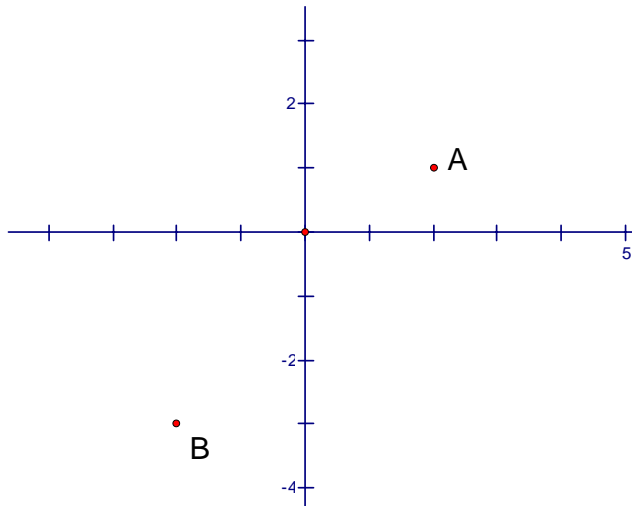


Instructions: Choose the best answer for each problem and mark it on the Scantron sheet provided

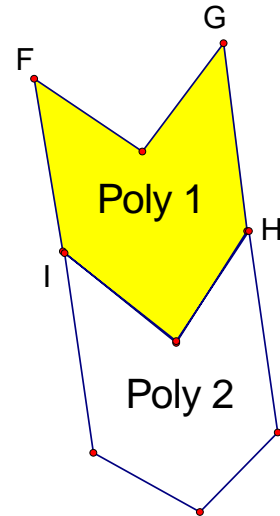


Use the graph to the left to answer questions 1 – 3.

- What are the coordinates of point A?
 (A) (1, 2) (B) (2, 1)
 (C) (-1, 2) (D) (-1, -2)
- What are the coordinates of $A + B$?
 (A) (0, -2) (B) (-4, -4)
 (C) (-1, -2) (D) (0, 2)
- What are the coordinates of $A - B$?
 (A) (4, 4) (B) (4, 1)
 (C) (4, 2) (D) (-4, -2)

4. In the given tessellation, “Poly 1” is translated to “Poly 2” by

- (A) \overrightarrow{FG} (B) \overrightarrow{HG} (C) \overrightarrow{IH} (D) \overrightarrow{FI}



For problems #5 and #6: Given points C(3, 7) and D(-4, 31)

- What is the distance between points C and D?
 (A) 5 (B) 25 (C) $2\sqrt{6}$ (D) $\sqrt{26}$
- What is the midpoint of line segment \overline{CD} ?
 (A) (3.5, 19.5) (B) (-1, 39) (C) (-0.5, 19) (D) (0.5, 20)

For problems #7 and #8: Three vertices of a square are (-1, 5), (5, 3), and (3, -3).

- What is the 4th vertex of the square?
 (A) (3, 1) (B) (-3, -1) (C) (3, 5) (D) (-3, -5)
- What is the center of the square?
 (A) (0.5, 0.5) (B) (1, 1) (C) (3, 2) (D) (2, 4)

9. Name the coordinates of the intersection of a horizontal line through $(-3, 5)$ and a vertical line through $(2, 6)$.
- (A) $(-3, 2)$ (B) $(5, 6)$ (C) $(-3, 6)$ (D) $(2, 5)$

For problems #10 and #11: Suppose P $(10, -5)$

10. How far is P from the origin?
 (A) $10\sqrt{5}$ (B) 10 (C) 15 (D) $5\sqrt{5}$
11. How far is P from $(1, 1)$?
 (A) $10\sqrt{5}$ (B) $\sqrt{117}$ (C) $4\sqrt{5}$ (D) 15
12. Which of the following is NOT a triangle similarity theorem.
 (A) SSA (B) SAS (C) AA (D) SSS

For problems #13 - #15: $\triangle ABC$ has vertices $A(1, 4)$, $B(3, 6)$, and $C(8, -1)$. Point B is added to each of the vertices to form $\triangle A'B'C'$

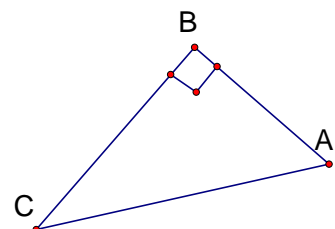
13. What are the coordinates of point A' ?
 (A) $(4, 10)$ (B) $(-1, 2)$ (C) $(-1, 10)$ (D) $(5, 2)$
14. Describe the translation of $\triangle ABC$ to $\triangle A'B'C'$.
 (A) up 3, right 6 (B) up 6, right 3 (C) down 3, left 6 (D) down 6, right 3
15. What is true about the triangles?
 (A) They are congruent (B) They are similar, but not congruent
 (C) They are isosceles (D) They have the same area, but different perimeter

For # 16 – 17, Quad GEOM has coordinates $G(3, 4)$, $E(6, 2)$, $O(-4, 3)$, and $M(2, -8)$

16. If GEOM is translated so that O is now at the origin, what are the new coordinates of G?
 (A) $(7, 7)$ (B) $(-1, 7)$ (C) $(7, 1)$ (D) $(-3, 2)$
17. If GEOM is scaled by $-1/2$, what are the coordinates of M?
 (A) $(4, -16)$ (B) $(-4, 16)$ (C) $(-1, -4)$ (D) $(-1, 4)$

18. If $\sin A = 5/13$ for the triangle to the right, find $\tan C$.
 (Note: figure NOT drawn to scale)

- (A) $5/12$ (B) $12/5$ (C) $13/5$ (D) $12/13$

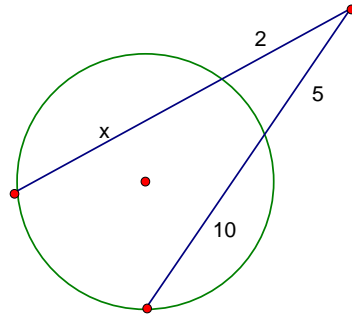


19. If $H(-2, 3)$, which point is NOT collinear with H and the origin?

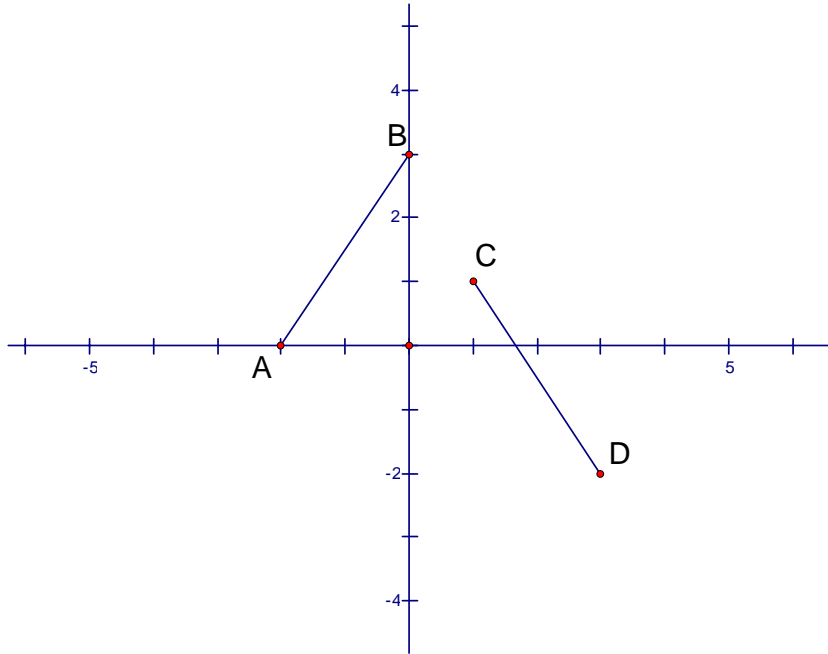
- (A) $(-4, 6)$ (B) $(-1, -3/2)$ (C) $(1, -3/2)$ (D) $(-2/3, 1)$

20. Find x in the given picture.

- (A) 4 (B) $1/2$ (C) $-4/3$ (D) 13



Questions 21 – 24: True or False. Choose A for True and B for False on your Scantron.



20. Vectors \overline{AB} and \overline{CD} are in the opposite direction.
 21. Vectors \overline{AB} and \overline{CD} are the same length.
 22. Vectors \overline{AB} and \overline{CD} are perpendicular.
 23. Vectors \overline{AB} and \overline{CD} are equivalent.

25. The scale on a map of Illinois reads “1 inch = 9 miles.” If the actual distance between Chicago and Champaign is 120 miles, how long is this trip on the map?

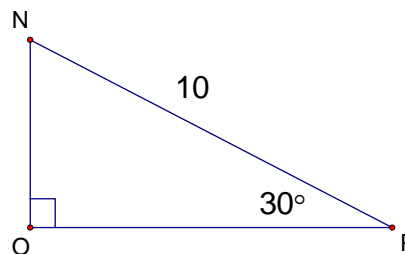
- (A) 10 inches (B) 13.3 miles (C) 13.3 inches (D) 0.075 miles

26. A rectangular prism with $l = 10$ inches, $w = 4$ inches and $h = 13$ inches is scaled by $1/4$. What is the **volume** of the resulting object? (Volume of rectangular prism = $l \cdot w \cdot h$)

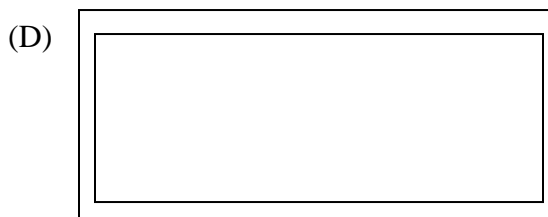
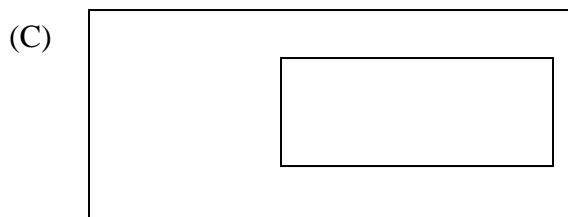
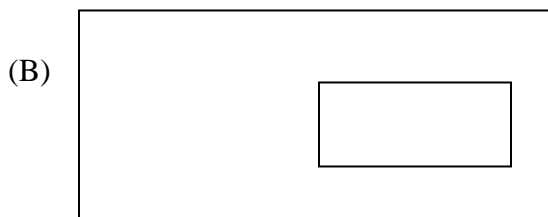
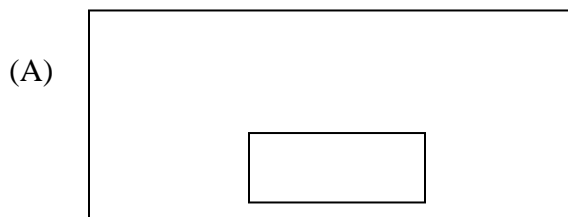
- (A) 130 in^3 (B) 32.5 in^3 (C) 8.125 in^3 (D) 2.03 in^3

27. Find the length of \overline{OP} in the given right triangle.

- (A) 5 (B) $5\sqrt{3}$ (C) $5\sqrt{2}$ (D) $10\sqrt{3}$



28. Which pair of the polygons below are scaled copies?

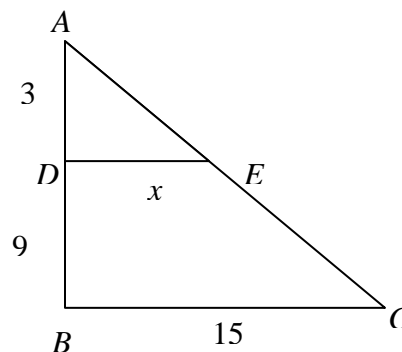


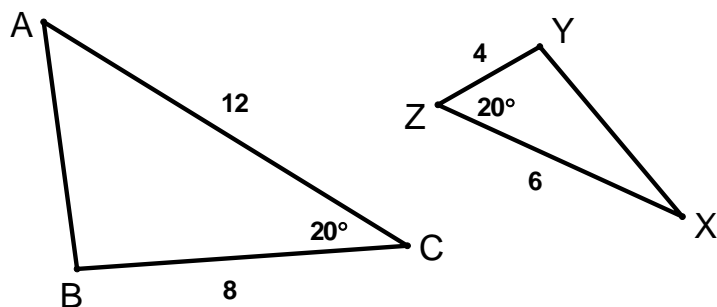
29. A square of side length 10 units is scaled by a factor of 4. The image is then scaled by a factor of $\frac{1}{5}$. Finally, the result is scaled by a factor of 3. What is the length of the sides of the final square?

- (A) $\frac{8}{3}$ units (B) 24 units (C) 57.6 units (D) $\frac{12}{5}$ units

30. Given the following triangle with \overline{DE} parallel to \overline{BC} , solve for x .

- (A) $x = 45/9$ (B) $x = 5$
 (C) $x = 15/4$ (D) $x = 9$



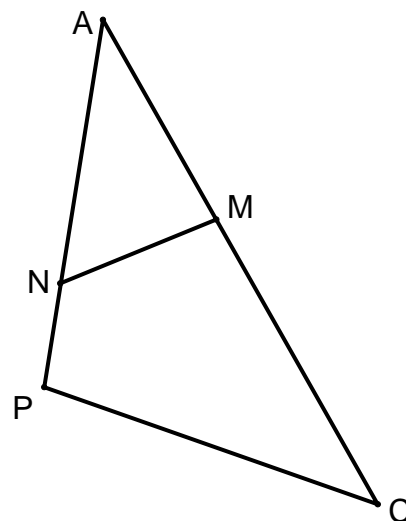


31. Which postulate guarantees that $\triangle ABC \sim \triangle XYZ$?

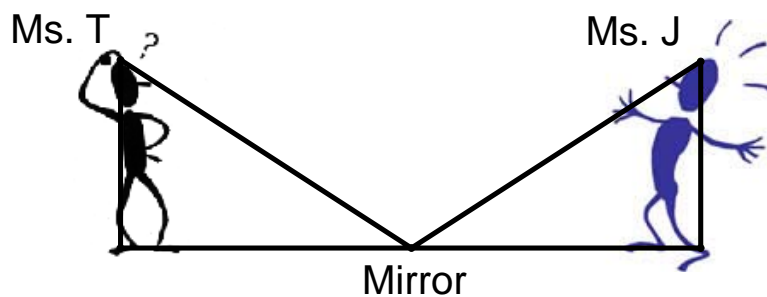
- (A) SSA (B) AA
 (C) SAS (D) Hypotenuse-leg

32. In the picture at right, $\triangle PAC \sim \triangle MAN$. Which one of the following statements is **correct**?

- (A) $\frac{MN}{CP} = \frac{AN}{AP}$ (B) $\frac{AM}{AC} = \frac{AN}{AP}$
 (C) $\frac{AP}{NM} = \frac{MC}{AM}$ (D) $\frac{AM}{AP} = \frac{MN}{PC}$



33. Ms. Tani is in trouble. She is trying to recreate the “magic” trick where she correctly guesses a person’s height, but she forgot how it works. She knows the height to her eyes is 68”, the distance from her to the mirror is 51”, and from the mirror to Ms. Jang is 48”. Being the kind, forgiving soul that you are, you whisper the correct answer to Ms. Tani, which is...



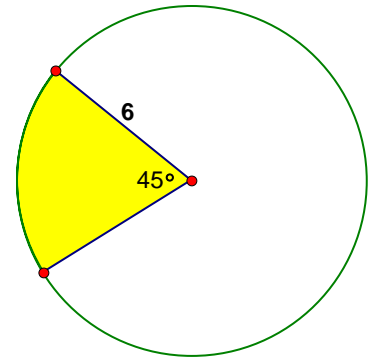
- (A) 72.25” (B) 36.00” (C) 64.00” (D) 66.50”

34. Which of the following polygons does **not** tessellate the plane?

- (A) Equilateral triangle (B) Square (C) Regular Pentagon (D) Regular Hexagon

35) Find the area of the shaded region at the right.

- (A) $\frac{9\pi}{2}$ (B) $\frac{3\pi}{2}$ (C) $\frac{9}{2\pi}$ (D) $\frac{3}{2\pi}$



36) If the ratio of **areas** of two similar figures is 5:6, then the ratio of their corresponding **sides** is

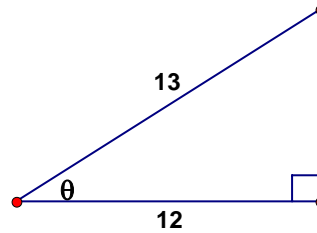
- (A) 25:36 (B) $\sqrt{5} : \sqrt{6}$ (C) 10 : 12 (D) 5 : 6

37) A regular polygon had an **area** of 15 in^2 . It was scaled by a factor of “r” and its new **area** is 1500 in^2 . Find the scale factor “r”

- (A) 10 (B) 100 (C) 1000 (D) 1/10

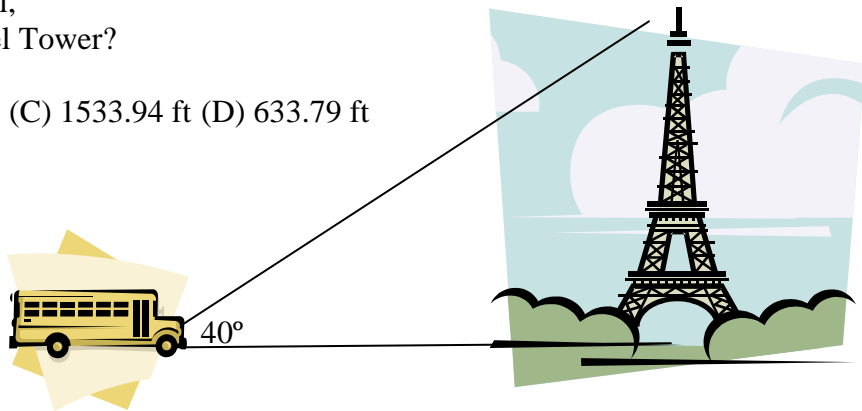
38) Using the figure at the right, find $\sin \theta$.

- (A) $\frac{12}{13}$ (B) $\frac{5}{12}$ (C) $\frac{5}{13}$ (D) 22.62°



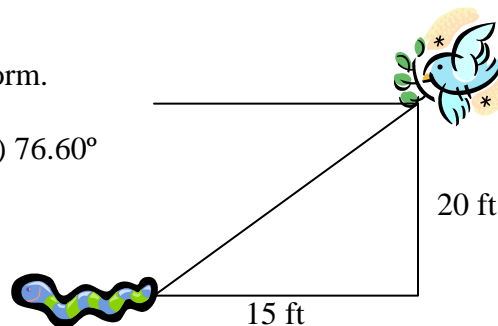
39) If the Eiffel Tower is 986 feet tall, how far is the bus from the Eiffel Tower?

- (A) 1175.07 ft (B) 827.35 ft (C) 1533.94 ft (D) 633.79 ft



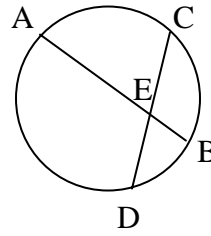
40) Find the angle of depression from the bird to the worm.

- (A) 36.87° (B) 90° (C) 53.13° (D) 76.60°



41) If $AE = 10$, $ED = 4$ and $EC = 6$, find the length of BE .

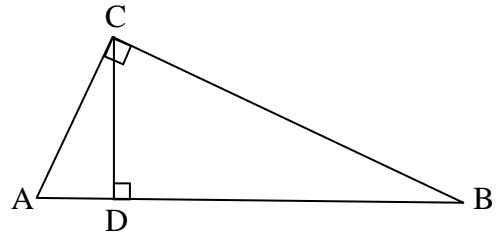
- (A) 10 (B) 24 (C) 2.4 (D) 15



For problems 42-43, refer to the figure at the right.

42) If $CD = 8$ and $AD = 2$, find the length of BD .

- (A) 16 (B) 32 (C) $2\sqrt{17}$ (D) 2



43) If $AD = 5$, $DB = 15$, find the length of AC .

- (A) 10 (B) $5\sqrt{3}$ (C) 100 (D) 75

44) Walk A. Thon walks 2 miles north, 20 miles east, 5 miles north and 4 miles east. Mare A. Thon needed to meet Walk for lunch. Mare A. Thon started at the same place but ran DIRECTLY (in a straight line) to meet Walk. How far did Mare. A. Thon run?

- (A) 26.50 (B) 31 (C) 25 (D) 25.50

45) The ratio of the surface areas of 2 spheres is 4:9. What is the ratio of the volumes?

- (A) 4:9 (B) 8:27 (C) 16:81 (D) 64: 729

Section II – Free Response

Instructions: Full credit will ONLY be given for answers with support (work, explanation, etc). NO partial credit will be given for incorrect, unsupported answers. Each problem is worth 10 points unless otherwise stated

1. In each case, find the coordinates of a point that is 10 units from the origin that ...

(A) is on the y-axis _____

(B) has an x-coordinate of $\sqrt{7}$ _____

2) Given $L(3, -4)$, $E(20, 13)$, $G(m, n)$ and $O(65, -117)$, and that vector \overrightarrow{LE} is equivalent to \overrightarrow{GO} ,

a. Find the exact coordinates of point G. (*Show all work.*)

b. Find the magnitude (length) of \overrightarrow{LE} . (*Show all work.*)

3. Find the coordinates of each point at right:

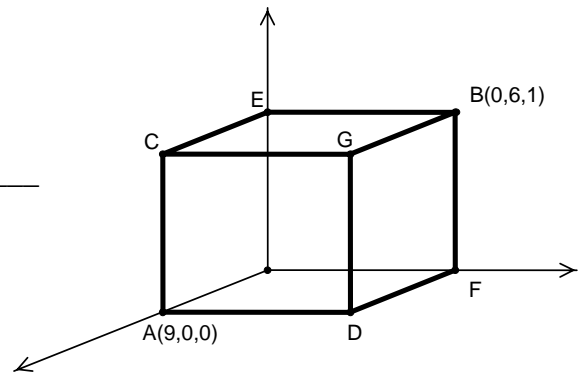
$C =$ _____

$D =$ _____

$E =$ _____

$F =$ _____

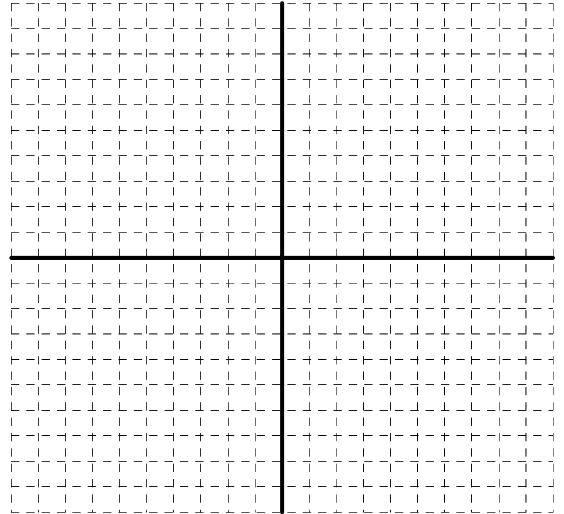
$G =$ _____



4. If $A = (4, -4)$ and $B = (5, 4)$, consider the quadrilateral whose vertices are O, A, B , and $(A + B)$. (Use the coordinate plane to the right to help you.)

(A) Find its perimeter, exactly.

(B) Find its area, exactly.



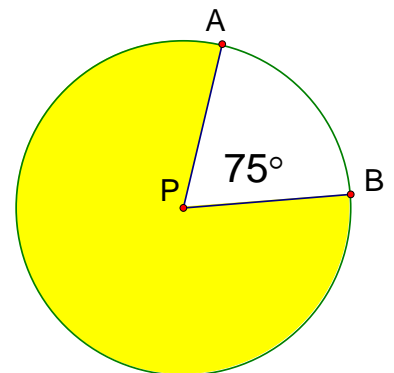
5. $A = (2, 5, 12)$, $B = (-10, -4, 5)$. Find

(A) the length of \overline{AB} (to the nearest hundredth)

(B) the midpoint of \overline{AB} .

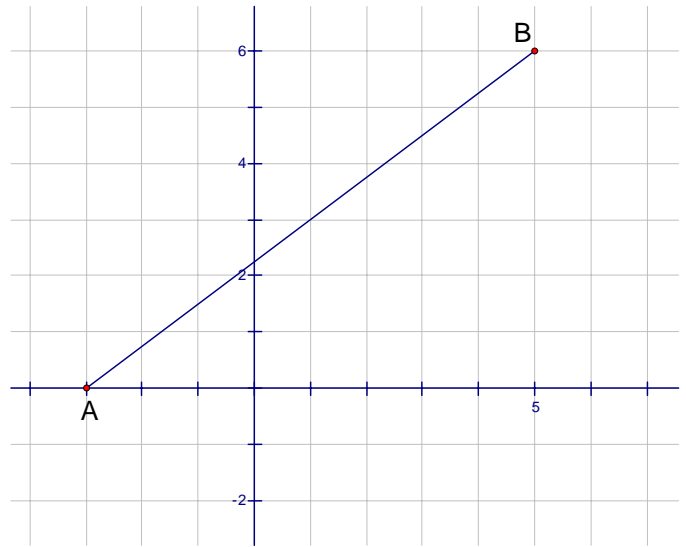
6. Use the circle to the right with **center P** and **radius AP = 10 cm**. Leave all answers as EXACT answers.

a) Find the AREA of the shaded region.

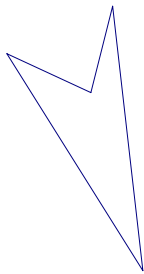


b) Find the ARC LENGTH of MINOR arc AB.

7. Using the diagram, find the acute angle formed by line segment \overline{AB} and the x-axis. Give your answer to the nearest tenth of a degree.



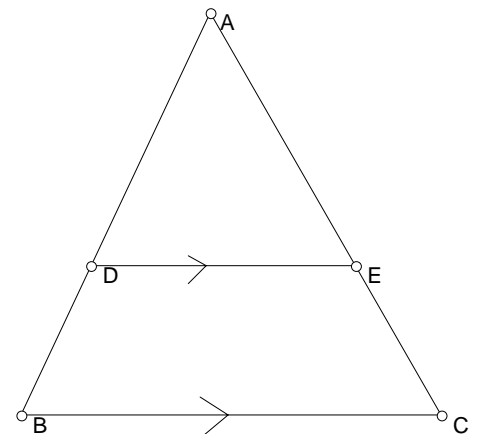
8. Dilate the figure below by a factor of 1.5 so that the resulting image is **to the right** of the original. Clearly mark your center of dilation.



9. In the given triangle, $\overline{DE} \parallel \overline{BC}$.

a) If $AD = 10$, $DB = 4$, and $EC = 6$. Find AC .

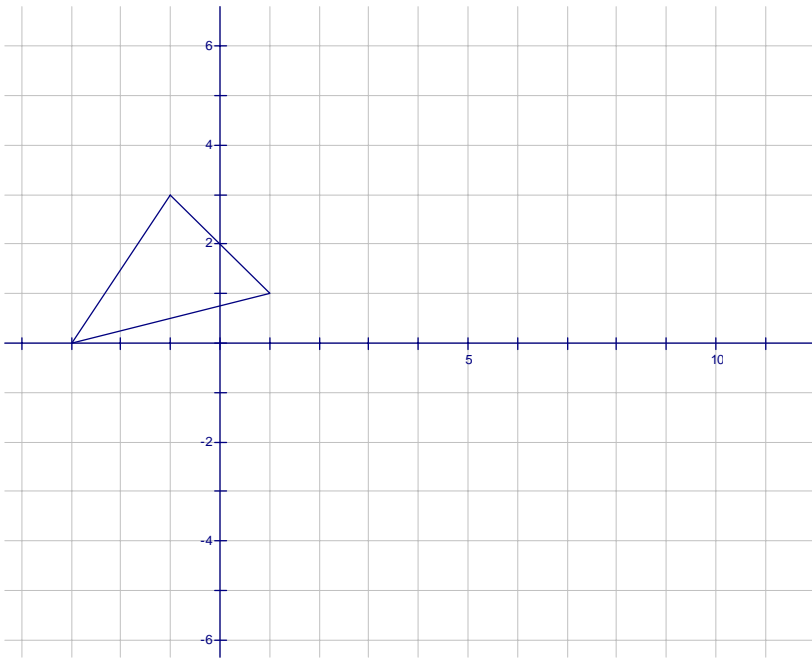
b. Using the same triangle, if $AD = 4$, $DB = x - 2$, $DE = x + 6$ and $BC = 4x$, find x .



10. You stand 20 feet from a window. In the window, a building that is 540 feet appears to be 2 feet tall. How many feet away from you is the building? First draw a diagram, then solve the problem. Answer in feet (there are 5280 feet in a mile).

11. Apply each rule to the shape below and GRAPH the result. Then DESCRIBE the transformation
For the verbal descriptions, be sure to

- use geometric terminology. (i.e. translation, dilation, reflection)
- specify the direction and amount of translation
- the dilation factor
- type of reflection.



a. $(x, y) \mapsto (x + 4, y - 3)$

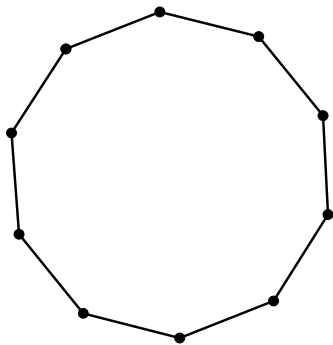
Description:

b. $(x, y) \mapsto (-2x, 2y)$

Description:

12. The regular decagon has perimeter 80.

a. Use trigonometry to find the apothem to the nearest 0.01.



b. Find the decagon's area. If you can't do part (a), you can use the variable A to stand for the length of the apothem in your answer.