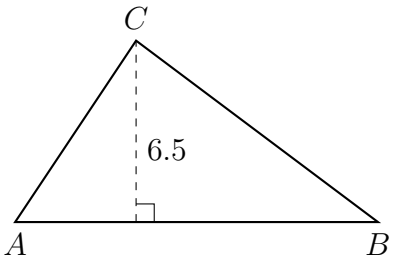
Part 1, Solid Geometry: Volume & Density

1. Find the area of a semi-circle with diameter 8. Round to the *nearest tenth*.

2. Find the volume of a cylindrical tank with radius of 6 feet and a height of 8 feet, to the *nearest cubic foot*.

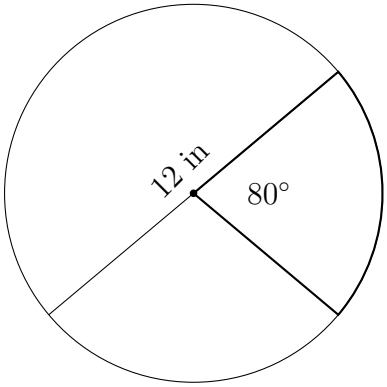
3. A box in the shape of a rectangular prism has a volume of 60 cubic feet. It's length is 5 feet and width 3 feet. How tall is it?

4. The area of $\triangle ABC$ is 68.25 square inches. The altitude of the triangle is 6.5 inches. Find the length of the base AB.

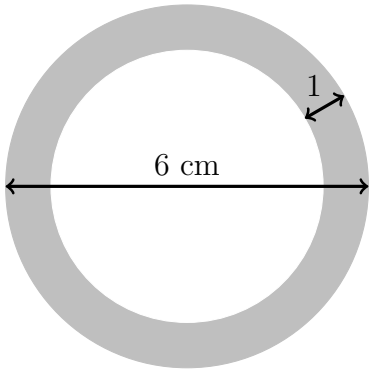


5. Find the weight of a steel ball with a diameter of 1.2 inches, to the *nearest tenth of an ounce*. (The density of steel is 4.6 ounce per cubic inch)

6. A circle with a diameter of 12 in and a central angle of 80° is drawn below. What is the area of the sector formed by the 80° angle, to the *nearest tenth of a square inch*?



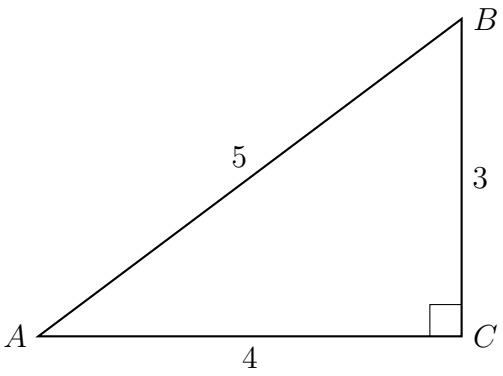
7. A bakery sells hollow chocolate spheres. The outer diameter of each sphere is 6 cm. The thickness of the chocolate of each sphere is 1 cm. Determine and state, to the *nearest tenth of a cubic centimeter*, the amount of chocolate in each hollow sphere.



8. A right cylinder is cut horizontally. The shape of the cross section is a
   (a) circle
   (b) cylinder
   (c) rectangle
   (d) triangular prism

9. Which three-dimensional figure will result when a right triangle 8 inches tall and 3 inches wide is continuously rotated about the longer side?
   (a) a cone with a height of 6 inches and radius of 8 inches
   (b) a cone with a height of 8 inches and diameter of 6 inches
   (c) a cylinder with a radius of 8 inches and a height of 6 inches
   (d) a cylinder with a diameter of 6 inches and a height of 8 inches

10. $\triangle ABC$ is shown with $m\angle C = 90°$ and the lengths of the triangle's sides are $BC = 3$, $AC = 4$, and $AB = 5$.



(a) State, as a decimal, the value of $\sin A$.

(b) Find the measure of $\angle A$, to the *nearest degree*.

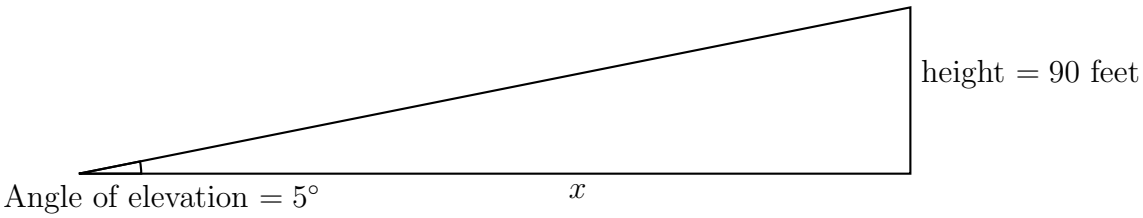
(c) Find the degree measure of $\angle B$.

11. Express each trigonometric ratio to the *nearest thousandth* and each angle measure to the nearest degree.

(a) $\sin 55° =$

(b) $\cos^{-1} 0.766 =$

12. A sailor observes the top of a lighthouse with an angle of elevation of 5°. She knows the lighthouse is 90 feet tall. Determine and state the distance x between the sailor and the lighthouse, to the *nearest foot*.



13. Solve for the value of x.

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

14. Given $f(x) = \frac{3}{2}x - 5$. Solve for x such that for $f(x) = 1$.

15. Given $g(x) = 2x^2 - 3x + 2$. Simplify $g(0)$.

16. Given $h(x) = x^2 + 8x + 7$. Solve $h(x) = 0$.

17. Simplify each expression. (Leave it in radical form if necessary, not a decimal.)

    (a) $\sqrt{18}$

    (b) $\sqrt{\frac{81}{16}}$

Part 2, Solid Geometry: Volume & Density

18. The line l has the equation $y = \frac{2}{3}x + 7$. To each line below, circle whether l is parallel, perpendicular, or neither.

    (a) parallel perpendicular neither $y = \frac{2}{3}x - 2$

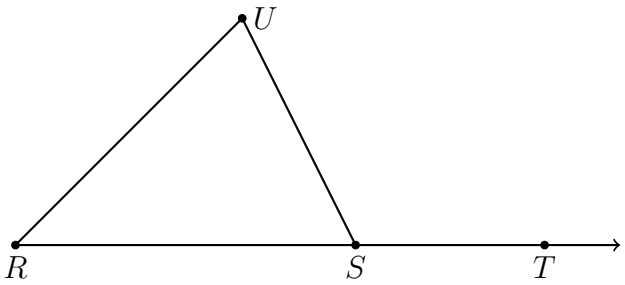
    (b) parallel perpendicular neither $y = \frac{3}{2}x + 7$

    (c) parallel perpendicular neither $y = -\frac{2}{3}x + 5$

    (d) parallel perpendicular neither $3x + 2y = 6$

19. Write an equation of the line that is parallel to the line whose equation is $y = \frac{1}{3}x + 4$ and passes through the point $(4, -1)$.

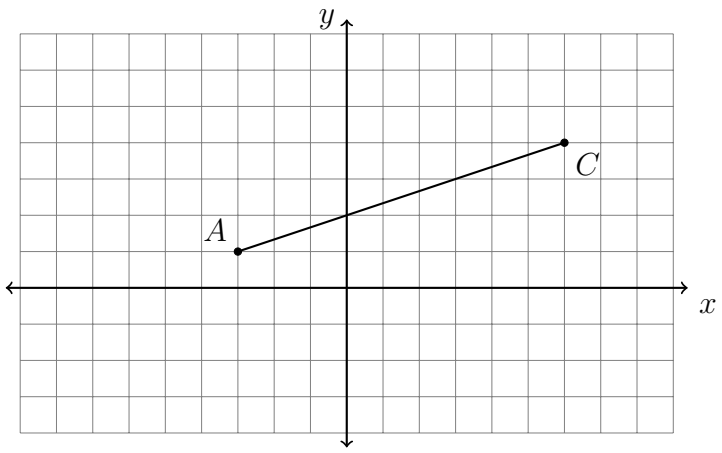
20. Given $m\angle R = 30$ and $m\angle U = 70$. Find $m\angle UST$.



21. Write down the center and radius of each circle.

    (a) $(x + 1)^2 + (y + 3)^2 = 1$ (b) $x^2 + (y - 4)^2 = 25$

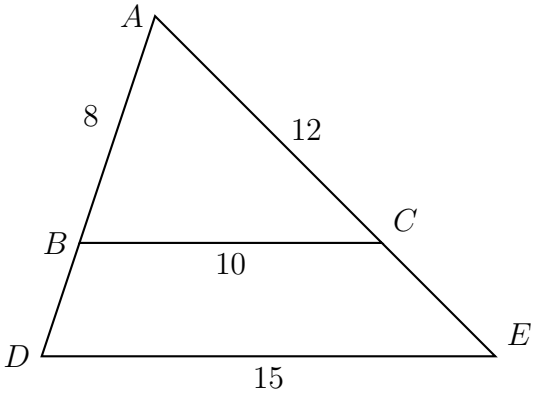
22. In the diagram below, $\overline{AC}$ has endpoints with coordinates $A(-3, 1)$ and $C(6, 4)$.



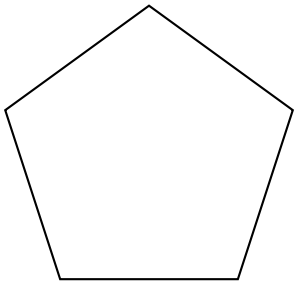
If B is a point on $\overline{AC}$ and $AB{:}BC = 2{:}1$, what are the coordinates of B?

23. Triangle ABC is dilated with a scale factor of k centered at A, yielding $\triangle ADE$, as shown. Given $AB = 8$, $BC = 10$, $AC = 12$, and $DE = 15$.

Find BD, AE, and k (the scale factor).

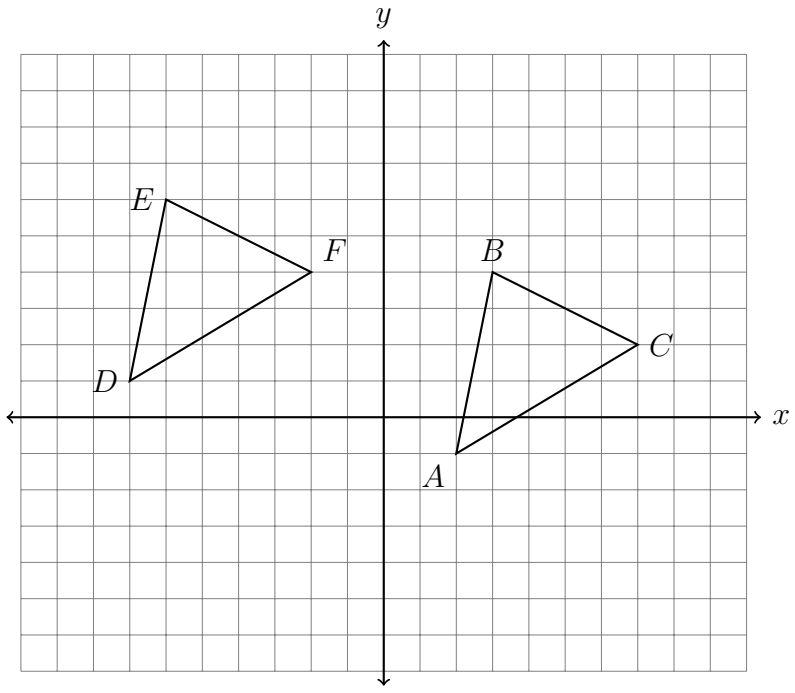


24. What is the smallest non-zero angle of rotation about its center that would map the pentagon onto itself?

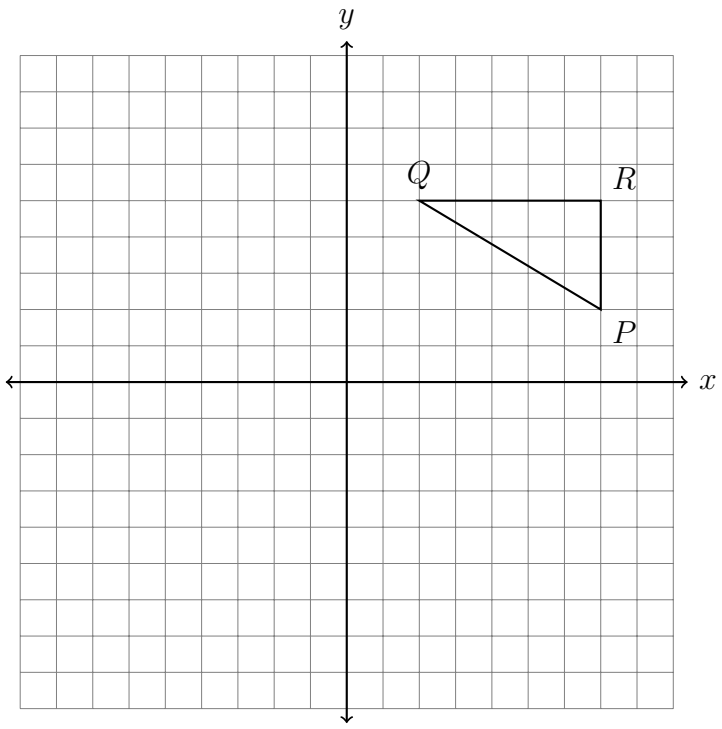


25. A translation maps $A(-1, 4) \rightarrow A'(-2, 14)$. What is the image of $B(-4, -7)$ under the same translation?

26. What transformation maps $\triangle ABC$ onto $\triangle DEF$, shown below? Fully specify the transformation.



27. Reflect $\triangle PQR$ across the x-axis, drawing its image $\triangle P'Q'R'$ and labeling its vertices.

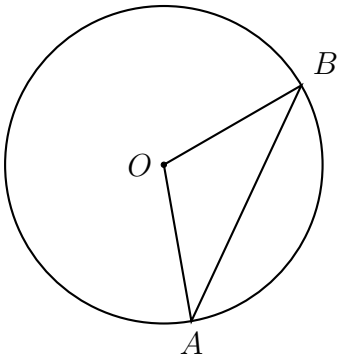


28. In a right triangle, the acute angles have the relationship $\sin x = \cos 30$. Find x.

29. If $\sin(2x - 8)^\circ = \cos 42^\circ$, what is the value of x?

30. Find the distance between $(0, 5)$ and $(6, -3)$.

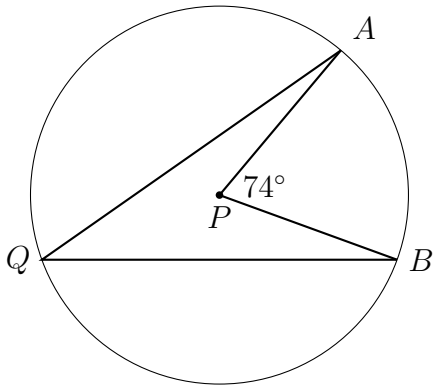
31. Given circle O with inscribed $\triangle AOB$. $m\angle O = 110$. Find $m\angle A$.



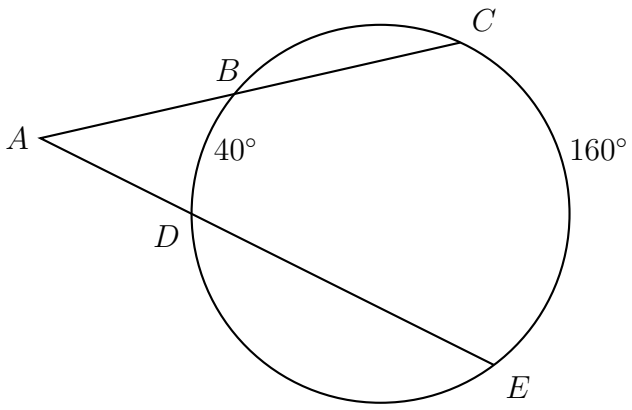
32. Given circle P with $m\angle APB = 74°$.

(a) Write down the $m\widehat{AB}$.

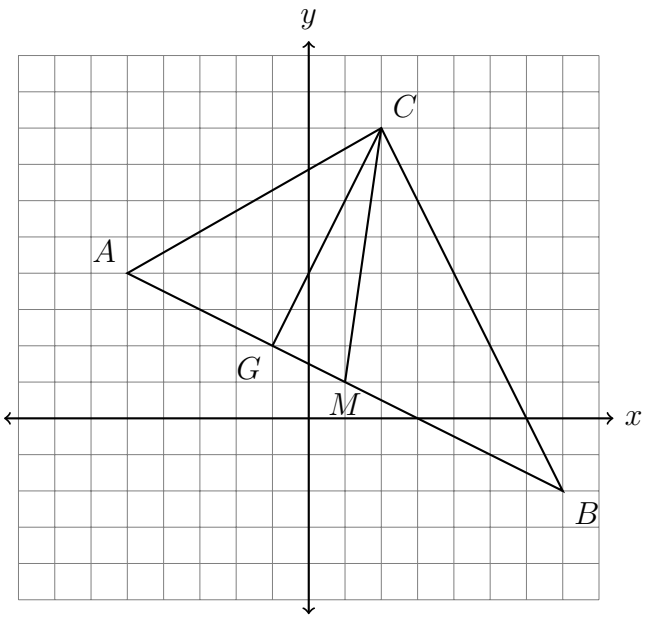
(b) Find the $m\angle AQB$.



33. The secants $\overline{ABC}$ and $\overline{ADE}$ intersect the circle O, as shown in the diagram. Given $m\widehat{BD} = 40°$ and $m\widehat{CE} = 160°$. Find the $m\angle A$.



34. On the set of axes below, $\triangle ABC$, altitude $\overline{GC}$, and median $\overline{MC}$ are drawn.



Determine which equations represent the area of the triangle, circling True or False.

(a) T F $Area_{\triangle} = \dfrac{(CG)(AB)}{2}$

(b) T F $Area_{\triangle} = \dfrac{(CM)(AB)}{2}$

(c) T F $Area_{\triangle} = \dfrac{(AC)(AB)}{2}$

(d) T F $Area_{\triangle} = \dfrac{(CG)(BC)}{2}$

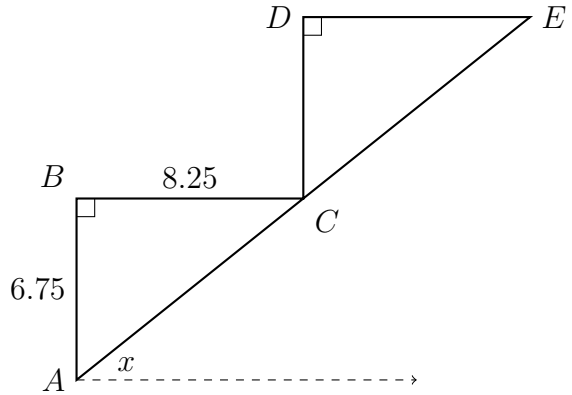
35. The point $M(3, 7)$ is the midpoint of $\overline{AB}$. If the coordinates of A are $(2, 10)$, find B.

36. A monument in the shape of a pyramid with a square base has a volume of 128 cubic feet. If its height measures 6 feet, what is the length of the side of the base?

Early finishers

37. A staircase riser is cut as a series of congruent triangles with each step's "rise" equal to 6.75 inches, and the "run" of each step is 8.25 inches, as shown below. ($AB = 6.75$ and $BC = 8.25$)

    (a) What is the angle of inclination of the staircase, x, rounded to the *nearest degree*?



    (b) Find the diagonal length of the two-step riser, the distance AE, to the *nearest tenth of an inch.*

38. Given circle O with chords $\overline{AD}$ and $\overline{BE}$ intersecting at C, as shown in the diagram. Given $m\widehat{AB} = 86°$, $m\widehat{BD} = 75°$, and $m\widehat{DE} = 50°$.

    (a) Find the $m\angle ACB$.

    (b) Find the measure of the minor arc, $m\widehat{AE}$.