UNIT 3 QUESTIONS 16-20

2D GEO WORD

1999

2008B

2009A

2008B

2009A

2009B

16. Trapezoid $ABCD$ has $\overline{AD} \parallel \overline{BC}$, $BD = 1$, $\angle DBA = 23°$, and $\angle BDC = 46°$. The ratio $BC : AD$ is $9 : 5$. What is CD?

(A) $\frac{7}{9}$ **(B)** $\frac{4}{5}$ **(C)** $\frac{13}{15}$ **(D)** $\frac{8}{9}$ **(E)** $\frac{14}{15}$

2011B

2012A

16. Circle C_1 has its center O lying on circle C_2. The two circles meet at X and Y. Point Z in the exterior of C_1 lies on circle C_2 and $XZ = 13$, $OZ = 11$, and $YZ = 7$. What is the radius of circle C_1?

(A) 5 **(B)** $\sqrt{26}$ **(C)** $3\sqrt{3}$ **(D)** $2\sqrt{7}$ **(E)** $\sqrt{30}$

2014A

2002B 17. Andy's lawn has twice as much area as Beth's lawn and three times as much area as Carlos' lawn. Carlos' lawn mower cuts half as fast as Beth's mower and one third as fast as Andy's mower. If they all start to mow their lawns at the same time, who will finish first?

(A) Andy **(B)** Beth **(C)** Carlos **(D)** Andy and Carlos tie for first.

(E) All three tie.

2011A

2016A 17. Let $ABCD$ be a square. Let E, F, G, and H be the centers, respectively, of equilateral triangles with bases $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, and $\overline{DA}$, each exterior to the square. What is the ratio of the area of square $EFGH$ to the area of square $ABCD$?

(A) 1 **(B)** $\frac{2+\sqrt{3}}{3}$ **(C)** $\sqrt{2}$ **(D)** $\frac{\sqrt{2}+\sqrt{3}}{2}$ **(E)** $\sqrt{3}$

2007B 18. Let a, b, and c be digits with $a \neq 0$. The three-digit integer abc lies one third of the way from the square of a positive integer to the square of the next larger integer. The integer acb lies two thirds of the way between the same two squares. What is $a+b+c$?

(A) 10 **(B)** 13 **(C)** 16 **(D)** 18 **(E)** 21

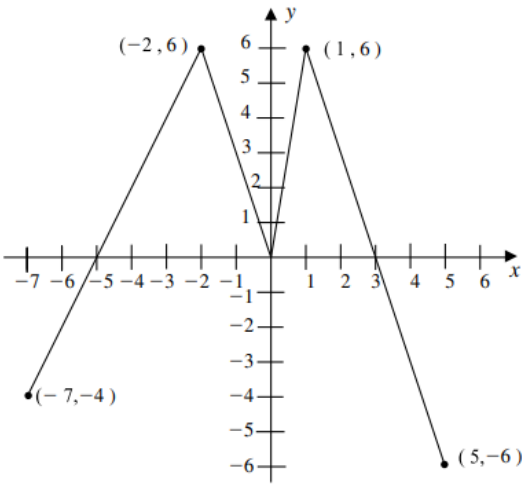
2013A 18. Six spheres of radius 1 are positioned so that their centers are at the vertices of a regular hexagon of side length 2. The six spheres are internally tangent to a larger sphere whose center is the center of the hexagon. An eighth sphere is externally tangent to the six smaller spheres and internally tangent to the larger sphere. What is the radius of this eighth sphere?

(A) $\sqrt{2}$ **(B)** $\frac{3}{2}$ **(C)** $\frac{5}{3}$ **(D)** $\sqrt{3}$ **(E)** 2

2017B 18. The diameter $\overline{AB}$ of a circle of radius 2 is extended to a point D outside the circle so that $BD = 3$. Point E is chosen so that $ED = 5$ and line ED is perpendicular to line AD. Segment $\overline{AE}$ intersects the circle at a point C between A and E. What is the area of $\triangle ABC$?

(A) $\frac{120}{37}$ **(B)** $\frac{140}{39}$ **(C)** $\frac{145}{39}$ **(D)** $\frac{140}{37}$ **(E)** $\frac{120}{31}$

2002A 19. The graph of the function f is shown below. How many solutions does the equation $f(f(x)) = 6$ have?



(A) 2 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** 7

2009A 19. Andrea inscribed a circle inside a regular pentagon, circumscribed a circle around the pentagon, and calculated the area of the region between the two circles. Bethany did the same with a regular heptagon (7 sides). The areas of the two regions were A and B, respectively. Each polygon had a side length of 2. Which of the following is true?

(A) $A = \frac{25}{49}B$ **(B)** $A = \frac{5}{7}B$ **(C)** $A = B$ **(D)** $A = \frac{7}{5}B$ **(E)** $A = \frac{49}{25}B$

2017A 19. A square with side length x is inscribed in a right triangle with sides of length 3, 4, and 5 so that one vertex of the square coincides with the right-angle vertex of the triangle. A square with side length y is inscribed in another right triangle with sides of length 3, 4, and 5 so that one side of the square lies on the hypotenuse of the triangle. What is $\frac{x}{y}$?

(A) $\frac{12}{13}$ **(B)** $\frac{35}{37}$ **(C)** 1 **(D)** $\frac{37}{35}$ **(E)** $\frac{13}{12}$