Header: Your Name
Mrs. Theo
3/7/22
Notes

Writing Ratios of x to y

Writing as a Ratio of $x:y$

1st thing on top

Goal: get $\frac{x}{y}$ = something

1.) If $3x = 4y$, then find the ratio of x to y.

$\frac{3x}{y} = \frac{4y}{y}$

$\frac{3x}{y} = 4$

$\frac{1}{3}\cdot\frac{3x}{y} = 4\cdot\frac{1}{3}$

$\frac{x}{y} = \frac{4}{3}$

2.) Find the ratio of $x:y$ in the equation below.

$5x = 4y$

$\frac{1}{5}\cdot\frac{5x}{y} = \frac{4y}{y}\cdot\frac{1}{5}$

$\frac{x}{y} = \frac{4}{5}$

Ratio Examples

3.) Is $\frac{p}{q} = \frac{r}{s}$ equivalent to $\frac{r}{p} = \frac{s}{q}$?

$\frac{p}{q} \overset{?}{=} \frac{r}{s}$ $\quad$ $\frac{r}{p} \overset{?}{=} \frac{s}{q}$

if cross products are the same then these proportions are equivalent

$ps = rq$ $\quad$ $rq = ps$

Yes

4.) Find the ratio of $x:y$ in the equation below.

$$\frac{x+2}{5} = \frac{y+4}{10}$$

$10(x+2) = 5(y+4)$

$10x + 20 = 5y + 20$

$-20 \quad -20$

$\frac{1}{10}\cdot\frac{10x}{y} = \frac{5y}{y}\cdot\frac{1}{10}$

must have same constant on both sides to be proportional and write $\frac{x}{y}$

$\frac{x}{y} = \frac{5}{10}$

$\frac{x}{y} = \frac{1}{2}$

ratio of x to y is 1:2

Your Turn Practice/Homework

Find the ratio of x to y.

1.) $6(y+3)=2(x+9)$

$6y+18=2x+18$

$\frac{1}{2}\cdot\frac{6y}{y}=\frac{2x}{y}\cdot\frac{1}{2}$

$\frac{6}{2}=\frac{x}{y}$

$\frac{3}{1}=\frac{x}{y}$

x to y: 3:1

2.) $\frac{3}{x+5}=\frac{9}{y+15}$

$3(y+15)=9(x+5)$

$3y+45=9x+45$

$-45\quad\quad-45$

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

$\left(\frac{1}{9}\right)\frac{9x}{y}=3\left(\frac{1}{9}\right)$

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

$\frac{x}{y}=\frac{1}{3}$

x to y: 1:3

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

$\frac{x}{y}=\frac{1}{3}$

Find the ratio of x to y (Challenge Problems).

3.) $x(a+b)=y(c+d)$

$\frac{x(a+b)}{y}=\frac{y(c+d)}{y}$

$\frac{x(a+b)}{y(a+b)}=\frac{(c+d)}{(a+b)}$

$\frac{x}{y}=\frac{c+d}{a+b}$

c+d : a+b

4.) $ex-fy=gx+hy$

get x's on one side and y's on the other

$-gx\quad\quad-gx$

$ex-gx-fy=hy$

$+fy\quad\quad+fy$

$ex-gx=hy+fy$

Factor out x and y

$\frac{x(e-g)}{y(e-g)}=\frac{y(h+f)}{x(e-g)}$

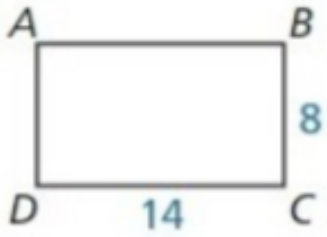
$\frac{x}{y}=\frac{h+f}{e-g}$

h+f : e-g

In Exercises 11 and 12, $RSTU \sim ABCD$. Find the ratio of their perimeters.

ratio of Perimeters = K

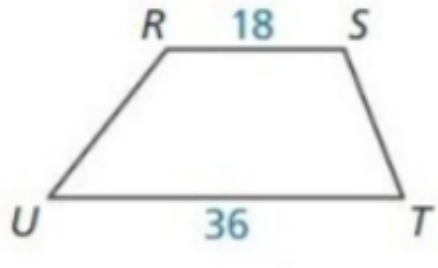
11.

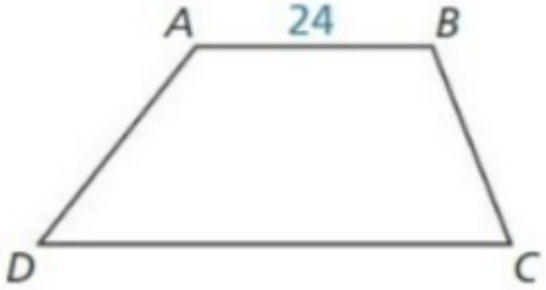


$K = \frac{12}{8} = \frac{3}{2}$

3:2

12.





In Exercises 13–16, two triangles are similar. The perimeter of one triangle and the ratio of th corresponding side lengths are given. Find the perimeter of the other triangle.

13. perimeter of smaller triangle: 48 cm; ratio: $\frac{2}{3}$

$K = \frac{3}{2}$ bigger triangle is the New

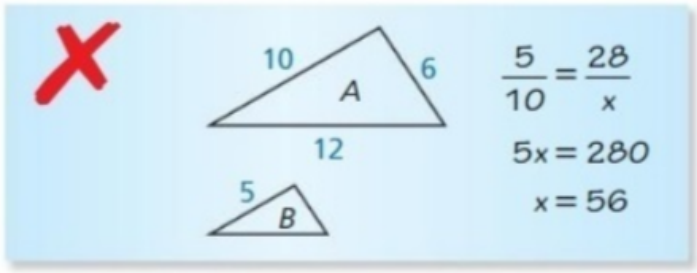
P=48

P=?

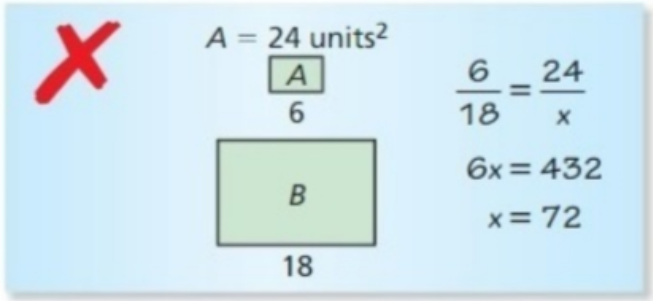
$\frac{3}{2} = \frac{P}{48}$

15. perimeter of larger triangle: 120 yd; ratio: $\frac{1}{6}$

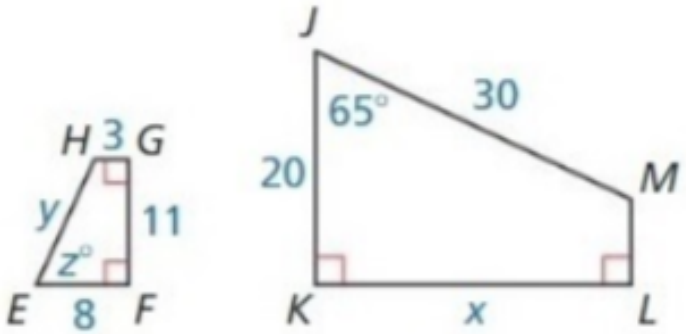
23. ERROR ANALYSIS Describe and correct the error in finding the perimeter of triangle B. The triangles are similar.



24. ERROR ANALYSIS Describe and correct the error in finding the area of rectangle B. The rectangles are similar.



ANALYZING RELATIONSHIPS In Exercises 28–34, *JKLM* ~ *EFGH*.

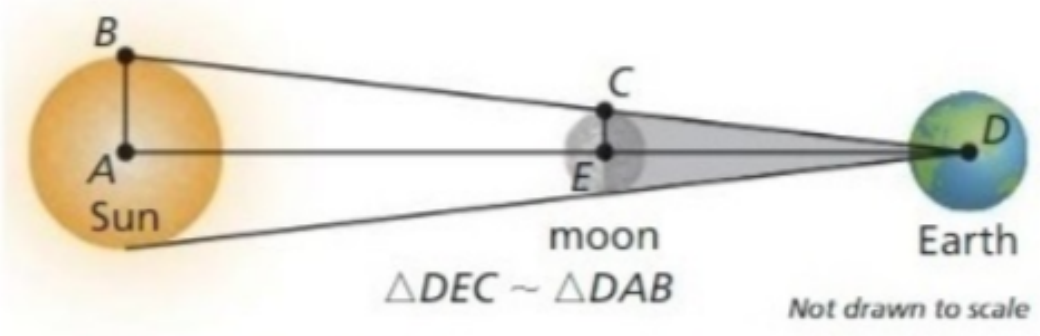


31. Find the perimeter of each polygon.

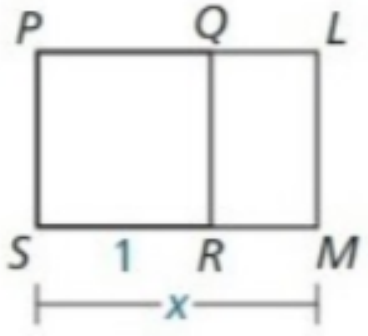
32. Find the ratio of the perimeters of *JKLM* to *EFGH*.

34. Find the ratio of the areas of *JKLM* to *EFGH*.

51. MODELING WITH MATHEMATICS During a total eclipse of the Sun, the moon is directly in line with the Sun and blocks the Sun's rays. The distance DA between Earth and the Sun is 93,000,000 miles, the distance DE between Earth and the moon is 240,000 miles, and the radius AB of the Sun is 432,500 miles. Use the diagram and the given measurements to estimate the radius EC of the moon.



55. CRITICAL THINKING In the diagram, $PQRS$ is a square, and $PLMS \sim LMRQ$. Find the exact value of x. This value is called the *golden ratio*. Golden rectangles have their length and width in this ratio. Show that the similar rectangles in the diagram are golden rectangles.



In Exercises 13–16, two polygons are similar. The perimeter of one polygon and the ratio of the corresponding side lengths are given. Find the perimeter of the other polygon.

16. perimeter of larger polygon: 85 m; ratio: $\frac{2}{5}$

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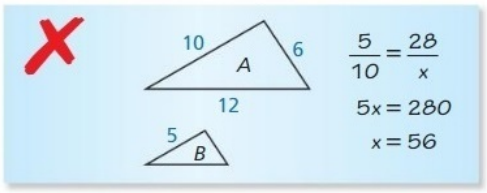

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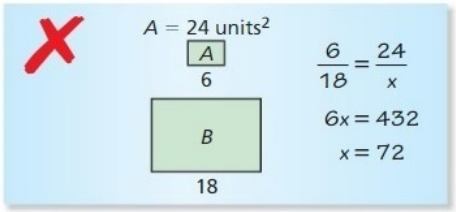

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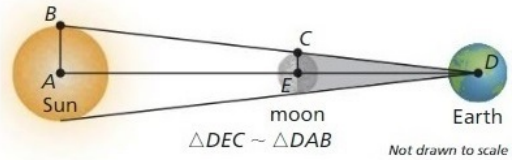

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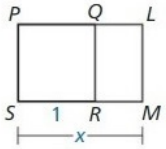

5. $x = 30$

6. $x = 24$

11. 2 : 3

12. 4 : 3

16. 34 m

17. 288 ft, 259.2 ft

18. 130 ft, 52 ft

23. Because the first ratio has a side length of B over a side length of A, the second ratio should have the perimeter of B over the perimeter of A;
$\frac{5}{10} = \frac{x}{28}$
$x = 14$

24. The square of the ratio of their corresponding side lengths should be set equal to the ratio of their areas;
$\left(\frac{6}{18}\right)^2 = \frac{24}{x}$
$x = 216$

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

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

30. $x = 27.5, y = 12, z = 65$

31. 34, 85

32. 5 : 2

33. 60.5, 378.125

34. 25 : 4

35. B, D

36. no; Corresponding side lengths are not proportional.

37. $x = 35.25, y = 20.25$

38. $x = 7.5, y = 166$

51. about 1116 mi

55. $x = \frac{1+\sqrt{5}}{2}$; $x = \frac{1+\sqrt{5}}{2}$ satisfies the proportion $\frac{1}{x} = \frac{x-1}{1}$.