7-1 Ratios and Proportions

13. The ratio of the measures of the three sides of a triangle is 9: 7: 5. Its perimeter is 191.1 inches. Find the measure of each side

SOLUTION:

Just as the ratio $\frac{9}{7}$ or 9:7 is equivalent to $\frac{9x}{7x}$ or $9x:7x$, the extended ratio can be written as $9x:7x:5x$.

The perimeter is 191.1 inches so the sum of the lengths of the sides is 191.1. Solve for x.

$$\begin{aligned} 9x + 7x + 5x &= 191.1 \\ 21x &= 191.1 \\ x &= 9.1 \end{aligned}$$

So the measures of the three sides are 9(9.1) or 81.9 in., 7(9.1) or 63.7 in., and 5(9.1) or 45.5 in..

ANSWER:

81.9 in., 63.7 in., 45.5 in.

15. The ratio of the measures of the three sides of a triangle is $\frac{1}{4}:\frac{1}{8}:\frac{1}{6}$. Its perimeter is 4.75 feet. Find the length of the longest side.

SOLUTION:

The given ratio $\frac{1}{4}:\frac{1}{8}:\frac{1}{6}$ is equivalent to $\frac{1}{4}x:\frac{1}{8}x:\frac{1}{6}x$.

The perimeter is 4.75 feet, so the sum of the lengths of the sides is 4.75. Solve for x.

$$\begin{aligned} \tfrac{1}{4}x + \tfrac{1}{8}x + \tfrac{1}{6}x &= 4.75 \\ 24(\tfrac{1}{4}x + \tfrac{1}{8}x + \tfrac{1}{6}x) &= 24(4.75) \\ 6x + 3x + 4x &= 114 \\ 13x &= 114 \\ x &= \tfrac{114}{13} \approx 8.8 \end{aligned}$$

So the measures of the three sides are $\frac{8.8}{4}$ or 2.2 ft, $\frac{8.8}{8}$ or 1.1 ft, and $\frac{8.8}{6}$ or 1.47 ft. The length of the longest side is 2.2 ft.

ANSWER:

2.2 ft

Find the measures of the angles of each triangle.

17. The ratio of the measures of the three angles is 3:6:1.

SOLUTION:

Just as the ratio $\frac{3}{6}$ or 3:6 is equivalent to $\frac{3x}{6x}$ or $3x$:$6x$, the extended ratio can be written as $3x$:$6x$:$1x$. We know that sum of the measures of all interior angles in a triangle is 180 degrees. Set the sum of the extended ratios equal to 180 and solve for x.

$$\begin{aligned} 3x + 6x + 1x &= 180 \\ 10x &= 180 \\ x &= 18 \end{aligned}$$

So the measures of the three angles are 3(18) or 54, 6(18) or 108, and 1(18) or 18.

ANSWER:

54, 108, 18

19. The ratio of the measures of the three angles is 10:8:6.

SOLUTION:

Just as the ratio $\frac{10}{8}$ or 10:8 is equivalent to $\frac{10x}{8x}$ or $10x$:$8x$, the extended ratio can be written as $10x$:$8x$:$6x$.

We know that sum of the measures of all interior angles in a triangle is 180. Set the sum of the extended ratio equal to 180 and solve for x.

$$\begin{aligned} 10x + 8x + 6x &= 180 \\ 24x &= 180 \\ x &= 7.5 \end{aligned}$$

So the measures of the three angles are 10(7.5) or 75, 8(7.5) or 60, and 6(7.5) or 45.

ANSWER:

75, 60, 45

Solve each proportion.

22. $\frac{w}{6.4} = \frac{1}{2}$

SOLUTION:

$\frac{w}{6.4} = \frac{1}{2}$

Cross multiply.

$w(2) = 6.4$

Solve for w.

$$\begin{aligned} 2w &= 6.4 \\ w &= 3.2 \end{aligned}$$

ANSWER:

3.2

24. $\frac{11}{20} = \frac{55}{20x}$

SOLUTION:

$\frac{11}{20} = \frac{55}{20x}$

Cross multiply.

$11(20x) = 55(20)$

Solve for x.

$$\begin{aligned} 220x &= 1100 \\ x &= 5 \end{aligned}$$

ANSWER:

5

26. $\frac{a+2}{a-2} = \frac{3}{2}$

SOLUTION:

$\frac{a+2}{a-2} = \frac{3}{2}$

Cross multiply.

$2(a+2) = 3(a-2)$

Solve for a.

$$\begin{aligned} 2a + 4 &= 3a - 6 \\ a &= 10 \end{aligned}$$

ANSWER:

10

28. $\frac{3x-6}{2}=\frac{4x-2}{4}$

SOLUTION:

$\frac{3x-6}{2}=\frac{4x-2}{4}$

Cross multiply.

$4(3x-6)=2(4x-2)$

Solve for x.

$$\begin{aligned}12x-24&=8x-4\\4x&=20\\x&=5\end{aligned}$$

ANSWER:

5

34. The perimeter of a rectangle is 98 feet. The ratio of its length to its width is 5: 2. Find the area of the rectangle.

SOLUTION:

The ratio $\frac{5}{2}$ or 5:2 is equivalent to $\frac{5x}{2x}$ or $5x$:$2x$.

The perimeter is 98 feet, so the sum of the lengths of the sides is 98. Solve for x.

$$\begin{aligned}2(l+w)&=98\\2(5x+2x)&=98\\2(7x)&=98\\14x&=98\\x&=7\end{aligned}$$

So the length and width of the rectangle are 5(7) or 35 feet and 2(7) or 14 feet respectively.

$$\begin{aligned}\text{Area}&=\ell w\\&=35\times 14\\&=490\end{aligned}$$

Thus the area of the rectangle is 490 square feet.

ANSWER:

490 ft^2

36. The ratio of the measures of the side lengths of a quadrilateral is 2:3:5:4. Its perimeter is 154 feet. Find the length of the shortest side.

SOLUTION:

The ratio $\frac{2}{3}$ or 2:3 is equivalent to $\frac{2x}{3x}$ or $2x$:$3x$, the extended ratio can be written as $2x$:$3x$:$5x$:$4x$.

The perimeter is 154 feet, so the sum of the lengths of the sides is 154. Solve for x.

$$\begin{aligned}2x+3x+5x+4x&=154\\14x&=154\\x&=11\end{aligned}$$

So the measures of the four sides are 2(11) or 22 ft, 3(11) or 33 ft, 5(11) or 55 ft, and 4(11) or 44 ft. Therefore the length of the shortest side is 22 ft.

ANSWER:

22 ft