

SAMPLE PAGES

from

Passing the NCCTM

❖ *SECOND EDITION* ❖

by Jane Hereford

*Chapter 13 is enclosed
to illustrate the quantity
and quality of problems in
this workbook.*

CPC

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RATIOS AND PROPORTIONS

CHAPTER

13

A ratio is a way to compare numbers.

EXAMPLES

5 cherries, 10 watermelons

Make a ratio of cherries to watermelons.

$$5 \text{ to } 10 \quad 5:10 \quad \frac{5}{10}$$

Lowest terms: $1 \text{ to } 2 \quad 1:2 \quad \frac{1}{2}$

These are the 3 ways to show ratio!

Two ratios that are equal are called a proportion.

$$\frac{5}{10} \begin{array}{c} \nearrow \nwarrow \\ \searrow \swarrow \end{array} \frac{1}{2}$$

Are they equal?

Multiply diagonals ($\nearrow \swarrow$) to see.

$$10 \times 1 = 10$$

$$5 \times 2 = 10$$

Yes, they are equal! This is a proportion.

In comparing ratios, the top numbers of each ratio (fraction) must compare the same items (cherries), and the bottom numbers must compare the same items (watermelons).

EXAMPLE

Write the ratio of 20 mangos to 40 limes in one crate. Write the ratio of 1 mango and 2 limes in another crate.

$$\frac{20 \text{ mangos}}{40 \text{ limes}} \quad \frac{1 \text{ mango}}{2 \text{ limes}} \quad \begin{array}{l} \text{(mangos on top)} \\ \text{(limes on bottom)} \end{array}$$

Are they a proportion (equal)?

$$\frac{20}{40} \begin{array}{c} \nearrow \nwarrow \\ \searrow \swarrow \end{array} \frac{1}{2} \quad \frac{20 \times 2 = 40}{40 \times 1 = 40} \quad \text{Yes!}$$

PRACTICE

Write a ratio (in fraction form) for each. Reduce to lowest terms if necessary.

1. 24, 28	_____	11. 10, 100	_____
2. 1, 15	_____	12. 16, 20	_____
3. 5, 6	_____	13. 13, 15	_____
4. 4, 8	_____	14. 25, 35	_____
5. 5, 9	_____	15. 21, 27	_____
6. 3, 7	_____	16. 8, 16	_____
7. 30, 40	_____	17. 2, 16	_____
8. 11, 12	_____	18. 3, 15	_____
9. 8, 10	_____	19. 2, 4	_____
10. 10, 40	_____	20. 6, 15	_____

PRACTICE

Multiply diagonals to see if these are proportions (equal). Write yes or no.

1. $\frac{.08}{.18}$ $\frac{.24}{.52}$	_____	5. $\frac{12}{21}$ $\frac{10}{15}$	_____
2. $\frac{3}{6}$ $\frac{2}{5}$	_____	6. $\frac{9}{15}$ $\frac{8}{130}$	_____
3. $\frac{8}{30}$ $\frac{12}{45}$	_____	7. $\frac{18}{14}$ $\frac{54}{42}$	_____
4. $\frac{6.5}{1.3}$ $\frac{.5}{.1}$	_____	8. $\frac{9}{12}$ $\frac{12}{16}$	_____

(continued on next page)

$$9. \frac{8}{9} \quad \frac{24}{27} \quad \underline{\hspace{2cm}}$$

$$17. \frac{4}{10} \quad \frac{14}{35} \quad \underline{\hspace{2cm}}$$

$$10. \frac{1}{4} \quad \frac{3}{8} \quad \underline{\hspace{2cm}}$$

$$18. \frac{2}{3} \quad \frac{3}{8} \quad \underline{\hspace{2cm}}$$

$$11. \frac{2}{3} \quad \frac{7}{16} \quad \underline{\hspace{2cm}}$$

$$19. \frac{15}{10} \quad \frac{20}{16} \quad \underline{\hspace{2cm}}$$

$$12. \frac{3}{10} \quad \frac{12}{15} \quad \underline{\hspace{2cm}}$$

$$20. \frac{6}{15} \quad \frac{3}{7} \quad \underline{\hspace{2cm}}$$

$$13. \frac{12}{28} \quad \frac{18}{42} \quad \underline{\hspace{2cm}}$$

$$21. \frac{3}{8} \quad \frac{30}{80} \quad \underline{\hspace{2cm}}$$

$$14. \frac{9}{8} \quad \frac{17}{16} \quad \underline{\hspace{2cm}}$$

$$22. \frac{4}{8} \quad \frac{1}{2} \quad \underline{\hspace{2cm}}$$

$$15. \frac{3}{9} \quad \frac{21}{63} \quad \underline{\hspace{2cm}}$$

$$23. \frac{4}{5} \quad \frac{32}{40} \quad \underline{\hspace{2cm}}$$

$$16. \frac{.7}{.8} \quad \frac{.02}{.17} \quad \underline{\hspace{2cm}}$$

$$24. \frac{4.2}{9} \quad \frac{25.2}{50} \quad \underline{\hspace{2cm}}$$

Let's solve for a missing part of a proportion.

EXAMPLES

$$\frac{3}{10} = \frac{w}{30}$$

$$\frac{3}{10} \swarrow \quad \nwarrow \frac{w}{30}$$

$$10w = 90$$

$$w = 9$$

Multiply diagonals first.

To solve for w, divide each side by 10.

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

$$\frac{4}{8} \swarrow \quad \nwarrow \frac{4}{b}$$

$$4b = 32$$

$$b = 8$$

Multiply diagonals.

To solve for b, divide each side by 4.

PRACTICE

Solve each proportion.

1. $\frac{6}{4} = \frac{w}{14}$

6. $\frac{2}{5} = \frac{y}{35}$

2. $\frac{1.5}{h} = \frac{.07}{.14}$

7. $\frac{1.6}{2.4} = \frac{3.4}{c}$

3. $\frac{3}{39} = \frac{b}{13}$

8. $\frac{a}{2.8} = \frac{24}{1.6}$

4. $\frac{t}{28} = \frac{24}{1.6}$

9. $\frac{8}{6} = \frac{x}{27}$

5. $\frac{8}{x} = \frac{28}{42}$

10. $\frac{s}{12} = \frac{6}{8}$

(continued on next page)

$$11. \frac{3}{7} = \frac{t}{49}$$

$$16. \frac{y}{2} = \frac{3.055}{4.7}$$

$$12. \frac{7}{16} = \frac{w}{4.8}$$

$$17. \frac{7}{14} = \frac{x}{42}$$

$$13. \frac{12}{8} = \frac{x}{28}$$

$$18. \frac{3}{w} = \frac{9}{12}$$

$$14. \frac{3}{a} = \frac{18}{24}$$

$$19. \frac{4}{5} = \frac{12}{y}$$

$$15. \frac{8.6}{17.2} = \frac{1}{x}$$

$$20. \frac{t}{9} = \frac{16}{20}$$

➤ Similar Triangles

Similar triangles are triangles that look alike, but are different sizes.



Triangle 1

Triangle 2

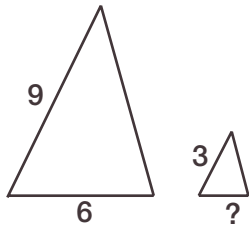
We can use ratios to show that these triangles are proportional. Use a side from triangle 1 on top and the same side from triangle 2 on the bottom.

$$\begin{array}{ccccccc} 4 & \longrightarrow & 8 & \longrightarrow & 10 & \longrightarrow & \text{Triangle 1} \\ 2 & \longrightarrow & 4 & \longrightarrow & 5 & \longrightarrow & \text{Triangle 2} \end{array}$$

$$\left(\frac{2}{1}, \frac{2}{1}, \frac{2}{1} \right) \longrightarrow \text{Reduced - ALL THE SAME!}$$

Since we can make ratios that are equal, we can find a missing side.

EXAMPLE



Triangle 1 Triangle 2

These triangles are similar. Find the missing side.

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

$$9x = 18$$

$$\frac{9x}{9} = \frac{18}{9}$$

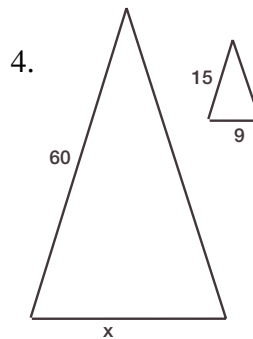
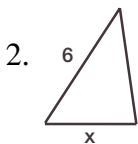
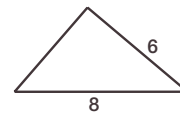
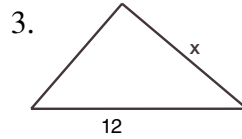
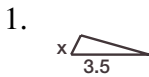
$$x = 2$$

Make a proportion. Put a side from Triangle 1 over the corresponding side of Triangle 2. Repeat this step to complete your proportion.

Multiply diagonals. To solve for x , divide each side by 9.

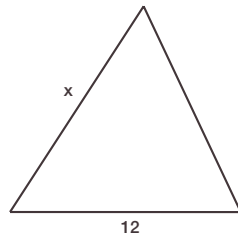
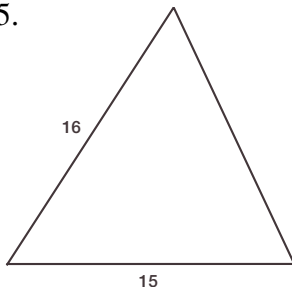
PRACTICE

Solve for the missing side.

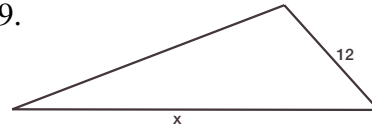


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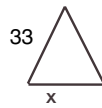
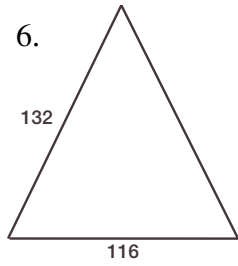
5.



9.



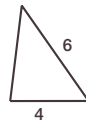
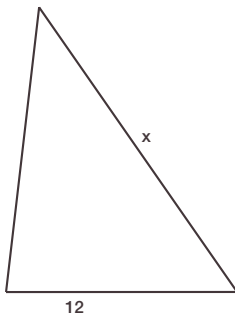
6.



10.



7.



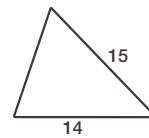
11.



8.



12.



➤ Review

- Which of the following is equal to $\frac{1}{2}$?
 - $\frac{3}{12}$
 - $\frac{5}{10}$
 - $\frac{3}{8}$
 - $\frac{9}{14}$
- Which ratio is the same as $\frac{3}{4}$?
 - $\frac{9}{8}$
 - $\frac{1}{12}$
 - .75
 - $\frac{75}{100}$
- What is the ratio $\frac{25}{30}$ in lowest terms (reduced)?
 - $\frac{1}{5}$
 - $\frac{5}{6}$
 - $\frac{2}{3}$
 - .83
- Which is a ratio for 3 red buttons compared to 7 blue buttons?
 - $\frac{7}{3}$
 - $2\frac{1}{3}$
 - $\frac{3}{7}$
 - .42
- If 3 pounds of peanuts sell for \$15, how many pounds sell for \$45?
 - 135 pounds
 - 225 pounds
 - 9 pounds
 - 45 pounds
- What proportion did you use to solve number 5?
 - $\frac{3}{15} = \frac{45}{x}$
 - $\frac{x}{15} = \frac{3}{45}$
 - $\frac{15}{x} = \frac{45}{3}$
 - $\frac{3}{15} = \frac{x}{45}$
- $\frac{2}{30} = \frac{10}{x}$ x = _____.
 - 15
 - 300
 - $\frac{2}{3}$
 - 150
- $\frac{16}{24} = \frac{14}{x}$ x = _____.
 - 21
 - 9.3
 - 224
 - 336
- Which pair of fractions is equal?
 - $\frac{6}{15}$, $\frac{3}{7}$
 - $\frac{3}{4}$, $\frac{9}{11}$
 - $\frac{2}{5}$, $\frac{12}{35}$
 - $\frac{2}{3}$, $\frac{8}{12}$

10. In 7 minutes, Carla read 364 words. How many words did she read in 12 minutes?
- 3,057
 - 624
 - 212
 - 2,546
11. What proportion did you use to solve number 10?
- $\frac{x}{7} = \frac{364}{12}$
 - $\frac{7}{364} = \frac{x}{12}$
 - $\frac{7}{x} = \frac{364}{12}$
 - $\frac{7}{364} = \frac{12}{x}$
12. What proportion did you use to solve number 11?
- $\frac{3.98}{5} = \frac{x}{2}$
 - $\frac{x}{2} = \frac{5}{3.98}$
 - $\frac{2}{3.98} = \frac{5}{x}$
 - $\frac{2}{x} = \frac{3.98}{5}$
13. Which pair of fractions are equal?
- $\frac{3}{8}$, $\frac{12}{24}$
 - $\frac{2}{3}$, $\frac{20}{30}$
 - $\frac{1}{2}$, $\frac{20}{50}$
 - $\frac{5}{6}$, $\frac{16}{18}$
14. A recipe uses 3 cups of sugar to make 48 pieces of taffy. How much sugar would you use to make 72 pieces of taffy?
- 216
 - 144
 - $\frac{1}{16}$
 - 4.5
15. What proportion would you use to solve this problem? If 96 inches are in 8 feet, how many inches are in 15 feet?
- $\frac{8}{x} = \frac{15}{96}$
 - $\frac{96}{x} = \frac{15}{8}$
 - $\frac{96}{8} = \frac{15}{x}$
 - $\frac{96}{8} = \frac{x}{15}$
16. $\frac{a}{5} = \frac{12}{3}$ a = _____.
- 20
 - 60
 - 4
 - $\frac{12}{15}$
17. If 2 containers of soda cost \$3.98, how much would 5 containers cost?
- \$9.95
 - \$19.90
 - \$.40
 - \$1.59

18. A ladder has a shadow 3.5 meters long. Marlowe's shadow is .75 meters long. If Marlowe is 1.5 meters tall, how tall is the ladder?
- 5.25 meters
 - 7 meters
 - 1.125 meters
 - 2.625 meters

19. $\frac{w}{21} = \frac{2}{3}$ $w = \underline{\hspace{2cm}}$.

- 42
- 126
- 14
- $1\frac{1}{2}$

20. $\frac{15}{20} = \frac{z}{16}$ $z = \underline{\hspace{2cm}}$.

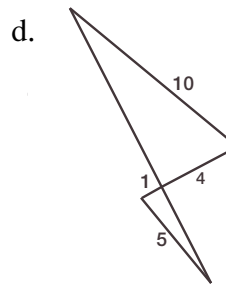
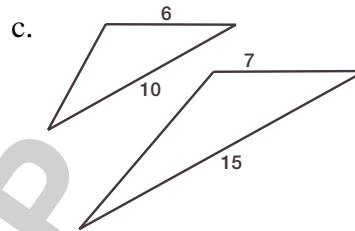
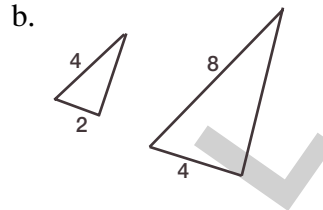
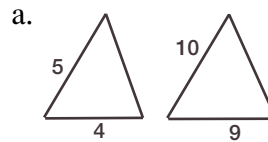
- 20
- $\frac{1}{20}$
- 240
- 12

21. A fire tower has a shadow 48 yards long. A tree, 3 yards long, has a shadow 9.6 yards. How tall is the fire tower?
- 15 yards
 - 144 yards
 - 460.8 yards
 - 28.8 yards

22. Write the ratio 36 to 48 in simplest form.

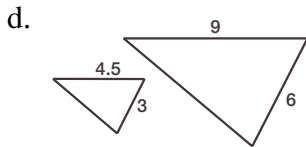
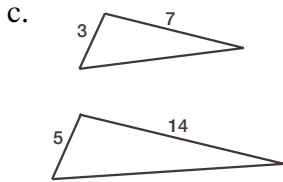
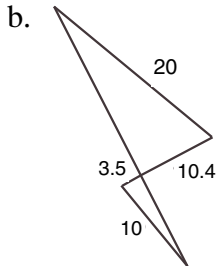
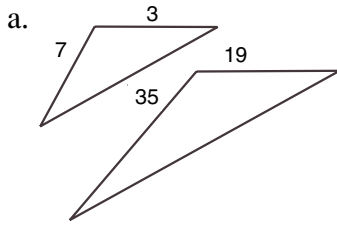
- $\frac{3}{4}$
- $\frac{36}{48}$
- $\frac{6}{8}$
- $\frac{1}{3}$

23. Which pair of triangles are similar?



24. A pole has a shadow that is 5 feet long. Jackie's shadow is 3 feet long, and she is 6 feet tall. How tall is the pole?
- 2.5
 - 30
 - 15
 - 10

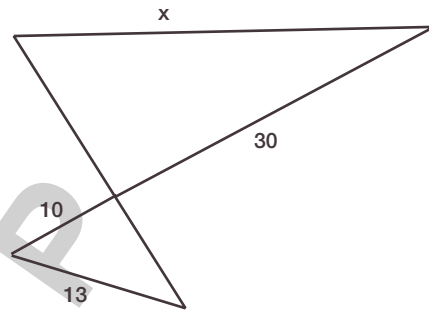
25. Which pair of triangles are similar?



26. A house has a shadow 34 feet long. Eddie is 6 feet tall and has a shadow that is 12 feet long. How tall is the building?

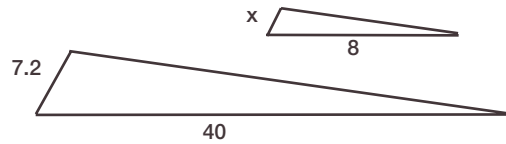
- a. 408 feet
- b. 72 feet
- c. 204 feet
- d. 17 feet

27. $x = ?$



- a. 300
- b. 39
- c. 130
- d. 10

28. Which proportion would you use to solve for x ?



- a. $\frac{7.2}{8} = \frac{x}{40}$
- b. $\frac{40}{8} = \frac{x}{7.2}$
- c. $\frac{40}{7.2} = \frac{x}{8}$
- d. $\frac{x}{7.2} = \frac{8}{40}$