

Solve for x:

$$1) \frac{3}{x-4} = \frac{7}{x}$$

$$\begin{aligned} 7(x-4) &= 3x \\ 7x-28 &= 3x \\ -28 &= -4x \Rightarrow \boxed{x=7} \end{aligned}$$

$$2) \frac{1+3x}{4} = \frac{5}{2}$$

$$\begin{aligned} 20 &= 2(1+3x) \\ 20 &= 2+6x \\ 18 &= 6x \Rightarrow \boxed{x=3} \end{aligned}$$

$$3) \frac{2x+5}{3} = \frac{x-5}{4}$$

$$\begin{aligned} 3(x-5) &= 4(2x+5) \\ 3x-15 &= 8x+20 \\ -15 &= 5x+20 \\ -35 &= 5x \Rightarrow \boxed{x=-7} \end{aligned}$$

- 4) Mr. Jones has taken a survey of college students and found that 1 out of 5 students are liberal arts majors. If a college has 12,000 students, what is the best estimate of the number of students who are liberal arts majors?

$$\frac{1 \text{ lib arts}}{5 \text{ students}} = \frac{x}{12000} \Rightarrow 5x = 12000$$

$$x = 2400$$

2400 students would be liberal arts majors

- 5) A national forest service wanted to estimate the number of deer in a particular national park. They caught and tagged 72 deer and released them back into the park. Later they selected a sample of 323 deer. Of the 323 deer, 19 were tagged. Assuming that the proportion of tagged deer in the sample holds for all deer in the forest, what is the best estimate of the number of deer in the park?

$$\frac{72 \text{ tagged}}{x} = \frac{19 \text{ tagged}}{323 \text{ total}} \Rightarrow 19x = 23256$$

$$x = 1224$$

1224 would be a good estimate for the total # of deer in the park

- 6) In the diagram, AB : BC is in the ratio 2:7 and AC = 36. Find AB and BC.

$$AB + BC = AC$$

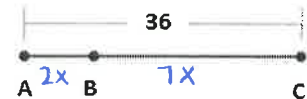
$$2x + 7x = 36$$

$$9x = 36$$

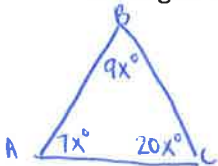
$$\boxed{x=4}$$

$$AB = 2(4) = 8$$

$$BC = 7(4) = 28$$



- 7) The measures of the angles of a triangle are in the extended ratio of 7 : 9 : 20. Find the measures of the angles of the triangle.



$$7x + 9x + 20x = 180$$

$$36x = 180$$

$$\boxed{x=5}$$

$$7x : 9x : 20x$$

$$m\angle A = 7(5) = 35^\circ$$

$$m\angle B = 9(5) = 45^\circ$$

$$m\angle C = 20(5) = 100^\circ$$

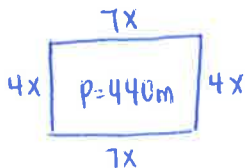
- 8) The perimeter of a rectangular corn field is 440 meters. The ratio of its length to its width is 7 : 4. What is the length and width of the field?

$$7x : 4x$$

$$7x + 4x + 7x + 4x = 440$$

$$22x = 440$$

$$\boxed{x=20}$$



$$\begin{aligned} \text{length} &= 7(20) = 140\text{m} \\ \text{width} &= 4(20) = 80\text{m} \end{aligned}$$

- 9) Given that $\frac{ED}{BA} = \frac{EC}{BC}$, find BC to the nearest tenth. The figure is not drawn to scale.

add together

$$\frac{9}{16} = \frac{14}{14+x}$$

$$224 = 9(14+x)$$

$$224 = 126 + 9x$$

$$98 = 9x$$

$$x = 10.9$$

$BC = 14 + 10.9$

$BC = 24.9$

- 10) A map has a scale of 1 inch: 56 miles. If the actual distance between two cities is 448 miles, how far apart are they on the map?

$$\frac{\text{map}}{\text{actual}} : \frac{1 \text{ in}}{56 \text{ mi}} = \frac{x}{448}$$

$$\Rightarrow 56x = 448$$

$$x = 8$$

They are 8 inches apart on the map

- 11) Determine whether the polygons are similar. If they are, write a similarity statement and state the scale factor.

$$\frac{\Delta TUV}{\Delta XYZ} : \frac{TU}{XY}, \frac{TV}{YZ}, \frac{UV}{XZ}$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$\frac{16}{12}, \frac{22}{21}, \frac{22}{16.5}$$

$$\downarrow \quad \downarrow \quad \downarrow$$

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

Yes, $\Delta TUV \sim \Delta XYZ$ with a scale factor of $\frac{4}{3}$

- 12) Given that $\Delta ABC \sim \Delta DEF$, please solve for x and y .

$$\frac{\Delta ABC}{\Delta DEF} : \frac{AB}{DE}, \frac{BC}{EF}, \frac{AC}{DF}$$

$$\downarrow$$

$$\frac{y}{7} = \frac{8}{5} = \frac{14}{x}$$

$$\frac{y}{7} = \frac{8}{5}$$

$$5y = 56$$

$$y = 11.2$$

$$\frac{8}{5} = \frac{14}{x}$$

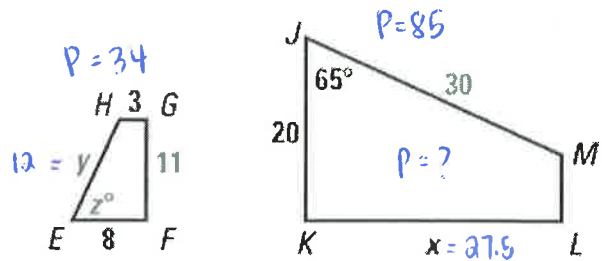
$$8x = 70$$

$$x = 8.75$$

13) In the diagram, $JKLM \sim EFGH$.

a) Find the scale factor of JKLM to EFGH.

$$\frac{JKLM}{EFGH} : \frac{JK}{EF} = \frac{20}{8} = \frac{5}{2} \text{ or } 5:2$$



b) Find the values of x, y, and z.

$$\angle z = 65^\circ \text{ } \langle E \text{ and } \langle J \text{ are corresponding}$$

To find x: $\frac{JK}{EF} = \frac{KL}{FG} \Rightarrow \frac{20}{8} = \frac{x}{11} \Rightarrow 8x = 220 \Rightarrow x = 27.5$

To find y: $\frac{JK}{EF} = \frac{MJ}{HE} \Rightarrow \frac{20}{8} = \frac{30}{y} \Rightarrow 20y = 240$

$$y = 12$$

c) Find the perimeter of each polygon.

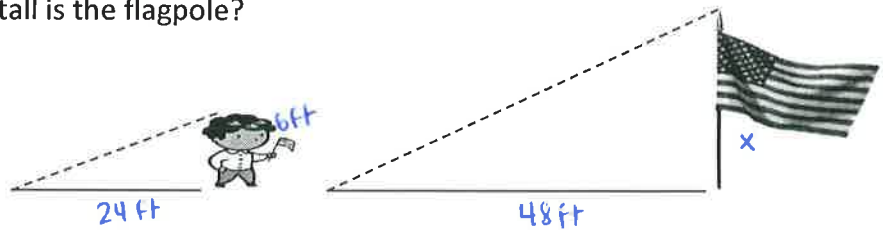
$$\frac{JKLM}{EFGH} : \frac{5}{2} = \frac{x}{34} \Rightarrow 2x = 170 \Rightarrow x = 85$$

Perimeter of EFGH = 34 units
Perimeter of JKLM = 86 units

d) Find the ratio of the perimeter of JKLM to EFGH.

$$\frac{P \text{ of } JKLM}{P \text{ of } EFGH} = \frac{86}{34} = \frac{5}{2} \text{ or } 5:2$$

14) A flagpole casts a shadow 48 feet long at the same time that a 6-ft tall person casts a shadow 24-ft long. How tall is the flagpole?



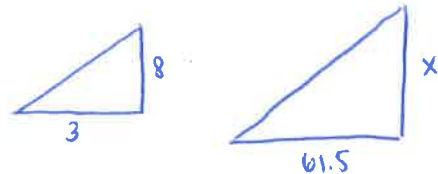
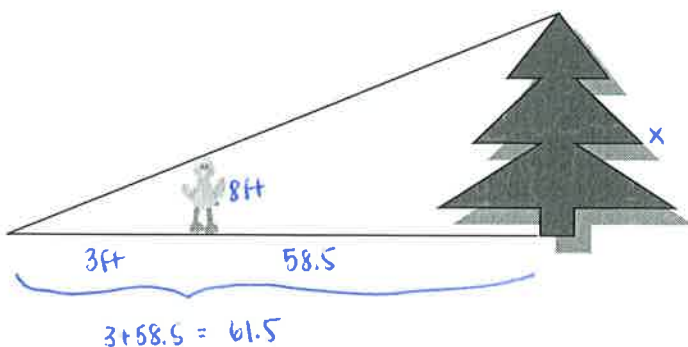
$$\frac{6}{x} = \frac{24}{48}$$

$$24x = 288$$

$$x = 12$$

The flagpole is 12 ft tall

15) Big Bird wants to find the height of the tree that contains his nest. From the base of the tree, Big Bird (who is 8 feet tall by the way) walks 58.5 feet along the tree's shadow until he is 3 feet from the end of the shadow. How tall is the tree? Label the diagram using the information above to help you solve the problem!



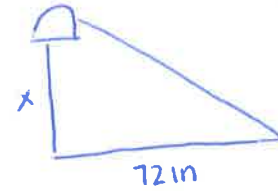
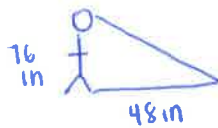
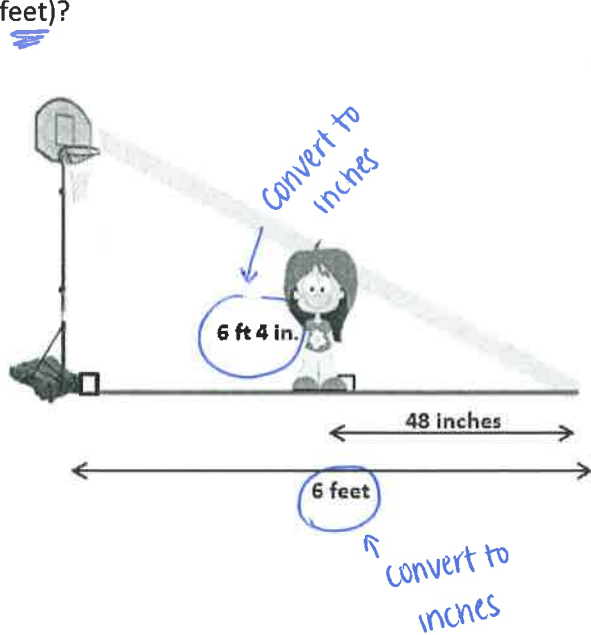
$$\frac{8}{x} = \frac{3}{61.5}$$

$$3x = 492$$

$$x = 164$$

The tree is 164 feet tall

16) Liza is standing beside a basketball hoop. Liza is 6 feet 4 inches tall and casts a shadow that is 48 inches long. The basketball hoop casts a shadow that is 6 feet long. How tall is the basketball hoop (in feet)?



$$\frac{76}{x} = \frac{48}{72}$$

$$48x = 5472$$

$$x = 114 \text{ inches} \div 12$$

$$= 9.5 \text{ feet or } 9 \text{ ft } 6 \text{ inches}$$

17) A 40 ft tree is inverted (looks upside down) when viewed through a lens. Its image through the lens is also smaller.

a. If $\overline{AB} \parallel \overline{DE}$, please explain why the triangles shown are similar.

$\angle ACB \cong \angle ECD$ (vertical angles)

$\angle A \cong \angle E$ (alt. interior angles)

So the Δ 's are similar by AA \checkmark

b. Write a similarity statement.

$$\triangle ABC \sim \triangle EDC$$

*make sure you match up corresponding angles in the same order! *

c. Write a proportion to find the height of the inverted image (which is AB).

$$\frac{AB}{DE} = \frac{AC}{EC} \Rightarrow \frac{x}{40} = \frac{12.5}{100}$$

$$100x = 500$$

$$x = 5$$

The inverted image (AB) is 5 ft tall

