

**2009 Middle School Math Festival****Individual Round: Geometry**

1. A straight line on a graph passes through the points  $(-2, 5)$  and  $(4, -3)$ . Which of the points below also lie on the line?

A.  $\left(\frac{3}{2}, 7\right)$

B.  $\left(\frac{11}{2}, -5\right)$

C.  $\left(2, \frac{1}{3}\right)$

D.  $(-1, 1)$

2. A rectangular rose garden has a width of 24 feet and the diagonal path measuring 51 feet divides the garden into two equal sections. What is the length of the garden?

A. 56 ft

B. 45 ft

C. 36 ft

D. 27 ft

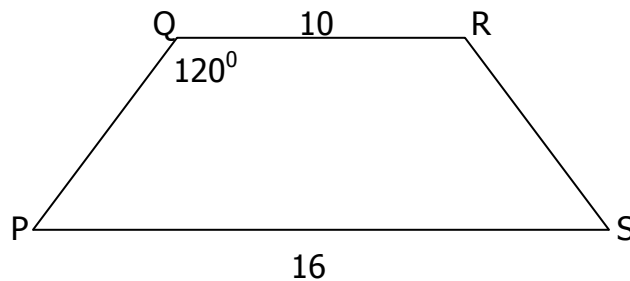
3. In the figure below,  $PQRS$  is an isosceles trapezoid. What is its exact area.

A.  $13\sqrt{3}$

C.  $39\sqrt{3}$

B. 13

D. 19.5



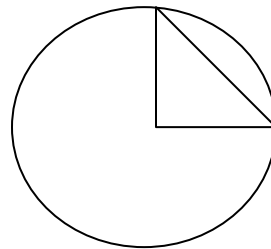
4. Inside the circle is an isosceles right triangle with one vertex at the center of the circle. If the hypotenuse of the triangle is  $\frac{1}{\sqrt{2}}$ , what is the area of the circle, in terms of  $\pi$ ?

A.  $\pi$

C.  $2\pi$

B.  $\frac{\pi}{4}$

D.  $\frac{\pi}{16}$



5. Triangle  $ABC$  with  $A(-5, -2)$ ,  $B(-3, 2)$ , and  $C(-1, -2)$  is reflected over the  $y = x$  line. What are the coordinates of the reflected image, in order?

A.  $(5, -2), (3, 2), (1, -2)$

C.  $(5, 2), (3, -2), (1, 2)$

B.  $(-5, 2), (-3, -2), (1, 2)$

D.  $(-2, -5), (2, -3), (-2, -1)$

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6. A square right pyramid has a height of 8 ft and a slant height of 10 ft. Calculate the total surface area.

- A.  $156 \text{ ft}^2$       B.  $204 \text{ ft}^2$       C.  $276 \text{ ft}^2$       D.  $384 \text{ ft}^2$

7. A rectangular piece of fabric measures 2 feet by 3 feet. You plan to cut out some right triangular shapes with legs of length 6 inches and 12 inches. How many triangular shapes can be cut out?

- A. 24      B. 12      C. 6      D. 48

8. A 3" x 5" photo is enclosed in a frame with a width of  $1 \frac{1}{2}$  inches wide on each side. What is the area of the photo/frame combination?

- A.  $15 \text{ in}^2$       B.  $24.75 \text{ in}^2$       C.  $28 \text{ in}^2$       D.  $48 \text{ in}^2$

9. A circle with an area of  $18.84 \text{ mm}^2$ . What is its diameter (to the nearest tenth)?

- A. 18.84 mm      B. 6 mm      C. 4.9 mm      D. 2.4 mm

10. A square with an area of  $2 \text{ in}^2$  is inscribed within a circle. What is the area of the circle, in terms of  $\pi$ ?

- A.  $\pi$       B.  $2\pi$       C.  $\sqrt{2}\pi$       D.  $4\pi$

11. For a regular dodecagon, what is the measure of each interior angle?

- A.  $12^\circ$       B.  $30^\circ$       C.  $150^\circ$       D.  $125^\circ$

12. A triangular prism has a right triangle at each end with legs of 5 and 12 feet. The perpendicular distance between the two ends is 10 feet. What is the total surface area?

- A.  $360 \text{ ft}^2$       B.  $330 \text{ ft}^2$       C.  $600 \text{ ft}^2$       D.  $230 \text{ ft}^2$

13. A right circular cylinder has a diameter of  $\sqrt{72}$  and a height of  $8\sqrt{2}$ . What is the volume, in terms of  $\pi$ ?

- A.  $(288\sqrt{2})\pi$       B.  $(144\sqrt{2})\pi$       C.  $(72\sqrt{2})\pi$       D.  $(48\sqrt{2})\pi$

14. A rectangular solid has dimensions of 3 yards by 3 feet by 3 inches. What is the volume, in cubic inches?

- A.  $27 \text{ in}^3$       B.  $1,296 \text{ in}^3$       C.  $3,888 \text{ in}^3$       D.  $11,664 \text{ in}^3$

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15. Solid A has a total surface area of  $24 \text{ in}^2$  while Solid B has a total surface area of  $6 \text{ in}^2$ . The volume of Solid B is  $6 \text{ in}^3$ . Find the volume of the solid A.

- A.  $48 \text{ in}^3$       B.  $24 \text{ in}^3$       C.  $12 \text{ in}^3$       D.  $1.5 \text{ in}^3$

16. Given the conditional statement "If you live in California, then you need a mountain bike," what is the contrapositive statement?

- A. If you do not live in California, then you do not need a mountain bike.  
 B. If you need a mountain bike, then you live in California.  
 C. If you do not need a mountain bike, then you do not live in California.  
 D. If you live in Alaska, you do not need a mountain bike.

17.  $M$  is the midpoint of  $\overline{AB}$  and  $N$  is the midpoint of  $\overline{MB}$ . If  $AN = 60$ , what is the length of  $\overline{AB}$ ?

- A. 20      B. 40      C. 80      D. 120

18.  $\overline{BC}$  bisects  $\angle ABD$ . If  $m\angle ABC = 28y - 6$  and  $m\angle CBD = 37 - y$ , what is  $y$ ?

- A.  $\frac{40}{13}$       B.  $\frac{43}{29}$       C.  $\frac{8}{3}$       D.  $\frac{34}{13}$

19. Find the equation for the perpendicular bisector of  $\overline{AB}$  for  $A(-1, 2)$  and  $B(3, -2)$ .

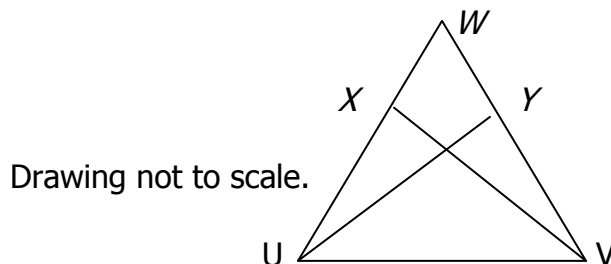
- A.  $y = x + 1$       B.  $y = x - 1$       C.  $y = x + 2$       D.  $x = 1$

20. The measure of three angles of a triangle are  $4x$ ,  $2x + 10$ , and  $90 - x$ . What is the positive difference between the largest and smallest angle?

- A.  $10^\circ$       B.  $16^\circ$       C.  $20^\circ$       D.  $32^\circ$

21.  $\overline{WU} \cong \overline{WV}$  and  $\overline{WX} \cong \overline{WY}$ . What congruence rule proves  $\triangle UYW \cong \triangle VXW$ .

- A. SAS      C. ASA  
 B. SSS      D. AAS



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22. A circle with an area of  $3\pi$  is inscribed inside a square. What is the perimeter of the square?

- A.  $4\sqrt{3}$                       B.  $8\sqrt{3}$                       C. 12                      D. 24

23. A 5-foot ladder is resting against a wall. Its base is 1 foot, 3 inches away from the wall. How high up the wall does it reach?

- A. 23 ft, 5 in                      B. 3 ft, 9 in                      C. 4 ft, 10 in                      D. 5 ft, 2 in

24. A cube container has a volume of  $\sqrt{8}$  ft<sup>3</sup>. What is the longest length object which could fit in the box (i.e. corner to corner distance)?

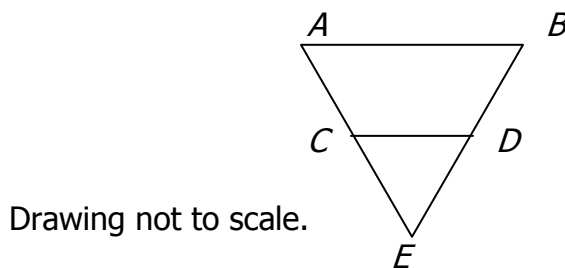
- A. 2 ft, 5 in                      B. 6 feet                      C. 6 ft, 11 in                      D. 8 feet

25. A square has an area of 20 in<sup>2</sup>. What is the exact length of the diagonal?

- A.  $2\sqrt{5}$                       B.  $4\sqrt{5}$                       C.  $2\sqrt{10}$                       D. 10

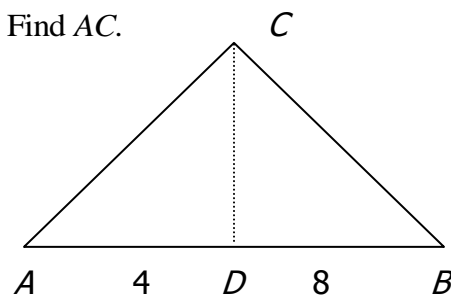
26.  $AB$  is parallel to  $CD$ .  $AB = 63$ ,  $CD = 18$ , and  $BD = 30$ . Find  $DE$ .

- A. 8.6                      C. 42  
B. 12                      D. 75



27.  $\overline{CD}$  is the altitude to the hypotenuse of right triangle  $ABC$ . Find  $AC$ .

- A. 48                      C.  $4\sqrt{2}$   
B. 4                      D.  $4\sqrt{3}$



Drawing not to scale

28. If  $\sin A = \frac{4}{5}$ , what is  $\tan A$ ?

- A.  $\frac{3}{4}$                       B.  $\frac{3}{5}$                       C.  $\frac{5}{4}$                       D.  $\frac{4}{3}$

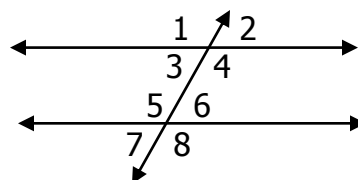
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29. In triangle  $ABC$ , the  $m\angle B = 3m\angle A$  and  $m\angle C = 2m\angle B + 10$ . What is the measurement of the largest angle?

- A.  $17^\circ$                       B.  $51^\circ$                       C.  $112^\circ$                       D.  $124^\circ$

30. Lines  $m$  and  $n$  are parallel. If  $m\angle 2 = 8x + 30$  and  $m\angle 7 = 30x - 25$ , find  $m\angle 1$ .

- A.  $130^\circ$                       C.  $67^\circ$   
 B.  $113^\circ$                       D.  $50^\circ$

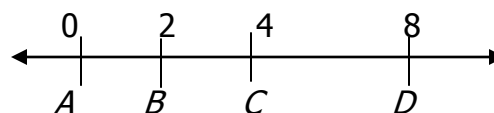


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31. Two angles are supplementary. One angle is  $32^\circ$  less than the other angle. What is the measurement of the smallest angle?

- A.  $29^\circ$                       B.  $61^\circ$                       C.  $74^\circ$                       D.  $106^\circ$

32. Point  $X$  (not shown) on the number line is three units from Point  $C$  and 5 units from Point  $B$ . Where is Point  $X$  located?



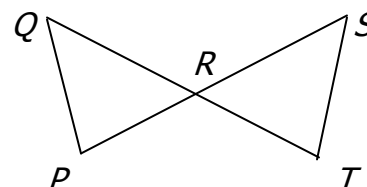
- A. Between  $A$  and  $B$                       C. To the right of  $D$   
 B. Between  $C$  and  $D$                       D. Between  $B$  and  $C$

33. You have 100 feet of fencing. What is the largest area you could enclose?

- A.  $100 \text{ ft}^2$                       B.  $900 \text{ ft}^2$                       C.  $2500 \text{ ft}^2$                       D.  $625 \text{ ft}^2$

34.  $\overline{PR} \cong \overline{TR}$  and  $\angle Q \cong \angle S$ . What congruence rule proves  $\triangle QPR \cong \triangle STR$ .

- A. SAS                      C. ASA  
 B. AAS                      D. SSS



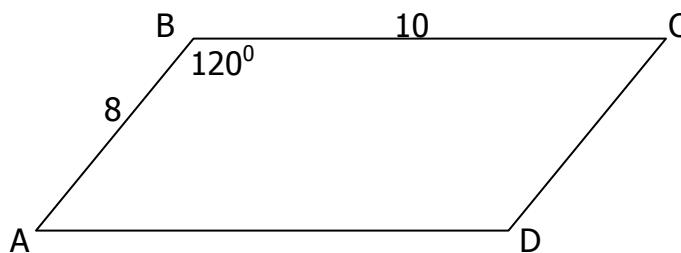
35. Classify the triangle with sides measuring 2, 4, and 5.

- A. acute                      B. right                      C. obtuse                      D. isosceles

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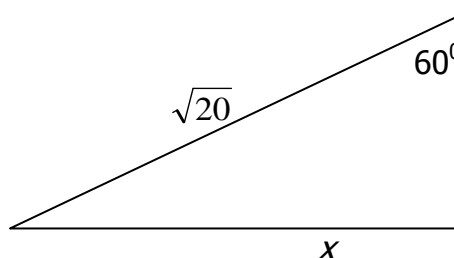
36. In the figure below, quadrilateral  $ABCD$  is a parallelogram. Calculate the area of the parallelogram.

- A.  $20\sqrt{3}$       C.  $32\sqrt{3}$   
 B.  $40\sqrt{3}$       D. 40



37. What is the exact value of  $x$ ?

- A.  $2\sqrt{15}$       C.  $\sqrt{10}$   
 B.  $\sqrt{5}$       D.  $\sqrt{15}$



38. Triangle  $ABC$  with  $A(-5, -2)$ ,  $B(-3, 2)$ , and  $C(-1, -2)$  is transformed 8 units right and 3 units down. What are the coordinates of the transformed image, in order?

- A.  $(-13, -5), (-11, -1), (-9, -5)$       C.  $(3, -5), (5, -1), (7, -5)$   
 B.  $(3, 1), (5, 5), (7, 1)$       D.  $(-13, 1), (-11, 5), (-9, 1)$

39. One leg of a right triangle is 3 and the hypotenuse is  $2\sqrt{3}$ . What is the length of the other leg?

- A.  $\sqrt{21}$       B.  $3\sqrt{3}$       C. 3      D.  $\sqrt{3}$

40. What is the exact distance between  $(-9, 2)$  and  $(3, -10)$ ?

- A.  $2\sqrt{6}$       B. 10      C. 24      D.  $12\sqrt{2}$