Geometry

Answer each of the multiple-choice questions and mark your answers on that answer sheet provided. When finished with the multiple-choice items, then answer the tie breaker items in the order provided. Be sure your name is on each page of the tie-breaker items.

1. A sewing club is making a quilt consisting of 25 squares. Each of the squares has a diagonal measuring $30\sqrt{2}$ cm.  If the quilt has five rows and five columns, what is the perimeter of the quilt?

        a)   150 cm                b) 300 cm       c) 600 cm      d) 900 cm

2. Point M is plotted in the coordinate plane at (-3, 4) and is reflected over the line y = - x + 4. What are the coordinates of M' after the reflection?

    a)  (-4, 3)
    b)  (0, 7)
    c)  (4, -3)
    d)  (7, 0)

3. If a cylindrical barrel measures 22 inches in diameter, how many inches will it roll in eight revolutions along a smooth surface?

        a.   $121\pi$    b. $168\pi$         c. $176\pi$         d. $228\ \pi$

4. In the coordinate plane, $\Delta ABC$ has vertices at A(1, -2), B(1, 0.5), and C(2, 1) and $\Delta DEF$ has vertices at D(4, -3), E(4,2) and F(6,3).  $\Delta DEF$ is the image of $\Delta ABC$ under a dilation of the plane. What is the scale factor and center of dilation?

    a)  Center of dilation (0, 0) and scale factor 2
    b)  Center of dilation (-1, -2) and scale factor 2
    c)  Center of dilation (-2, -1) and scale factor 4
    d)  Center of dilation (-2, -1) and scale factor 2

5. **In the figure below, $\overline{AD}$ is the angle bisector of ∠BAC and $\overline{EB} \parallel \overline{AD}$.  Which triangle is isosceles?**
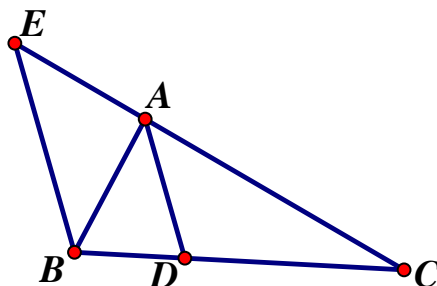


    **a) △ABE**
    **b) △ABD**
    **c) △ADC**
    **d) △ABC**
    **e) None of a - d**

6. Determine the value of x in the figure below. The lines are marked as parallel and congruent segments are marked.

a) 90
b) 60
c) 30
d) 15

$(90-x)°$
$2x°$
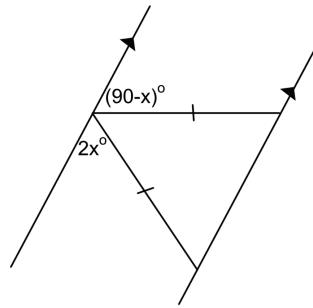
7. Given coordinates of the vertices of a quadrilateral, determine the most specific class to which it belongs: square, rectangle, parallelogram. Find the perimeter of the quadrilateral.
A(4, 3), B(11, 3), C(14, 7), D(7. 7)
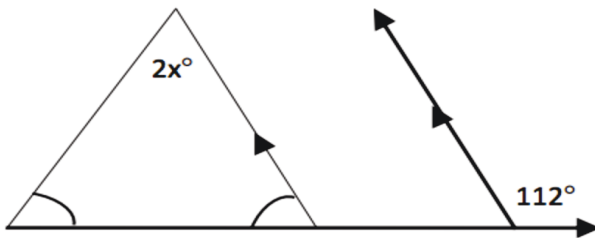
a) Parallelogram with a perimeter of 20 units
b) Parallelogram with a perimeter of 22 units
c) Parallelogram with a perimeter of 24 units
d) None of these

8.

**The radius is 18 ft. The length of $\overarc{RT}$ is _____**

R
T
B
A

$m\angle TBR = 30.00°$
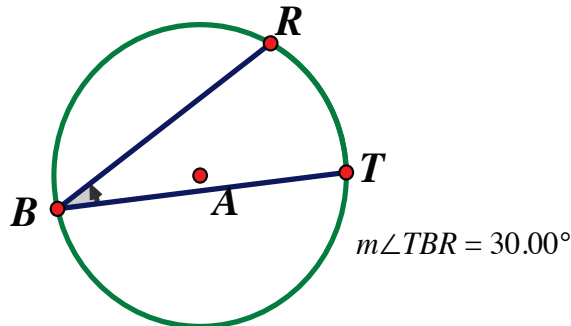
a)  $3\pi$ ft.     b) $6\pi$ ft.    c)  $18\pi$ ft.      d) $36\pi$ ft

9. Find the value of x in the figure below:

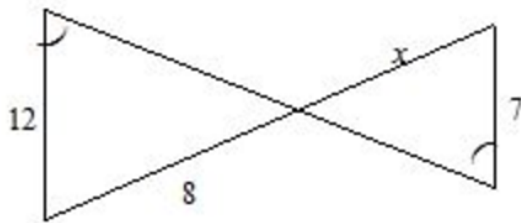$2x°$

$112°$

a)  56     b) 22      c) 30      d) 44

10. Which of the following is *not* true for a parallelogram?

    a) Opposite angles are congruent.
    b) Opposites sides are congruent.
    c) Diagonals bisect opposite angles.
    d) Diagonals bisect each other.

11. Find the perimeter of an equilateral triangle with a height of $7\sqrt{3}$.

    a) 7
    b) $21\sqrt{2}$
    c) $21\sqrt{3}$
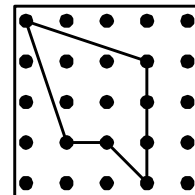    d) 42

12. Explain why the triangles below are similar and find the value of x.



Not drawn to scale

    a) SSS Theorem x=$10\frac{1}{2}$
    b) AA Theorem, x=$10\frac{1}{2}$
    c) SAS Theorem, x=$4\frac{2}{3}$
    d) AA Theorem, x= $4\frac{2}{3}$

13. The figure in the drawing to the right is sketched on a geoboard in which the horizontal and vertical distance between any two dots is 1 unit. Determine the perimeter of the sketched figure.



    a. $2\sqrt{10} + 4 + \sqrt{2}$ units
    b. $2\sqrt{10} + 5$ units
    c. 6.5 units
    d. None of the above

14. In the diagram below ABCD is a parallelogram. Angle DCB is 75°. Angle EFA is 40°. Which of the following is the measure of Angle DEC ?

   a.   35°               b. 65°            c. 75°           d. 105°
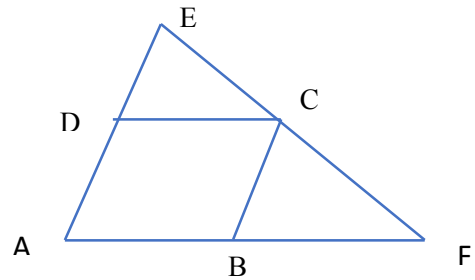
15. In the figure below, line l is parallel to segment AB. Segment AB is fixed. Point P moves from its current position to right on line l, as P moves to the right which of the following measures is always increasing?
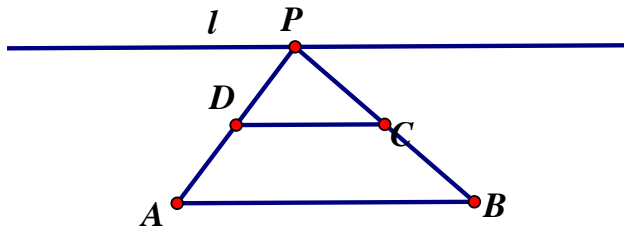
   a)   The distance PB
   b)   The distance DC
   c)   The perimeter of triangle PAB
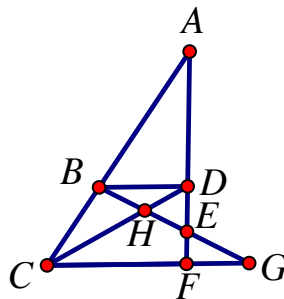   d)   The area of triangle PAB
   e)   None of the above

16. In the figure below:

AB = CG and $\overline{BD} \parallel \overline{CG}$.
Consider these statements:
I. $\triangle ABD \sim \triangle ACF$      II. $\triangle ABE \sim \triangle GFE$      III. $\triangle BDH \sim \triangle GHC$

   a) I and II
   b) II and III
   c) I and III
   d) All the statements.
   e) None of the statements.

17. A cone that holds ice cream at Baskin Robins has a radius of 3 cm at the top and is 6 cm tall. It is filled completely with ice cream. Also, there is half a spherical dip of ice cream on top of the cone. The sphere has a diameter of 8 cm. Which of the following values gives the total volume of ice cream on and in the cone?

a. $18\,\pi$          b. $42.6\,\pi$       c. $60.6\,\pi$       d. $85.3\,\pi$

18. Which of the following transformatioins of $\Delta PTS$ could be used to show that $\Delta PTS \cong \Delta QTR$?
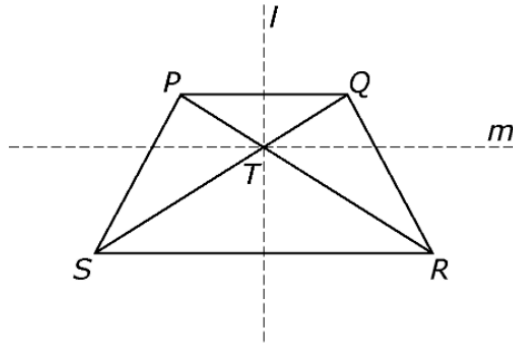


     a) A reflection over $\overline{QS}$
     b) A reflection over $\overline{PR}$
     c) A reflection over line $m$
     d) A reflection over line $l$

19. Which of the following is a correct explanation of how to rotate the plane 30° counterclockwise about point X to find the image of point A, which will be named point A'.

.A

.X

     a) Draw a circle with center A and radius XA. Move point X counterclockwise around the circle to point A' such that the measure of <AXA' is 30°.
     b) Draw a circle with center X and radius XA. Move point X counterclockwise around the circle to point A' such that the measure of <AXA' is 30°.
     c) Draw a circle with $\overline{XA}$ as a diameter. Move point X counterclockwise around the circle to point A' such that the measure of <AXA' is 30°.
     d) Draw a circle with $\overline{XA}$ as a diameter. Move point A counterclockwise around the circle to point A' such that the measure of <AXA' is 30°.

20. In an equilateral triangle, if the legs have length x, then what is the length of the altitude?

    a) $x^2$

    b) $\frac{x}{2}\sqrt{2}$

    c) $\frac{x}{2}\sqrt{3}$

    d) $\frac{3x^2}{4}$

21. How far does the tip of a minute hand on a clock travel in 48 minutes, if the distance from the center to the tip is 8 cm.

    a) $4\pi$ cm

    b) $6\pi$ cm

    c) $6.4\pi$ cm

    d) $12.8\pi$ cm

22. A student has two straws. One is 6 cm long and the other is 10 cm. She picks a third straw at random from a group of 4 straws. The lengths are 3 cm, 4 cm, 5 cm, and 6 cm. What is the probability that the straw she picks will allow her to form a triangle?

    a) 100%

    b) 75%

    c) 50%

    d) 25%

23. The bases of a prism are triangles having sides of measure 9 cm, 12 cm, and 15 cm. If the height is h, which of the following expressions will result in the measure of the surface area of the prism?

    a) $108 + (9h + 12h + 15h)$ cm$^3$

    b) $108 + h(9 + 12 + 15)$ cm$^2$

    c) $54 + 36h$ cm$^2$

    d) $108 + 36h^3$ cm$^2$

24. In the figure below the $\sin(52°) = \frac{17}{c}$. Based on the figure, which of the following equations is also true?
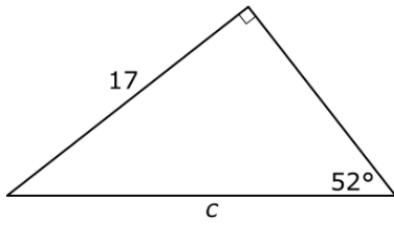


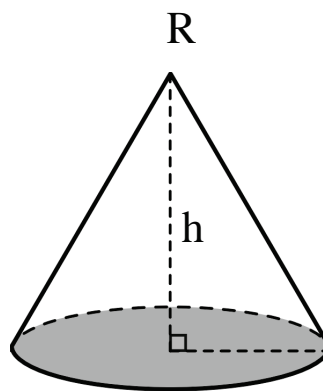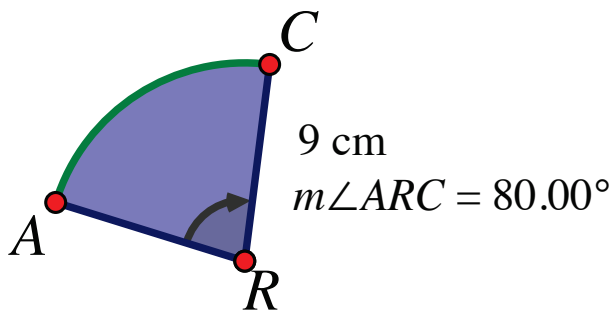a) $\sin(38°) = \frac{c}{17}$

b) $\cos(38°) = \frac{17}{c}$

c) $\cos(52°) = \frac{17}{c}$

d) $\tan(52°) = \frac{c}{17}$

Geometry
Tie-Breakers

Name: _____

1. Sector ARC has a radius of 9 cm and an angle that measures $80^o$. When sector ARC is cut out and AR and RC are taped together, they form a cone. The length of AC becomes the circumference of the base of the cone. What is the height, h, of the cone?

C

9 cm

$m\angle ARC = 80.00°$

A

R

R

h

Name: _____

2. a) Given Circle with center at O and a point P outside of the circle, construct the two tangent lines through P to the circle with center at O. Label the lines as m and k.

   b) How do you know that lines m and k are the tangent lines to circle with center O through point P?
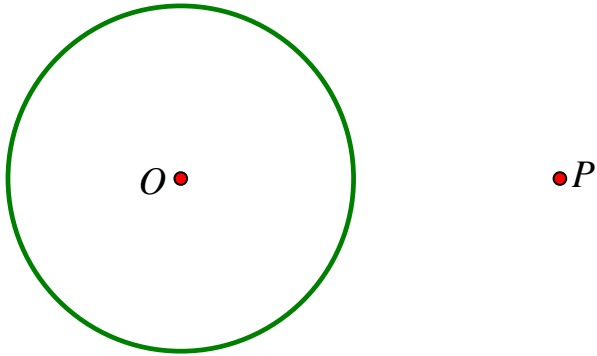
O •          •P

3. In Triangle ABC, $\overline{AD}$ and $\overline{BE}$ are medians intersecting at P.
   Determine the value of the ratio, $\dfrac{\text{Area } \triangle PAB}{\text{Area } \triangle PDE}$
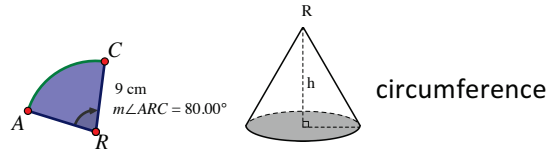
   Justify your conclusion.
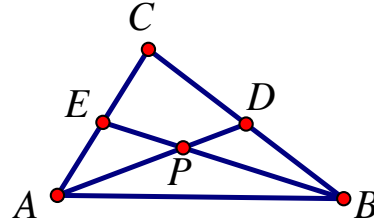
Answers to Multiple Choice Items

1. C
2. B
3. C
4. D
5. A
6. C
7. C
8. B
9. B
10. C
11. D
12. D
13. A
14. B
15. C
16. C
17. C
18. D
19. D
20. C
21. D
22. C
23. B
24. B

## Solution to Tie Breaker 1

If sector R were drawn to be a full circle, then the
Circle R would be $18\pi$ .



Thus, the length of arc AC becomes $\frac{80}{360} = \frac{x}{18\pi}$ ; x = $4\pi$ (which is the circumference of the base of the cone.)

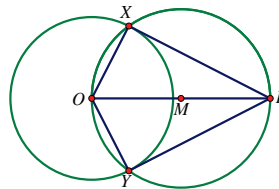So: $4\pi = 2\pi\,r$ where r is the radius of the base of the cone.
Then r = 2 , which is the radius of the base of the cone.
Using the Pythagorean theorem, then $2^2 + h^2 = 9^2$
　　　Then h = $\sqrt{77}$

## Solution to Tie Breaker 2



Given: Circle with center O
　　　Point P outside circle O

Proof: Construct line segment OP
　　　Find midpoint of OP and label M
　　　Use point M and construct circle with center M, which goes through points P and O.
　　　Circles O and M intersect in two points, X and Y
　　　Segments OX and OY are radii of Circle O
　　　Draw line segments PX and PY
　　　PX $\perp$ OX and PY $\perp$ OY because OP is the diameter of circle M
　　　Angles formed by OXP and OYP are right angles because they intersect semicircles
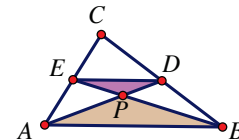　　　formed by diameter OP.
　　　Therefore, PX and PY are tangent to circle O.

## Solution to Tie Breaker 3

In Triangle ABC, $\overline{AD}$ and $\overline{BE}$ are medians intersecting at P.
Determine the value of the ratio,　$\dfrac{\text{Area } \triangle \text{PAB}}{\text{Area } \triangle \text{PDE}}$



$\dfrac{\text{Area } \triangle PAB}{\text{Area } \triangle EDP} = 4.00$

Draw line segment ED.

Since E and D are medians of $\triangle ABC$ , then ED is parallel to AB and ED = $\frac{1}{2} AB$
By AA theorem, $\triangle ABP \sim EDP$

Therefore ratio of areas is 4:1