The Greeks

The Seven Sages of Greece

1) Thales of Mitletus
2) Solon of Athens
3) Bias of Priene
4) Chilo of Sparta
5) Cleobulus of Rhodes
6) Periander of Corinth
7) Pittacus of Mitylene

Thales of Mitletus (625-547 B C)

Thales was a businessmen, statesmen, and philosopher. Thales traveled to Egypt and studied Egyptian geometry. While in Egypt, Thales was able to calculate the height of the Great Pyramid of Cheops which earned him great respect of the pharaoh. In the end, Thales was given credit for the proof that corresponding sides of similar triangles are proportional.

Pythagoras of Samos

Pythagorean Theorem

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

Pythagoras founded school south of what is present day Italy.
His students or disciples were referred to as Pythagoreans.
Pythagoras students study four main areas which were theory of numbers, astronomy, geometry, and music

Euclid of Alexander

Euclid Postulates

1) A straight line segment can be drawn from any point to any other point.
2) A straight line segment can be extended continuously into an infinite straight line.
3) A circle may be described with any center and any radius.
4) All right angles are equal to one another.
5) Given a line and a point not on the line, there is one and only one line through the point parallel to the original line.

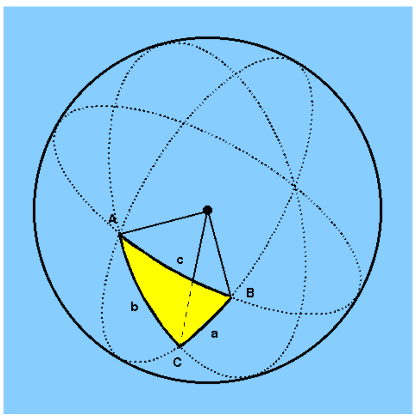
Non-Euclidean Geometries

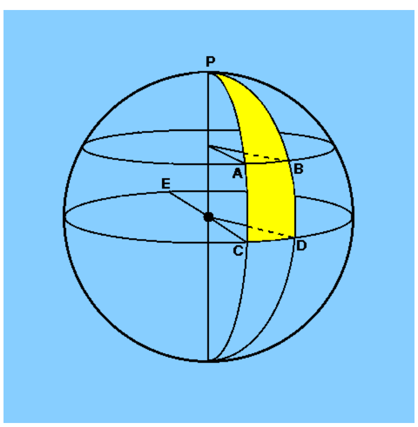
If a particular type of geometry accepts Euclid's fifth postulate as being true, then this type of geometry is referred to as a Euclidean geometry.

If a particular type of geometry does not accept Euclid's fifth postulate as being true, then this type of geometry is referred to as a Non-Euclidean geometry.

In Non-Euclidean geometries, parallel lines do not exist and lines are allowed to have curvature.

For example triangles could appear as below:





http://www.cst.cmich.edu/users/manou1a/341.sum05/341.X.doc

Similar Triangles

Ratios

The ratio of 3 to 4 can be written as 3:4 or $\frac{3}{4}$

Example of ratios

3 cups of milk to 5 cups of flour

8 ounces of 2-cycle oil: 2 gallons of gasoline

15 shots made to 20 shots attempted

8 passes completed to 11 passes attempted

Solving proportions

Find the missing value.

1)

$$\frac{8}{12} = \frac{x}{20}$$
$$12 \cdot x = 8 \cdot 20$$
$$12x = 160$$
$$\frac{12x}{12} = \frac{160}{12}$$
$$x = 13\frac{1}{3}$$

2)

$$\frac{y}{30} = \frac{3}{5}$$
$$5 \cdot y = 3 \cdot 30$$
$$5y = 90$$
$$\frac{5y}{5} = \frac{90}{5}$$
$$y = 18$$

3)

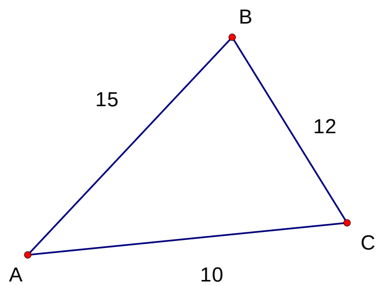
$$\frac{3}{10} = \frac{x+2}{45}$$
$$10(x+2) = 3 \cdot 45$$
$$10x + 20 = 135$$
$$10x + 20 - 20 = 135 - 20$$
$$\frac{10x}{10} = \frac{115}{10}$$
$$x = 11.5$$

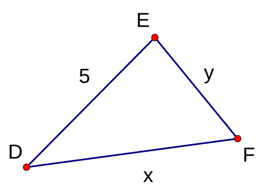
Using ratios to find the missing side of a triangle

CSSTP

Corresponding sides of similar triangles are proportional

Given $\Delta ABC \sim \Delta DEF$, find x and y.





Find y

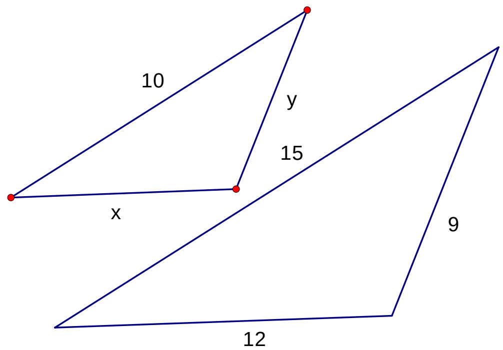
$$\frac{15}{5} = \frac{12}{y}$$
$$15y = 5(12)$$
$$15y = 60$$
$$y = 4$$

Find x

$$\frac{15}{5} = \frac{10}{x}$$
$$15x = 5(10)$$
$$15x = 50$$
$$\frac{15x}{15} = \frac{50}{15}$$
$$x = 3\frac{1}{3}$$

More Examples

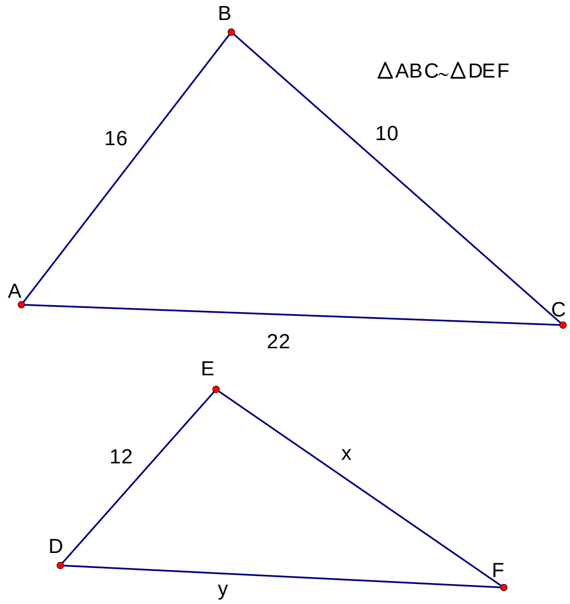
1)



$$\frac{y}{9} = \frac{10}{15}$$
$$15 \cdot y = 9 \cdot 10$$
$$15y = 90$$
$$\frac{15y}{15} = \frac{90}{15}$$
$$y = 6$$

$$\frac{x}{12} = \frac{10}{15}$$
$$15 \cdot x = 12 \cdot 10$$
$$15x = 120$$
$$\frac{15x}{15} = \frac{120}{15}$$
$$x = 8$$

2)



$$\frac{16}{12} = \frac{10}{x}$$

$$16x = 12 \cdot 10$$

$$16x = 120$$

$$x = 7.5$$

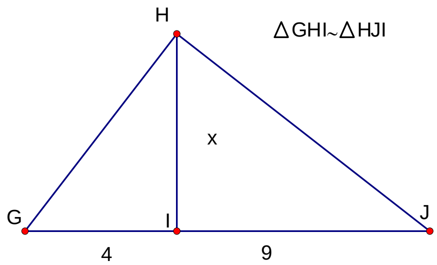
$$\frac{16}{12} = \frac{22}{y}$$

$$16y = 12 \cdot 22$$

$$16y = 264$$

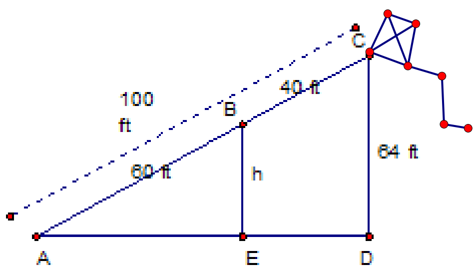
$$y = 16.5$$

3)



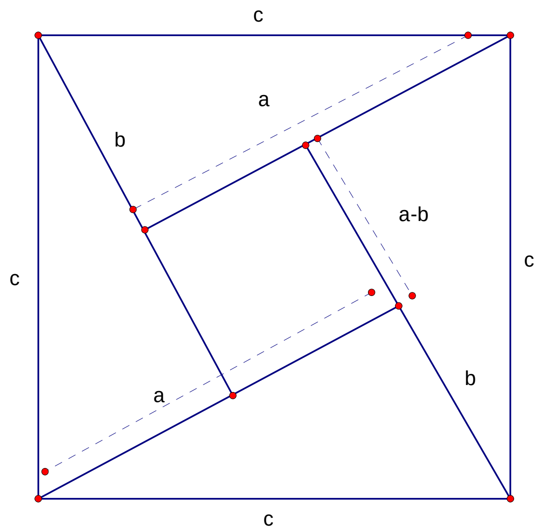
$$\frac{4}{x} = \frac{x}{9}$$
$$x^2 = 36$$
$$\sqrt{x^2} = \sqrt{36}$$
$$x = 6$$

4) With 100 ft of string out a kite is 64 ft above the ground. When a girl flying the kite pulls in 40 ft of the string, the angle formed by the string and the ground does not change. What is the height of the kite above the ground after she pulls in 40 feet of the string?



$$\frac{60}{100} = \frac{h}{64}$$
$$100h = 60 \cdot 64$$
$$100h = 3840$$
$$\frac{100h}{100} = \frac{3850}{100} \Rightarrow x = 38.4 \ ft$$

Garfield Proof of Pythagorean Theorem



Area of Big Square = Area of Little Square + 4(Area of the Triangles)

$$c^2 = (a-b)^2 + 4\left(\frac{1}{2}ab\right)$$

$$c^2 = (a-b)(a-b) + 2ab$$

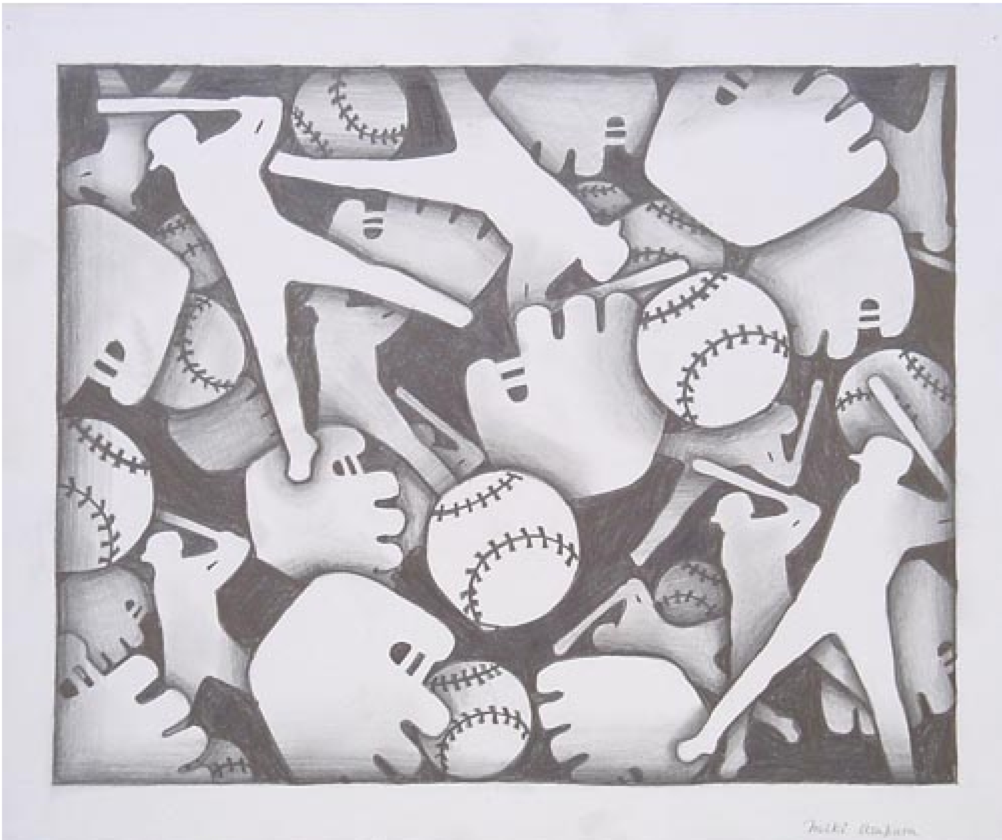
$$c^2 = a^2 - 2ab + b^2 + 2ab$$

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

Perspective

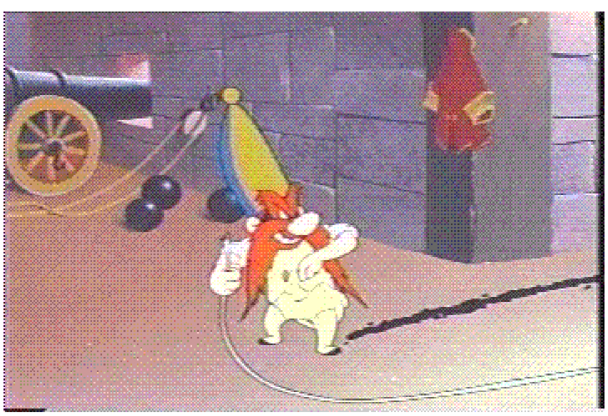
Types of perspective

1) **Overlapping shapes**: In overlapping shapes depth perception is created by using overlapping shapes.

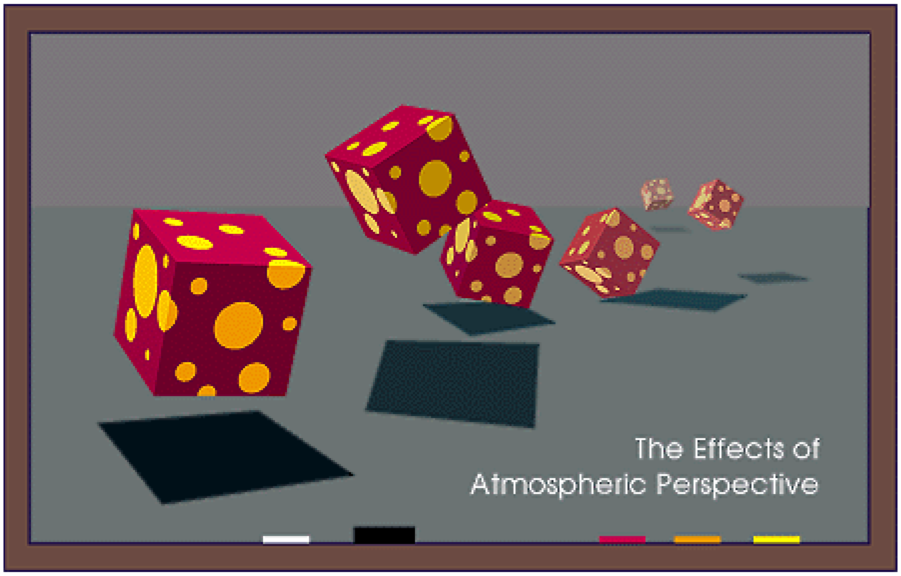


Photos courtesy: http://fog.ccsf.cc.ca.us/~rholbert/dezin.html

2) **Diminishing sizes**: In diminishing sizes depth is created by systematically making objects smaller.



3) **Atmospheric Perspective**: In atmospheric perspective depth is created by making objects that are farther away less clear by diminishing both color and shading.



4) **One-Point Perspective**: In one perspective depth is creating by using a vanishing point.

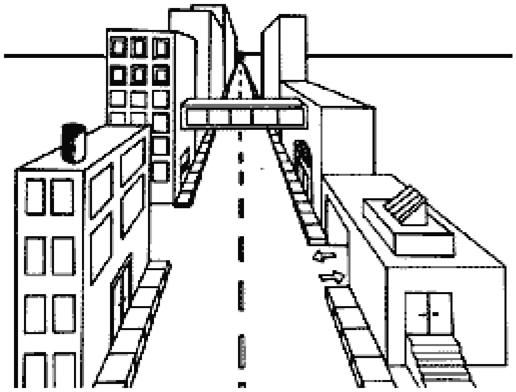
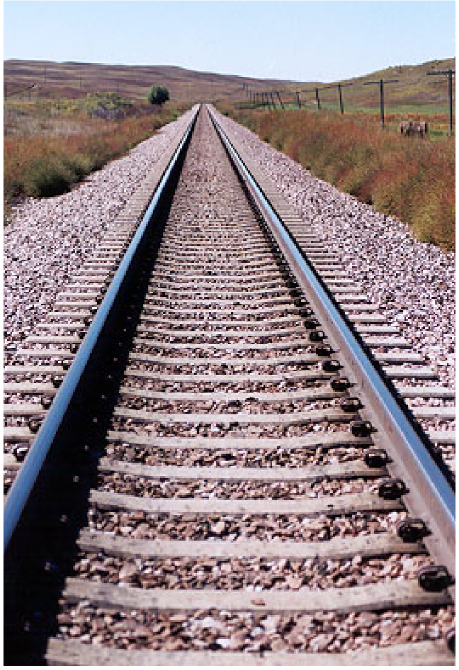


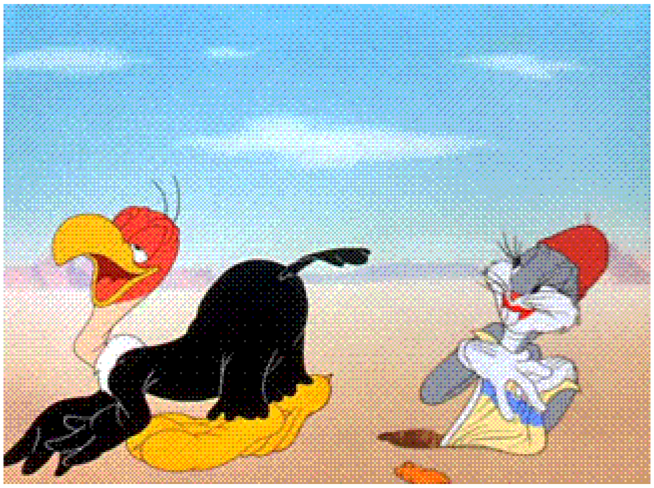
Photo courtesy of http://www.cartage.org.lb/en/themes/Arts/drawings/PerspectiveDrawing/OnePointPersp/OnePointPersp.htm



http://facweb.cs.depaul.edu/sgrais/images/Lec2/france10.jpg

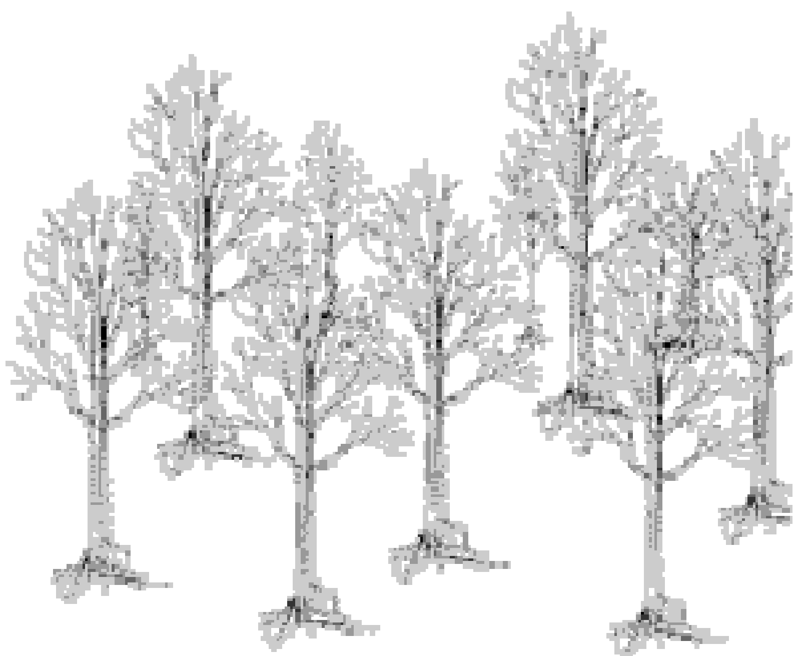
Identify the perspective

1)



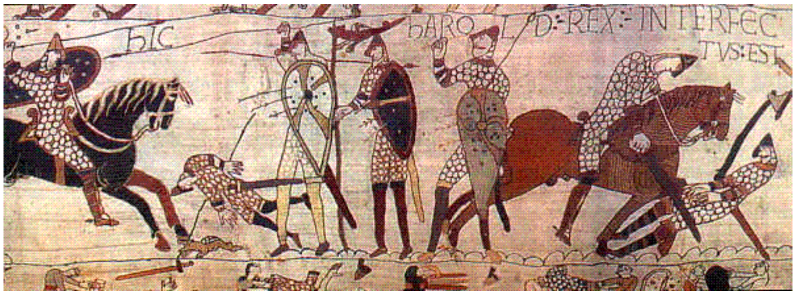
Solution: The picture mostly has the use of atmospheric perspective

2)



Solution: The picture uses overlapping shapes

3)



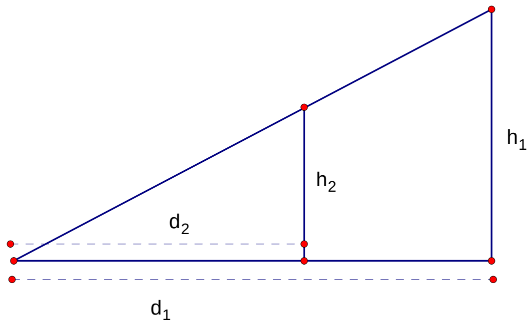
Solution: This picture has no perspective

4)

Solution: The picture mostly has the use of atmospheric perspective

http://www.frick.org/html/pntg6df.htm

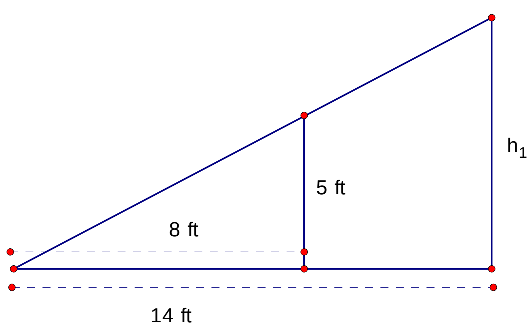
Perspective and Proportions



$$\frac{h_1}{d_1} = \frac{h_2}{d_2}$$

Examples

1) Find h_1



$$\frac{h_1}{d_1} = \frac{h_2}{d_2}$$

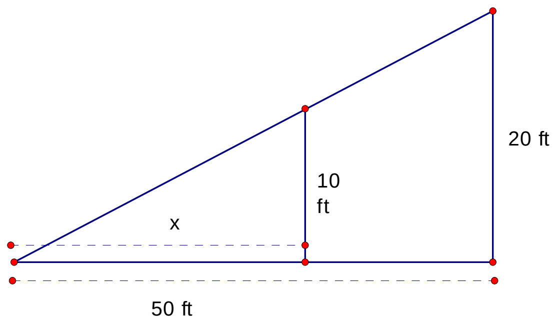
$$\frac{h_1}{14} = \frac{5}{8}$$

$$8h_1 = 5(14)$$

$$8h_1 = 70$$

$$h_1 = 8.75 \ \ ft$$

2) Find x



$$\frac{h_1}{d_1} = \frac{h_2}{d_2}$$

$$\frac{10}{x} = \frac{20}{50}$$

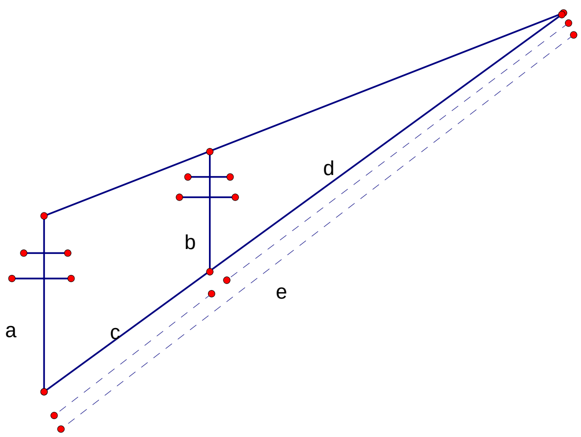
$$20x = 500$$

$$\frac{20x}{20} = \frac{500}{20}$$

$$x = 25 \ \ ft$$

Exercises on page 286-297

22)



$a = 3\ in$

$e = 12\, in$

$b = 2\ in$

$d = ?$

$$\frac{3}{12} = \frac{2}{d}$$

$3d = 12(2)$

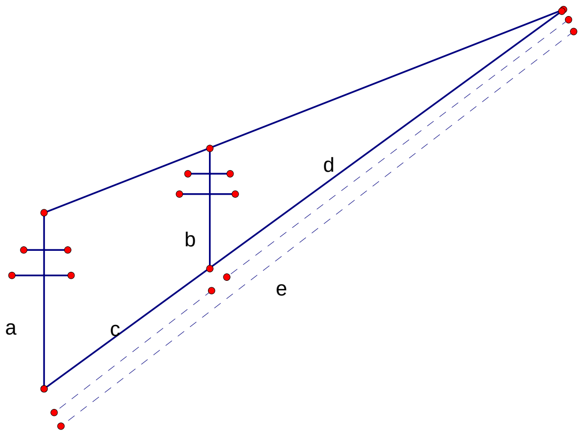
$3d = 24$

$$\frac{3d}{3} = \frac{24}{3}$$

$d = 8\ in$

$c = 12 - 8 = 4\ in$

20)



$a = 4m,\ e = 10m,\ d = 2m$

$$\frac{4}{10} = \frac{b}{2}$$

$10b = 2(4)$

$10b = 8$

$b = .8\ m$

$c = 10 - 2 = 8m$