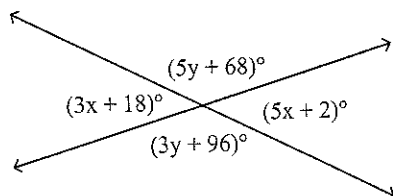


Geometry 2017 Final Exam Review. Your Final exam questions will come from this worksheet.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

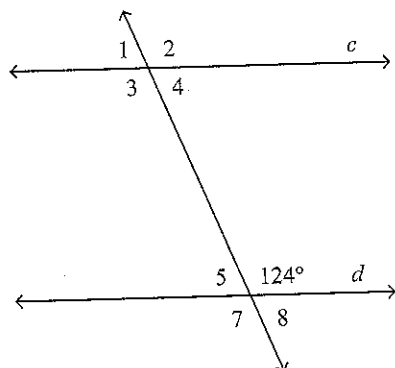
- _____ 1. Find the values of x and y .



- a. $x = 20, y = 2$
b. $x = 8, y = 14$

- c. $x = 20, y = 14$
d. $x = 8, y = 2$

- _____ 2. In the diagram, $c \parallel d$. Identify three numbered angles that have a measure of 124° .

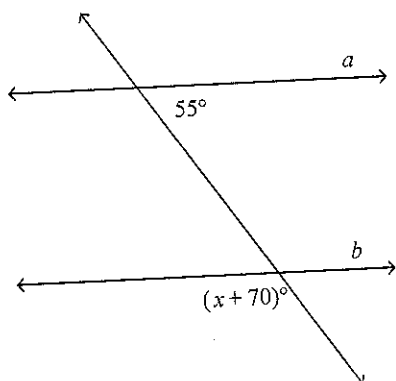


- a. $\angle 2, \angle 7$, and $\angle 1$
b. $\angle 2, \angle 4$, and $\angle 1$

- c. $\angle 3, \angle 7$, and $\angle 4$
d. $\angle 2, \angle 3$, and $\angle 7$

Name: _____

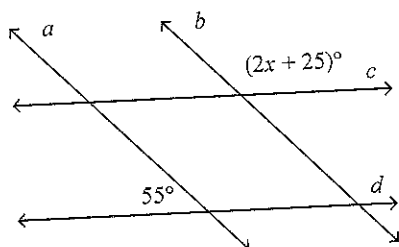
- _____ 3. In the diagram, $a \parallel b$. Find the value of x .



- a. 125
b. 55

- c. -15
d. 195

- _____ 4. Find the value of x that makes $a \parallel b$.

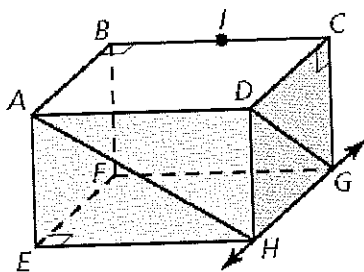


- a. 130
b. 50

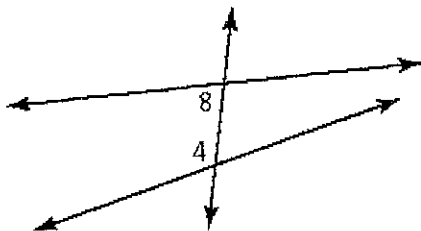
- c. 15
d. 55

Name: _____

In the diagram, think of each segment in the figure as part of a line.



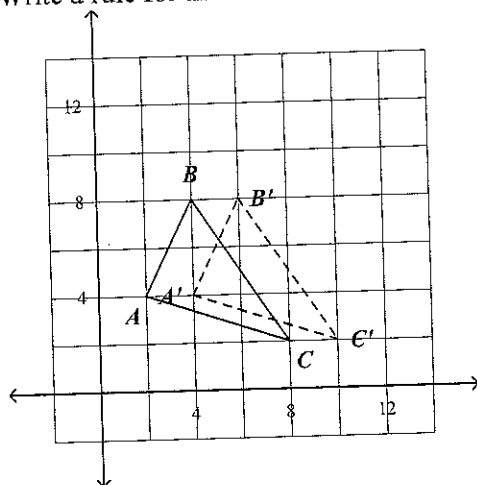
- _____ 5. Name the line(s) through point D that appear parallel to $\overleftrightarrow{HG}$.
- a. $\overleftrightarrow{DH}$ c. $\overleftrightarrow{DC}$ and $\overleftrightarrow{AD}$
 b. $\overleftrightarrow{DC}$ d. $\overleftrightarrow{DG}$
- _____ 6. Name the line through point D that appears perpendicular to $\overleftrightarrow{HG}$.
- a. $\overleftrightarrow{DG}$ c. $\overleftrightarrow{DH}$
 b. $\overleftrightarrow{DC}$ d. $\overleftrightarrow{AD}$
- _____ 7. Classify the pair of numbered angles.



- a. corresponding c. alternate interior
 b. alternate exterior d. consecutive interior

Name: _____

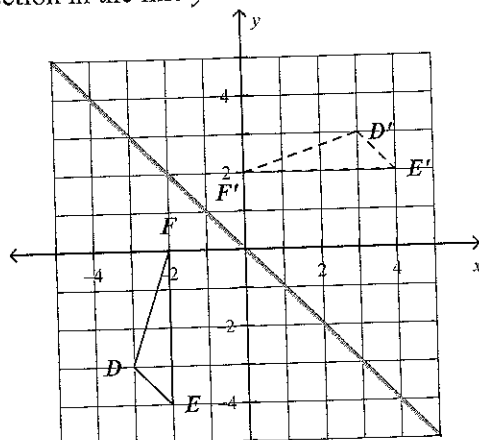
8. Write a rule for the translation of $\triangle ABC$ to $\triangle A'B'C'$.



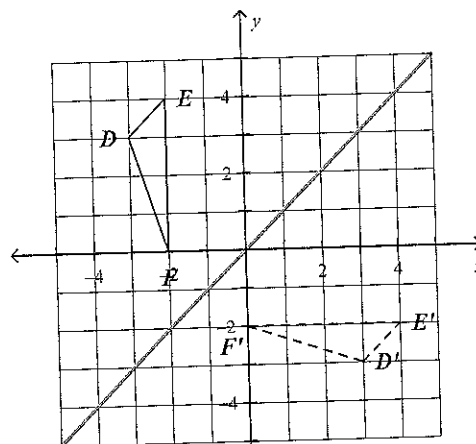
- a. $(x, y) \rightarrow (x-1, y-3)$ c. $(x, y) \rightarrow (x, y+2)$
 b. $(x, y) \rightarrow (x+2, y)$ d. $(x, y) \rightarrow (x+3, y+2)$

9. The vertices of $\triangle DEF$ are $D(-3, -3)$, $E(-2, -4)$, and $F(-2, 0)$. Graph $\triangle DEF$ and its image after the reflection in the line $y = -x$.

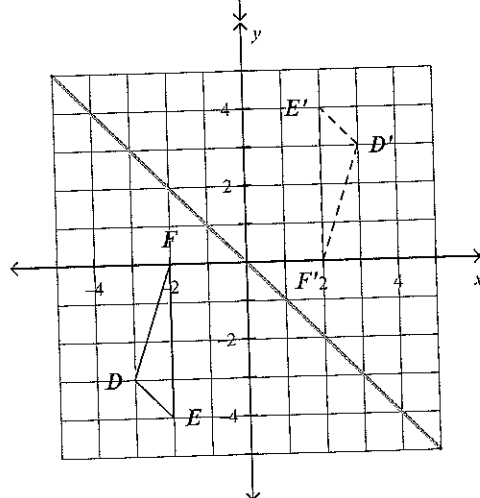
a.



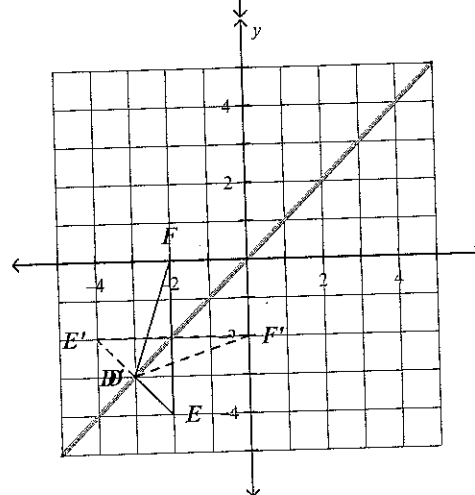
c.



b.

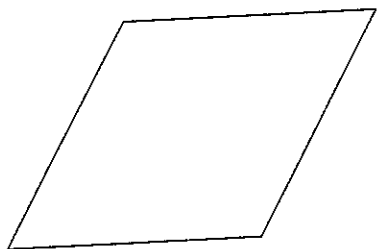


d.



Name: _____

_____ 10. How many lines of symmetry does the rhombus have?

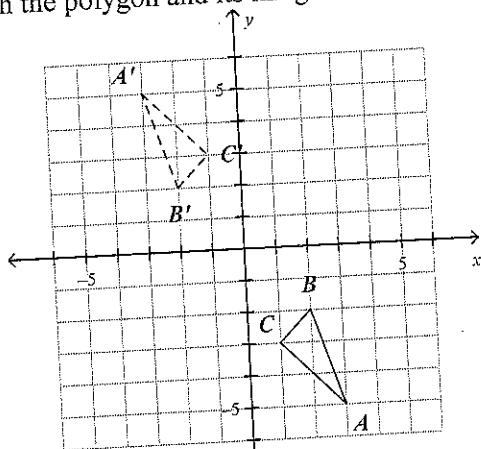


- a. 1
b. 4

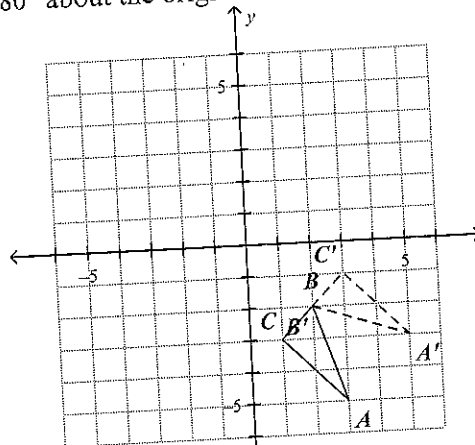
- c. 2
d. none

_____ 11. Graph the polygon and its image after a rotation of 180° about the origin.

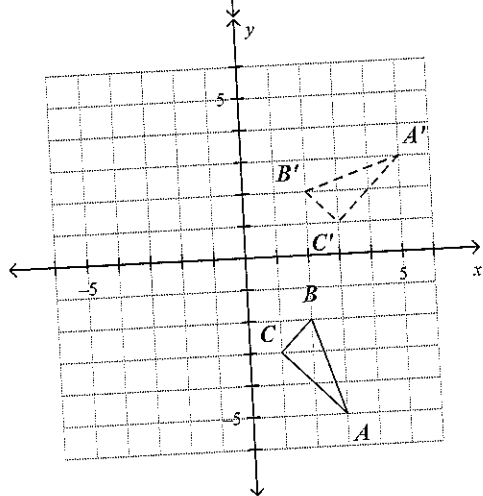
a.



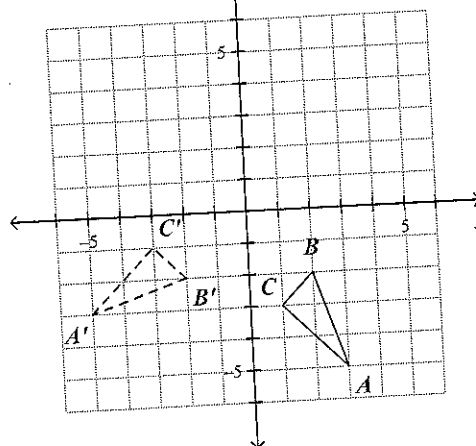
c.



b.

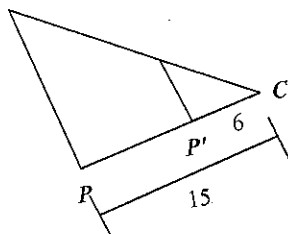


d.



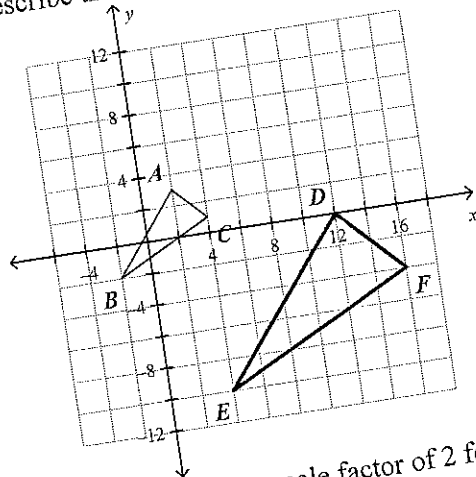
Name: _____

12. Find the scale factor of the dilation. Then tell whether the dilation is a *reduction* or an *enlargement*.



- a. $\frac{5}{2}$; enlargement
- b. $\frac{2}{3}$; reduction
- c. $\frac{2}{5}$; reduction
- d. $\frac{3}{2}$; enlargement

13. Describe the similarity transformation that maps $\triangle ABC$ to $\triangle DEF$ (dilations have a center at the origin).

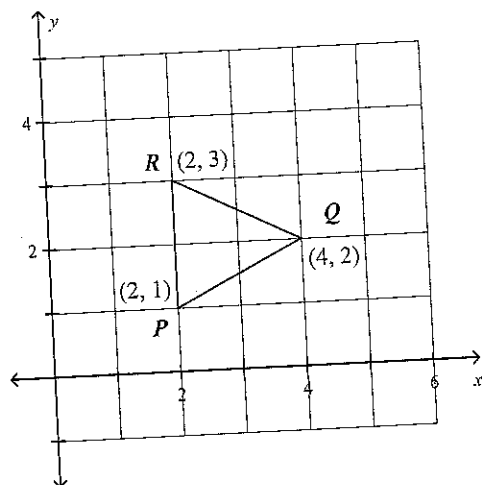


- a. dilation with a scale factor of 2 followed by a translation 4 units right and 3 units down
- b. dilation with a scale factor of $\frac{1}{2}$ followed by a translation 4 units left and 3 units up
- c. translation 4 units right and 3 units down followed by a dilation with a scale factor of 2
- d. translation 4 units left and 3 units up followed by a dilation with a scale factor of $\frac{1}{2}$

14. You want to enlarge a picture by a factor of 4 from its current size of 5 inches by 7 inches. What is the size of the enlarged picture?
- a. 9 in. by 11 in.
 - b. 9 in. by 28 in.
 - c. 20 in. by 28 in.
 - d. 20 in. by 11 in.

Name: _____

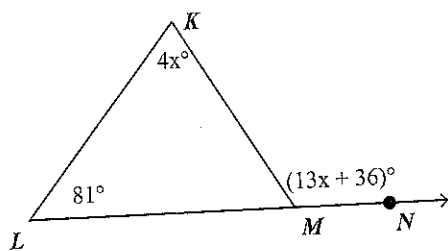
15. Classify $\triangle PQR$ by its sides. Then determine whether it is a right triangle.



- a. isosceles ; not right
b. isosceles ; right

- c. scalene ; not right
d. scalene ; right

16. Find $m\angle KMN$.



- a. 20°
b. 79°

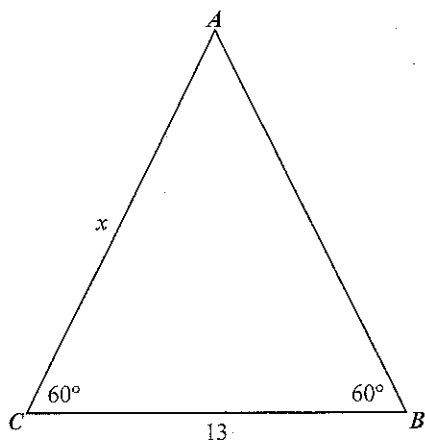
- c. 101°
d. 5°

17. In a right triangle, the measure of one acute angle is 2 times the sum of the measure of the other acute angle and 6. Find the measure of each acute angle.
- a. $20^\circ, 70^\circ$
b. $26^\circ, 64^\circ$
c. $34^\circ, 56^\circ$
d. $23^\circ, 57^\circ$

Name: _____

ID: A

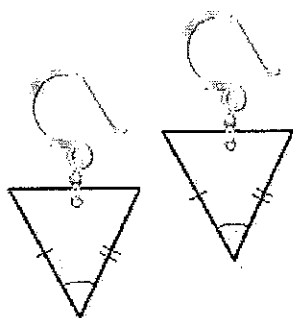
____ 18. Find the value of x .



- a. 13
- b. 60

- c. 26
- d. $13\sqrt{3}$

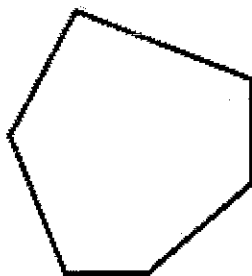
____ 19. Are the triangles congruent by the ASA Congruence Theorem?



- a. yes

- b. no

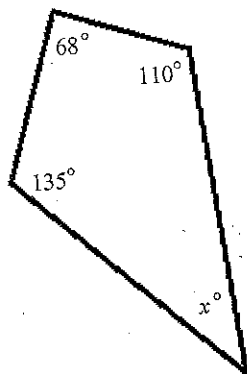
____ 20. Find the sum of the measures of the interior angles of the given figure.



- a. 900°
- b. 1440°

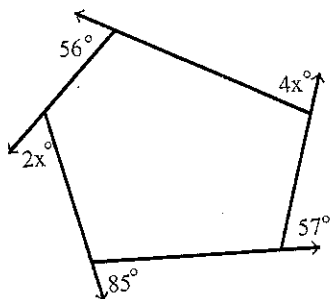
- c. 720°
- d. 1080°

Name: _____

21. Find the value of x .

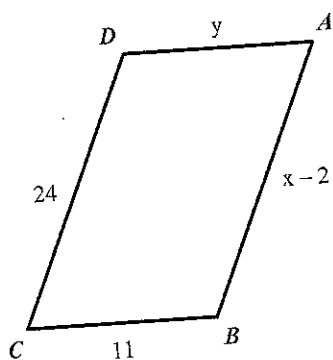
- a. 47
- b. 110

- c. 68
- d. 112

22. Find the value of x .

- a. 3
- b. 27

- c. 57
- d. 81

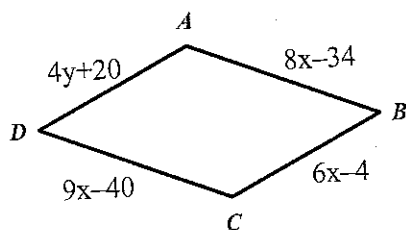
23. Find the values of x and y in the parallelogram.

- a. $x = 13, y = 24$
- b. $x = 24, y = 13$

- c. $x = 26, y = 11$
- d. $x = 11, y = 26$

Name: _____

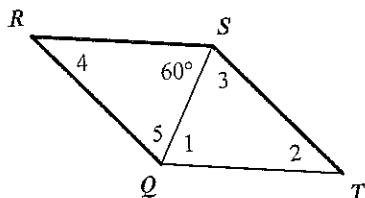
24. For what values of x and y is quadrilateral $ABCD$ a parallelogram?



- a. $x = 12, y = 3$
 b. $x = 6, y = 12$
 c. $x = 6, y = 3$
 d. $x = 74, y = 105$

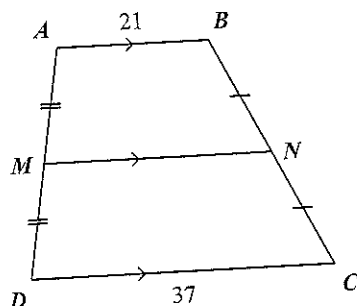
Find the measures of the numbered angles in rhombus $QRST$.

25.



- a. $m\angle 1 = 60^\circ, m\angle 2 = 120^\circ, m\angle 3 = 60^\circ, m\angle 4 = 120^\circ, m\angle 5 = 60^\circ$
 b. $m\angle 1 = 60^\circ, m\angle 2 = 60^\circ, m\angle 3 = 60^\circ, m\angle 4 = 60^\circ, m\angle 5 = 60^\circ$
 c. $m\angle 1 = 30^\circ, m\angle 2 = 90^\circ, m\angle 3 = 30^\circ, m\angle 4 = 90^\circ, m\angle 5 = 30^\circ$
 d. $m\angle 1 = 30^\circ, m\angle 2 = 60^\circ, m\angle 3 = 30^\circ, m\angle 4 = 60^\circ, m\angle 5 = 30^\circ$

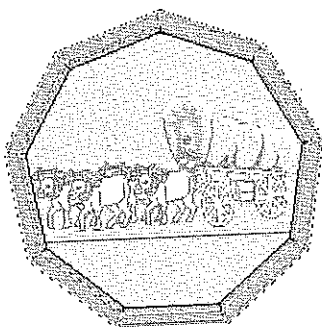
26. Find the length of the midsegment of the trapezoid.



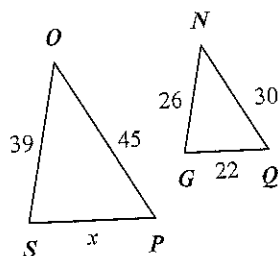
- a. 29
 b. 47.5
 c. 8
 d. 39.5

Name: _____

27. The badge shown is shaped like a regular nonagon. Find the measure of each interior angle of the badge. Then find the measure of each exterior angle.

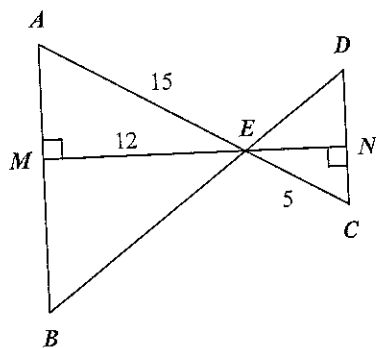


- a. interior: 40° ; exterior: 140°
 b. interior: 140° ; exterior: 40°
 c. interior: 160° ; exterior: 20°
 d. interior: 20° ; exterior: 160°
28. In the diagram, $\triangle SOP \sim \triangle GNQ$. Find the value of x .



- a. 35
 b. 22
 c. 37
 d. 33

29. $\triangle ABE \sim \triangle CDE$. Find the length of altitude $\overline{NE}$.

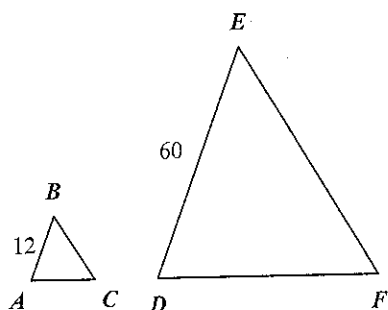


- a. 4
 b. 2
 c. 22
 d. 6

Name: _____

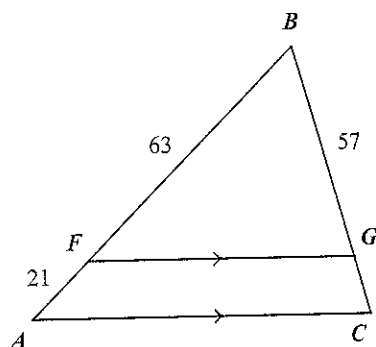
ID: A

- _____ 30. A rectangular yard is fenced in using 319 feet of custom fence. Your friends really like the fence and decide to fence in their yard using the same fence. Their yard is similar but has a scale factor of $\frac{8}{5}$ times the size of yours, how much fence, to the nearest foot, will they have to purchase?
- a. about 321 feet c. about 510 feet
b. about 542 feet d. about 199 feet
- _____ 31. $\triangle ABC \sim \triangle DEF$. The area of $\triangle DEF$ is given. Find the area of $\triangle ABC$.



A = 1200 sq in.

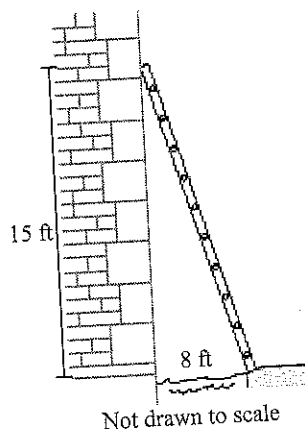
- a. 1152 in.² c. 240 in.²
b. 48 in.² d. 25 in.²
- _____ 32. Two trees are growing in a clearing. The first tree is 17 feet tall and casts a 10 foot shadow. The second tree casts a 35 foot shadow. How tall is the second tree to the nearest tenth of a foot?
- a. about 72.1 ft c. about 4.9 ft
b. 42 ft d. 59.5 ft
- _____ 33. What is the length of $\overline{CG}$?



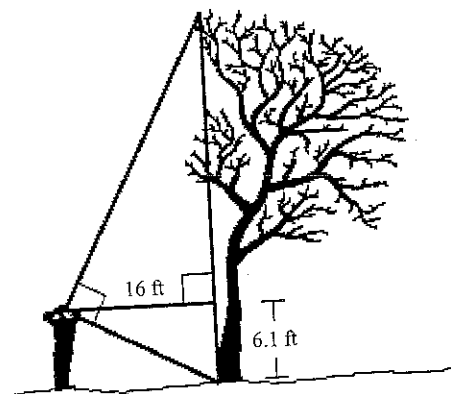
- a. 15 c. 57
b. 19 d. 21

Name: _____

34. A castle guard is standing on the opposite side of an 8-foot moat and wants to reach a window that is 15 feet above the ground. The guard props a ladder against the castle wall to form a right triangle as shown. Approximate the length of the ladder needed to reach the window to the nearest tenth of a foot.



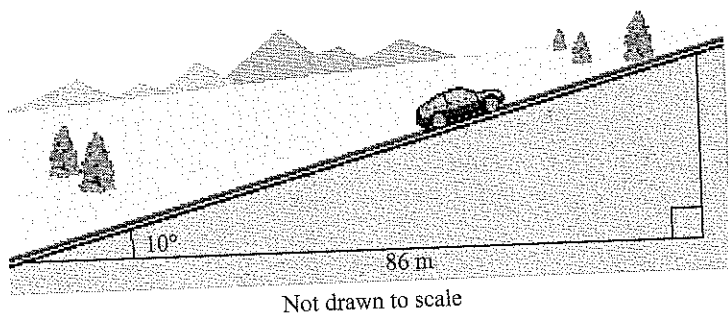
- a. 17.0 ft
b. 23.0 ft
c. 289.0 ft
d. about 12.7 ft
35. Determine whether segments with lengths of 29, 19, and 29 form a triangle. If so, classify the triangle as *acute*, *right*, or *obtuse*.
- a. not a triangle
b. obtuse triangle
c. acute triangle
d. right triangle
36. To cut down a dead tree so that it does not land on your house, you first need to find its height. You use a metal square to line up the top and bottom of the tree. The vertical distance from the ground to your eye is 6.1 feet, and the distance from you to the tree is 16 feet. Approximate the height (in feet) of the tree. Round your answer to the nearest tenth.



- a. about 48.1 ft
b. about 97.6 ft
c. about 17.1 ft
d. about 42.0 ft

Name: _____

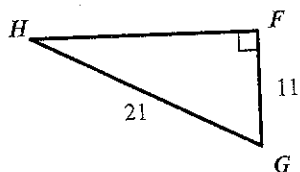
37. A car is traveling along a road that makes a 10° angle with the ground. Find the elevation of the car on a stretch of road that extends horizontally 86 meters. Round your answer to the nearest tenth.



- a. about 15.2 m
b. about 487.7 m
c. about 55.8 m
d. about 132.6 m

Solve the triangle. Round decimal answers to the nearest tenth.

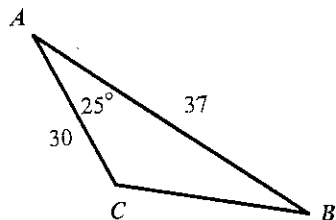
38.



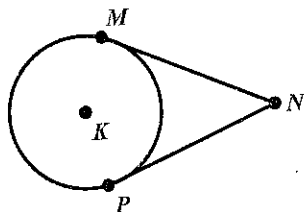
- a. $FH \approx 17.9$, $m\angle H \approx 31.6^\circ$, $m\angle G \approx 58.4^\circ$
b. $FH \approx 23.7$, $m\angle H \approx 65.1^\circ$, $m\angle G \approx 24.9^\circ$
c. $FH \approx 17.9$, $m\angle H \approx 58.4^\circ$, $m\angle G \approx 31.6^\circ$
d. $FH \approx 23.7$, $m\angle H \approx 24.9^\circ$, $m\angle G \approx 65.1^\circ$

Name: _____

39. Find the area of the triangle. Round your answer to the nearest tenth.

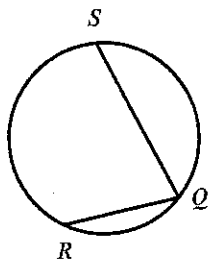


- a. about 503.0 units²
 b. about 234.6 units²
 c. about 258.8 units²
 d. about 555.0 units²
40. In the diagram, $\overline{MN}$ is tangent to $\odot K$ at M , $\overline{NP}$ is tangent to $\odot K$ at P , $MN = 128$, and $NP = 2x + 70$. Find the value of x .



- a. $x = 29$
 b. $x = 99$
 c. $x = -9$
 d. $x = 38$

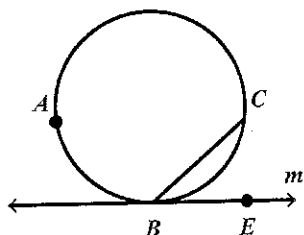
41. In the diagram, $m\angle Q = 75^\circ$ and $m\widehat{QS} = 133^\circ$. Find $m\widehat{QR}$.



- a. $m\widehat{QR} = 77^\circ$
 b. $m\widehat{QR} = 150^\circ$
 c. $m\widehat{QR} = 47^\circ$
 d. $m\widehat{QR} = 152^\circ$

Name: _____

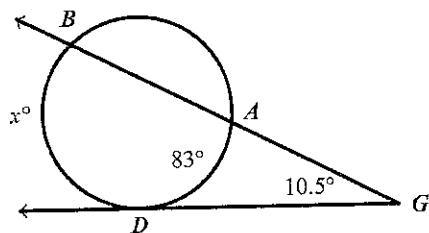
- _____ 42. In the diagram, line m is tangent to the circle and $m\widehat{CAB} = 278^\circ$. Find $m\angle CBE$.



- a. $m\angle CBE = 41^\circ$
 b. $m\angle CBE = 278^\circ$
 c. $m\angle CBE = 139^\circ$
 d. $m\angle CBE = 164^\circ$

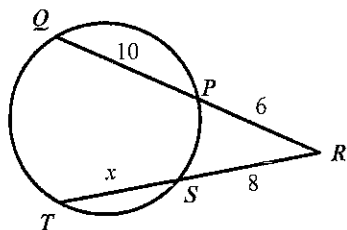
Find the value of x .

- _____ 43.



- a. $x = 104$
 b. $x = 93.5$
 c. $x = 72.5$
 d. $x = 166$

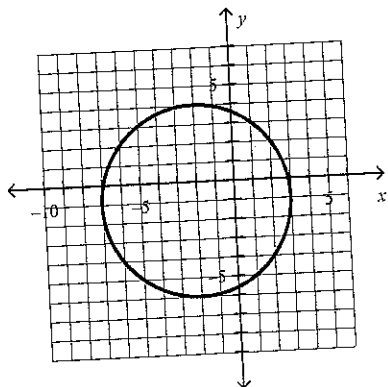
- _____ 44. Find the value of x .



- a. $x = 4$
 b. $x = 7.5$
 c. $x = 8$
 d. $x = 13.3$

Name: _____

- _____ 45. Write the standard equation of the circle shown below.



a. $(x+2)^2 + (y+1)^2 = 25$

b. $(x-2)^2 + (y-1)^2 = 25$

c. $(x+2)^2 + (y+1)^2 = 5$

d. $(x+1)^2 + (y+2)^2 = 25$

- _____ 46. Write the standard equation of the circle with center $(6, -1)$ and radius 7.4.

a. $(x-6)^2 + (y+1)^2 = 54.76$

b. $(x+6)^2 + (y-1)^2 = 54.76$

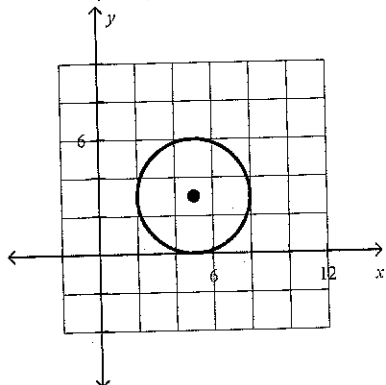
c. $(x-6)^2 + (y+1)^2 = 7.4$

d. $(x+1)^2 + (y-6)^2 = 54.76$

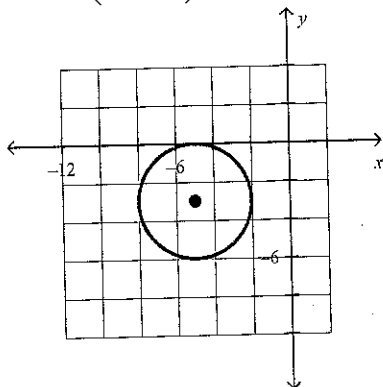
Name: _____

47. The equation of a circle is $x^2 + y^2 - 10x - 6y + 25 = 0$. Find the center and the radius of the circle. Then graph the circle.

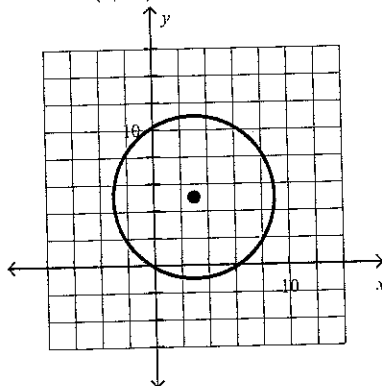
a. center: $(5, 3)$, radius: 3



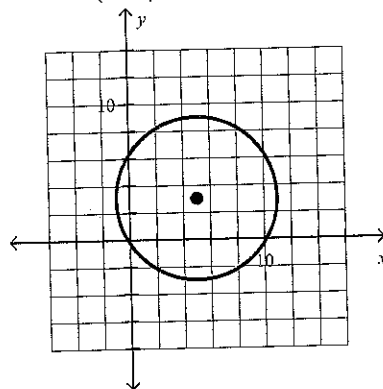
b. center: $(-5, -3)$, radius: 3



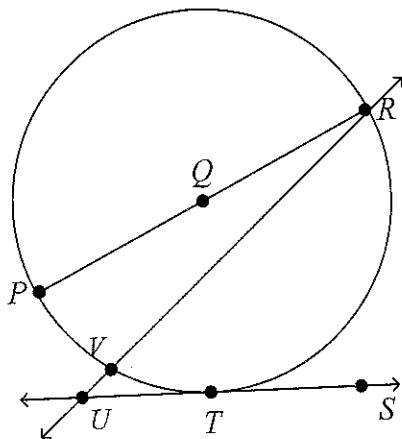
c. center: $(3, 5)$, radius: 6



d. center: $(5, 3)$, radius: 6



Name: _____

Use the diagram of circle Q to answer the question.

____ 48. What word best describes $\overline{PR}$?

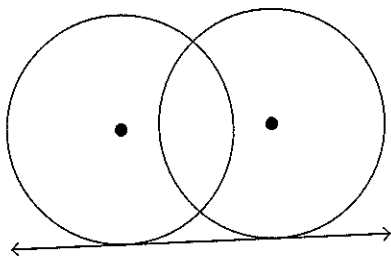
- a. radius
- b. chord
- c. diameter
- d. secant
- e. tangent

____ 49. What word best describes $\overline{PQ}$?

- a. radius
- b. chord
- c. diameter
- d. secant
- e. tangent

Tell whether the common tangent is *internal* or *external*.

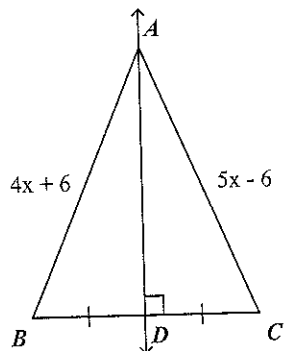
____ 50.



a. internal

b. external

Name: _____

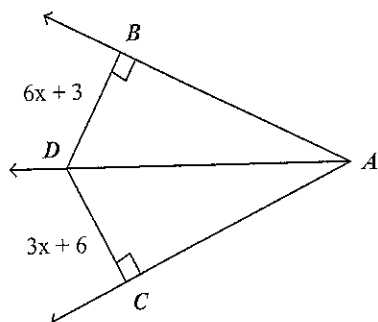
____ 51. Find AB .

a. $AB = 20$

b. $AB = 10$

c. $AB = 54$

d. $AB = 12$

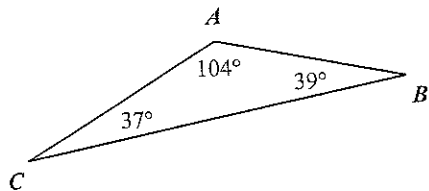
____ 52. In the diagram, $\overrightarrow{AD}$ bisects $\angle BAC$. Find BD .

a. $BD = 12$

b. $BD = 1$

c. $BD = 9$

d. $BD = 18$

____ 53. List the sides of $\triangle ABC$ from shortest to longest.

a. $\overline{AB}, \overline{CB}, \overline{AC}$

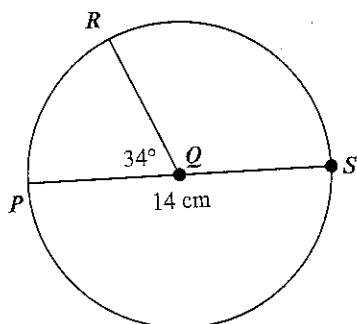
b. $\overline{AB}, \overline{AC}, \overline{CB}$

c. $\overline{CB}, \overline{AB}, \overline{AC}$

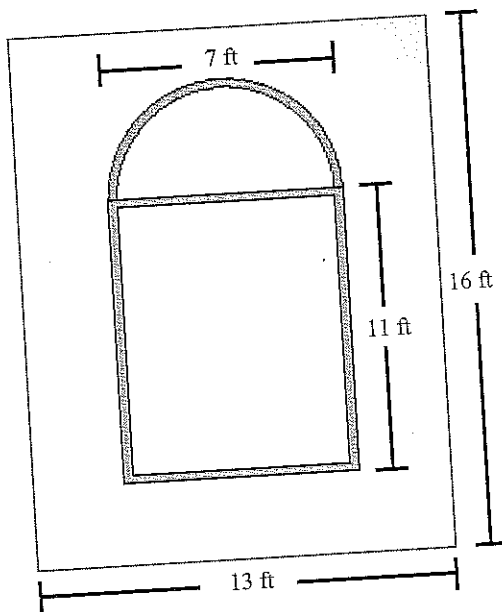
d. $\overline{CB}, \overline{AC}, \overline{AB}$

Name: _____

54. The diameter of $\odot Q$ is 14 centimeters. Find the arc length of $\widehat{PR}$.



- a. about 476.00 cm
b. about 148.24 cm
c. about 4.15 cm
d. about 8.31 cm
55. Wallpaper is to be applied to the wall surrounding a Norman window (a shape made by placing a semicircle on top of a rectangle). How many square feet of wallpaper are required to cover the wall surrounding the window?

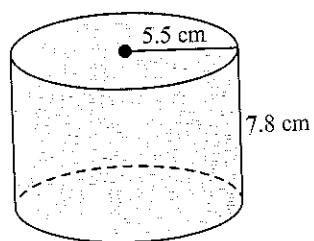


- a. about 131.00 ft²
b. about 96.24 ft²
c. about 111.76 ft²
d. about 147.52 ft²

Name: _____

Find the volume of the cylinder.

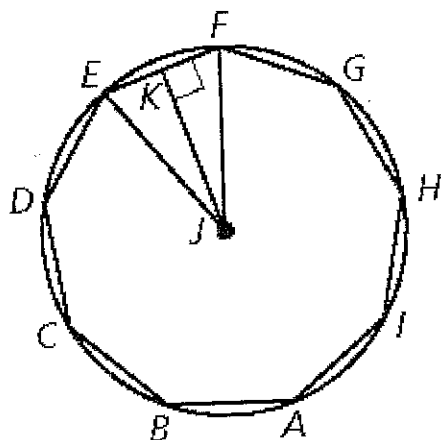
____ 56.



- a. about 134.77 cm^3
 b. about 269.55 cm^3

- c. about 1482.52 cm^3
 d. about 741.26 cm^3

____ 57. In the diagram, $ABCDEFGHI$ is a regular nonagon inscribed in $\odot J$. Find $m\angle EJK$.



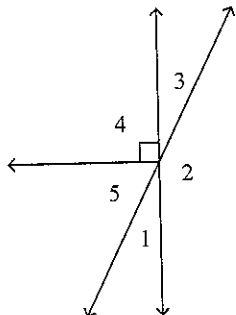
- a. 20°
 b. 70°

- c. 18°
 d. 72°

Name: _____

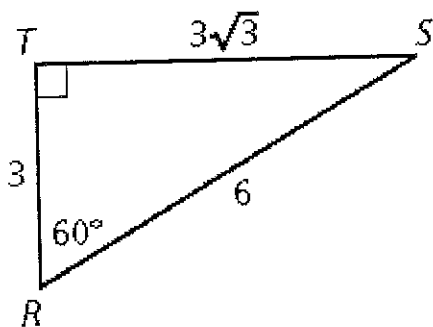
Multiple Response*Identify one or more choices that best complete the statement or answer the question.*

- _____ 1. In the diagram, $m\angle 1 = (2x + 4)^\circ$ and $m\angle 5 = (4x + 20)^\circ$. Which angle measures are possible?



- a. 178°
 b. 2°
 c. 26°
 d. 64°

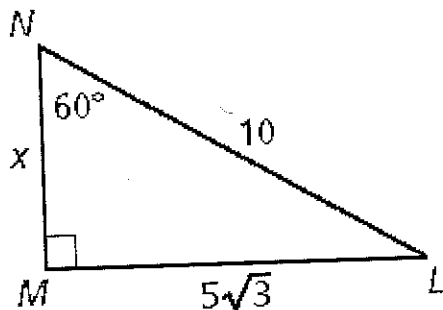
- _____ 2. Which ratios are equal to $\frac{\sqrt{3}}{2}$?



- a. $\tan R$
 b. $\cos S$
 c. $\tan S$
 d. $\sin R$

Name: _____

3. Which equations can you use to find MN ?



a. $\sin N = \frac{x}{10}$

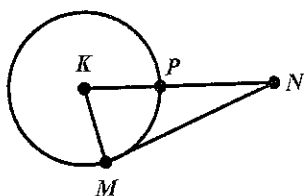
b. $\cos N = \frac{x}{10}$

c. $\tan L = \frac{x}{5\sqrt{3}}$

d. $\tan N = \frac{x}{5\sqrt{3}}$

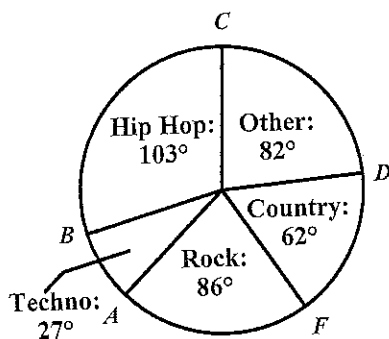
Numeric Response

1. In the diagram, point M is a point of tangency, $NM = 336$, and $NP = 294$. What is the radius of $\odot K$?



2. In a recent survey at school, students were asked to choose their favorite type of music. The circle graph shows the results. What percent of students chose Techno or Other? Round to the nearest percent.

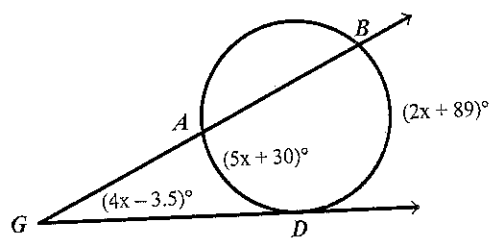
What is Your Favorite Music Type?



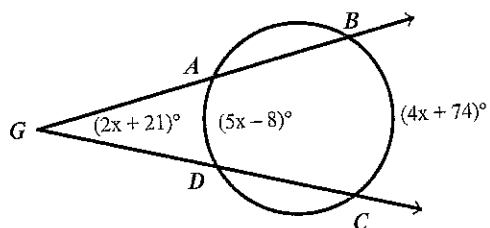
Name: _____

Find the value of x .

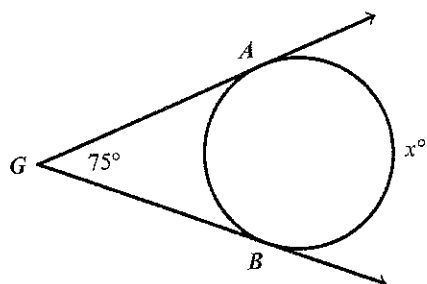
3.



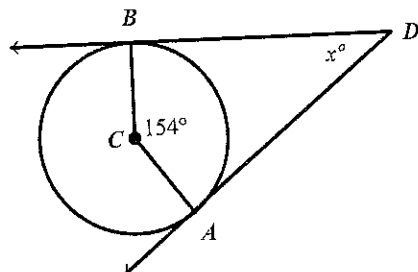
4.



5.

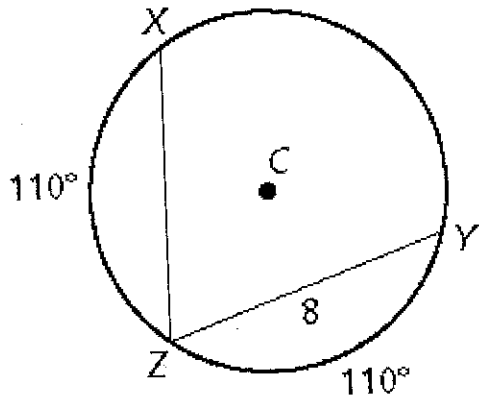


6.

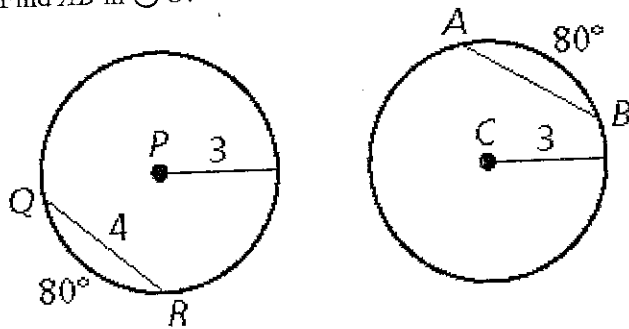


Name: _____

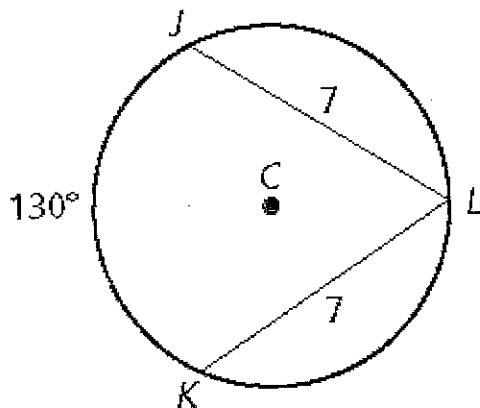
7. Find
- XZ
- in
- $\odot C$
- .



8. Find
- AB
- in
- $\odot C$
- .



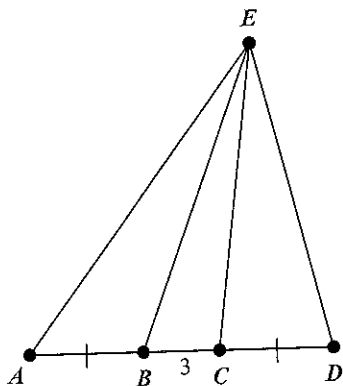
9. Find
- $m\widehat{KL}$
- (in degrees) in
- $\odot C$
- .



Name: _____

Matching

In the diagram, $AB = CD$, $BC = 3$, $AC = -7x - 14$, and $BD = -5x + 6$. Match the numbered equation or reason below with its corresponding letter (a - g) to show that $AB = 53$.



Equation	Reason
1. $AB = CD$, $AC = -7x - 14$, $BD = -5x + 6$, $BC = 3$	1. Given
2.	2. Addition Property of Equality
3. $AB + BC = AC$	3.
4. $CD + BC = BD$	4. Segment Addition Postulate
5. $AC = BD$	5.
6.	6. Substitution Property of Equality
7. $-2x - 14 = 6$	7. Addition Property of Equality
8. $-2x = 20$	8. Addition Property of Equality
9. $x = -10$	9.
10.	10. Substitution Property of Equality
11. $AB + 3 = 56$	11. Simplify
12. $AB = 53$	12. Subtraction Property of Equality

- a. $-7x - 14 = -5x + 6$
 b. Division Property of Equality
 c. Addition Property of Equality
 d. Segment Addition Postulate

- e. $AB + BC = CD + BC$
 f. Substitution Property of Equality
 g. $AB + 3 = -7(-10) - 14$

- ____ 1. Equation 2
 ____ 2. Reason 3
 ____ 3. Reason 5
 ____ 4. Equation 6
 ____ 5. Reason 9

Name: _____

_____ 6. Equation 10

Match the coordinates of $\overline{A'B'}$ to the transformation applied to $\overline{AB}$ so that $\overline{AB} \cong \overline{A'B'}$ given that $A(-5, 1)$ and $B(-5, 3)$.

a. $A'(5, 1), B'(5, 3)$

d. $A'(5, -1), B'(5, -3)$

b. $A'(-1, 3), B'(-1, 5)$

e. $A'(-1, -5), B'(-3, -5)$

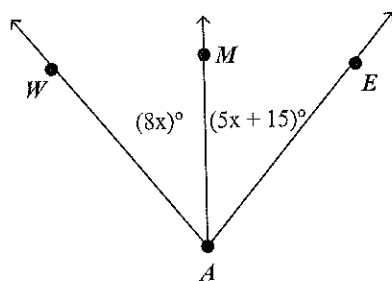
c. $A'(-5, 9), B'(-5, 11)$

f. $A'(-1, 5), B'(-3, 5)$

_____ 7. reflection over the y-axis

Short Answer

1. Three planes head out on a search-and-rescue mission. Plane M flies due north, plane E veers to the east at an angle of $(5x + 15)^\circ$, and plane W veers to the west at an angle of $(8x)^\circ$. Plane M bisects the angle formed by the other two planes. Find the value of x . Then write a two-column proof to support your answer.



2. Graph $\triangle JKL$ with vertices $J(1, 1)$, $K(3, 5)$ and $L(5, 3)$ and its image after the composition.

Translation: $(x, y) \rightarrow (x + 5, y - 2)$

Translation: $(x, y) \rightarrow (x - 1, y + 2)$

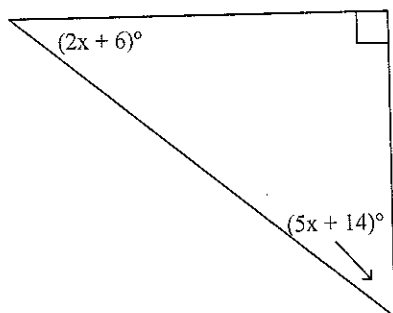
3. Graph $\triangle ABC$ with vertices $A(-2, 3)$, $B(0, -4)$, and $C(2, 0)$ and its image after the similarity transformation.

Translation: $(x, y) \rightarrow (x + 3, y - 2)$

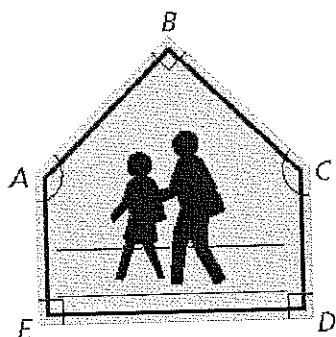
Dilation: $(x, y) \rightarrow (1.5x, 1.5y)$

Name: _____

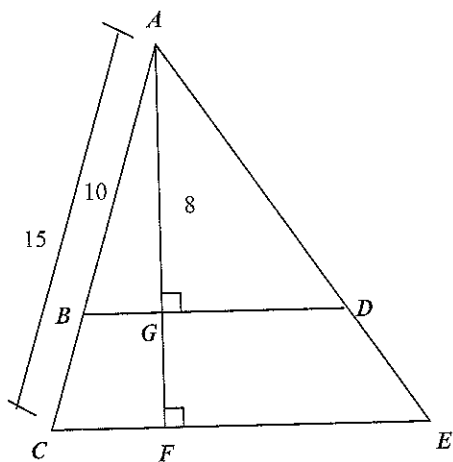
4. Find the measure of each acute angle.



5. A school crossing sign is shown. Find the measures of $\angle A$ and $\angle C$.



6. $\triangle ACE \sim \triangle ABD$ with side lengths as labeled and $BD = 18$, perimeter of $\triangle ACE = 63.6$

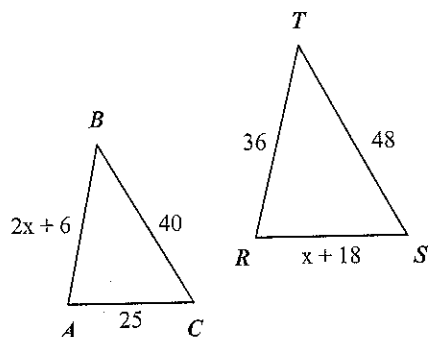


- Find AF .
- Find the perimeter of $\triangle ABD$.
- Find the area of $\triangle ACE$.

Name: _____

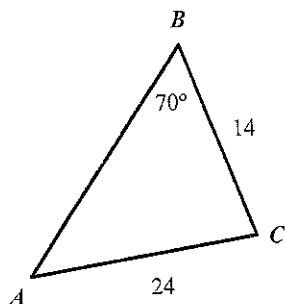
ID: A

7. Find the value of x that makes $\triangle ABC \sim \triangle RTS$.

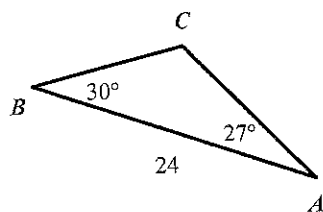


Solve the triangle. Round decimal answers to the nearest tenth.

8.

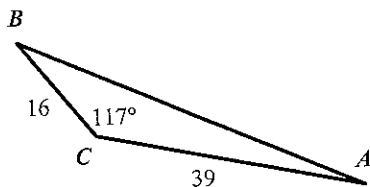


9.

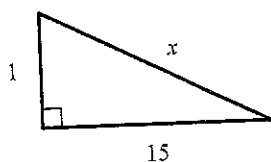


Name: _____

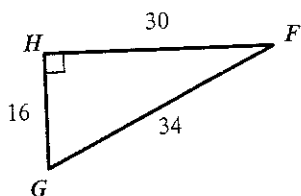
10.



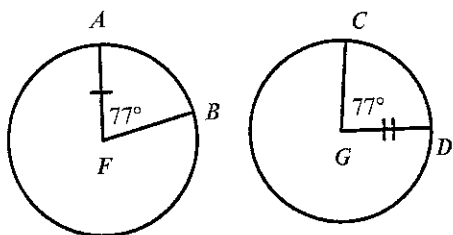
11. Find the value of x . Then tell whether the side lengths form a Pythagorean triple.



12. Find $\sin G$, $\cos G$, $\sin F$, and $\cos F$. Write each answer as a fraction and as a decimal rounded to four places.



13. Tell whether $\widehat{AB} \cong \widehat{CD}$. Explain why or why not.

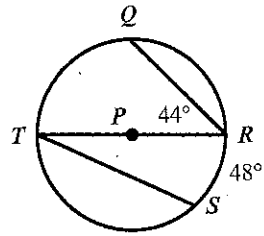


Name: _____

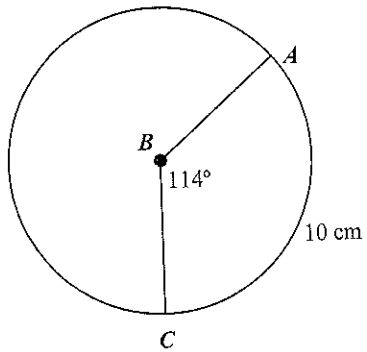
14. Find the indicated measure.

a. $m\angle T$

b. $m\widehat{QR}$

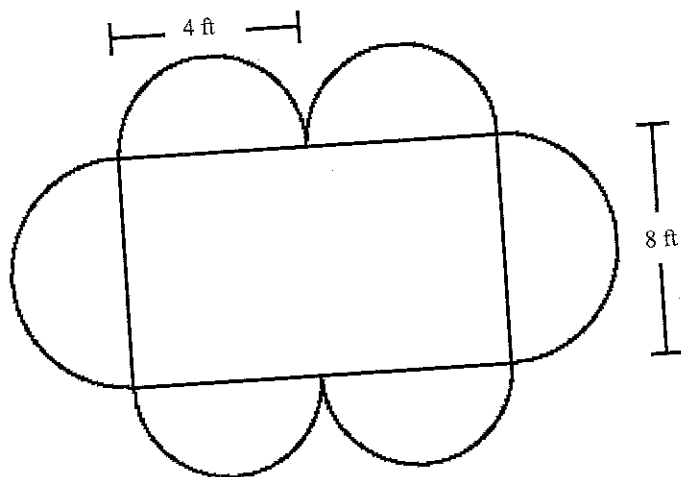


15. The
- $m\widehat{AC}$
- is 10 centimeters. Find the circumference of
- $\odot B$
- .



Name: _____

16. A billboard shaped like the following figure needs to be painted.

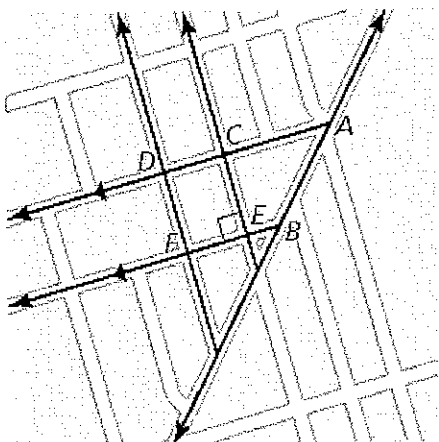


- What is the total area that needs painting?
 - Purple paint costs \$10 per gallon, and yellow paint costs \$14 per gallon. Assuming the semi-circles are to be one color and the rectangle is to be another, what color should each be painted in order to minimize the cost of painting the billboard?
 - Painter 1 can paint 16 square feet every 8 minutes. Painter 2 can paint 11 square feet every 4 minutes. If painter 1 paints the semi-circles and painter 2 paints the rectangle, who will finish first?
17. A farmer needs to build a pen shaped like a rectangular prism. The walls of the pen are to be 5 feet tall and the pen must be able to hold a volume of 360 cubic feet.
- What should the area of the base be to meet these criteria?
 - What possible dimensions could the base be to have this area?

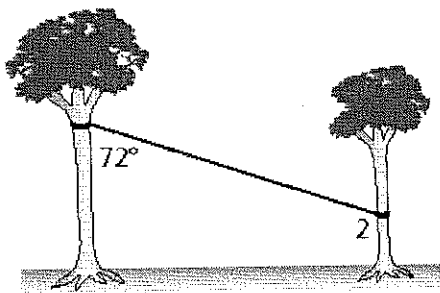
Other

The given line markings show how the roads in a town are related to one another.

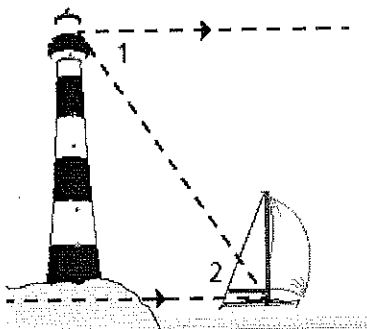
1. Name a pair of parallel lines.



2. A rope for zip lining is tied between two parallel trees. The rope is taut, forming a straight line. What is $m\angle 2$? How do you know?

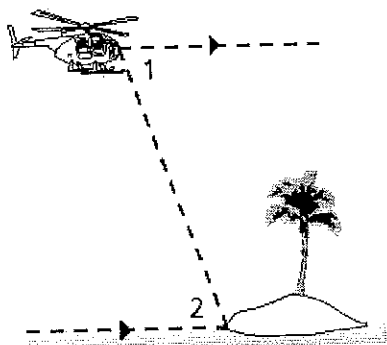


3. A sailor sees a lighthouse at a 55° angle of elevation from the horizontal. In the diagram, $m\angle 2 = 55^\circ$. What is $m\angle 1$? How do you know?

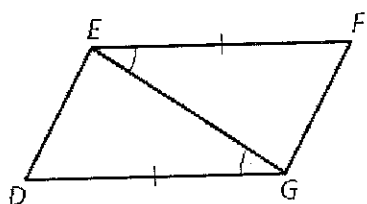


Name: _____

4. A helicopter pilot sees an island at a 70° angle of depression from the horizontal. In the diagram, $m\angle 1 = 70^\circ$. What is $m\angle 2$? How do you know?

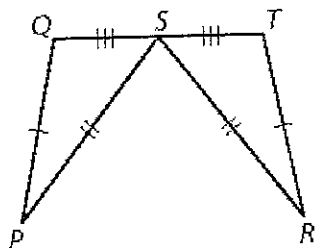


5. Use the information in the diagram to prove that $\triangle DEG \cong \triangle FGE$.



Write a proof.

6. Given $\overline{PQ} \cong \overline{RT}$, $\overline{PS} \cong \overline{RS}$, $\overline{QS} \cong \overline{TS}$
Prove $\triangle PQS \cong \triangle RTS$



7. $\triangle ABC$ is a right triangle with $m\angle C = 90^\circ$. $\triangle ABC$ is inscribed in $\odot P$. $PA = 6$ centimeters and $m\widehat{BC} = 138^\circ$.
- Draw a diagram of this scenario.
 - Find the diameter of $\odot P$.
 - Find AC .
 - Find BC .
 - Find the area of $\triangle ABC$.

Geometry 2017 Final Exam Review. Your Final exam questions will come from this worksheet.

Answer Section

MULTIPLE CHOICE

1. ANS: B PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.6
NAT: HSG-CO.C.9
NOT: Example 4-2
KEY: using angle relationships
2. ANS: D PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.2
NAT: HSG-CO.C.9
NOT: Example 1
KEY: corresponding angles
3. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.2
NAT: HSG-CO.C.9
KEY: parallel lines NOT: Example 2
4. ANS: B PTS: 1 DIF: Level 2 REF: Geometry Sec. 3.3
NAT: HSG-CO.C.9
NOT: Example 1
KEY: corresponding angles
5. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.1
NAT: HSG-CO.A.1
NOT: Example 1
KEY: parallel lines | skew lines | parallel planes | transversal
6. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.1
NAT: HSG-CO.A.1
NOT: Example 1
KEY: parallel lines | skew lines | parallel planes | transversal
7. ANS: D PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.1
NAT: HSG-CO.A.1
KEY: corresponding angles | alternate interior angles | alternate exterior angles | consecutive interior angles
NOT: Example 3
8. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.1
NAT: HSG-CO.A.2 | HSG-CO.A.4 | HSG-CO.A.5 | HSG-CO.B.6
KEY: transformation | image | preimage | translation NOT: Example 3
9. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.2
NAT: HSG-CO.A.2 | HSG-CO.A.4 | HSG-CO.A.5 | HSG-CO.B.6
KEY: reflection | line of reflection | transformation NOT: Example 3
10. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.2
NAT: HSG-CO.A.3 | HSG-CO.A.4
KEY: line symmetry | line of symmetry
NOT: Example 5
11. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.3
NAT: HSG-CO.A.2 | HSG-CO.A.4 | HSG-CO.A.5 | HSG-CO.B.6
KEY: rotation | center of rotation | angle of rotation | transformation
NOT: Example 2
12. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.5
NAT: HSG-SRT.A.1b
KEY: dilation | scale factor | enlargement | reduction | transformation
NOT: Example 1

13. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.6
 NAT: HSG-CO.A.5
 KEY: dilation | similarity transformation | translation | transformation
 NOT: Example 2
14. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.6
 NAT: HSG-CO.A.5
 KEY: dilation | similarity transformation | translation
 NOT: Application-1
15. ANS: A PTS: 1 DIF: Level 2 REF: Geometry Sec. 5.1
 NAT: HSG-MG.A.1
 KEY: classifying triangles
 NOT: Example 2
16. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 5.1
 NAT: HSG-CO.C.10
 KEY: exterior angles
 NOT: Example 3
17. ANS: B PTS: 1 DIF: Level 2 REF: Geometry Sec. 5.1
 NAT: HSG-CO.C.10
 KEY: interior angles
 NOT: Example 4
18. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 5.4
 NAT: HSG-CO.C.10 | HSG-MG.A.1
 KEY: application | finding measures in a triangle
 NOT: Example 2
19. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 5.6
 NAT: HSG-CO.B.8
 KEY: congruent triangles | application
 NOT: Example 1
20. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.1
 NAT: HSG-CO.C.11
 KEY: angle measures of a polygon
 NOT: Example 1
21. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.1
 NAT: HSG-CO.C.11
 KEY: angle measures of a polygon
 NOT: Example 3
22. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.1
 NAT: HSG-CO.C.11
 KEY: angle measures of a polygon
 NOT: Example 5
23. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.2
 NAT: HSG-CO.C.11
 KEY: parallelogram
 NOT: Example 1
24. ANS: C PTS: 1 DIF: Level 2 REF: Geometry Sec. 7.3
 NAT: HSG-CO.C.11 | HSG-MG.A.1
 KEY: parallelogram
 NOT: Example 2-2
25. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.4
 NAT: HSG-CO.C.11 | HSG-SRT.B.5 | HSG-MG.A.1
 KEY: rhombus
 NOT: Example 3
26. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.5
 NAT: HSG-MG.A.1
 KEY: trapezoid | midsegment of a trapezoid
 NOT: Example 3
27. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 7.1
 NAT: HSG-CO.C.11
 KEY: angle measures of polygons | application
 NOT: Example 6

28. ANS: D PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.1
NAT: HSG-SRT.A.2 KEY: similar figures
NOT: Example 2
29. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.1
NAT: HSG-SRT.A.2 KEY: similar figures
NOT: Example 3
30. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.1
NAT: HSG-SRT.A.2 | HSG-MG.A.3 KEY: similar figures | application | perimeter
NOT: Example 4
31. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.1
NAT: HSG-SRT.A.2 KEY: similar figures | area
NOT: Example 5
32. ANS: D PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.2
NAT: HSG-SRT.A.3 | HSG-SRT.B.5 KEY: application | similar figures | AA Similarity Theorem
NOT: Example 3
33. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 8.4
NAT: HSG-SRT.B.5 | HSG-GPE.B.6 KEY: Triangle Proportionality Theorem
NOT: Example 1
34. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.1
NAT: HSG-SRT.C.8 KEY: Pythagorean Theorem | application
NOT: Example 3-1
35. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.1
NAT: HSG-SRT.C.8
KEY: Triangle Inequality Theorem | Pythagorean Inequalities Theorem
NOT: Example 5
36. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.3
NAT: HSG-SRT.B.5 KEY: geometric mean | application
NOT: Example 5-1
37. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.4
NAT: HSG-SRT.C.6 | HSG-SRT.C.8 KEY: angle of elevation | application
NOT: Example 4-1
38. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.6
NAT: HSG-SRT.C.8 KEY: solve a right triangle
NOT: Example 3
39. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 9.7
NAT: HSG-SRT.D.9 KEY: area of a triangle
NOT: Example 2
40. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.1
NAT: HSG-C.A.2 KEY: circle | tangent of a circle | application
NOT: Example 5
41. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.4
NAT: HSG-C.A.2 KEY: inscribed angle NOT: Example 2
42. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
NAT: HSG-C.A.2 KEY: circle | measures of arcs NOT: Example 1
43. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
NAT: HSG-C.A.2 KEY: circle | application | measures of arcs
NOT: Example 2

44. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.6
NAT: HSG-C.A.2 KEY: circle | application | secant segment
NOT: Example 2
45. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.7
NAT: HSG-GPE.A.1 KEY: circle | standard equation of a circle
NOT: Example 1
46. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.7
NAT: HSG-GPE.A.1 KEY: circle | standard equation of a circle
NOT: Example 1
47. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.7
NAT: HSG-GPE.A.1 KEY: circle NOT: Example 3
48. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.1
NAT: HSG-CO.A.1 | HSG-C.A.2 KEY: circle NOT: Example 1
49. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.1
NAT: HSG-CO.A.1 | HSG-C.A.2 KEY: circle NOT: Example 1
50. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.1
NAT: HSG-CO.A.1 | HSG-C.A.2 KEY: circle | common tangent | tangent of a circle
NOT: Example 2
51. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 6.1
NAT: HSG-CO.C.9 | HSG-MG.A.1 KEY: perpendicular bisector
NOT: Example 1
52. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 6.1
NAT: HSG-CO.C.9 | HSG-MG.A.1 KEY: angle bisector
NOT: Example 3
53. ANS: B PTS: 1 DIF: Level 1 REF: Geometry Sec. 6.5
NAT: HSG-CO.C.10 KEY: angles and sides of a triangle
NOT: Example 4
54. ANS: C PTS: 1 DIF: Level 1 REF: Geometry Sec. 11.1
NAT: HSG-C.B.5 | HSG-CO.A.1 KEY: arc length NOT: Example 2
55. ANS: C PTS: 1 DIF: Level 2 REF: Geometry Sec. 11.2
NAT: HSG-GMD.A.1 | HSG-C.B.5 KEY: area | application
NOT: Example 5-2
56. ANS: D PTS: 1 DIF: Level 1 REF: Geometry Sec. 11.5
NAT: HSG-GMD.A.1 | HSG-GMD.A.2 | HSG-GMD.A.3 | HSG-MG.A.1
KEY: volume NOT: Example 2
57. ANS: A PTS: 1 DIF: Level 1 REF: Geometry Sec. 11.3
NAT: HSG-GMD.A.3 KEY: regular polygon
NOT: Example 2

MULTIPLE RESPONSE

1. ANS: C, D PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.6
NAT: HSG-CO.C.9 KEY: using angle relationships
NOT: Combined Concept
2. ANS: B, D PTS: 1 DIF: Level 2 REF: Geometry Sec. 9.5
NAT: HSG-SRT.C.6 | HSG-SRT.C.7 | HSG-SRT.C.8 KEY: sine | cosine | tangent
NOT: Example 5

3. ANS: B, C PTS: 1 DIF: Level 2 REF: Geometry Sec. 9.5
 NAT: HSG-SRT.C.6 | HSG-SRT.C.7 | HSG-SRT.C.8 KEY: sine | cosine | tangent
 NOT: Example 5

NUMERIC RESPONSE

1. ANS: 45

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.1
 NAT: HSG-C.A.2 KEY: circle | radius of a circle NOT: Example 4

2. ANS: 30%

PTS: 1 DIF: Level 2 REF: Geometry Sec. 10.2
 NAT: HSG-C.A.2 KEY: circle | measures of arcs | application
 NOT: Example 3-2

3. ANS: 6

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
 NAT: HSG-C.A.2 KEY: circle | application | measures of arcs
 NOT: Example 2

4. ANS: 8

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
 NAT: HSG-C.A.2 KEY: circle | application | measures of arcs
 NOT: Example 2

5. ANS: 255

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
 NAT: HSG-C.A.2 KEY: circle | application | measures of arcs
 NOT: Example 2

6. ANS: 26

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.5
 NAT: HSG-C.A.2 KEY: circle | application | circumscribed angle
 NOT: Example 3-1

7. ANS: 8

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.3
 NAT: HSG-C.A.2 KEY: circle | measures of arcs NOT: Example 1

8. ANS: 4

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.3
 NAT: HSG-C.A.2 KEY: circle | measures of arcs NOT: Example 1

9. ANS: 115

PTS: 1 DIF: Level 1 REF: Geometry Sec. 10.3
 NAT: HSG-C.A.2 KEY: circle | measures of arcs NOT: Example 1

MATCHING

1. ANS: E PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
2. ANS: D PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
3. ANS: F PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
4. ANS: A PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
5. ANS: B PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
6. ANS: G PTS: 1 DIF: Level 2 REF: Geometry Sec. 2.4
 NAT: HSG-CO.C.9 | HSG-CO.C.10 | HSG-CO.C.11 | HSG-SRT.B.4
 KEY: properties of equality NOT: Combined Concept
7. ANS: A PTS: 1 DIF: Level 2 REF: Geometry Sec. 4.4
 NAT: HSG-CO.A.5 | HSG-CO.B.6
 KEY: translation | congruence transformation | reflection | rotation | congruent figures
 NOT: Combined Concept

SHORT ANSWER

1. ANS:

$x = 5;$

Given $\overrightarrow{AM}$ bisects $\angle WAE$ Prove $x = 5$

STATEMENTS	REASONS
1. $\overrightarrow{AM}$ bisects $\angle WAE$.	1. Given
2. $\angle WAM \cong \angle EAM$	2. Definition of angle bisector
3. $m\angle WAM = m\angle EAM$	3. Definition of congruent angles
4. $8x = 5x + 15$	4. Substitution Property of Equality
5. $3x = 15$	5. Subtraction Property of Equality
6. $x = 5$	6. Division Property of Equality

PTS: 1

DIF: Level 2

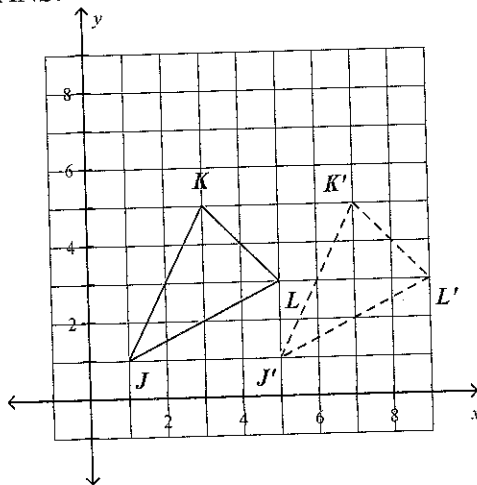
REF: Geometry Sec. 2.5

NAT: HSG-CO.C.9

KEY: properties of equality | application

NOT: Application-2

2. ANS:



PTS: 1

DIF: Level 1

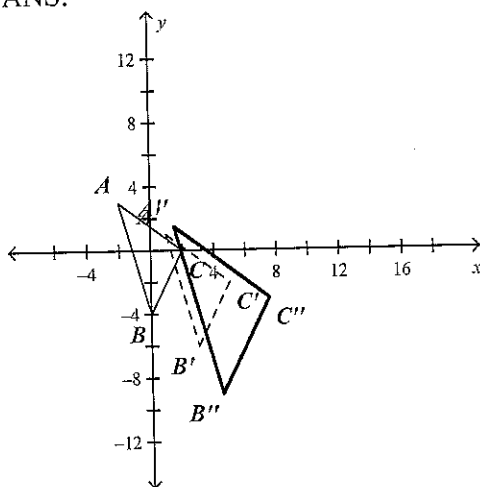
REF: Geometry Sec. 4.1

NAT: HSG-CO.A.2 | HSG-CO.A.4 | HSG-CO.A.5 | HSG-CO.B.6

KEY: transformation | image | preimage | translation | composition of transformations

NOT: Example 5

3. ANS:



$$A'(1, 1), B'(3, -6), C'(5, -2)$$

$$A''(1.5, 1.5), B''(4.5, -9), C''(7.5, -3)$$

PTS: 1 DIF: Level 1 REF: Geometry Sec. 4.6

NAT: HSG-CO.A.5

KEY: dilation | similarity transformation | translation | transformation

NOT: Example 1

4. ANS:

$$26^\circ, 64^\circ$$

PTS: 1 DIF: Level 1

REF: Geometry Sec. 5.1

NAT: HSG-CO.C.10

KEY: interior angles

NOT: Example 4

5. ANS:

$$m\angle A = 135^\circ, m\angle C = 135^\circ$$

PTS: 1 DIF: Level 2

REF: Geometry Sec. 7.1

NAT: HSG-CO.C.11

KEY: angle measures of a polygon | application

NOT: Example 4

6. ANS:

a. 12

b. 42.4

c. 162

PTS: 1 DIF: Level 2

REF: Geometry Sec. 8.1

NAT: HSG-SRT.A.2 | HSG-MG.A.3

KEY: similar figures

NOT: Combined Concept

7. ANS:

$$x = 12$$

PTS: 1 DIF: Level 1

REF: Geometry Sec. 8.3

NAT: HSG-SRT.B.5 | HSG-MG.A.1

KEY: SSS Similarity Theorem

NOT: Example 2

8. ANS:

$$m\angle A \approx 33.2^\circ, m\angle C \approx 76.8^\circ, c \approx 24.9$$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 9.7

NAT: HSG-SRT.D.10 | HSG-SRT.D.11 | HSG-MG.A.3

KEY: Law of Sines

NOT: Example 3

9. ANS:

$$m\angle C = 123^\circ, a \approx 13.0, b \approx 14.3$$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 9.7

NAT: HSG-SRT.D.10 | HSG-SRT.D.11 | HSG-MG.A.3

KEY: Law of Sines

NOT: Example 4

10. ANS:

$$m\angle A \approx 17.1^\circ, m\angle B \approx 45.9^\circ, c \approx 48.4$$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 9.7

NAT: HSG-SRT.D.10 | HSG-SRT.D.11

KEY: Law of Cosines

NOT: Example 6

11. ANS:

$$x = \sqrt{226}; \text{no}$$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 9.1

NAT: HSG-SRT.C.8

KEY: Pythagorean Theorem | Pythagorean triple

NOT: Example 1

12. ANS:

$$\sin G = \frac{30}{34} = \frac{15}{17} \approx 0.8824, \cos G = \frac{16}{34} = \frac{8}{17} \approx 0.4706, \sin F = \frac{16}{34} = \frac{8}{17} \approx 0.4706, \cos F = \frac{30}{34} = \frac{15}{17} \approx 0.8824$$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 9.5

NAT: HSG-SRT.C.6 | HSG-SRT.C.7 | HSG-SRT.C.8

KEY: sine | cosine

NOT: Example 1

13. ANS:

$\widehat{AB}$ is not congruent to $\widehat{CD}$; The two arcs have the same measure but are in two non-congruent circles.

PTS: 1

DIF: Level 2

REF: Geometry Sec. 10.2

NAT: HSG-C.A.2

KEY: circle | congruent arcs

NOT: Example 4

14. ANS:

a. $m\angle T = 24^\circ$

b. $m\widehat{QR} = 92^\circ$

PTS: 1

DIF: Level 1

REF: Geometry Sec. 10.4

NAT: HSG-C.A.2

KEY: inscribed angle

NOT: Example 1

15. ANS:

about 31.58 cm

PTS: 1

DIF: Level 1

REF: Geometry Sec. 11.1

NAT: HSG-C.B.5 | HSG-CO.A.1

KEY: arc length

NOT: Example 2

16. ANS:

- a. about 139.40 ft²
- b. The semi-circles should be purple and the rectangle should be yellow.
- c. Painter 2

PTS: 1 DIF: Level 3 REF: Geometry Sec. 11.2
 NAT: HSG-GMD.A.1 | HSG-C.B.5 KEY: area | application
 NOT: Example 5-3

17. ANS:

- a. 72 ft²
- b. *Sample answer:* 9 ft and 8 ft or other factors of 72

PTS: 1 DIF: Level 2 REF: Geometry Sec. 11.5
 NAT: HSG-GMD.A.1 | HSG-GMD.A.2 | HSG-GMD.A.3 | HSG-MG.A.1 | HSG-MG.A.2
 KEY: volume | application NOT: Example 5

OTHER

1. ANS:

$$\overleftrightarrow{AD} \parallel \overleftrightarrow{BF}$$

PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.1
 NAT: HSG-CO.A.1 KEY: parallel lines | application | perpendicular lines
 NOT: Example 2

2. ANS:

$m\angle 2 = 108^\circ$; Consecutive Interior Angles Theorem

PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.2
 NAT: HSG-CO.C.9 KEY: parallel lines | application
 NOT: Example 5

3. ANS:

$m\angle 1 = 55^\circ$; Alternate Interior Angles Theorem

PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.2
 NAT: HSG-CO.C.9 KEY: parallel lines | application
 NOT: Example 5

4. ANS:

$m\angle 2 = 70^\circ$; Alternate Interior Angles Theorem

PTS: 1 DIF: Level 1 REF: Geometry Sec. 3.2
 NAT: HSG-CO.C.9 KEY: parallel lines | application
 NOT: Example 5

5. ANS:

STATEMENTS	REASONS
1. $\overline{DG} \cong \overline{EF}$	1. Given
2. $\angle FEG \cong \angle DGE$	2. Given
3. $\overline{EG} \cong \overline{EG}$	3. Reflexive Property of Congruence
4. $\triangle DEG \cong \triangle FGE$	4. SAS Congruence Theorem

PTS: 1 DIF: Level 1
 NAT: HSG-CO.B.8 | HSG-MG.A.1
 NOT: Example 1

REF: Geometry Sec. 5.3
 KEY: congruent triangles | SAS Congruence Theorem

6. ANS:

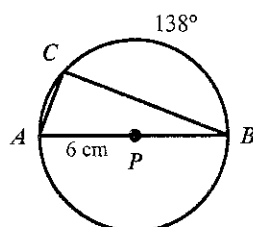
STATEMENTS	REASONS
1. $\overline{PQ} \cong \overline{RT}$	1. Given
2. $\overline{PS} \cong \overline{RS}$	2. Given
3. $\overline{QS} \cong \overline{TS}$	3. Given
4. $\triangle PQS \cong \triangle RTS$	4. SSS Congruence Theorem

PTS: 1 DIF: Level 1
 NAT: HSG-CO.B.8 | HSG-MG.A.1
 NOT: Example 1

REF: Geometry Sec. 5.5
 KEY: congruent triangles | SSS Congruence Theorem

7. ANS:

a.



- b. 12 cm
- c. $AC \approx 4.3$ cm
- d. $BC \approx 11.2$ cm
- e. about 24.1 cm^2

PTS: 1 DIF: Level 3 REF: Geometry Sec. 10.4
 NAT: HSG-C.A.2 | HSG-SRT.C.8
 KEY: inscribed polygon | application | area of a triangle | cosine | sine
 NOT: Example 4-3