

Adult Learning Academy
Pre-Algebra Workbook
UNIT 2: FRACTIONS



LEARNING OBJECTIVES

1. Understanding & Identification:

- ☐ Recognize proper fractions, improper fractions, and mixed numbers
- ☐ Identify the numerator and denominator of fractions; understand how they relate to part and whole
- ☐ Plot Fractions on a number line

2. Conversions & Comparisons:

- ☐ Recognize and write equivalent fractions
- ☐ Reduce fractions and simplify to lowest possible terms
- ☐ Convert between improper fractions and mixed numbers
- ☐ Rewrite unlike fractions, using the lowest common denominator (LCD)
- ☐ Describe, order and compare fractions

3. Operations with Like and Unlike Fractions:

- ☐ Add fractions
- ☐ Subtract Fractions
- ☐ Multiply Fractions
- ☐ Divide Fractions
- ☐ Follow order of operations rules when performing calculations with fractions

4. Operations with Mixed Numbers:

- | | |
|---|---|
| <input type="checkbox"/> Add mixed numbers | <input type="checkbox"/> Follow order of operations rules when performing operations involving mixed number |
| <input type="checkbox"/> Subtract mixed numbers | |
| <input type="checkbox"/> Multiply mixed numbers | |
| <input type="checkbox"/> Divide mixed numbers | |

5. Word Problems:

- ☐ Solve basic word problems that use fractions and mixed numbers, including applications to the transportation industry, and those involving area and perimeter

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UNIT 2 VIDEO & EXERCISE LIST

Topic	Website	Videos	Exercises
Understanding Fractions	www.khanacademy.org	Numerator, Denominator of a Fraction	Recognizing Fractions 0.5
		Identifying Fraction Parts	Recognizing Fractions
			Fractions on the Number line 1
			Fraction Word Problems 1
Equivalent Fractions	www.khanacademy.org	Equivalent Fractions	Simplifying Fractions
		Equivalent Fractions Example	Comparing Fractions 1
		Comparing Fractions	Equivalent Fractions
		Fractions in Lowest Terms	Equivalent Fractions 2
		Finding Common Denominators	Comparing Fractions 2
		Ordering Fractions	
		Comparing Fractions 2	
Add, Subtract Fractions	www.khanacademy.org	Adding Fractions w/ Like Denominators	Adding Frac. w/ Common Denom
		Subtracting Fractions	Subtract Frac. w/Common Denom
		Adding and Subtracting Fractions	Adding Fractions
		Adding Fractions w/ unlike denom	Subtracting Fractions
		Adding Fractions Ex. 1	Adding and Subtracting Fractions
Multiplying Fractions	www.khanacademy.org	Multiplying Fractions	Multiplying Fractions 0.5
		Multiplying Fractions Word Problem	Multip. Fractions Word Problems
Dividing Fractions	www.khanacademy.org	Dividing Fractions	Dividing Fractions 0.5
		Dividing Fractions Example	Dividing Fractions Word Problems
		Dividing Fractions Word Problems	
Mixed Numbers and Improper Fractions	www.khanacademy.org	Proper and Improper Fractions	Fractions on the Number Line 2
		Comparing Imp Frac & Mixed Numbers	Comparing Imp Frac & Mixed No.
		Mixed Numbers and Improper Frac.	Converting Mixed Numbers & I.F.
		Changing a Mixed Number to Imp Frac	
		Changing an Imp Fract to a Mixed No.	
		Ordering Imp. Fractions & Mixed No.	

Topic	Website	Videos	Exercises
Mixed Number Add & Sub	www.khanacademy.org	Adding Mixed Numbers	Add/Subt Mixed Numbers 0.5
		Adding Mixed Nos. w/ Unlike Denom	Add/Subt Mixed Numbers 1
		Adding Mixed Nos. Word Problem	
		Subtracting Mixed Numbers	
		Subtracting Mixed Numbers 2	
		Subtracting Mixed Numbers Word Prob	
Mixed Number Mult & Div		Multiplying Fractions and Mixed Nos.	Multiplying Mixed Numbers 1
		Multiplying Mixed Numbers	
		Dividing Mixed Numbers	
		Dividing Mixed Numbers and Fractions	
Review of Unit 2	www.stlcc.edu	Blackboard PowerPoint	"Unit 2 Review Flashcards"
Compass Practice	http://www.hostos.cuny.edu/oaa/compass/pre-alg_prac2.htm		Fractions



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1. Write five fractions that are equivalent to each number:

a.

$$\frac{1}{2}$$

b.

$$\frac{1}{4}$$

c.

$$\frac{3}{4}$$

d.

$$0$$

e.

$$1$$

f.

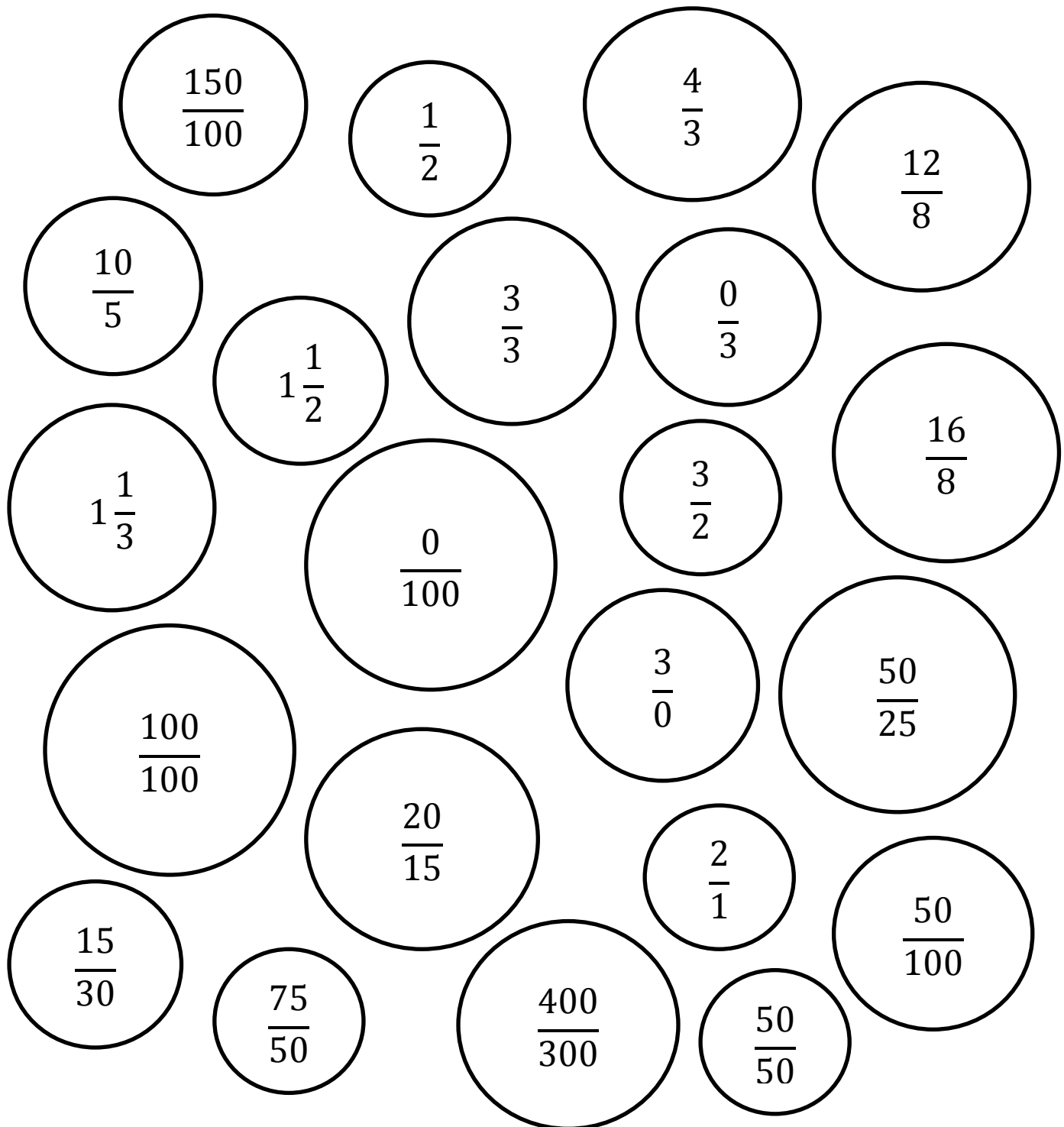
$$2$$

2. Fill in the blanks:

To create equivalent fractions, M_____ the N_____ and the D_____ by the S_____ number. This is the same as multiplying the fraction by _____, which does not change its value.

2.2 COLORING MATCHING: EQUIVALENT FRACTIONS

Color all equivalent fractions the same color.



$\frac{150}{100}$ $\frac{1}{2}$ $\frac{4}{3}$ $\frac{12}{8}$
 $\frac{10}{5}$ $1\frac{1}{2}$ $\frac{3}{3}$ $\frac{0}{3}$
 $1\frac{1}{3}$ $\frac{0}{100}$ $\frac{3}{2}$ $\frac{16}{8}$
 $\frac{100}{100}$ $\frac{3}{0}$ $\frac{50}{25}$
 $\frac{15}{30}$ $\frac{20}{15}$ $\frac{2}{1}$ $\frac{50}{100}$
 $\frac{75}{50}$ $\frac{400}{300}$ $\frac{50}{50}$

FRACTION RAP

When you're adding up or taking away fractions, don't be a hater!
Bottom number's got to be the same—COMMON DENOMINATOR!

Multiply fractions, no big problem
Top times top and bottom times bottom

Dividing fractions, easy as pie
Flip the second and multiply!

THE BIRTHDAY SONG:

You must have common denominators
You must have common denominators
To ADD or SUBTRACT,
You must have common denominators!

KFC

To Divide Fractions, remember... KFC!!
Keept the first fraction the same.
Flip the second fraction.
Change the division to multiplication.

1. Circle the GREATER number from each pair:

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

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

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

d. $\frac{11}{10}$ 1

e. $\frac{1}{2}$ $\frac{3}{8}$

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

2. Color the boxes as directed:

a. Color $\frac{1}{3}$ of the candy bar:

b. Color $\frac{2}{6}$ of the candy bar:

c. Color $\frac{1}{2}$ of the candy bar:

3. Cross out the fraction that is UNDEFINED:

$\frac{5}{0}$ $\frac{0}{5}$

4. What is half of $\frac{2}{3}$?

5. Circle ALL the fractions that equal one half:

$\frac{2}{1}$ $\frac{1}{2}$ $\frac{8}{16}$ $\frac{10}{20}$

6. Simplify. Write your answer in simplest form:

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

b. $\frac{2}{3} - \frac{1}{4}$

c. $\frac{2}{3} \cdot \frac{3}{4}$

d. $\frac{2}{3} \div \frac{3}{4}$

e. $1\frac{3}{4} + 2\frac{1}{3}$

f. $1\frac{3}{4} \times 2\frac{1}{3}$

g. $1\frac{3}{4} \div 2\frac{1}{3}$

1. About $\frac{1}{60}$ of live births is twins. $\frac{1}{3}$ of all twin births are identical twins.
 - a. What fraction of live births are NOT twins?
 - b. What fraction of twin births are fraternal (not identical) twins?
 - c. In a year of 360 births at a particular hospital, how many set of twins would you expect? How many sets of identical twins?

2. About $\frac{3}{4}$ of the Earth's 200 million square mile surface is covered in water.
 - a. How many million square miles of the Earth's surface are covered with water?
 - b. How many million square miles of the Earth's surface are land?

3. The $\frac{5}{16}$ inch wrench is too small. The $\frac{7}{16}$ inch wrench is too big. Which size might work?
 - a) $\frac{1}{2}$ inch
 - b) $\frac{3}{8}$ inch
 - c) $\frac{1}{4}$ inch

4. Which is larger: a $\frac{7}{8}$ inch bolt or a $\frac{3}{4}$ inch bolt? By how much?

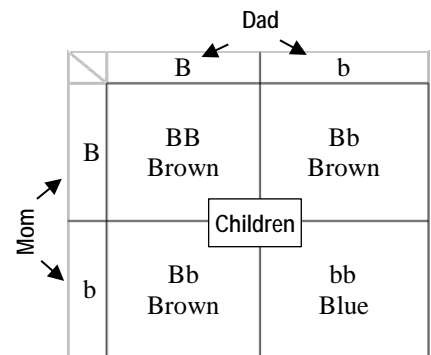
5. Fact: Cigarette smoke contains 4,800 chemicals. 69 of those cause cancer.
 - a. What fraction of the chemicals in cigarette smoke are carcinogenic?
 - b. What fraction of the chemicals in cigarette smoke are non-carcinogenic?



6. Half of computer users use Chrome as their browser. $\frac{1}{4}$ of computer users use Internet Explorer, $\frac{1}{20}$ use Safari, and the rest use Firefox
- What fraction of computer users use Firefox as their browser?
 - Out of 500 college students, how many would you expect to use Chrome? Internet Explorer? Safari? Firefox?
7. The gene for brown eyes (B) is dominant and the gene for blue eyes (b) is recessive. If a child inherits the gene for brown eyes (B) from both parents, their eyes will be brown (BB). If a child inherits the gene for brown eyes (B) from one parent and the gene for blue eyes (b) from the other parent, the child's eyes will be brown (Bb). The only way for the child to have blue eyes (bb) is to inherit the gene for blue eyes (b) from both parents.

We can use a Punnett square to show the probability of the children's eye color. In the square below, the eye color probability for children whose parent's both have brown (Bb) eyes is shown:

- What fraction of the children will have brown eyes?
- What fraction will have blue eyes?
- Out of 8 children in this family, how many would you expect to have brown eyes? Blue eyes?

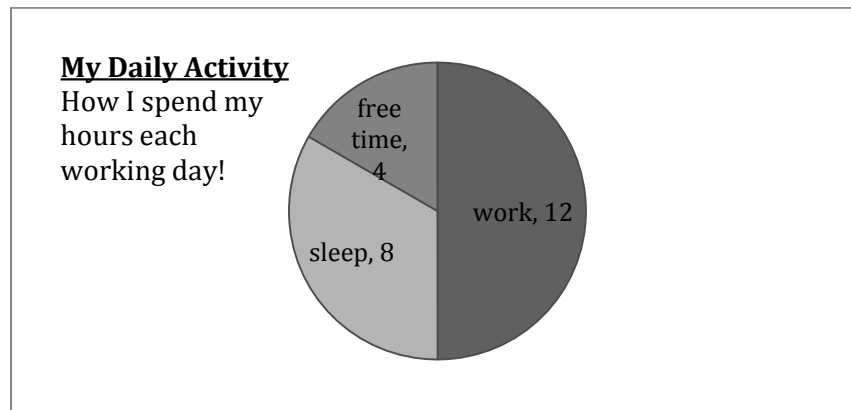


8. A zoo nutritionist uses the following recipe to feed the small mammals each day:

$$10 \frac{3}{4} \text{ cups chopped carrots} \qquad 5 \frac{2}{3} \text{ cups chopped lettuce} \qquad 7 \frac{1}{2} \text{ vitamin tablets}$$

- How much of each ingredient should he include in order to DOUBLE this recipe?
- How much of each ingredient should he include in order to cut this recipe in HALF?

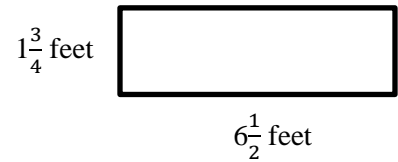
9. On the days when you are working, this graph shows how your time breaks down for a 24-hour day:



Write each fraction and simplify:

- What fraction of your time do you spend working?
- What fraction of your time do you spend sleeping?
- What fraction of your time do you have free?
- Add the three fractions above. What is the total? Why does this total make sense?
- According to the graph, what fraction of the day are you AWAKE?
- What fraction of your DAY OFF do you spend working?
- Your friend spends $\frac{1}{6}$ of her day at work. How long is her shift?
- Your friend has $\frac{1}{5}$ of her day for free time. Who has more free time—you or her?
- You spend $\frac{1}{3}$ of your work time on paperwork. How many hours is this?

10. The storage shelf at work measures $6\frac{1}{2}$ feet by $1\frac{3}{4}$ feet.



- a. You decide to attach a rim to go around the edge of the shelf to keep items from falling off. How many feet of rim should you order?

(Note: You are finding the *PERIMETER* of the rectangle. You can find it by adding up the lengths of *ALL* four of the sides.)

- b. Rim material costs \$4 per foot. How much will your rim cost?

- c. You also choose to buy water-resistant shelf paper to protect the surface of the shelf. A roll of shelf paper covers 5 square feet. How many of rolls will you need? (Note: You are finding the *AREA* of a rectangle. You can find it by multiplying the length of the rectangle by its width. Area is always measured in square units.)

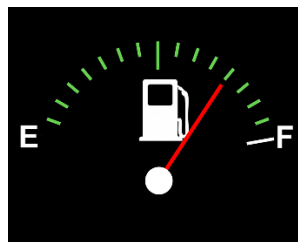
11. In an experiment measuring height, children grew $\frac{1}{2}$ inch, $3\frac{5}{8}$ inches, and $1\frac{2}{3}$ inches in a year. What is the MEAN amount of growth for the three children?

12. Approximate:

- a. How many pounds does the item weigh?

- b. How full is the tank?

- c. How long is the line?



Resources

Image used in question 3

[Companion wrenches](#) by [Typhoon](#) is licensed under [CC BY-SA 3.0](#)

Image used in question 12a

[Fraction Scale](#) by [OER Training](#) is licensed under [CC BY 4.0](#)

Image used in question 12b

[Gas Gauge](#) is a derivative of [Fuel Gauge](#), which is available in the public domain under [CC0 Public Domain](#)

Image used in question 12c

[Line Segment](#) is a derivative of [10cm ruler](#), which is available in the public domain



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2.1 Famous Equivalent Fractions

1a. $\frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}, \frac{6}{12}, \text{etc.}$

1b. $\frac{1}{4} = \frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \frac{5}{20}, \frac{6}{24}, \text{etc.}$

1c. $\frac{3}{4} = \frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}, \frac{18}{24}, \text{etc.}$

1d. $0 = \frac{0}{2}, \frac{0}{3}, \frac{0}{4}, \frac{0}{5}, \frac{0}{6}, \text{etc}$

1e. $1 = \frac{2}{2}, \frac{3}{3}, \frac{4}{4}, \frac{5}{5}, \frac{6}{6}, \text{etc}$

1f. $2 = \frac{2}{1}, \frac{4}{2}, \frac{6}{3}, \frac{8}{4}, \frac{10}{5}, \text{etc}$

2. To create equivalent fractions Multiply the Numerator and the Denominator by the Same number. This is the same as multiplying the fraction by 1, which does not change its value.

2.2 Color Matching Equivalent Fractions

$\frac{0}{3} = \frac{0}{100}$

$\frac{1}{2} = \frac{15}{30} = \frac{50}{100}$

$\frac{3}{3} = \frac{50}{50} = \frac{100}{100}$

$1\frac{1}{3} = \frac{4}{3} = \frac{20}{15} = \frac{400}{300}$

$1\frac{1}{2} = \frac{3}{2} = \frac{12}{8} = \frac{75}{50} = \frac{150}{50}$

$\frac{2}{1} = \frac{10}{5} = \frac{16}{8} = \frac{50}{25}$

* $\frac{3}{0}$ is undefined and does not have a match

2.4 Fractions Quiz

1a. $\frac{1}{3}$ 1b. $\frac{4}{3}$ 1c. $\frac{7}{8}$

1d. $\frac{11}{10}$ 1e. $\frac{4}{3}$ 1f. $\frac{7}{8}$

2.4 Fractions Quiz (cont.)

2a. 

2b. 

2c. 

3. $\frac{5}{0}$

4. $\frac{1}{2} \cdot \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$

5. $\frac{1}{2}, \frac{8}{16}, \frac{10}{20}$

6a. $\frac{4}{4} = 1$

6b. $\frac{8}{12} - \frac{3}{12} = \frac{5}{12}$

6c. $\frac{6}{12} = \frac{1}{2}$

6d. $\frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$

6e. $1\frac{9}{12} + 2\frac{4}{12} = 3\frac{13}{12} = 4\frac{1}{12}$

6f. $\frac{7}{4} \times \frac{7}{3} = \frac{49}{12} = 4\frac{1}{12}$

6g. $\frac{7}{4} \div \frac{7}{3} = \frac{7}{4} \times \frac{3}{7} = \frac{21}{28} = \frac{3}{4}$

2.5 Incredible Growing and Shrinking Numbers

1. Shrunk; $\frac{20}{1} \times \frac{1}{10} = \frac{20}{10} = 2$

2. Shrunk; $\frac{20}{1} \times \frac{1}{2} = \frac{20}{2} = 10$

3. Shrunk; $\frac{20}{1} \times \frac{3}{4} = \frac{60}{4} = 15$

4. Same; $\frac{20}{1} \times \frac{5}{5} = \frac{100}{5} = 20$

5. Grew; $\frac{20}{1} \times \frac{5}{4} = \frac{100}{4} = 25$

2.5 Incredible Growing and Shrinking Numbers (cont.)

6. **Grew;** $20 \div \frac{1}{10} = \frac{20}{1} \times \frac{10}{1} = \frac{200}{1} = 200$

7. **Grew;** $20 \div \frac{1}{2} = \frac{20}{1} \times \frac{2}{1} = \frac{40}{1} = 40$

8. **Grew;** $20 \div \frac{3}{4} = \frac{20}{1} \times \frac{4}{3} = \frac{80}{3} = 26\frac{2}{3}$

9. **Same;** $20 \div \frac{5}{5} = \frac{20}{1} \times \frac{5}{5} = \frac{100}{5} = 20$

10. **Shrunk;** $20 \div \frac{5}{4} = \frac{20}{1} \times \frac{4}{5} = \frac{80}{5} = 16$

11. **shrinks**

12. **grows**

13. **stays the same**

14. **stays the same**

15. **grows**

15. **shrinks**

2.6 Career Applications: STEM

1a. $\frac{59}{60}$ 1b. $\frac{2}{3}$

1c. Remember that “of” means “multiply”:
 $\frac{1}{60}$ of 360 = $\frac{1}{60} \cdot \frac{360}{1} = 6$ **sets of twins**

2a. $\frac{3}{4}$ of 200 = $\frac{3}{4} \cdot \frac{200}{1}$
= 150 million square miles

2b. $\frac{1}{4}$ of 200 or $\frac{1}{4} \cdot \frac{200}{1}$
= 50 million square miles
(You could also have subtracted 200-150 to get the same answer!)

3. b) $\frac{3}{8}$ **inch** because $\frac{3}{8} = \frac{6}{16}$

4. $\frac{3}{4} = \frac{6}{8}$, so $\frac{7}{8} > \frac{3}{4}$
 $\frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{6}{8} = \frac{1}{8}$ **inch larger**

2.6 Career Applications: STEM (cont.)

5a. $\frac{69}{4800} = \frac{23}{1600}$

5b. $\frac{4800-69}{4800} = \frac{4731}{4800} = \frac{1577}{1600}$

6a. $\frac{1}{2} + \frac{1}{4} + \frac{1}{20} = \frac{10}{20} + \frac{5}{20} + \frac{1}{20}$
 $= \frac{16}{20}$ who use the other browsers,
So, $\frac{4}{20} = \frac{1}{5}$ use Firefox

6b. $\frac{1}{2}$ of 500 = **250 Chrome**
 $\frac{1}{4} \cdot 500 = \mathbf{125}$ **Internet Explorer**
 $\frac{1}{20} \cdot 500 = \mathbf{25}$ **Safari**
 $\frac{1}{5} \cdot 500 = \mathbf{100}$ **Firefox**

7a. $\frac{3}{4}$

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

7c. Brown: $\frac{3}{4}$ of 8 = $\frac{3}{4} \cdot \frac{8}{1} = 6$ **children with brown eyes**

Blue: $\frac{1}{4}$ of 8 = $\frac{1}{4} \cdot \frac{8}{1} = 2$ **children with blue eyes**

8. First, convert fractions to improper fractions:

$$10 \frac{3}{4} \text{ cups chopped carrots} = \frac{43}{4} \text{ cups}$$

$$5 \frac{2}{3} \text{ cups chopped lettuce} = \frac{17}{3} \text{ cups}$$

$$7 \frac{1}{2} \text{ vitamin tablets} = \frac{15}{2} \text{ tablets}$$

8a. Multiply each improper fraction by $\frac{2}{1}$

$$\text{Carrots: } \frac{43}{4} \cdot \frac{2}{1} = \frac{86}{4} = \mathbf{21 \frac{1}{2} \text{ cups of carrots}}$$

$$\text{Lettuce: } \frac{17}{3} \cdot \frac{2}{1} = \frac{34}{3} = \mathbf{11 \frac{1}{3} \text{ cups of lettuce}}$$

$$\text{Vitamins: } \frac{15}{2} \cdot \frac{2}{1} = \frac{30}{2} = \mathbf{15 \text{ vitamins}}$$

2.6 Career Applications: STEM (cont.)

- 8b. Divide each fraction by 2
(or multiply each by $\frac{1}{2}$)

Carrots: $\frac{43}{4} \cdot \frac{1}{2} = \frac{43}{8} = 5\frac{3}{8}$ **cups of carrots**

Lettuce: $\frac{17}{3} \cdot \frac{1}{2} = \frac{17}{6} = 2\frac{5}{6}$ **cups of lettuce**

Vitamins: $\frac{15}{2} \cdot \frac{1}{2} = \frac{15}{4} = 3\frac{3}{4}$ **vitamins**

9a. $\frac{12}{24} = \frac{1}{2}$ **of the day**

9b. $\frac{8}{24} = \frac{1}{3}$ **of the day**

9c. $\frac{4}{24} = \frac{1}{6}$ **of the day**

9d. $\frac{12}{24} + \frac{8}{24} + \frac{4}{24} = \frac{24}{24} = 1$, **which is the entire day!**

9e. You are awake for $\frac{16}{24} = \frac{2}{3}$ **of your day**

9f. $\frac{0}{24} = 0$

9g. $\frac{1}{6}$ of 24 = $\frac{1}{6} \cdot \frac{24}{1} = 4$ **hours**

9h. $\frac{1}{5} > \frac{1}{6}$, **so your friend has more free time**

9i. $\frac{1}{3} \cdot \frac{12}{1} = 4$ **hours**

10a. $1\frac{3}{4} + 6\frac{1}{2} + 1\frac{3}{4} + 6\frac{1}{2}$
 $= 1\frac{3}{4} + 6\frac{2}{4} + 1\frac{3}{4} + 6\frac{2}{4}$
 $= 14\frac{10}{4} = 14 + 2\frac{2}{4}$
 $= 16\frac{1}{2}$ **feet**

10b. $16\frac{1}{2} \cdot 4 = \frac{33}{2} \cdot \frac{4}{1} = \66

10c. $1\frac{3}{4} \cdot 6\frac{1}{2} = \frac{7}{4} \cdot \frac{13}{2} = \frac{91}{8}$
 $= 11\frac{3}{8}$ **square feet = 3 rolls** (you can't purchase only part of a roll!)

11. First, add all 3:

$$\frac{1}{2} + \frac{29}{8} + \frac{5}{3} = \frac{12}{24} + \frac{87}{24} + \frac{40}{24} = \frac{139}{24}$$

Then, divide by 3 (multiply by the reciprocal)

$$\frac{139}{24} \cdot \frac{1}{3} = \frac{139}{72} = 1\frac{57}{72} = 1\frac{19}{24}$$
 inches

12a. about $7\frac{3}{4}$ **lbs.**

12b. $\frac{3}{4}$ **of a tank full.**

12c. $3\frac{4}{10} = 3\frac{2}{5}$ **centimeters.**



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