

Use this space for  
computations.

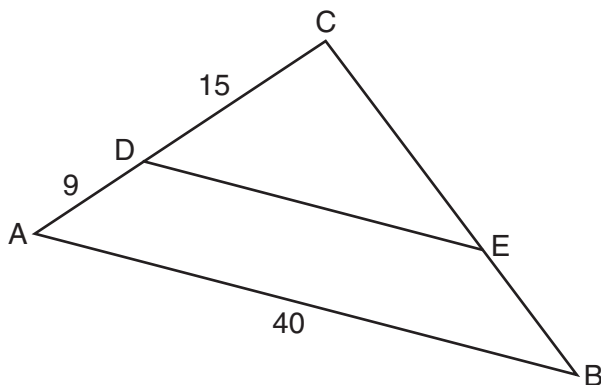
11 Rectangle  $A'B'C'D'$  is the image of rectangle  $ABCD$  after a dilation centered at point  $A$  by a scale factor of  $\frac{2}{3}$ . Which statement is correct?

- (1) Rectangle  $A'B'C'D'$  has a perimeter that is  $\frac{2}{3}$  the perimeter of rectangle  $ABCD$ .
- (2) Rectangle  $A'B'C'D'$  has a perimeter that is  $\frac{3}{2}$  the perimeter of rectangle  $ABCD$ .
- (3) Rectangle  $A'B'C'D'$  has an area that is  $\frac{2}{3}$  the area of rectangle  $ABCD$ .
- (4) Rectangle  $A'B'C'D'$  has an area that is  $\frac{3}{2}$  the area of rectangle  $ABCD$ .

12 The equation of a circle is  $x^2 + y^2 - 6x + 2y = 6$ . What are the coordinates of the center and the length of the radius of the circle?

- (1) center  $(-3,1)$  and radius 4
- (2) center  $(3,-1)$  and radius 4
- (3) center  $(-3,1)$  and radius 16
- (4) center  $(3,-1)$  and radius 16

13 In the diagram of  $\triangle ABC$  below,  $\overline{DE}$  is parallel to  $\overline{AB}$ ,  $CD = 15$ ,  $AD = 9$ , and  $AB = 40$ .



The length of  $\overline{DE}$  is

- (1) 15
- (2) 24
- (3) 25
- (4) 30

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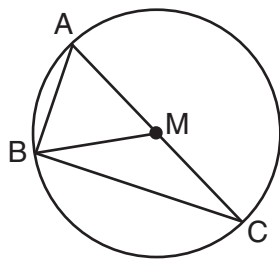
14 The line whose equation is  $3x - 5y = 4$  is dilated by a scale factor of  $\frac{5}{3}$  centered at the origin. Which statement is correct?

- (1) The image of the line has the same slope as the pre-image but a different  $y$ -intercept.
- (2) The image of the line has the same  $y$ -intercept as the pre-image but a different slope.
- (3) The image of the line has the same slope and the same  $y$ -intercept as the pre-image.
- (4) The image of the line has a different slope and a different  $y$ -intercept from the pre-image.

15 Which transformation would *not* carry a square onto itself?

- (1) a reflection over one of its diagonals
- (2) a  $90^\circ$  rotation clockwise about its center
- (3) a  $180^\circ$  rotation about one of its vertices
- (4) a reflection over the perpendicular bisector of one side

16 In circle  $M$  below, diameter  $\overline{AC}$ , chords  $\overline{AB}$  and  $\overline{BC}$ , and radius  $\overline{MB}$  are drawn.

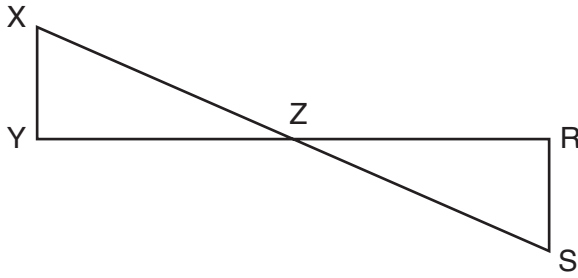


Which statement is *not* true?

- (1)  $\triangle ABC$  is a right triangle.
- (2)  $\triangle ABM$  is isosceles.
- (3)  $m\widehat{BC} = m\angle BMC$
- (4)  $m\widehat{AB} = \frac{1}{2}m\angle ACB$

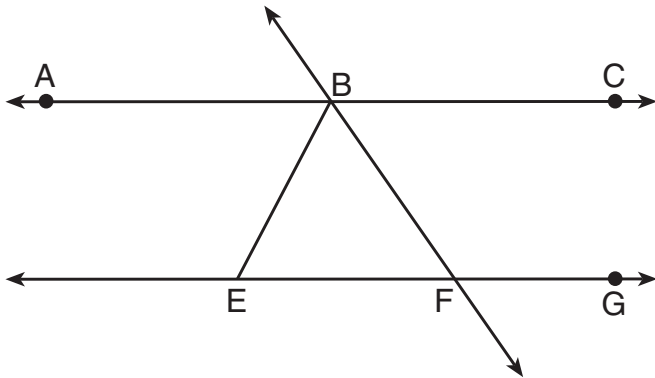
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- 17 In the diagram below,  $\overline{XS}$  and  $\overline{YR}$  intersect at  $Z$ . Segments  $XY$  and  $RS$  are drawn perpendicular to  $\overline{YR}$  to form triangles  $XYZ$  and  $SRZ$ .



Which statement is always true?

- (1)  $(XY)(SR) = (XZ)(RZ)$       (3)  $\overline{XS} \cong \overline{YR}$   
(2)  $\triangle XYZ \cong \triangle SRZ$       (4)  $\frac{XY}{SR} = \frac{YZ}{RZ}$
- 18 As shown in the diagram below,  $\overline{ABC} \parallel \overline{EFG}$  and  $\overline{BF} \cong \overline{EF}$ .



If  $m\angle CBF = 42.5^\circ$ , then  $m\angle EBF$  is

- (1)  $42.5^\circ$       (3)  $95^\circ$   
(2)  $68.75^\circ$       (4)  $137.5^\circ$
- 19 A parallelogram must be a rhombus if its diagonals
- (1) are congruent
  - (2) bisect each other
  - (3) do not bisect its angles
  - (4) are perpendicular to each other

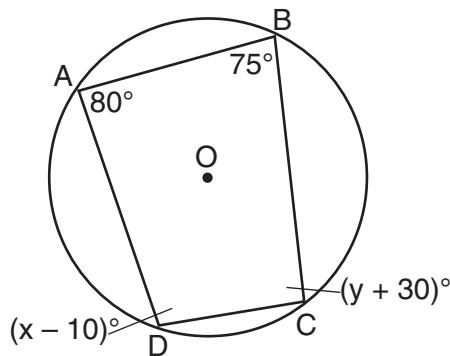
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20 What is an equation of a line which passes through  $(6,9)$  and is perpendicular to the line whose equation is  $4x - 6y = 15$ ?

(1)  $y - 9 = -\frac{3}{2}(x - 6)$       (3)  $y + 9 = -\frac{3}{2}(x + 6)$

(2)  $y - 9 = \frac{2}{3}(x - 6)$       (4)  $y + 9 = \frac{2}{3}(x + 6)$

21 Quadrilateral  $ABCD$  is inscribed in circle  $O$ , as shown below.



If  $m\angle A = 80^\circ$ ,  $m\angle B = 75^\circ$ ,  $m\angle C = (y + 30)^\circ$ , and  $m\angle D = (x - 10)^\circ$ , which statement is true?

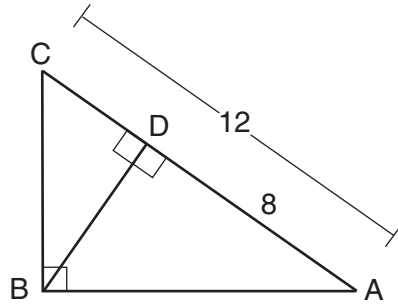
- (1)  $x = 85$  and  $y = 50$       (3)  $x = 110$  and  $y = 75$   
(2)  $x = 90$  and  $y = 45$       (4)  $x = 115$  and  $y = 70$

22 A regular pyramid has a square base. The perimeter of the base is 36 inches and the height of the pyramid is 15 inches. What is the volume of the pyramid in cubic inches?

- (1) 180      (3) 540  
(2) 405      (4) 1215

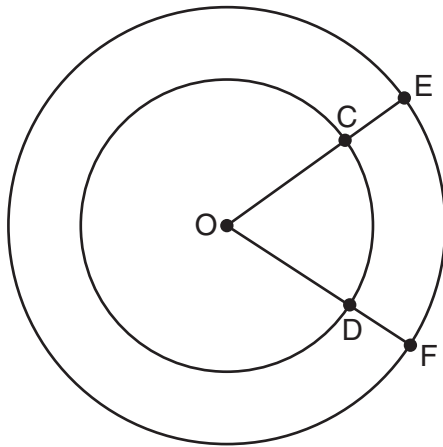
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- 23 In the diagram below of  $\triangle ABC$ ,  $\angle ABC$  is a right angle,  $AC = 12$ ,  $AD = 8$ , and altitude  $\overline{BD}$  is drawn.



What is the length of  $\overline{BC}$ ?

- (1)  $4\sqrt{2}$  (3)  $4\sqrt{5}$   
 (2)  $4\sqrt{3}$  (4)  $4\sqrt{6}$
- 24 In the diagram below, two concentric circles with center  $O$ , and radii  $\overline{OC}$ ,  $\overline{OD}$ ,  $\overline{OE}$ , and  $\overline{OF}$  are drawn.



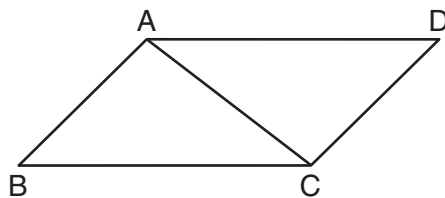
If  $OC = 4$  and  $OE = 6$ , which relationship between the length of arc  $EF$  and the length of arc  $CD$  is always true?

- (1) The length of arc  $EF$  is 2 units longer than the length of arc  $CD$ .  
 (2) The length of arc  $EF$  is 4 units longer than the length of arc  $CD$ .  
 (3) The length of arc  $EF$  is 1.5 times the length of arc  $CD$ .  
 (4) The length of arc  $EF$  is 2.0 times the length of arc  $CD$ .

## Part II

Answer all 7 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [14]

25 Given: Parallelogram  $ABCD$  with diagonal  $\overline{AC}$  drawn



Prove:  $\triangle ABC \cong \triangle CDA$