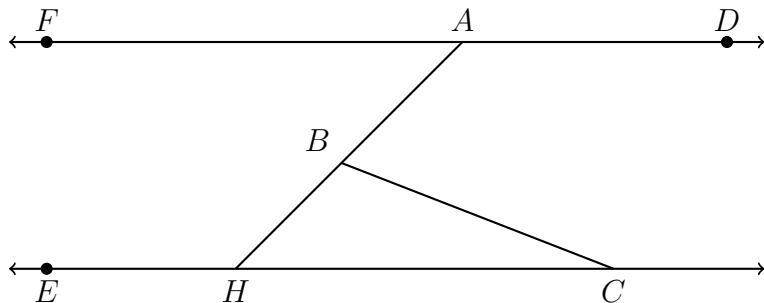1. In the diagram below, $\overline{FAD} \parallel \overline{EHC}$, and $\overline{ABH}$ and $\overline{BC}$ are drawn.

If $m\angle FAB = 48°$ and $m\angle ECB = 18°$, what is $m\angle ABC$?

(a) 18°

(b) 48°

(c) 66°

(d) 114°

2. A cone has a volume of 108π and a base diameter of 12. What is the height of the cone?

3. The endpoints of directed line segment PQ have coordinates of $P(-7, -5)$ and $Q(5, 3)$. What are the coordinates of point A, on $\overline{PQ}$, that divide $\overline{PQ}$ into a ratio of 1:3?

4. Jaden is comparing two cones. The radius of the base of cone A is twice as large as the radius of the base of cone B. The height of cone B is twice the height of cone A. The volume of cone A is

(a) twice the volume of cone B

(b) four times the volume of cone B

(c) equal to the volume of cone B

(d) equal to half the volume of cone B

5. Kayla was cutting right triangles from wood to use for an art project. Two of the right triangles she cut are shown below.
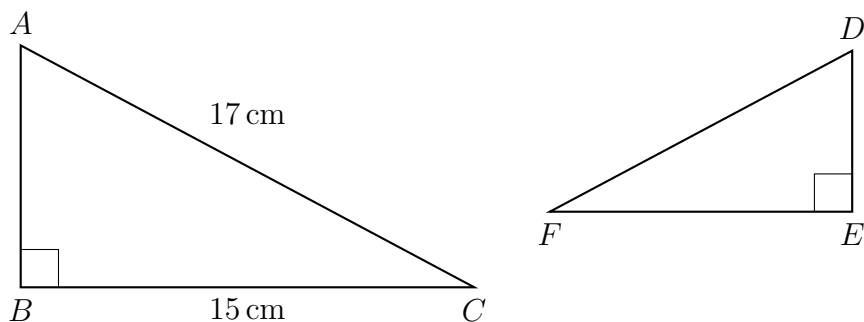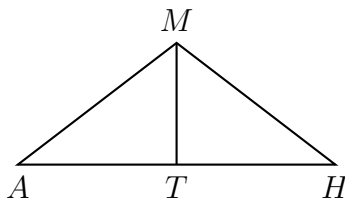

If $\triangle ABC \sim \triangle DEF$, with right angles B and E, $BC = 15$ cm, and $AC = 17$ cm, what is the measure of $\angle F$, to the *nearest degree*?

6. A regular hexagon is rotated about its center. Which degree measure will carry the regular hexagon onto itself?

(a) 45°

(c) 120°

(b) 90°

(d) 135°
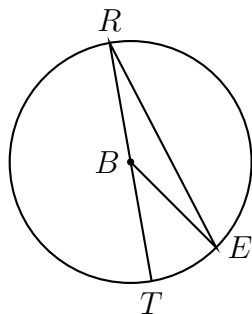
7. In triangle MAH below, $\overline{MT}$ is the perpendicular bisector of $\overline{AH}$.

Which statement is *not* always true?

(a) $\triangle MAH$ is isosceles.

(b) $\triangle MAT$ is isosceles.

(c) $\overline{MT}$ bisects $\angle AMH$.

(d) $\angle A$ and $\angle TMH$ are complementary.

8. In circle B below, diameter $\overline{RT}$, radius $\overline{BE}$, and chord $\overline{RE}$ are drawn.

It $m\angle TRE = 15°$ and $BE = 9$, then the area of sector EBR is what in terms of π?

9. Lou has a solid clay brick in the shape of a rectangular prism with a length of 8 inches, a width of 3.5 inches, and a height of 2.25 inches. If the clay weighs 1.055 oz/in^3, how much does Lou's brick weigh, to the nearest ounce?

10. For the acute angles in a right triangle, $\sin(4x)° = \cos(3x + 13)°$. What is the number of degrees in the measure of the smaller angle?

11. A rectangular tabletop will be made of maple wood that weighs 43 pounds per cubic foot. The tabletop will have a length of eight feet, a width of three feet, and a thickness of one inch. Determine and state the weight of the tabletop, in pounds.

12. Determine and state an equation of the line perpendicular to the line $5x - 4y = 10$ and passing through the point $(5, 12)$.

13. After a dilation with center $(0,0)$, the image of $\overline{DB}$ is $\overline{D'B'}$. If $DB = 4.5$ and $D'B' = 18$, then what is the scale factor of this dilation?

14. In the diagram below of circle O, points K, A, T, I, and E are on the circle, $\triangle KAE$ and $\triangle ITE$ are drawn, $\overset{\frown}{KE} \cong \overset{\frown}{EI}$, and $\angle EKA \cong \angle EIT$.
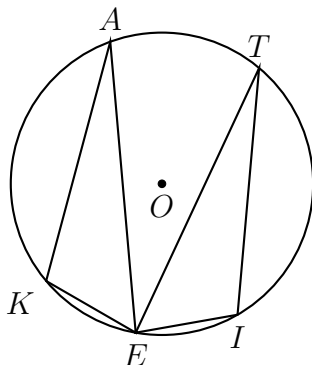

Which statement about $\triangle KAE$ and $\triangle ITE$ is always true?

(a) They are neither congruent nor similar.

(b) They are similar but not congruent.

(c) They are right triangles.

(d) They are congruent.

15. From a point on the ground one-half mile from the base of a historic monument, the angle of elevation to its top is $11.87°$. To the nearest foot, what is the height of the monument? (1 mile $=$ 5280 feet)

16. The area of a sector of a circle with a radius measuring 15 cm is 75π cm^2. What is the measure of the central angle that forms the sector?

17. Point M divides $\overline{AB}$ so that $AM : MB = 1 : 2$. If A has coordinates $(-1, -3)$ and B has coordinates $(8, 9)$, what are the coordinates of M?

18. What is an equation of the image of the line $y = \dfrac{3}{2}x - 4$ after a dilation of a scale factor of $\dfrac{3}{4}$ centered at the origin?

19. Which three-dimensional figure will result when a rectangle 6 inches long and 5 inches wide is continuously rotated about the longer side?

   (a) a rectangular prism with a length of 6 inches, width of 6 inches, and height of 5 inches

   (b) a rectangular prism with a length of 6 inches, width of 5 inches, and height of 5 inches

   (c) a cylinder with a radius of 5 inches and a height of 6 inches

   (d) a cylinder with a radius of 6 inches and a height of 5 inches

20. In the diagram below of triangle ABC, $\overline{AC}$ is extended through point C to point D, and $\overline{BE}$ is drawn to $\overline{AC}$.
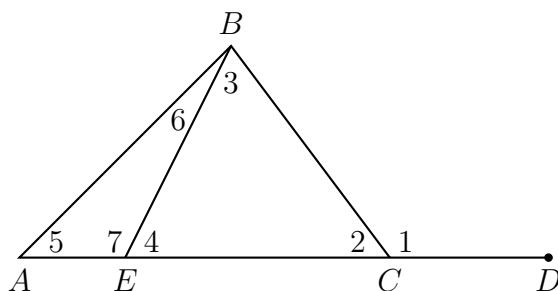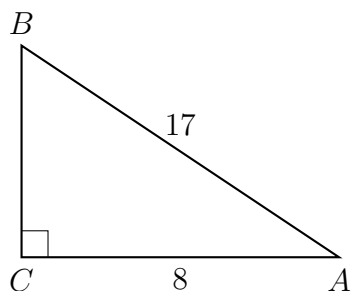

   Which equation is always true?

   (a) $\angle 1 = m\angle 3 + m\angle 2$ (c) $\angle 6 = m\angle 3 - m\angle 2$

   (b) $\angle 5 = m\angle 3 - m\angle 2$ (d) $\angle 7 = m\angle 3 + m\angle 2$

21. In right triangle ABC, $m\angle C = 90°$ and $AC \neq BC$. Which trigonometric ratio is equivalent to $\sin B$?

    (a) $\cos A$ (c) $\tan A$

    (b) $\cos B$ (d) $\tan B$

22. In the diagram below of right triangle ABC, $AC = 8$, and $AB = 17$.

    Which equation would determine the value of angle A?
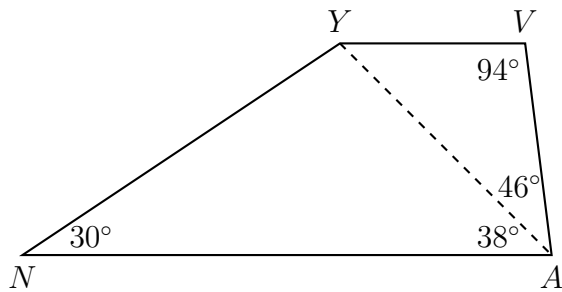
    (a) $\sin A = \dfrac{8}{17}$ (c) $\cos A = \dfrac{15}{17}$

    (b) $\tan A = \dfrac{8}{15}$ (d) $\tan A = \dfrac{15}{8}$

23. Which equation represents a line that is perpendicular to the line represented by

$y = \dfrac{2}{3}x + 1$?

    (a) $3x + 2y = 12$ (c) $y = \dfrac{3}{2}x + 2$

    (b) $3x - 2y = 12$ (d) $y = -\dfrac{2}{3}x + 4$

24. In diagram of quadrilateral $NAVY$, $m\angle YNA = 30°$, $m\angle YAN = 38°$, $m\angle AVY = 94°$, and $m\angle VAY = 46°$.
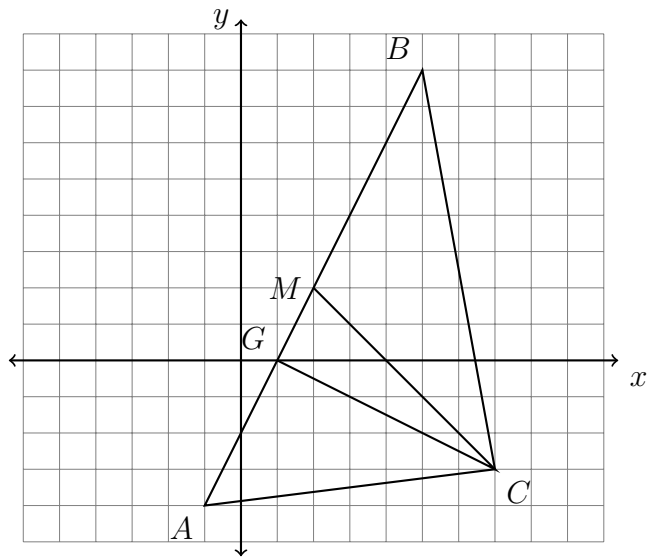

Which segment has the shortest length?

(a) $\overline{AY}$

(b) $\overline{NY}$

(c) $\overline{VA}$

(d) $\overline{VY}$

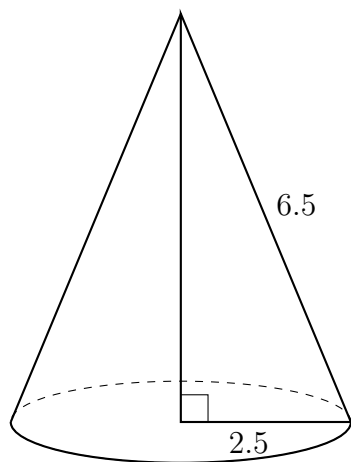25. In the diagram below, $\triangle ABC$, altitude $\overline{CG}$, and median $\overline{CM}$ are drawn.

Which expression represents the area of $\triangle ABC$?

(a) $\dfrac{(BC)(AC)}{2}$

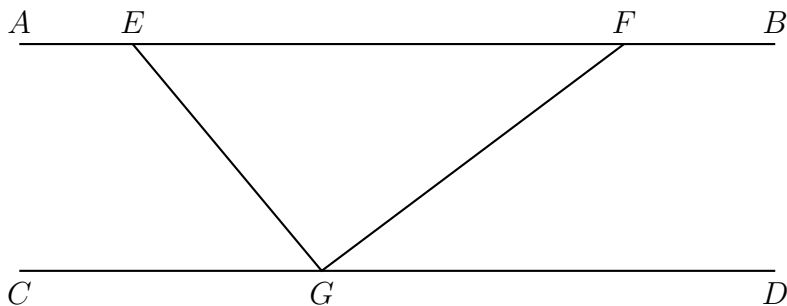(b) $\dfrac{(GC)(BC)}{2}$

(c) $\dfrac{(CM)(AB)}{2}$

(d) $\dfrac{(GC)(AB)}{2}$

26. As shown in the diagram below, the radius of a cone is 2.5 cm and its slant height is 6.5 cm.

How many cubic centimeters are in the volume of the cone? Express your answer in terms of π.

27. In the diagram below, $\overline{AEFB} \parallel \overline{CGD}$, and $\overline{GE}$ and $\overline{GF}$ are drawn.

If $m\angle EFG = 32°$ and $m\angle AEG = 137°$, what is $m\angle EGF$?

(a) 11°   (c) 75°

(b) 43°   (d) 105°

28. An isosceles right triangle whose legs measure 6 is continuously rotated about one of its legs to form a three-dimensional object. The three-dimensional object is a

    (a) cylinder with a diameter of 6

    (b) cylinder with a diameter of 12

    (c) cone with a diameter of 6

    (d) cone with a diameter of 12

29. The coordinates of the endpoints of directed line segment ABC are $A(-8, 7)$ and $C(7, -13)$. If $AB : BC = 3 : 2$, what are the coordinates of B?

30. A circle with a diameter of 10 cm and a central angle of 30° is drawn below.
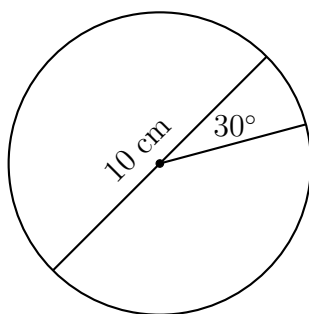
    What is the area, to the *nearest tenth of a square centimeter*, of the sector formed by the 30° angle?

31. A child's tent can be modeled as a pyramid with a square base whose sides measure 60 inches and whose height measures 84 inches. What is the volume of the tent, to the *nearest cubic foot*?