

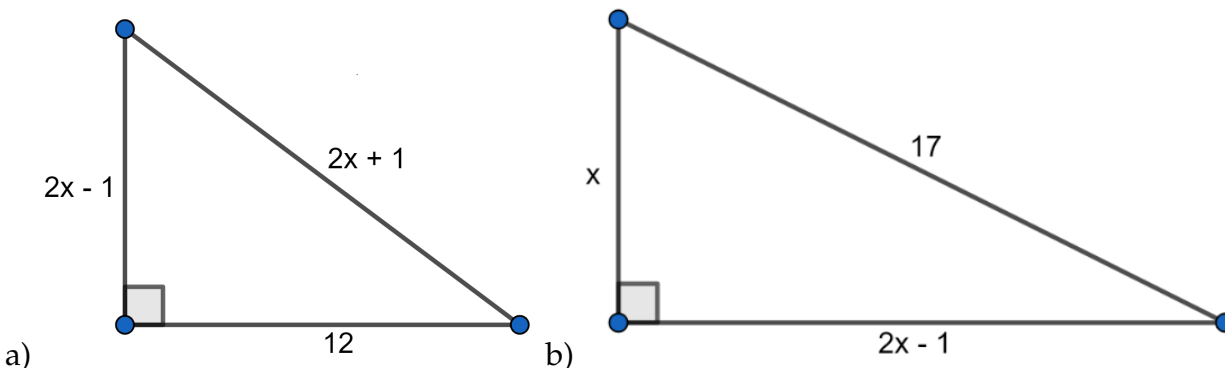
# Geometry Problems

- (a) A cube of side length 2 inches has the same volume as a rectangular prism with length 3 inches and width 1 inch. Find the height of the rectangular prism.

(b) Jason has just enough water to fill a cone-shaped cup with height 2 inches and diameter 6 inches to the brim. How much more water would he need to fill a cylinder with height 10 inches and diameter 3 inches?

(c) Bart submerges a sphere with radius 1 foot in a tank partially filled with water. He takes the sphere out, and then places a square base pyramid with side length 2 feet into the tank. He notices that the water level rises to the same level both times. What is the height of the pyramid?

- In the following images, find the lengths of the unknown sides:

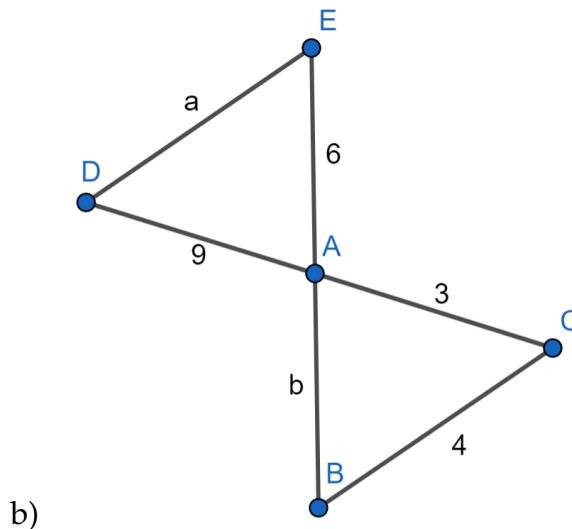
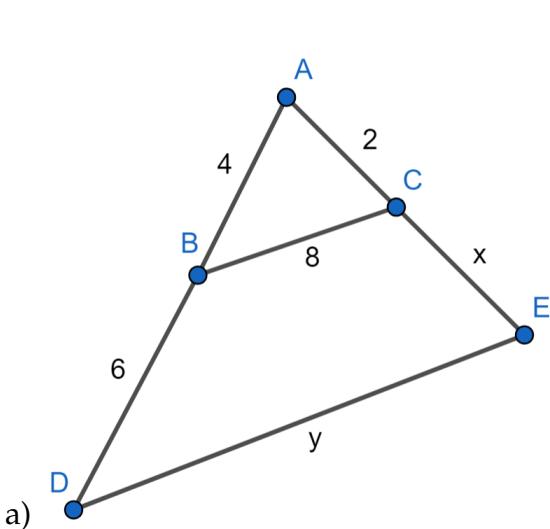


- If the distance between  $(3, 4)$  and  $(8, 16)$  is the same as the distance between  $(a, 5)$  and  $(12, a)$ , find the sum of all possible values of  $a$ .
- Find all points on the unit circle that are 1 unit away from the point  $(0, 1)$ .
- (a) The surface area of a cube with side length 3 cm is equal to the surface area of a rectangular prism with width 1 cm and height 7 cm. Find the length of the rectangular prism.

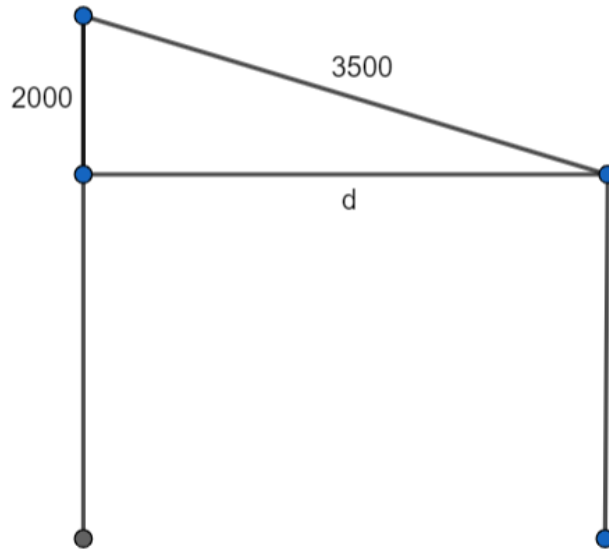
(b) Doug has enough paint to cover a cylinder with diameter 2 feet and height 7 feet completely. If he wants to paint a sphere of radius 5 feet, how much more paint would he need if 1 oz of paint is needed to cover one square foot of surface?

- (c) The volume of a cone with diameter 8 mm and height 5 mm is numerically equal to the surface area of a cylinder with radius 3 mm. Find the height of the cylinder.
6. (a) A unit circle has the same area as an equilateral triangle with side length  $s$ . Find  $s^2$ .
- (b) The legs of an isosceles right triangle have side length 2. If the perimeter of the right triangle is equal to the perimeter of an equilateral triangle, find the area of the equilateral triangle.
- (c) A circle with radius 3 has a circumference numerically equal to the perimeter of a right isosceles triangle. Find the area of the isosceles triangle.
7. (a) A cylinder is created by rotating a square  $ABCD$  around side  $AB$ . If this cylinder has volume  $8\pi$  cubic feet, what is the side length of  $ABCD$ ?
- (b) When a circle of radius 2 is rotated about one of the points on its circumference, it sweeps out a larger circle. What is the area of the new circle?
- (c) A right triangle  $ABC$  with  $AB = 3$  in,  $BC = 4$  in, and  $AC = 5$  in is rotated around side  $AB$  to form a circular cone. Find the volume of this cone.

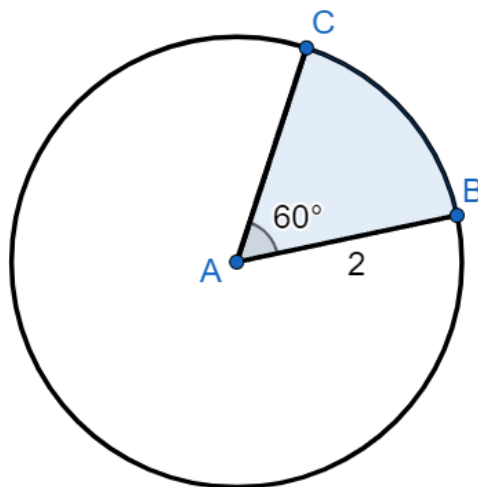
8. If  $DE \parallel BC$  in the following diagrams, find the values of the variables:



9. Two poles of different heights are at a distance  $d$  away from each other. Given that one pole is 2000 feet taller than the other, and the distance between the tips of the poles is 3500 feet, find  $\frac{d}{3500}$ .



10. In rectangle  $ABCD$ , it is given that  $AB : BC = 1 : 2$ . Rectangle  $ABEF$  is constructed so that  $AB : BE = 2 : 3$ . Find the ratio of the areas of the rectangles  $ABCD$  and  $ABEF$ .
11. In the diagram below, the radius of circle  $A$  is 2 units and  $m\angle BAC = 60^\circ$ . Find the length of arc  $BC$  as well as the area of the sector  $BAC$ .



12. Find the equation of the line tangent to  $x^2 + y^2 = 25$  at the point  $(3, 4)$  in standard form.
13. Find the intersection points of  $(x - 2)^2 + (y - 1)^2 = 4$  and  $x^2 + (y - 1)^2 = 9$ .
14. Lily wants to create a cubic box with an open top. She has 150 square inches of cardboard. What would be the volume of her box?
15. (a) A rectangle has area 3 square units. If its length is doubled and its width is tripled, what is the new area?
- (b) There are two circles,  $B$  and  $A$ . If the area of circle  $B$  is 100 times larger than the area of circle  $A$ , what is the ratio of the radius of circle  $B$  to the radius of circle  $A$ ?