0.667
b. 0.12
c. 0.625
d. 0.857
e. 0.375
f. 0.167
g. 0.68
h. 0.83
i. 0.2
j. 0.3

3.
a. <
b. >
c. <
d. <
e. <
f. >

4.
a. <
b. <
c. =
d. <
e. >
f. >
g. <
h. >
i. <
j. =

It is now Test time.

Please see your instructor to get the practice test.

Once you are prepared, you can write the Unit 5 test.
Your instructor will get that for you too!

Once you have completed the Unit 5 test, it will be time to write the Final test.

Good luck!

Book Five Final Review

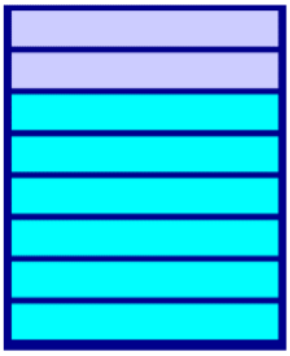
You will now practice all the skills you learned in Book 5. You can use this as a review for your final test.

If you can't remember how to do a question, go back to the lesson on this topic to refresh your memory. The unit and topic for where each question came from is listed next to the question.

Example: **1A** means Unit 1, Topic A

1-A

1. Write in lowest terms the common fractions to describe the shaded portion of each shape.

a. 

b. 

c. 

2. Draw your own fractions.

a. $\frac{1}{5}$ b. $\frac{3}{7}$

3. Answer the questions using a common fraction, in lowest terms.
    a. Rattan ran for 40 minutes. What fraction of an hour did he run?

b. Oliver answered 23 of the 27 questions on his test. What fraction of questions did he answer?

c. Belle got 49 marks on the test. The test was out of 56. What was her score?

1-B

4. Identify each fraction by writing: proper fraction, improper fraction, or mixed number next to each fraction.

a. $\frac{5}{2}$

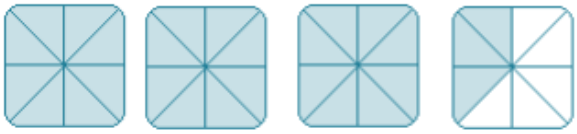
b. $2\frac{1}{3}$

c. $\frac{4}{5}$

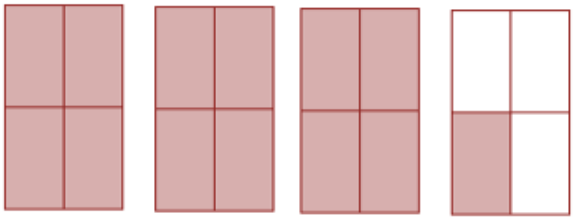
d. $\frac{7}{3}$

5. Write the improper fraction and the equivalent mixed number that describe the shaded part in each drawing.

a.



b.



6. Rename each improper fraction into a mixed number.

a. $\frac{11}{5} =$

b. $\frac{15}{4} =$

c. $\frac{19}{6} =$

7. Rename each whole number as an improper fraction. Use the denominator given to you.

1. $5 = \frac{}{2}$

2. $3 = \frac{}{5}$

3. $8 = \frac{}{3}$

8. Rename each mixed number as an improper fraction

a. $2\frac{3}{8} =$ b. $6\frac{5}{9} =$ c. $1\frac{2}{3} =$

2-A

9. Find the factors, common factors and the Greatest Common Factor (GCF) Fraction Factors Common Factors GCF

a. $\frac{4}{22}$ c. $\frac{27}{36}$

b. $\frac{12}{48}$ d. $\frac{12}{40}$

10. Express each fraction in lowest terms.

a. $\frac{7}{21} =$

b. $\frac{9}{24} =$

c. $\frac{10}{250} =$

d. $\frac{12}{36} =$

11. State if each pair of fractions is equivalent (=) or not equivalent (≠) by placing the correct sign between them.

a. $\frac{3}{4} \_\_\_\_\_ \frac{31}{42}$ c. $\frac{4}{13} \_\_\_\_\_ \frac{6}{39}$

b. $\frac{1}{7} \_\_\_\_\_ \frac{5}{35}$ d. $\frac{1}{3} \_\_\_\_\_ \frac{11}{13}$

12. Round to the nearest whole number.

a. $2\frac{1}{6} =$ b. $1\frac{4}{5} =$ c. $\frac{3}{5} =$

3-A

13. Write the multiplication equation you would use to find the answer to the question. Do not calculate the answer.

a. Joan peeled $\frac{3}{4}$ of the 35 kilograms of apples. How many kilograms of apples did Joan peel?

b. There are 16 bottles of ketchup in the restaurant. They are each full. How many full bottles of ketchup would there be if all ketchup bottles were put together?

c. Half a recipe that needs $2\frac{2}{3}$ cups of sugar.

d. The community pool has a capacity of 150 swimmers. The pool is full. How many swimmers are there?

14. Find the products. Make sure your answers are in lowest terms.

a. $\frac{1}{3} \times \frac{4}{5} =$

b. $\frac{1}{3}$ of $34 =$

c. $4 \times \frac{3}{5} =$

d. $\frac{5}{7}$ of $1\frac{1}{5} =$

e. $2\frac{1}{2} \times 7\frac{1}{2} =$

f. $\frac{3}{4} \times \frac{1}{7} \times 4\frac{5}{9} =$

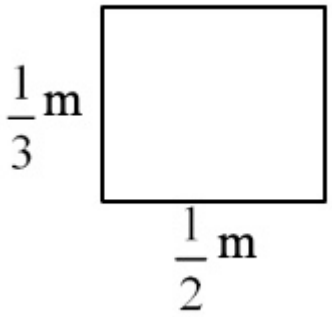
15. Solve the following word problems.

a. Emma saves $\frac{1}{5}$ of her income for the down payment on a house. If her annual income is $34 458.00, how much can she save in one year?

b. $\frac{1}{3}$ of the students at one Vancouver college speaks a language other than English. $\frac{3}{4}$ of those students are enrolled in English Language Learning (ELL). What fraction of the students are studying ELL?

c. A recipe calls for $1\frac{1}{2}$ cups of sugar. How much sugar should be used if the recipe is being tripled?

d. Find the area of the rectangle.



e. A corner store sells 2 345 items in one day. $\frac{4}{5}$ of those items are junk food. How many of those items are junk food?

16. Divide the following fractions. Show all your work, and make sure your answers are in the lowest terms.

a. $\frac{1}{3} \div \frac{3}{4} =$

b. $\frac{1}{2} \div \frac{3}{5} =$

c. $\frac{3}{5} \div 9 =$

d. $3\frac{2}{3} \div \frac{1}{2} =$

e. $5\frac{1}{5} \div \frac{6}{7} =$

f. $4\frac{1}{3} \div 2\frac{2}{5} =$

17. Solve the following word problems:

a. Kathy worked on planting garlic last weekend. It took her $3\frac{1}{2}$ minutes to plant one row. How many rows did she plant in $\frac{1}{3}$ of an hour? (one hour = 60 minutes)

b. Nicole knits socks in the evenings. It takes her $7\frac{1}{3}$ hours to knit one sock. How many hours does it take to knit a pair of socks (that is 2 socks)?

c. Last week Nicole knit for a total of $27\frac{1}{2}$ hours. Approximately how many socks could she knit in that time? (To get an approximate, round your numbers to whole numbers first).

d. A baking sheet is $39\frac{3}{5}$ cm by $18\frac{1}{4}$ cm. Find its area.

4-A

18. Add these common fractions. Make sure to reduce your answer to the lowest terms.

a. $$\begin{array}{r} \frac{1}{5} \\ +\ \frac{4}{5} \\ \hline \end{array}$$

b. $$\begin{array}{r} \frac{3}{5} \\ +\ \frac{6}{7} \\ \hline \end{array}$$

c. $\frac{2}{7} + \frac{3}{4} =$

d. $\frac{2}{3} + \frac{5}{9} =$

e. $$\begin{array}{r} \frac{5}{12} \\ +\ \frac{5}{8} \\ \hline \end{array}$$

f.
$$\begin{array}{r} \frac{2}{3} \\ + \quad \frac{5}{6} \\ \hline \end{array}$$

19. Add these mixed numbers, express the sum in the lowest terms.

a.
$$\begin{array}{r} 4\frac{2}{5} \\ + \quad 7\frac{4}{7} \\ \hline \end{array}$$

b. $2\frac{1}{3} + 4\frac{3}{4} =$

c. $1\frac{2}{3} + 3\frac{1}{2} + 3\frac{3}{4} =$

d. $4\frac{1}{8} + 1\frac{1}{4} =$

e.
$$\begin{array}{r} 4\frac{1}{9} \\ + \quad 2\frac{2}{3} \\ \hline \end{array}$$

f.
$$\begin{array}{r} 2\frac{7}{15} \\ + \quad 10\frac{1}{5} \\ \hline \end{array}$$

20. Subtract these common fractions, express the sum in the lowest terms.

a.
$$\begin{array}{r} \frac{5}{12} \\ - \quad \frac{1}{3} \\ \hline \end{array}$$

b. $$\begin{array}{r} \frac{5}{6} \\ -\ \frac{3}{4} \\ \hline \end{array}$$

c. $$\begin{array}{r} \frac{1}{2} \\ -\ \frac{9}{24} \\ \hline \end{array}$$

d. $\frac{4}{5} - \frac{1}{4} =$

e. $\frac{30}{35} - \frac{2}{5} =$

f. $\frac{1}{2} - \frac{5}{12} =$

21. Subtract these mixed numbers, express the sum in the lowest terms.

a. $$\begin{array}{r} 7\frac{2}{3} \\ -\ 2\frac{1}{6} \\ \hline \end{array}$$

b. $$\begin{array}{r} 2\frac{4}{7} \\ -\ 1\frac{5}{21} \\ \hline \end{array}$$

c. $$\begin{array}{r} 9\frac{1}{5} \\ -\ 4\frac{4}{25} \\ \hline \end{array}$$

d. $3\frac{1}{2} - 1\frac{4}{7} =$

e. $6\frac{1}{2} - 3\frac{3}{4} =$

f. $5\frac{1}{2} - 2\frac{7}{8} =$

22. Solve the following word problems.

    a. A concrete contractor needs $6\frac{1}{3}$ metres of wire mesh for a concrete walkway and $12\frac{3}{8}$ metres of wire mesh for a driveway. If the contractor starts with a roll that is $54\frac{1}{4}$ metres long, how much wire mesh is left at the end of the two jobs?

    b. Frida and Sean collect returnable bottles and cans. Frida has $3\frac{1}{3}$ bags of returnables. Sean has $4\frac{1}{2}$ bags to return. How much more does Sean have than Frida?

    c. Mike bought $5\frac{1}{4}$ metres of cotton to sew three shirts. Each shirt took $1\frac{3}{5}$ m of material. How much cotton is left over?

    d. A freight container is loaded with 3 groups of products. Group A weighs $58\frac{1}{2}$ tons, Group B weighs $23\frac{5}{8}$ tons and Group C weighs $29\frac{1}{4}$ tons. Find the weight of the products.

    e. If the loaded container is question d) is $189\frac{3}{5}$ tons, what is the weight of the empty container?

5-A

23. Write as a common fraction in lowest terms.

a. 0.75
b. 0.16
c. 0.1
d. 0.4
e. 1.6
f. 2.625
g. 3.3
h. 0.125

24. Write as decimals. Round your answer to 3 decimal places.

a. $\frac{3}{8}$
b. $\frac{1}{3}$
c. $\frac{3}{4}$
d. $\frac{1}{20}$
e. $\frac{1}{8}$
f. $1\frac{2}{3}$
g. $\frac{1}{5}$
h. $\frac{6}{6}$

25. Compare the following fractions, use < or >.

a. $\frac{2}{3}$ _____ $\frac{1}{4}$
b. $\frac{2}{5}$ _____ $\frac{4}{7}$
c. $\frac{5}{9}$ _____ $\frac{1}{3}$
d. $\frac{7}{12}$ _____ $\frac{2}{3}$

26. Compare the following fractions to decimals. Use < , >, or =.

a. $\frac{1}{2}$ _____ 0.5
b. $\frac{2}{3}$ _____ 0.625
c. 0.125 _____ $\frac{1}{8}$
d. $\frac{4}{9}$ _____ 0.6
e. 3.45 _____ $\frac{1}{8}$
f. $\frac{1}{5}$ _____ 0.3

Answers to Book Five Final Review

1. Write in lowest terms the common fractions to describe the shaded portion of each shape.

a. $\frac{3}{4}$
b. $\frac{1}{4}$
c. $\frac{1}{2}$

2. Draw your own fractions.

a. 

b. 

3. Answer the questions using a common fraction, in lowest terms.

   a. $\frac{2}{3}$ b. $\frac{23}{27}$ c. $\frac{7}{8}$

4. Identify each fraction by writing: proper fraction, improper fraction, or mixed number next to each fraction.

   a. improper fraction
   b. mixed number
   c. proper fraction
   d. improper fraction

5. Write the improper fraction and the equivalent mixed number that describe the shaded part in each drawing.

   a. $\frac{27}{8}$, $3\frac{3}{8}$ b. $\frac{13}{4}$, $3\frac{1}{4}$

6. Rename each improper fraction into a mixed number.

   a. $2\frac{1}{5}$ b. $3\frac{3}{4}$ c. $3\frac{1}{6}$

7. Rename each whole number as an improper fraction. Use the denominator given to you.

   a. $\frac{10}{2}$ b. $\frac{15}{5}$ c. $\frac{24}{3}$

8. Rename each mixed number as an improper fraction.

   a. $\frac{19}{8}$ b. $\frac{59}{9}$ c. $\frac{5}{3}$

9. Find the factors, common factors and the Greatest Common Factor (G.C.F.).

	Fraction	Factors	Common Factors	G.C.F.
a	$\frac{4}{22}$	1, 2, 4 1, 2, 11, 22	2	2
b	$\frac{12}{48}$	1, 2, 3, 4, 6, 12 1, 2, 3, 4, 6, 8, 12, 16, 24, 48	2, 3, 4, 6, 12	12
c	$\frac{27}{36}$	1, 3, 9, 27 1, 2, 3, 4, 6, 9, 12, 18, 36	3, 9	9
d	$\frac{12}{40}$	1, 2, 3, 4, 6, 12 1, 2, 4, 5, 8, 10, 20, 40	2, 4	4

10. Express each fraction in lowest terms.

    a. $\frac{1}{3}$
    b. $\frac{3}{8}$
    c. $\frac{1}{25}$
    d. $\frac{1}{3}$

11. State if each pair of fractions is equivalent (=) or not equivalent (≠) by placing the correct sign between them.

    a. ≠
    b. =
    c. ≠
    d. ≠

12. Round to the nearest whole number.

    a. 2
    b. 2
    c. 1

13. Write the multiplication equation you would use to find the answer to the question.

    a. $\frac{3}{4} \times \frac{35}{1}$
    b. $16 \times \frac{1}{4}$
    c. $\frac{1}{2} \times \frac{22}{3}$
    d. $150 \times \frac{1}{5}$

14. Find the products. Make sure your answers are in lowest terms.

a. $\frac{4}{15}$
b. $11\frac{1}{3}$
c. $2\frac{2}{5}$
d. $\frac{6}{7}$
e. $18\frac{3}{4}$
f. $\frac{41}{84}$

15. Solve the following word problems.

a. $\$6891\frac{3}{5}$
b. $\frac{1}{4}$
c. $4\frac{1}{2}$ cups
d. $\frac{1}{6}$ m^2
e. 1876

16. Divide the following fractions. Show all your work, and make sure your answers are in the lowest terms.

a. $\frac{4}{9}$
b. $\frac{5}{6}$
c. $\frac{1}{15}$
d. $7\frac{1}{3}$
e. $6\frac{1}{15}$
f. $1\frac{29}{36}$

17. Solve the following word problems.

a. $5\frac{5}{7}$ rows
b. $14\frac{2}{3}$ hours
c. 4 socks
d. $8\frac{2}{3}$ km
e. $722\frac{7}{10}$ cm^2

18. Add these common fractions, make sure to reduce your answer to the lowest terms.

a. 1
b. $1\frac{16}{35}$
c. $1\frac{1}{28}$
d. $1\frac{2}{9}$
e. $1\frac{1}{24}$
f. $1\frac{1}{2}$

19. Add these mixed numbers, express the sum in the lowest terms.

a. $11\frac{34}{35}$
b. $7\frac{1}{12}$
c. $8\frac{11}{12}$
d. $5\frac{3}{8}$
e. $6\frac{7}{9}$
f. $12\frac{2}{3}$

20. Subtract these common fractions. Express your answer in lowest terms.

a. $\frac{1}{12}$
b. $\frac{1}{12}$
c. $\frac{1}{8}$
d. $\frac{11}{20}$
e. $\frac{16}{35}$
f. $\frac{1}{12}$

21. Subtract these mixed numbers, express your answer in lowest terms.

a. $5\frac{1}{2}$
b. $1\frac{1}{3}$
c. $5\frac{1}{25}$
d. $1\frac{13}{14}$
e. $2\frac{3}{8}$
f. $2\frac{5}{8}$

22. Solve the following word problems.

a. $35\frac{13}{24}$ m
b. $1\frac{1}{6}$ more
c. $\frac{9}{20}$ metres
d. $111\frac{3}{8}$ tonnes
e. $78\frac{3}{8}$ tonnes

23. Write as a common fraction in lowest terms.

a. $\frac{3}{4}$
b. $\frac{1}{6}$
c. $\frac{1}{10}$
d. $\frac{2}{5}$
e. $1\frac{3}{5}$
f. $2\frac{5}{8}$
g. $3\frac{1}{3}$
h. $\frac{1}{8}$

24. Write as decimals. Round your answer to 3 decimal places.

a. 0.375
b. $0.\overline{3}$
c. 0.75
d. 0.05
e. 0.125
f. $1.\overline{6}$
g. 0.2
h. 1

25. Compare the following fractions, use < or >.

a. >
b. <
c. >
d. <

26. Compare the following fractions to decimals. Use < , >, or =.

a. =
b. >
c. =
d. <
e. >
f. <

Glossary

Addends

The numbers to be added together in an addition question. In 3 + 5 = 8, the addends are 3 and 5.

axis

Any straight line used for measuring or as a reference.

balance

Balance has many meanings. In money matters, the balance is the amount left. It might be the amount left in a bank account (bank balance) or it might be the amount you still must pay on a bill (balance owing).

cancelled cheque

A cheque that has been cashed. The cheque is stamped, or cancelled, so it is no longer negotiable.

circumference

The distance around a circle; the perimeter of a circle.

commission

Salespeople may be paid a percentage of the money made in sales. The commission is part or all of their earnings.

common fractions

e.g., ⅔, ³⁄₇ , ⁴⁹⁄₅₀

cross multiply

In a proportion, multiply the numerator of the first fraction times the denominator of the second fraction. Then multiply the denominator of the first fraction times the numerator of the second fraction. In a true proportion, the products of the cross multiplication are equal.

denominator

The bottom number in a common fraction; the denominator tells into how many equal parts the whole thing has been divided.

diameter

The distance across a circle through its centre.

difference

The result of a subtraction question, the answer. Subtraction gives the difference between two numbers.

digit

Any of the ten numerals (0 to 9) are digits. This term comes from our ten fingers which are called digits. The numerals came to be called "digits" from the practice of counting on the fingers!

discount

An amount taken off the regular cost. If something is bought "at a discount" it is bought at less than the regular price.

divide

To separate into equal parts.

dividend

The number or quantity to be divided; what you start with before you divide.

divisor

The number of groups or the quantity into which a number (the dividend) is to be separated.

equal (=)

The same as

Equation

A mathematical statement that two quantities are equal. An equation may use numerals with a letter to stand for an unknown quantity. 6 + Y = 9.

equivalent

Equal in value; equivalent numbers (whole or fractions) can be used interchangeably; that is, they can be used instead of each other.

estimate

Make an approximate answer. Use the sign ≈ to mean approximately equal.

Factors

The numbers or quantities that are multiplied together to form a given product. 5 × 2 = 10, so 5 and 2 are factors of 10.

fraction

Part of the whole; a quantity less than one unit.

horizontal

In a flat position, e.g. we are horizontal when we lie in a bed. A horizontal line goes across the page.

improper fraction

A common fraction with a value equal to or more than one.

infinite

Without end, without limit.

invert

To turn upside down.

like fractions

With the same denominators.

lowest terms

When the terms of a common fraction or ratio do not have a common factor (except 1), the fraction or ratio is in lowest terms (also called simplest form).

minuend

The first number in a subtraction question.

mixed decimal

A whole number and a decimal fraction. 1.75

mixed number

A whole number and a common fraction. 1 3/4

multiple

If a certain number is multiplied by another number, the product is a multiple of the numbers. Think of the multiplication tables. For example, 2, 4, 6, 8, 10, 12, 14... are multiples of 2.

multiplicand

The number to be multiplied.

multiplier

The number you multiply by.

negotiable

Something which can be cashed, that is, exchanged or traded as money.

numbers

Numbers represent the amount, the place in a sequence; *number* is the idea of quantity or order.

numerals

The digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 are also called numerals. These ten digits are combined to make infinite numerals. Digits are like letters, numerals are like words, and numbers are the meaning.

numerator

The top number in a common fraction; the numerator tells how many parts of the whole thing are being considered.

overdrawn

If the value of the cheques or money taken from a bank account is higher than the amount of money in the account, then the account is overdrawn. The account is "in the hole" or "in the red" are expressions sometimes used.

parallel

Two objects or lines side by side, never crossing and always the same distance from each other. Railway tracks are parallel, the lines on writing paper are parallel.

percent (%)

For every one hundred.

perimeter

The distance around the outside of a shape.

place value

We understand numbers by the way the digits (numerals) are arranged in relationship to each other and to the decimal point. Each position has a certain value. Our number system is a **decimal system**. The place value is based on **ten**.

prime number

A number that can only be divided evenly by itself and 1.

product

The result of a multiplying question, the answer.

Proper fraction

A common fraction with a value less than one.

proportion

Generally, proportion is a way of comparing a part of something to the whole thing. E.g., his feet are small in proportion to his height. In mathematics, proportion is used to describe two or more ratios that are equivalent to each other.

quotient

The result of a division question; the quotient tells how many times one number is contained in the other.

radius

The distance from the centre of a circle to the outside of the circle.

ratio

The relationship between two or more quantities. E.g., the ratio of men to women in the armed forces is 10 to 3 (10:3)

reciprocal

A number, when multiplied by its reciprocal, equals 1. To find the reciprocal of a common fraction, invert it. $\frac{3}{5} \times \frac{5}{3} = 1$

reduce

Write a common fraction in lowest terms. Divide both terms by same factor.

remainder

The amount left when a divisor does not divide evenly into the dividend. The remainder must be less than the divisor.

sign

In mathematics, a symbol that tells what operation is to be performed or what the relationship is between the numbers.

+ plus, means to add
− minus, means to subtract
× multiplied by, "times"
÷ divided by, division
= equal, the same quantity as
≠ not equal
≈ approximately equal
< less than
> greater than
≤ less than or equal to
≥ greater than or equal to

simplify

See *reduce*.

subtrahend

The amount that is taken away in a subtraction question.

sum

The result of an addition question, the answer to an addition question.

symbol

A written or printed mark, letter, abbreviation etc. that stands for something else.

term

a) A definite period of time, such as a school term or the term of a loan.

b) Conditions of a contract; the terms of the agreement.

c) In mathematics, the quantities in a fraction and in a ratio are called the *terms* of the fraction or

the *terms* of the ratio. In an algebra equation, the quantities connected by a + or − sign are also called terms.

total

The amount altogether.

transaction

One piece of business. A transaction often involves money. When you pay a bill, take money from the bank or write a cheque, you have made a transaction.

unit

Any fixed quantity, amount, distance or measure that is used as a standard. In mathematics, always identify the unit with which you are working. E.g., 3 km, 4 cups, 12 people, $76, 70 books, 545 g.

unit price

The price for a set amount. E.g., price per litre, price per gram.

unlike fractions

Fractions which have different denominators.

vertical

In an up and down position, e.g., we are vertical when we are standing up. On a page, a vertical line is shown from the top to the bottom of the page.

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