

## Solving Questions Using Proportions

Last week we looked at solving questions involving scale and proportion. To do these questions, we always follow the same steps.

Example: 5:x is proportional to 8:20

1. Write out your ratios and set them equal to each other.

$$\begin{array}{l} 5 : x \\ m : A \end{array} = \begin{array}{l} 8 : 20 \\ m : A \end{array} \rightarrow \frac{x}{5} = \frac{20}{8} \quad \begin{array}{l} 8x = 100 \\ x = \frac{100}{8} \end{array}$$

2. Turn your ratios into fractions.

3. Cross multiply, and solve for the variable.

Example. Thomas is building a model airplane. His model plane will be 8 inches long. The real plane is 24 feet long.

a) Create an equivalent 1: ratio

$$m: 8 \text{ in}$$

$$A = 24 \text{ ft}$$

$$8: 24 = 1: x$$

$$\frac{24}{8} = \frac{x}{1} \rightarrow \frac{8x}{8} = \frac{24}{8}$$

\* 1 in represents 3 ft

$$x = 3$$

b) If his model plane has a wingspan of 6 inches, what is the wingspan of the real plane? USE PROPORTIONS.

$$\text{Scale} = \frac{\text{Act}}{\text{model}}$$

$$= \frac{24 \text{ ft}}{8 \text{ in}}$$

$$\frac{1}{m} : \frac{3}{A} = \frac{6}{m} : \frac{w}{A}$$

$$\frac{3}{1} \leftarrow \frac{w}{6}$$

$$w = 18 \text{ ft}$$

Your Turn. Now Thomas is building a model train. Each car will be 10 cm long. Each car of the actual train is 15 m long.

a) Write the scale as an equivalent 1:something ratio

$$10 : 15 = 1 : x \rightarrow 15 = 10x$$
$$\frac{15}{10} = \frac{x}{1} \rightarrow \frac{15}{10} = \frac{10x}{10} \rightarrow x = 1.5$$

$1 : 1.5$

b) If his model train has a height of 4 cm, what is the height of the real train? USE PROPORTIONS.

$$1 : 1.5 = 4 : x$$

$$\frac{1.5}{1} = \frac{x}{4}$$

$$6 = x$$

The height of the real train is 6 m.

5. Part of a scale drawing for Josh's landscape design is shown below. The design is drawn on  $\frac{1}{4}$  inch grid paper.

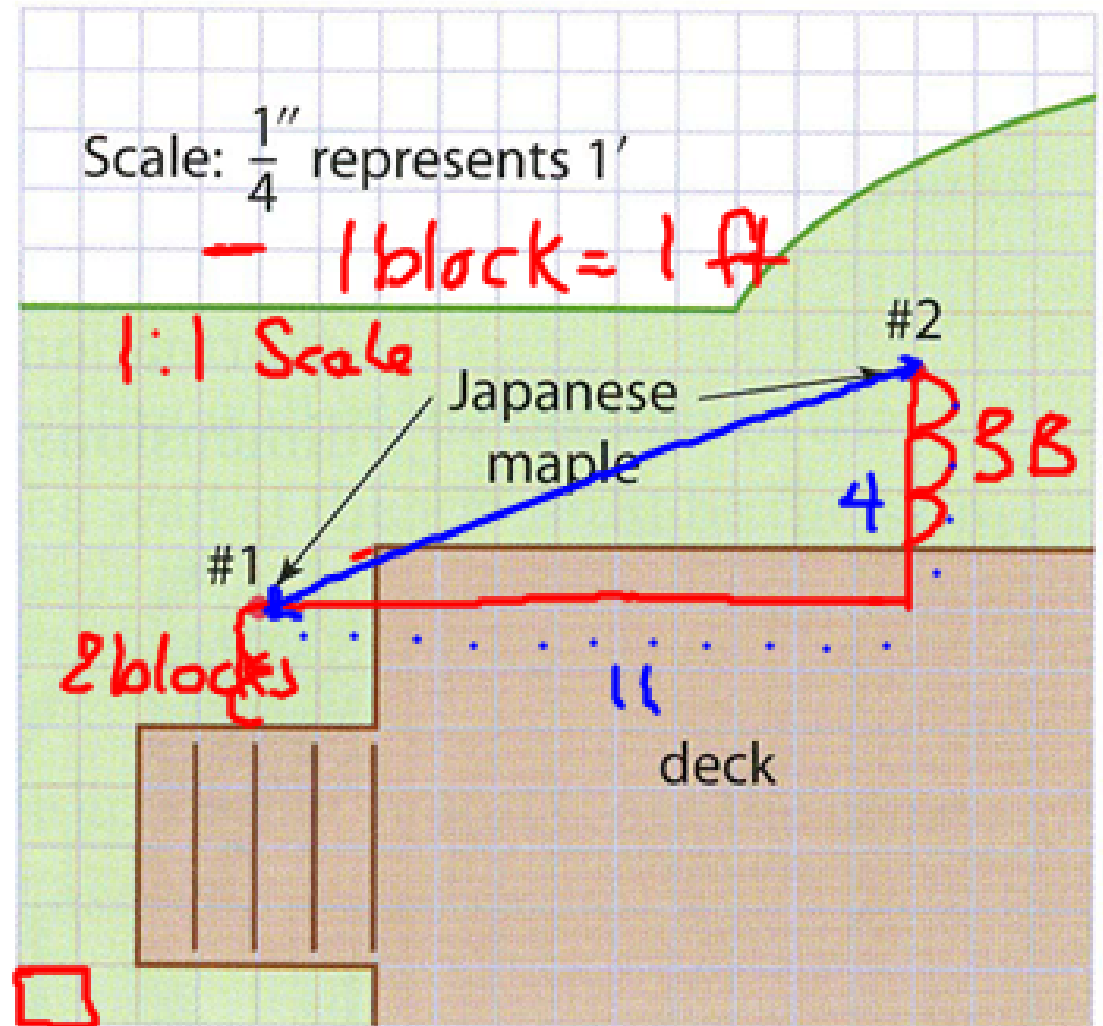
For parts a) to c), measure from the centre of the tree.

a) How far from the steps does Josh plan to plant tree #1? **2'**

b) How far from the deck will he plant tree #2? **3'**

c) Calculate the distance between the two trees, to the nearest foot. **Hint: Use the Pythagorean relationship.**

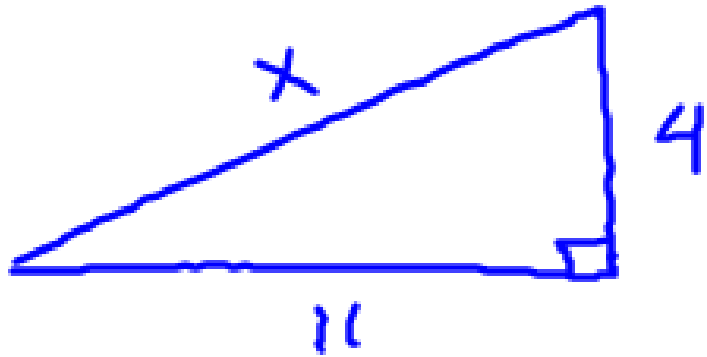
$$11.7 \text{ ft} \rightarrow 12 \text{ ft}$$



$$1:1 = 2:x$$

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

$$2 = x$$



$$1:1 = 3:x$$

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

$$3 = x$$

$$a^2 + b^2 = c^2$$

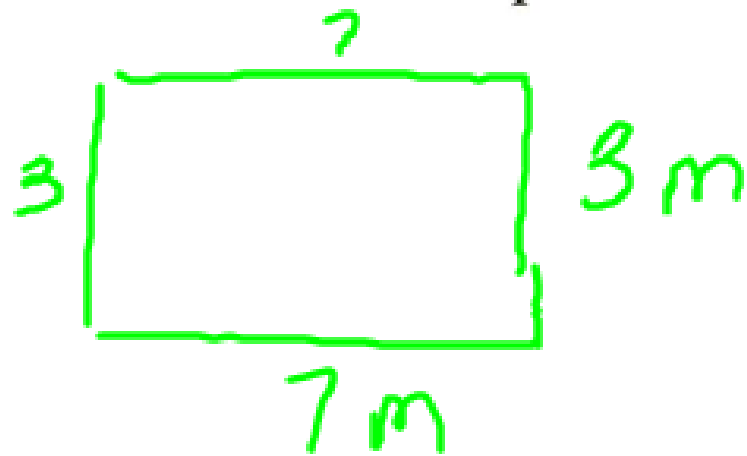
$$11^2 + 4^2 = c^2$$

$$121 + 16 = c^2$$

$$\sqrt{137} = \sqrt{c^2}$$

$$11.7 = c$$

- d) The dentist has a lot of riding toys to keep young clients happy while they are waiting. To protect the walls, the dentist wants to run carpet along the bottom 10 cm of each wall. How many square metres of carpet will it take to cover the bottom of the walls in the reception area?

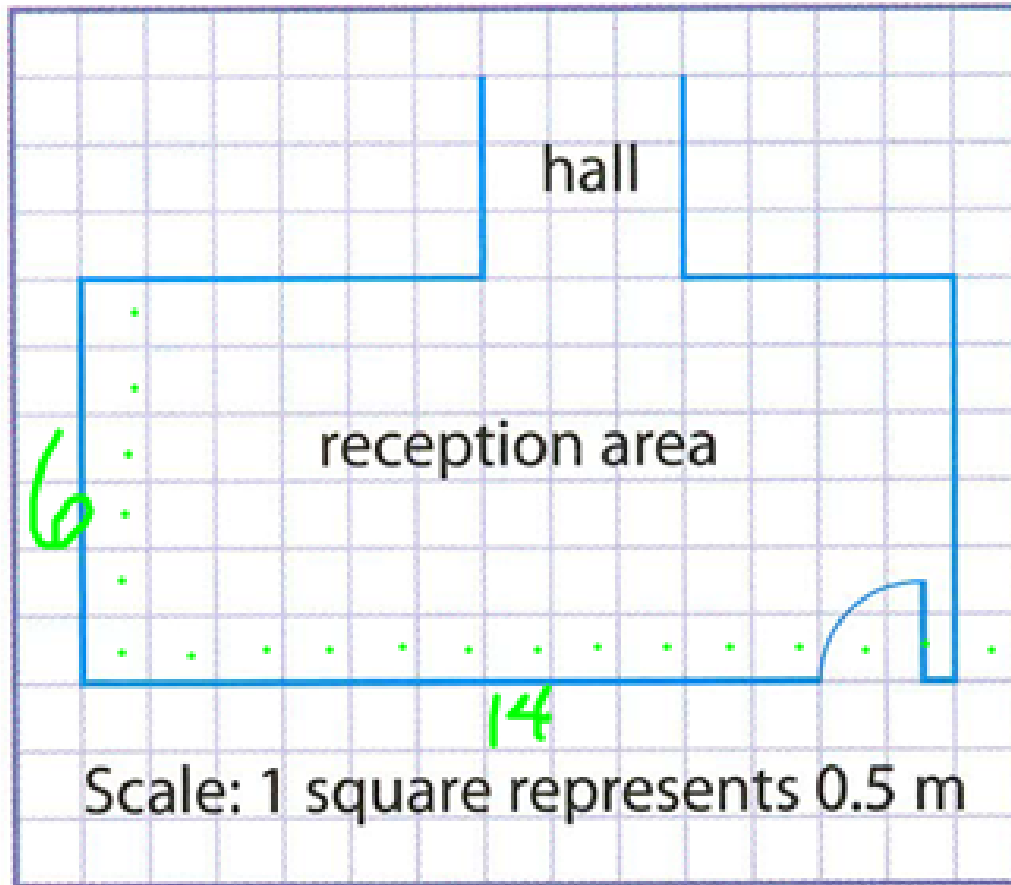


$$P = 7 + 7 + 3 + 3$$
$$P = 20$$

$$10 \text{ cm} = \frac{1 \text{ m}}{100 \text{ cm}}$$
$$= 0.1 \text{ m}$$

$$\text{Area} = l \times w$$
$$= 20 \times 0.1$$
$$= 2 \text{ m}$$

\* The dentist needs  
2 m of carpet



What is the area of the reception area?

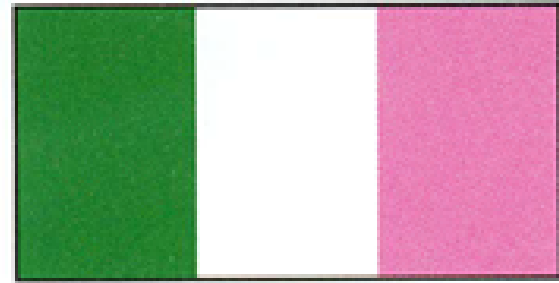
$$\begin{aligned}
 \text{Area} &= l \times w \\
 &= 7 \times 3 \\
 &= 21\text{m}
 \end{aligned}$$

$$1 : 0.5$$

$$6 \times 0.5 = 3$$

$$14 \times 0.5 = 7$$

5. The Newfoundland Tricolour can be of any size. The only condition is that the ratio of the flag's height to its width must be 1:2. Each colour takes up one third of the area of the flag.



- Explain the meaning of “a height to width ratio of 1:2.”
- Create a scale model of the flag with a height of 15 centimetres.
- Many tourist shops sell miniature flags. On grid paper, or by using a computer, create a scale model of a flag that is 6 inches wide.

$$1:2 = x:15 \quad 7.5:15$$

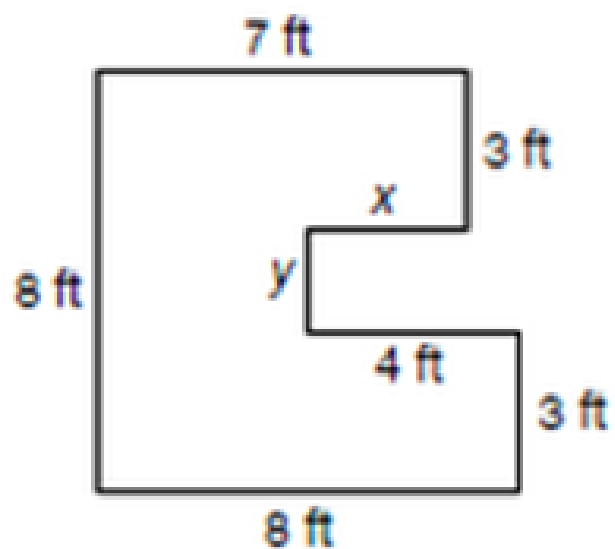
$$\frac{2}{1} = \frac{15}{x}$$

$$2x = 15$$

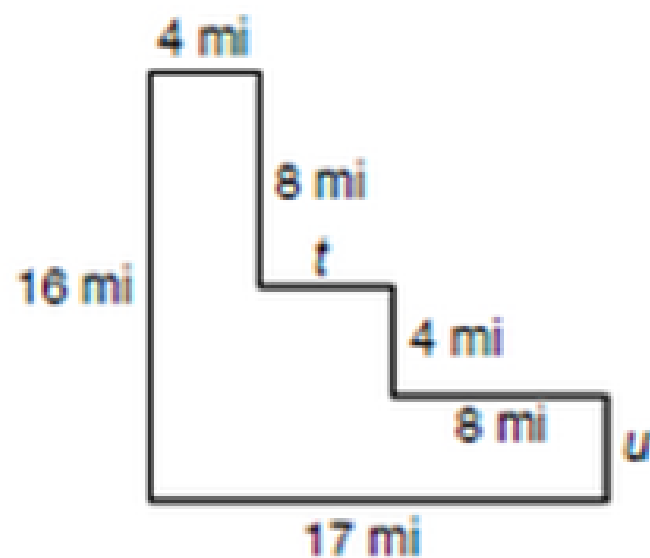
$$x = 7.5$$



9.  $x =$  \_\_\_\_\_  $y =$  \_\_\_\_\_



12.  $t =$  \_\_\_\_\_  $u =$  \_\_\_\_\_



13. The triangular base of a skyscraper has a perimeter of 89 m. If two of the sides have lengths 30 m and 35 m, what is the length of the third side?

7. A hospital's maintenance schedule calls for the walls of all washrooms to be painted. Below is a scale drawing of one washroom.

- All of the walls are made from concrete block that is 6 inches thick.
- The wall separating the sinks from the toilets goes from the floor to the ceiling.
- The ceiling is 9' 6" high.
- The door is 7' high.

Determine the total area to be painted.

