

$$\frac{X}{(4+2)} = \frac{1}{2}$$

$$X = \frac{(4 + 2) \times 1}{2}$$

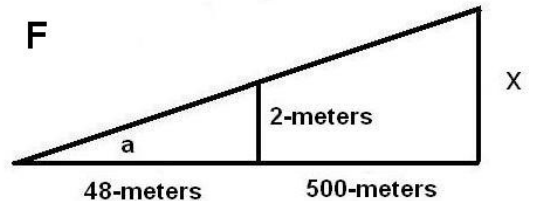
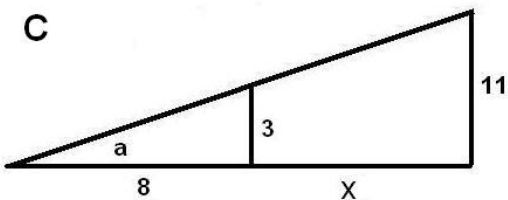
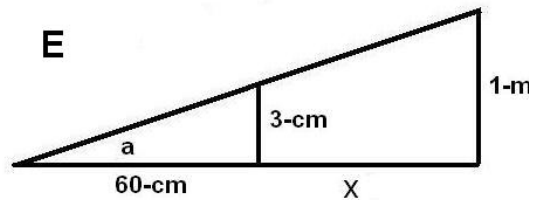
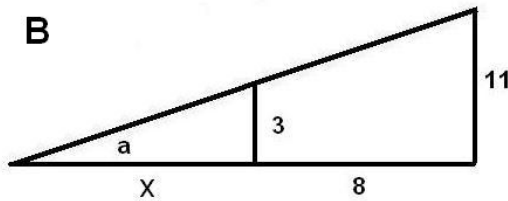
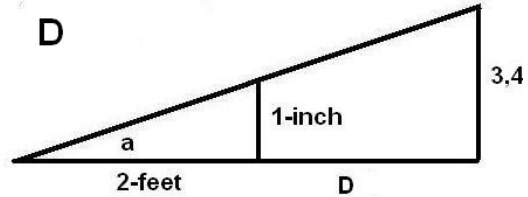
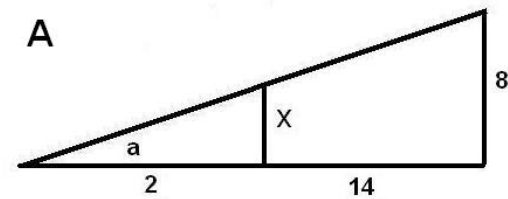
$$X = 3$$

The corresponding sides of similar triangles are proportional to one another as the illustration to the left shows. Because the vertex angle of the triangles are identical in measure, two objects at different distances from the vertex will subtend the same angle,  $a$ . The corresponding side to 'X' is '1' and the corresponding side to '2' is the combined length of '2+4'.

**Problem 1:** Use the properties of similar triangles and the ratios of their sides to solve for 'X' in each of the diagrams below.

**Problem 2:** Which triangles must have the same measure for the indicated angle  $a$  ?

**Problem 3:** The Sun is 400 times the diameter of the Moon. Explain why they appear to have the same angular size if the moon is at a distance of 384,000 kilometers?



**Problem 1:** Use the properties of similar triangles and the ratios of their sides to solve for 'X' in each of the diagrams below.

A)  $X / 2 = 8 / 16$  so  $X = 1$

B)  $3 / X = 11 / (X+8)$  so  $3(X + 8) = 11 X$  ;  $3X + 24 = 11 X$  ;  $24 = 8X$  and so  $X = 3$ .

C)  $3 / 8 = 11 / (x + 8)$  so  $3(x + 8) = 88$  ;  $3x + 24 = 88$  ;  $3x = 64$  and so  $X = 21 \frac{1}{3}$

D) 1-inch / 24-inches = 3,400 kilometers / ( D + 24-inches);

D will be very large compared to 24-inches so for the second ratio, ignore the 24-inches added to D to get  $1/24 = 3,400 \text{ km} / D$  and so  $D = 3,400 \text{ kilometers} \times (24)$  and  $D = 81,600 \text{ kilometers}$ . We see that this is vastly greater than 24-inches so we did not have to bother converting 24-inches to kilometers.

E)  $3 \text{ cm} / 60 \text{ cm} = 1 \text{ meter} / (X + 60 \text{ cm})$ .  $3/60 = 1 \text{ meter} / (X + 0.6 \text{ m})$  then  $3(X + 0.60) = 60$  ;  $3X + 1.8 = 60$  ;  $3X = 58.2 \text{ meters}$  so  $X = 19.4 \text{ meters}$ .

F)  $2 \text{ meters} / 48 \text{ meters} = X / 548 \text{ meters}$  ;  $1/24 = X/548$  ;  $X = 548 / 24$  ; so  $X = 22.83$ .

**Problem 2:** Which triangles must have the same measure for the indicated angle a ?

Answer: Because the triangle (D) has the side proportion 1-inch /24-inches = 1/24 and triangle (F) has the side proportion 2 meters / 48 meters = 1/24 these two triangles, **D and F, have the same angle measurement for angle a.**

**Problem 3:** The Sun is 400 times the diameter of the Moon. Explain why they appear to have the same angular size if the moon is at a distance of 384,000 kilometers?

Answer: From one of our similar triangles, the long vertical side would represent the diameter of the sun; the short vertical side would represent the diameter of the moon; the angle a is the same for both the sun and moon if the distance to the sun from Earth were 400x farther than the distance of the moon from Earth. Since the lunar distance is 384,000 kilometers, the sun must be at a distance of 154 million kilometers.