

# SQUARES, ROOTS AND PYTHAGOREAN THEOREM

## UNIT # 1

→ EXAM REVIEW

## Unit Review

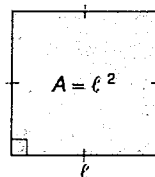
### What Do I Need to Know?

#### ✓ Side Length and Area of a Square

The side length of a square is equal to the square root of its area.

$$\text{Length} = \sqrt{\text{Area}}$$

$$\text{Area} = (\text{Length})^2$$



#### ✓ The Approximate Square Root of a Number

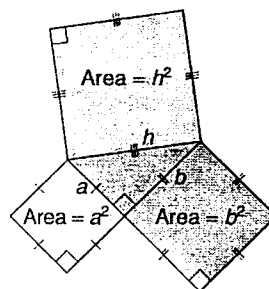
For numbers that are not perfect squares, we can determine the approximate square root using estimation or a calculator.

#### ✓ The Pythagorean Theorem

In a right triangle, the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the two legs.

$$h^2 = a^2 + b^2$$

Use the Pythagorean Theorem to find the length of a side in a right triangle, when two other sides are known.



### What Should I Be Able to Do?

#### LESSON

5.1

1. Use square tiles.  
Make as many different rectangles as you can with area 24 square units.  
Draw your rectangles on grid paper.  
Is 24 a perfect square?  
Justify your answer.
2. Which of these numbers is a perfect square?  
Use a diagram to support your answer.  
a) 18    b) 25    c) 44    d) 80

**LESSON**

- 3.** I am a square number.  
The sum of my digits is 7.  
What square number might I be?  
How many different numbers can you find?

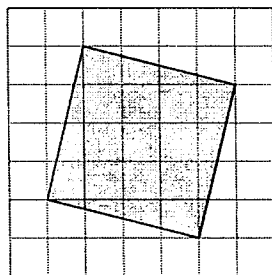
- 4.** Find the square of each number.  
a) 5      b) 7      c) 9      d) 13

- 5.** Find a square root.  
a)  $7^2$       b)  $\sqrt{289}$       c)  $\sqrt{400}$

- 6.** a) List the factors of each number in ascending order.  
i) 108      ii) 361      iii) 150  
iv) 286      v) 324      vi) 56  
b) Which numbers in part a are square numbers? How can you tell?

- 7.** The area of a square is  $121 \text{ cm}^2$ .  
What is the perimeter of the square?  
How did you find out?

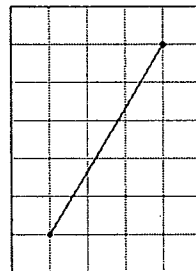
- 8.** Copy this square onto grid paper.  
Find its area.  
Then write the side length of the square.



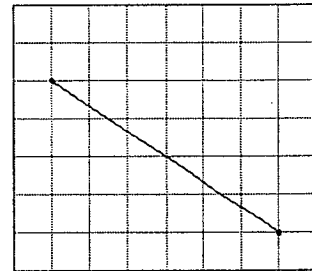
- 9.** The area of each square is given.  
Find its side length.  
Which side lengths are whole numbers?  
a)  $75 \text{ cm}^2$       b)  $96 \text{ cm}^2$       c)  $81 \text{ cm}^2$

- 10.** Without measuring, which line segment is longer? How can you tell?

a)



b)



- 11.** Find.  
a)  $\sqrt{26 \times 26}$   
b)  $\sqrt{5 \times 5}$   
c)  $\sqrt{50 \times 50}$   
d)  $\sqrt{13 \times 13}$

- 12.** Between which two consecutive whole numbers is each square root?  
How did you find out?  
a)  $\sqrt{46}$       b)  $\sqrt{84}$   
c)  $\sqrt{120}$       d)  $\sqrt{1200}$

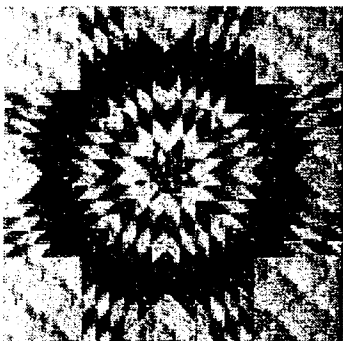
- 13.** Without using a calculator, estimate each square root to the nearest whole number.  
a)  $\sqrt{6}$       b)  $\sqrt{11}$   
c)  $\sqrt{26}$       d)  $\sqrt{35}$   
e)  $\sqrt{66}$       f)  $\sqrt{86}$

- 14.** Estimate each square root to one decimal place. Show your work.  
a)  $\sqrt{55}$       b)  $\sqrt{75}$   
c)  $\sqrt{95}$       d)  $\sqrt{105}$   
e)  $\sqrt{46}$       f)  $\sqrt{114}$

**LESSON**

- 15.** Which is the better estimate of  $\sqrt{72}$ : 8.48 or 8.49? How do you know?

- 16.** This First Nations quilt is a square, with area  $16\,900\text{ cm}^2$ . How long is each side of the quilt?



- 17.** Is each statement true or false?

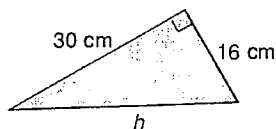
Justify your answers.

- a)  $\sqrt{2} + \sqrt{2} = 2$   
 b)  $\sqrt{29}$  is between 5 and 6.  
 c)  $\sqrt{9} + \sqrt{25} = \sqrt{64}$

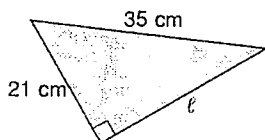
**1.5**

- 18.** Find the length of each side labelled with a variable. Give your answers to one decimal place where needed.

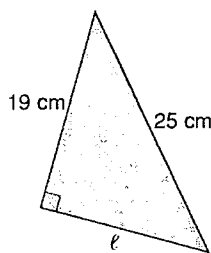
a)



b)

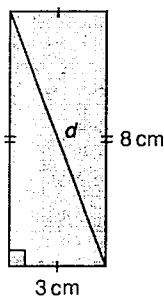


c)

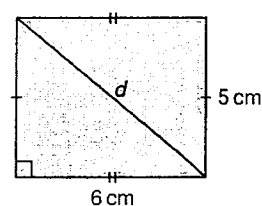


- 19.** Find the length of the diagonal,  $d$ , in each rectangle. Give your answers to one decimal place where needed.

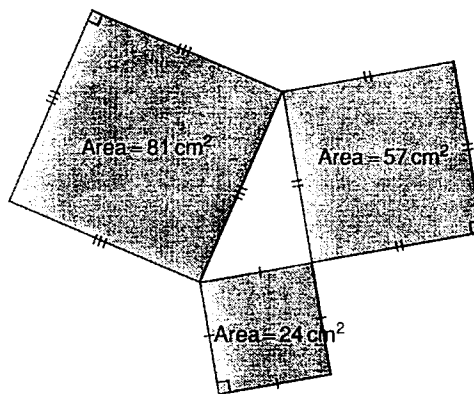
a)



b)



- 20.** The area of the square on each side of a triangle is given. Is the triangle a right triangle? How do you know?



**1.6**

- 21.** A triangle has side lengths 7 cm, 12 cm, and 15 cm. Is the triangle a right triangle? Justify your answer.

**LESSON**

**22.** Identify the sets of numbers that are Pythagorean triples.

How did you decide?

- a) 24, 32, 40      b) 11, 15, 24  
c) 25, 60, 65      d) 5, 8, 9

**23.** Two numbers in a Pythagorean triple are 20 and 29.

Find the third number.

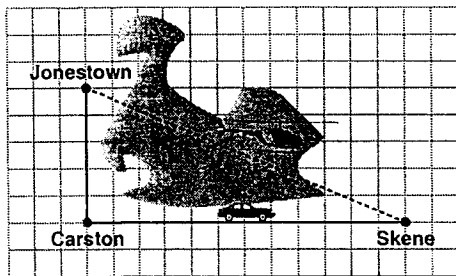
How many solutions are possible?

Justify your answer.

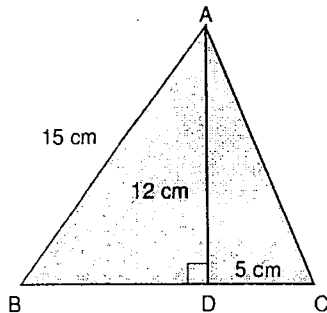
**24.**

Look at the map below. The side length of each grid square is 10 km.

How much farther is it to travel from Jonestown to Skene by car than by helicopter?

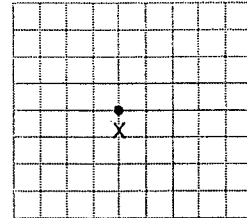


**25.** Find the perimeter of  $\triangle ABC$ .



**26.** There is a buried treasure at one of the points of intersection of the grid lines below.

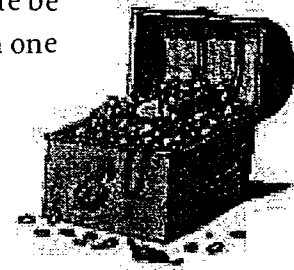
Copy the grid.



The treasure is  $\sqrt{13}$  units from the point marked X.

a) Where might the treasure be? Explain how you located it.

b) Could there be more than one position? Explain.



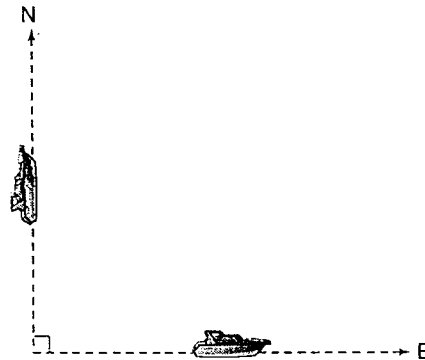
**27.** Two boats started at the same point.

After 2 h, one boat had travelled 20 km due east. The other boat had travelled 24 km due north.

How far apart are the boats?

Explain your thinking.

Give your answer to one decimal place.



# OPERATIONS ON FRACTIONS

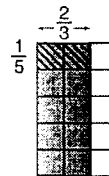
## UNIT #2

### Unit Review

#### What Do I Need to Know?

- To multiply two fractions:**  
Multiply the numerators and multiply the denominators.

$$\frac{2}{3} \times \frac{1}{5} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$$



$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$

**To multiply two mixed numbers:**

Write each number as an improper fraction, then multiply.

$$\begin{aligned} 1\frac{1}{2} \times 2\frac{5}{6} &= \frac{3}{2} \times \frac{17}{3} \\ &= \frac{17}{2}, \text{ or } 8\frac{1}{2} \end{aligned}$$

Simplify first, when you can.

- To divide two fractions:**

Method 1:

Use common denominators.

$$\frac{4}{5} \div \frac{3}{2} = \frac{8}{10} \div \frac{15}{10} = \frac{8}{15}$$

Method 2:

Use multiplication.

$$\frac{4}{5} \div \frac{3}{2} \text{ is the same as } \frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$$

**To divide two mixed numbers:**

Write each number as an improper fraction, then divide.

$$\begin{aligned} 3\frac{1}{2} \div 1\frac{2}{3} &= \frac{7}{2} \div \frac{5}{3} \\ &= \frac{7}{2} \times \frac{3}{5} \\ &= \frac{21}{10}, \text{ or } 2\frac{1}{10} \end{aligned}$$

- To identify the operation:**

- Think about the situation.
- Make sense of the problem.
- Think about what is happening in the problem. Use key words to help.

- The order of operations with whole numbers and decimals applies to fractions.**

- Do the operations in brackets first.
- Then divide and multiply, in order, from left to right.
- Then add and subtract, in order, from left to right.

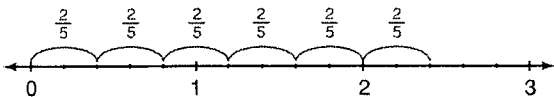
## What Should I Be Able to Do?

### LESSON

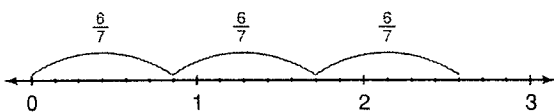
3.1

1. Write the multiplication equation each number line represents.

a)



b)



2. Multiply. Draw a picture or a number line to show each product.

a)  $\frac{1}{3} \times 3$     b)  $7 \times \frac{1}{2}$     c)  $8 \times \frac{2}{5}$

3. Solve each problem.

- a) There are 30 students in a class. Three-fifths of the students are girls. How many girls are in the class?
- b) Six glasses are  $\frac{2}{3}$  full. How many full glasses could be made?
- c) There are 75 cars in the parking lot of a car dealership. Two-thirds of the cars are new. How many of the cars are new?
- d) One serving is  $\frac{1}{12}$  of a cake. How many cakes are needed for 18 servings?

3.2

4. Draw an area model to find each product.

a)  $\frac{2}{3} \times \frac{3}{8}$     b)  $\frac{4}{5} \times \frac{3}{10}$   
 c)  $\frac{7}{10} \times \frac{3}{4}$     d)  $\frac{3}{7} \times \frac{1}{3}$

5. Fasil donated  $\frac{3}{5}$  of  $\frac{1}{4}$  of his allowance to a charity. What fraction of his allowance did Fasil donate?

3.3

6. Multiply. Use benchmarks to estimate to check each product is reasonable.

a)  $\frac{1}{2} \times \frac{3}{10}$     b)  $\frac{3}{5} \times \frac{1}{8}$   
 c)  $\frac{7}{8} \times \frac{2}{5}$     d)  $\frac{3}{11} \times \frac{44}{63}$

7. Twenty Grade 8 students are going on a school trip. They pre-order sandwiches. Three-quarters of the students order a turkey sandwich, while  $\frac{1}{4}$  of the students order a roasted vegetable sandwich. Of the  $\frac{3}{4}$  who want turkey,  $\frac{2}{5}$  do not want mayonnaise. What fraction of the students do not want mayonnaise?
8. Write a story problem that could be solved using the expression  $\frac{5}{7} \times \frac{3}{8}$ . Find the product to solve the problem. Estimate to check the solution is reasonable.

3.4

9. Write each mixed number as an improper fraction.

a)  $7\frac{1}{2}$     b)  $2\frac{7}{8}$     c)  $10\frac{7}{10}$

10. Use an area model to find each product.

a)  $1\frac{1}{2} \times 2\frac{1}{3}$     b)  $\frac{19}{3} \times \frac{6}{5}$   
 c)  $3\frac{1}{5} \times \frac{1}{4}$     d)  $2\frac{1}{4} \times 3\frac{1}{3}$

**LESSON**

**11.** Multiply. Estimate to check the product is reasonable.

a)  $1\frac{2}{3} \times 1\frac{9}{10}$

b)  $4\frac{1}{2} \times \frac{5}{8}$

c)  $\frac{9}{5} \times \frac{14}{8}$

d)  $1\frac{3}{10} \times 6\frac{2}{3}$

**12.** Jonathan works for a landscape maintenance company. It took Jonathan  $1\frac{3}{4}$  h to mow Mr. Persaud's lawn. The lawn he will mow next is  $2\frac{1}{3}$  times as large as Mr. Persaud's lawn. How long will it take Jonathan to mow the next lawn? What assumptions do you make?

**3.5**

**13.** Find each quotient. Use number lines to illustrate the answers.

a) One-half of a cake is shared equally among 5 people. What fraction of the whole cake does each person get?

b) Nakkita's dog eats  $\frac{3}{4}$  of a can of dog food each day. Nakkita has 9 cans of dog food. How many days' supply of dog food does Nakkita have?

**14.** Find each quotient.

a)  $3 \div \frac{4}{5}$

b)  $4 \div \frac{5}{6}$

c)  $\frac{3}{10} \div 2$

d)  $2\frac{5}{8} \div 3$

**15.** A glass holds  $\frac{3}{4}$  cup of milk. A jug contains 12 cups of milk. How many glasses can be filled from the milk in the jug?

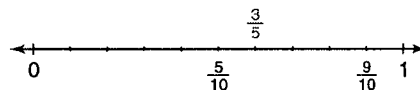
**16.** Kayla uses  $\frac{2}{3}$  of a scoop of detergent to do one load of laundry. Kayla has 9 scoops of detergent. How many loads of laundry can Kayla do?

**17.** When you divide a fraction by a whole number, is the quotient greater than or less than 1? Include examples in your explanation.

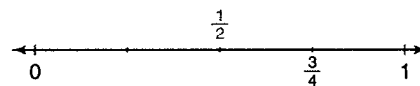
**3.6**

**18.** Use a copy of each number line to illustrate each quotient.

a)  $\frac{9}{10} \div \frac{3}{5}$



b)  $\frac{3}{4} \div \frac{1}{2}$



**19.** Divide. Estimate to check each quotient is reasonable.

a)  $\frac{3}{4} \div \frac{3}{8}$

b)  $\frac{1}{4} \div \frac{7}{8}$

c)  $\frac{5}{12} \div \frac{1}{3}$

d)  $\frac{1}{2} \div \frac{3}{5}$

**20.** Midori lives on a farm. Midori has  $\frac{7}{8}$  of a tank of gas. Each trip to town and back uses  $\frac{1}{6}$  of a tank of gas. How many trips to town and back can Midori make until she needs more gas? Estimate to check the solution is reasonable.

**21.** When you divide a proper fraction by its reciprocal, is the quotient less than 1, greater than 1, or equal to 1? Use examples in your explanation.

**LESSON**

- 22.** Write each mixed number as an improper fraction.
- a)  $3\frac{7}{11}$                       b)  $5\frac{1}{6}$   
 c)  $4\frac{8}{9}$                           d)  $2\frac{5}{12}$
- 23.** Divide. Estimate to check the quotient is reasonable.
- a)  $1\frac{3}{4} \div 2\frac{1}{8}$   
 b)  $3\frac{5}{6} \div 2\frac{1}{5}$   
 c)  $3\frac{1}{2} \div 1\frac{3}{8}$   
 d)  $2\frac{1}{5} \div 4\frac{2}{5}$
- 24.** A recipe for cereal squares calls for  $1\frac{1}{4}$  bags of regular marshmallows. The recipe makes a cookie sheet of squares. Marcus has  $\frac{3}{4}$  of a bag of marshmallows. He buys 5 more bags. How many sheets of cereal squares can Marcus make?
- 25.** A cookie recipe calls for  $\frac{3}{4}$  cup of rolled oats. Norma has  $\frac{5}{8}$  cup of rolled oats. How much more rolled oats does she need to make the cookies? How did you decide which operation to use?
- 26.** In a lottery for a local charity, 1000 tickets are sold. Of these tickets,  $\frac{1}{1000}$  will win \$1000,  $\frac{1}{500}$  will win \$50,  $\frac{1}{200}$  will win \$25,  $\frac{1}{100}$  will win \$10, and  $\frac{1}{10}$  will win \$5. How many tickets will not win a prize? How did you decide which operations to use?

- 27.** There are 30 students in a Grade 8 class. One-third of the students take a school bus,  $\frac{1}{5}$  take public transportation,  $\frac{1}{6}$  are driven by family, and the rest walk to school.
- a) What fraction of the students in the class walk to school?  
 b) How many of the students in the class walk to school? How did you decide which operations to use?

- 28.** Evaluate. State which operation you do first.

a)  $\frac{1}{5} + \frac{2}{3} \times \frac{3}{5}$     b)  $\frac{4}{5} \div (\frac{2}{3} - \frac{3}{10})$   
 c)  $\frac{7}{3} + \frac{1}{6} \times \frac{2}{5}$     d)  $\frac{7}{8} \div \frac{5}{6} \times \frac{4}{7}$

- 29.** Evaluate.

a)  $\frac{2}{3} + \frac{1}{4} - \frac{1}{6}$     b)  $\frac{3}{2} \times (\frac{4}{3} - \frac{1}{6})$   
 c)  $\frac{9}{8} \div (\frac{3}{4} + \frac{3}{2})$     d)  $\frac{2}{3} \times (\frac{1}{8} + \frac{5}{6} - \frac{3}{4})$

- 30.** Carlton evaluated this expression:

$$\begin{aligned}
 & 2\frac{4}{5} \div (\frac{2}{3} + \frac{1}{12}) \\
 & \text{His work is shown below.} \\
 & \text{Where did Carlton go wrong?} \\
 & \text{What is the correct answer?} \\
 & 2\frac{4}{5} \div (\frac{2}{3} + \frac{1}{12}) = 2\frac{4}{5} \div (\frac{8}{12} + \frac{1}{12}) \\
 & = 2\frac{4}{5} \div (\frac{9}{12}) \\
 & = \frac{14}{5} \div \frac{9}{12} \\
 & = \frac{14}{5} \times \frac{9}{12} \\
 & = \frac{14}{5} \times \frac{9^3}{12^2} \\
 & = \frac{21}{10} \\
 & = 2\frac{1}{10}
 \end{aligned}$$



## Exam Review Answer Keys

### Unit # 1 Key – Squares, Roots, Pythagorean

1. Rectangles: 1 unit by 24 units, 2 units by 12 units, 3 units by 8 units, 4 units by 6 units  
Not a perfect square since 24 cannot be modelled by a square
2. 25
3. Answers may vary. For example: 16, 25, 1024, 1600, 2401, 2500
- 4.a) 25      b) 49      c) 81      d) 169
- 5.a) 7      b) 17      c) 20
- 6.a) i) 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 108  
ii) 1, 19, 361  
iii) 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150  
iv) 1, 2, 11, 13, 22, 26, 143, 286  
v) 1, 2, 3, 4, 6, 9, 12, 18, 27, 36, 54, 81, 108, 162, 324  
vi) 1, 2, 4, 7, 8, 14, 28, 56  
b) 361 and 324; Both have an odd number of factors.
7. 44 cm
8.  $A = 17$  square units;  $s = \sqrt{17}$  units
- 9.a)  $\sqrt{75}$  cm    b)  $\sqrt{96}$  cm    c) 9 cm
10. b: I drew a square on each line segment and found the area. Square b has a greater area.
- 11.a) 26      b) 5      c) 50      d) 13
- 12.a) 6 and 7      b) 9 and 10  
c) 10 and 11      d) 34 and 35
- 13.a) 2    b) 3    c) 5    d) 6    e) 8    f) 9
- 14.a) 7.4    b) 8.7    c) 9.7    d) 10.2    e) 6.8    f) 10.7
15. 8.49, since  $8.48^2 = 71.9104$  and  $8.49^2 = 72.0801$
16. 130 cm
- 17.a) False      b) True      c) True
- 18.a) 34 cm      b) 28 cm      c) 16.2 cm
- 19.a) 8.5 cm      b) 7.8 cm
20. Yes, since  $24 + 57 = 81$
21. No;  $7^2 + 12^2 \neq 15^2$
22. a and c
23. 21: One solution, because in a Pythagorean triple all three numbers must be whole numbers
24. 40 km
25. 42 cm
26. The distance from each possible position to x is the hypotenuse of a right triangle with legs lengths 2 units and 3 units.
27. 31.2 km

### Unit #2 Key – Operations on Fractions

- 1.a)  $6 \times \frac{2}{5} = 2\frac{2}{5}$       b)  $3 \times \frac{6}{7} = 2\frac{4}{7}$
- 2.a) 1      b)  $3\frac{1}{2}$       c)  $3\frac{1}{5}$
- 3.a) 18      b) 4      c) 50      d)  $1\frac{1}{2}$
- 4.a)  $\frac{1}{4}$       b)  $\frac{6}{25}$       c)  $\frac{21}{40}$       d)  $\frac{1}{7}$
5.  $\frac{3}{20}$
- 6.a)  $\frac{3}{20}$       b)  $\frac{3}{40}$       c)  $\frac{7}{20}$       d)  $\frac{4}{21}$
7.  $\frac{3}{10}$
8. For example:  $\frac{5}{7}$  of a litter of mice are grey with white patches. The other  $\frac{2}{7}$  are black. Of the grey and white mice,  $\frac{3}{8}$  are female. What fraction of the litter is grey, white, and female?  $\frac{15}{56}$
- 9.a)  $\frac{15}{2}$       b)  $\frac{23}{8}$       c)  $\frac{107}{10}$
- 10.a)  $3\frac{1}{2}$       b)  $7\frac{3}{5}$       c)  $\frac{4}{5}$       d)  $7\frac{1}{2}$
- 11.a)  $3\frac{1}{6}$       b)  $2\frac{13}{16}$       c)  $3\frac{3}{20}$       d)  $8\frac{2}{3}$
12.  $4\frac{1}{12}$  h assuming that he mows at the same rate
- 13.a)  $\frac{1}{10}$       b) 12
- 14.a)  $3\frac{3}{4}$       b)  $4\frac{4}{5}$       c)  $\frac{3}{20}$       d)  $\frac{7}{8}$
15. 16 glasses
16.  $13\frac{1}{2}$  loads
17. For example:  $\frac{3}{4} \div 5 = \frac{3}{20} < 1$
- 18.a)  $1\frac{1}{2}$       b)  $1\frac{1}{2}$
- 19.a) 2      b)  $\frac{2}{7}$       c)  $1\frac{1}{4}$       d)  $\frac{5}{6}$
20.  $5\frac{1}{4}$

21. For example:  $\frac{3}{5} \div \frac{5}{3} = \frac{9}{25} < 1$

22. a)  $\frac{40}{11}$     b)  $\frac{31}{6}$     c)  $\frac{44}{9}$     d)  $\frac{29}{12}$

23. a)  $\frac{14}{17}$     b)  $1\frac{49}{66}$     c)  $2\frac{6}{11}$     d)  $\frac{1}{2}$

24.  $4\frac{3}{5}$

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

26. 882 tickets

27. a)  $\frac{3}{10}$                       b) 9 students

28. a)  $\frac{3}{5}$ ; Multiplication    b)  $2\frac{2}{11}$ ; Subtraction

    c)  $2\frac{2}{5}$ ; Multiplication    d)  $\frac{3}{5}$ ; Division

29. a)  $\frac{3}{4}$     b)  $1\frac{3}{4}$     c)  $\frac{1}{2}$     d)  $\frac{5}{36}$

30. Carlton should have written  $\frac{14}{5} \div \frac{9}{12} = \frac{14}{5} \times \frac{12}{9}$ .

Correct answer:  $3\frac{11}{15}$