

Kansas City Area Teachers of Mathematics  
2011 KCATM Math Competition

**GEOMETRY**  
**GRADES 7-8**

**INSTRUCTIONS**

- **Do not open this booklet** until instructed to do so.
- Time limit: **20 minutes**
- You **may use calculators**.
- Mark your answer on the Scantron sheet by **FILLING in the oval**.
- You **may not use rulers, protractors, or other measurement devices** on this test.
- Letter **“E” is “None of the above”**. It is a correct answer for some of the problems.
- Use the  $\pi$  key on your calculator.

- What is the area of a square with a perimeter of 28 inches?  
 A. 14 in      B. 49 sq. in      C. 7 sq. in.      D. 14 sq. in.      E. None of the above
- To the nearest tenth of an inch, find the base of a parallelogram when the area is 24 sq. m and the height of the parallelogram is 3.7 m.  
 A. 20.3 m      B. 6.5 m      C. 8.3 m      D. 4.6 m      E. None of the above
- To the nearest whole percent, find the geometric probability of landing on a shaded square if you toss a marker on the crossword puzzle in **Figure 1**.

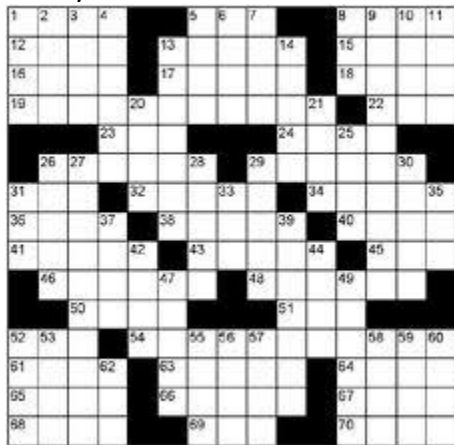


Figure 1

- 36%
- 37%
- 20%
- 21%
- None of the above

- Find the area of the block letter E in **Figure 2**.

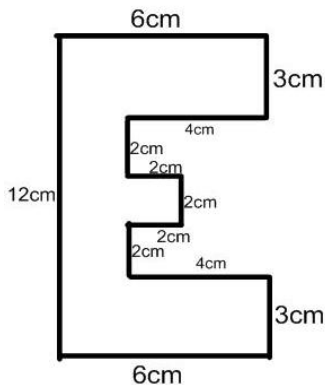


Figure 2

- $52 \text{ cm}^2$
- $50 \text{ cm}^2$
- $72 \text{ cm}^2$
- $48 \text{ cm}^2$
- None of the above

- Determine the value of  $x$  in the isosceles triangle given in **Figure 3**.

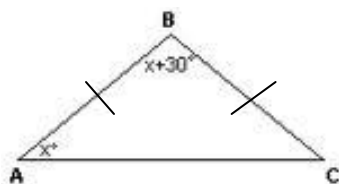


Figure 3

- $75^\circ$
- $40^\circ$
- $50^\circ$
- $60^\circ$
- None of the above

6. The number line in **Figure 4** includes both positive and negative integers. What is the location of point A if A is the midpoint of  $\overline{BC}$ , and C is the midpoint of  $\overline{DE}$ .

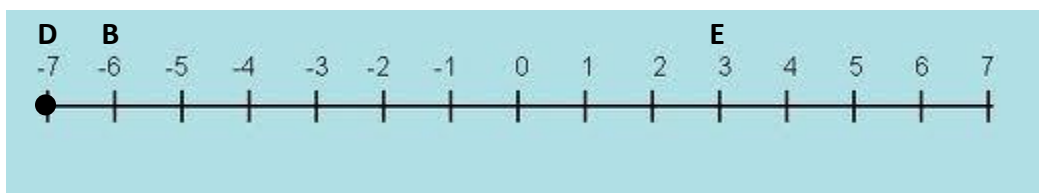


Figure 4

- A. -5                      B. -4                      C. -3                      D. 0                      E. None of the above

7. Find the complement of a  $42^\circ$  angle.

- A.  $42^\circ$                       B.  $58^\circ$                       C.  $138^\circ$                       D.  $48^\circ$                       E. None of the above

Use Figure 5 for Problems #8-10.

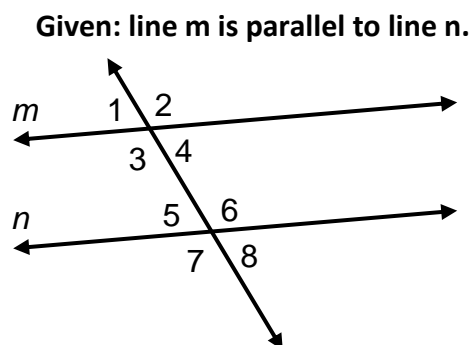


Figure 5

8. Name a pair of **alternate interior angles** in Figure 5.  
 A. 1 and 4                      B. 2 and 7                      C. 3 and 5                      D. 4 and 8                      E. None of the above
9. If  $m\angle 2 = 132^\circ$  find  $m\angle 6$ .  
 A.  $132^\circ$                       B.  $58^\circ$                       C.  $48^\circ$                       D.  $128^\circ$                       E. None of the above
10. If  $m\angle 3 = 3x - 5^\circ$  and  $m\angle 5 = x + 9^\circ$  determine the value of  $x$ .  
 A. 21                      B. 44                      C. 7                      D. 32

11. What is the central angle of a standard dart board? See **Figure 6**.

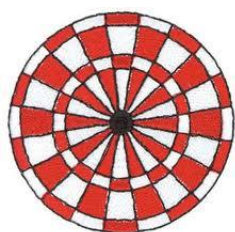
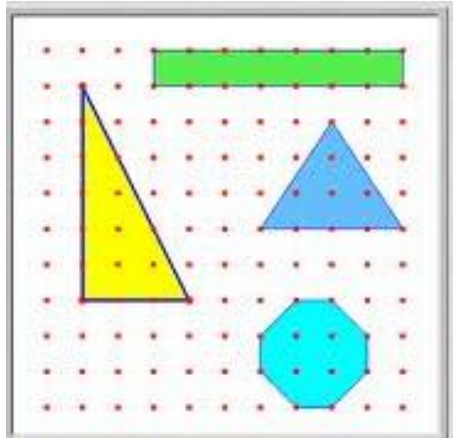


Figure 6

- A.  $15^\circ$                       B.  $18^\circ$                       C.  $20^\circ$                       D.  $24^\circ$   
 E. None of the above



12. Which two shapes on the geoboard have the same area? See **Figure 7**.

- A. Rectangle and right triangle
- B. Right triangle and isosceles triangle
- C. Isosceles triangle and octagon
- D. Octagon and rectangle
- E. None of the above

**Figure 7**

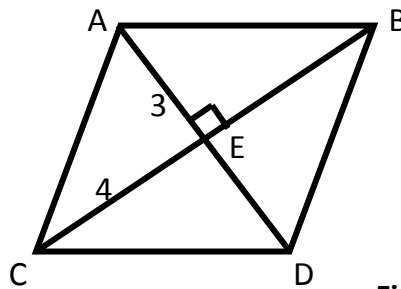
13. A Pythagorean Triple is defined as a set of three whole numbers such that work in the Pythagorean Theorem. Which set of 3 whole numbers is NOT a Pythagorean Theorem?

- A. 6, 8, 10
- B. 5, 12, 13
- C. 11, 60, 61
- D. 9, 40, 41
- E. None of the above

14. If a 36" board is cut into 3 pieces with a ratio of 2: 3: 7, determine the length of the largest piece.

- A. 21 in.
- B. 14 in.
- C. 28 in.
- D. 9 in.
- E. None of the above

Use the rhombus ABCD in **Figure 8** for problems #15-17. Given:  $AE = 3$  cm, and  $CE = 4$  cm



**Figure 8**

15. If  $m\angle ACD = 74^\circ$ , what is  $m\angle BAD$ ?

- A.  $74^\circ$
- B.  $37^\circ$
- C.  $16^\circ$
- D.  $53^\circ$
- E. None of the above

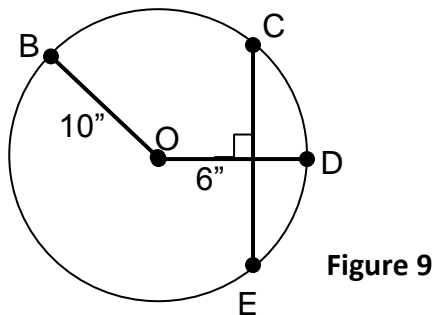
16. If  $AE = 3$  cm, and  $CE = 4$  cm, find the perimeter of the rhombus.

- A. 24 cm
- B. 20 cm
- C. 28 cm
- D. 26 cm
- E. None of the above

17. If  $AE = 3$  cm, and  $CE = 4$  cm, find the area of the rhombus. The formula is  $A = \frac{1}{2} (d_1)(d_2)$ .

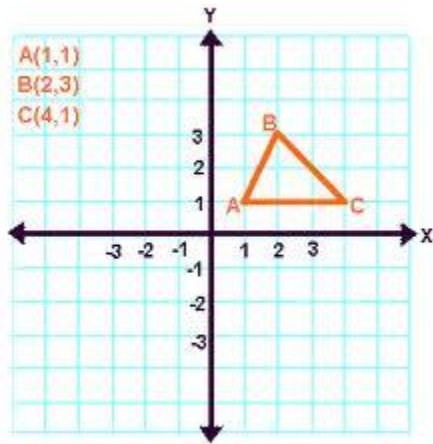
- A. 24 sq. cm
- B. 48 sq. cm
- C. 28 sq. cm
- D. 25 sq. cm
- E. None of the above

18. Determine the length of the chord  $\overline{CE}$  in circle O in **Figure 9** with the given information:



- A. 8"
- B. 10"
- C. 16"
- D. 14"
- E. None of the above

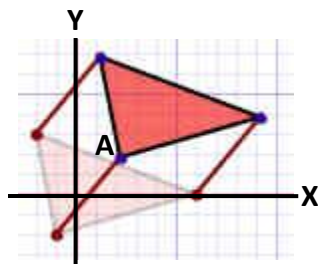
19. Determine the coordinates of  $C'$  when  $\triangle ABC$  is reflected over the vertical axis in **Figure 10**.



- A. (4, 1)
- B. (-4, 1)
- C. (-4, -1)
- D. (4, -1)
- E. None of the above

Figure 10

20. If the translation rule is  $(x - 3, y - 4)$ , determine the coordinates of  $A'$  in **Figure 11** if  $A(2, 2)$ .



- A. (0, 6)
- B. (4, 4)
- C. (-1, -2)
- D. (-7, 3)
- E. None of the above

Figure 11

21. Find one interior angle measure of a regular hexagon.

- A.  $90^\circ$
- B.  $120^\circ$
- C.  $135^\circ$
- D.  $150^\circ$
- E. None of the above

22. What is the area of a circle with circumference of  $16\pi$  inches?

- A.  $16\pi \text{ in}^2$
- B.  $64\pi \text{ in}^2$
- C.  $4\pi \text{ in}^2$
- D.  $256\pi \text{ in}^2$
- E. None of the above

23. If you cut the 4 large circles out of a piece of construction paper, to the nearest sq. inch, how much waste is there? The size of the square is 12". See **Figure 12**.

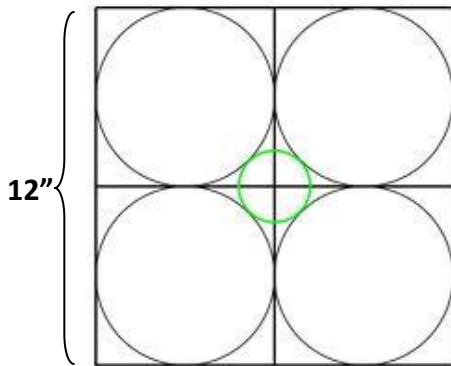


Figure 12

- A. 31 sq. inches
- B. 116 sq. inches
- C. 29 sq. inches
- D. 12 sq. inches
- E. None of the above

24. If you are 16 years old, then you can get a driver's license. Which of the following statements is the **converse**? Determine if the converse is **true** or **false**.

- A. If you aren't 16 years old, then you cannot get a driver's license. False
- B. If you don't get a driver's license, then you are not 16 years old. True
- C. If you get a driver's license, then you are 16 years old. False
- D. If you are at least 16 years old, then you can get a driver's license. True

25. Determine the **expression for the area** of the rectangle with dimensions  $(x + 2)$  and  $(x + 4)$  as demonstrated in **Figure 13** with Algebra Tiles:

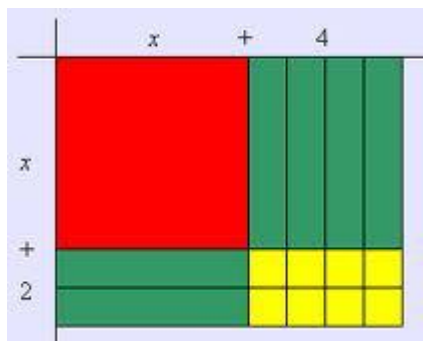


Figure 13

- A.  $x^2 - 2x + 8$
- B.  $x^2 + 4x + 8$
- C.  $x^2 + 6x - 8$
- D.  $x^2 + 6x + 8$
- E. None of the above

26. What is the expression for the **perimeter** of the parallelogram in **Figure 14**?

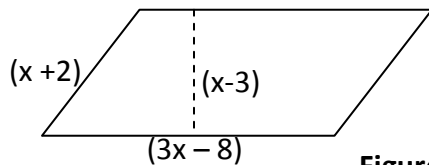


Figure 14

- A.  $4x - 6$
- B.  $8x - 12$
- C.  $5x - 9$
- D.  $3x^2 - 17x - 24$
- E. None of the above

27. Which shape best describes a quadrilateral with all right angles and four congruent sides?

- A. Rectangle
- B. Parallelogram
- C. Rhombus
- D. Square
- E. None of the above

28. Which shape describes the set of all points equidistant from one point in space?

- A. Square      B. Cube      C. Sphere      D. Circle      E. None of the above

29. In the rectangle given in **Figure 15**,  $m\angle 1 = 124^\circ$ . Determine the value of  $x^\circ$ .

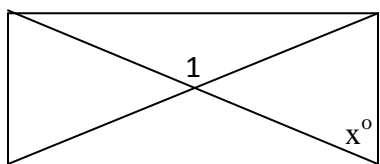


Figure 15

- A.  $62^\circ$   
 B.  $124^\circ$   
 C.  $56^\circ$   
 D.  $76^\circ$   
 E. None of the above

30. Shaun White is a professional skateboarder and snowboarder. If he does rotates two complete turns, what degree did he rotate? See Shaun White in **Figure 16**.



Figure 16

- A.  $180^\circ$       B.  $360^\circ$       C.  $540^\circ$       D.  $720^\circ$   
 E. None of the above

31. Determine the value of  $x$  given an exterior angle of a triangle as shown in **Figure 17**.

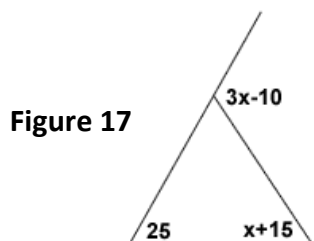


Figure 17

- A. 65      B. 10      C. 25      D.  $15^\circ$   
 E. None of the above

32. Which method can be used to prove the 2 triangles congruent in the **Figure 18**?

Given:  $\overline{AD} \cong \overline{CB}$  and  $\overline{AB} \cong \overline{CD}$

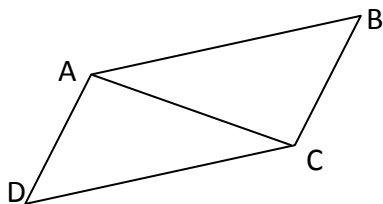


Figure 18

- A. SSS  
 B. SAS  
 C. AAS  
 D. HL  
 E. None of the above

33. Solve for distance,  $d$ , across the lake given two similar triangles in **Figure 19**.

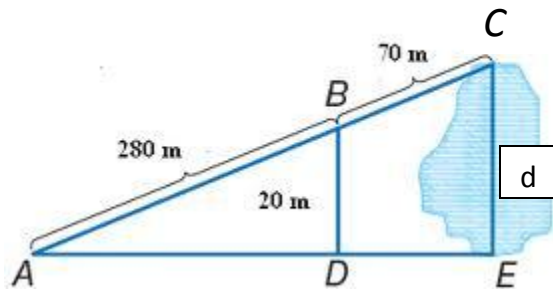


Figure 19

- A. 25 m
- B. 30 m
- C. 35 m
- D. 75 m
- E. None of the above

34. What is the hypotenuse value of a 45-45-90 triangle with side length 9?

- A.  $4.5\sqrt{2}$
- B.  $9\sqrt{2}$
- C.  $4.5\sqrt{3}$
- D.  $9\sqrt{3}$
- E. None of the above

35. What effect does doubling all sides of a cube have on the volume of the cube?

- A. Stays the same
- B. Doubles the volume
- C. Four times the volume
- D. Eight times the volume
- E. None of the above

36. To the nearest foot, determine how tall the flagpole is if its shadow is 23 ft. You are 5'3" tall and your shadow is 11 ft. long. **See Figure 20**.

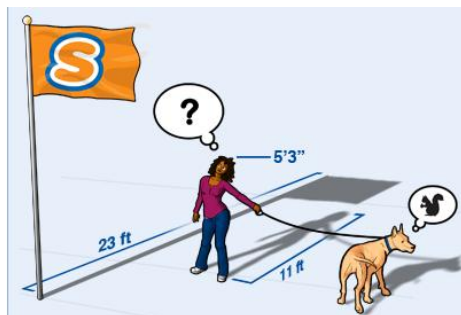


Figure 20

- A. 11 ft. tall
- B. 48 ft. tall
- C. 12 ft. tall
- D. 23 ft. tall
- E. None of the above

37. Which statement shows how to solve for the height of the ledge in **Figure 21**?

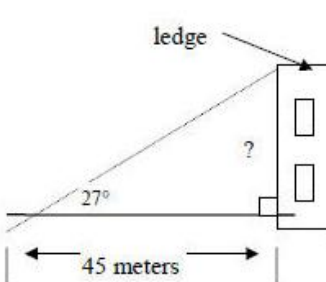


Figure 21

- A.  $\frac{45}{\tan 27^\circ}$
- B.  $45 \sin 27^\circ$
- C.  $45 \cos 27^\circ$
- D.  $45 \tan 27^\circ$
- E. None of the above



38. Determine  $x$  when given the central angle measure of  $74^\circ$  in the circle in Figure 22.

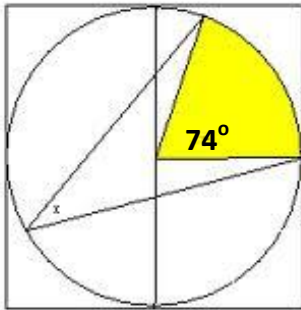


Figure 22

- A.  $74^\circ$
- B.  $33^\circ$
- C.  $27^\circ$
- D.  $37^\circ$
- E. None of the above

39. Determine the equation of a line perpendicular to the given line in Figure 23:

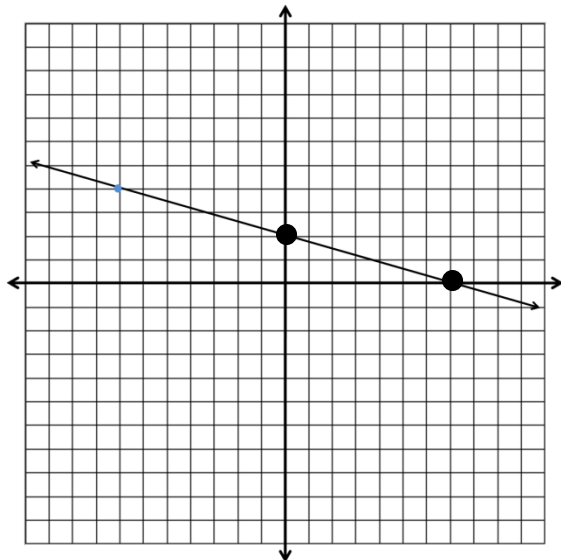


Figure 23

- A.  $y = 2/7 x - 5$
- B.  $y = -2/7x + 1$
- C.  $y = -7/2 x + 2$
- D.  $y = 7/2 x + 4$
- E. None of the above

40. Two angles form a linear pair. The obtuse angle is six less than twice the measure of the acute angle. Determine the measure of the obtuse angle.

- A.  $122^\circ$
- B.  $118^\circ$
- C.  $116^\circ$
- D.  $120^\circ$
- E. None of the above