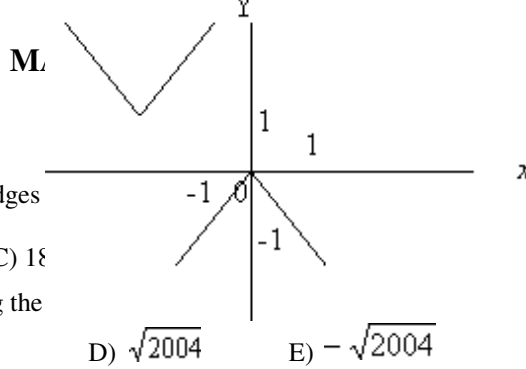


$y=f(x)$

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3 points each

1. A pyramid has 17 faces. How many edges

- A) 16
- B) 17
- C) 18

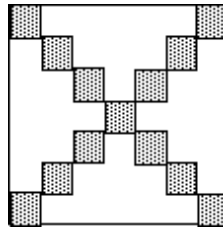
2. The smallest real number x satisfying the

- A) -2004
- B) 2004
- C) 0
- D) $\sqrt{2004}$
- E) $-\sqrt{2004}$

3. How many vertices does a regular polygon have when the sum of its interior angles is seven times smaller than the sum of the angles of a regular polygon with 16 vertices?

- A) 3
- B) 4
- C) 6
- D) 7
- E) 10

4. Let s be an odd natural number. In the square with side s , divided into s^2 little squares, the squares that lie on both diagonals of the big square have been shaded (the figure shows such a square for $s=7$). How many squares have not been shaded?



- A) $s^2 + 1 - 2s$
- B) $s^2 + 4 - 4s$
- C) $2s^2 + 1 - 4s$
- D) $s^2 - 1 - 2s$
- E) $s^2 - 2s$

5. There are 100 cards numbered with natural numbers from 1 to 100 in an envelope. What is the smallest number of cards that need to be randomly taken out of the envelope so that we can be sure that the product of the numbers on the cards which are taken out is divisible by 4?

- A) 51
- B) 52
- C) 53
- D) 54
- E) 55

6. Ewa bought m pens for n dollars each, and n pens for m dollars each, $m \neq n$. The average cost of each pen, in dollars, is:

- A) 1
- B) $\frac{m+n}{2}$
- C) $\frac{2mn}{m+n}$
- D) mn
- E) \sqrt{mn}

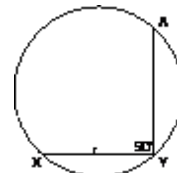
7. Square ABCD was divided into 18 small squares. 17 of these squares have sides equal to 1. What is the area of square ABCD?

- A) 25
- B) 49
- C) 81
- D) 100
- E) 225

8. Each Martian has antennas on its head. Exactly 1% of the Martian have three antennas, 97% have two antennas and the remaining 2% have 1 antenna. What percent of Martian have more antennas on their heads than the average number of antennas in the whole Martian population?

- A) 1
- B) 3
- C) 97
- D) 98
- E) 99

9. On a circle with radius r , three points X, Y, A were chosen so that $|XY| = r$, $XY \perp AY$ (see the figure). What is the measure of angle XAY?



- A) $22^\circ 30'$
- B) 30°
- C) 45°
- D) 60°
- E) 90°

10. There were 15 sheep and a certain number of shepherds in a field. When one half of the shepherds left along with one third of the sheep, the total number of legs of the remaining shepherds and sheep was 50. How many legs did the shepherds and

sheep have all together at the very beginning?

- A) 60 B) 72 C) 80 D) 90 E) 100

4 points each

11. How many two-digit natural numbers have the property such that the last digit of its square is equal to the last digit of its cube?

- A) 1 B) 9 C) 10 D) 21 E) More than 30

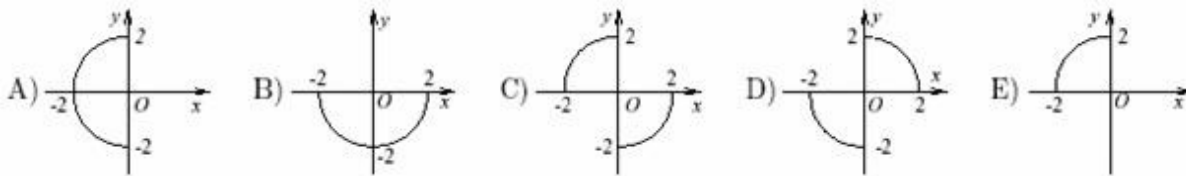
12. In a regular 14-gon, how many right triangles are there with vertices that are also the vertices of the regular 14-gon?

- A) 72 B) 82 C) 84 D) 88 E) Other number

13. How many squares are there on a coordinate plane that have one of their vertices at point $A(-1, -1)$ and at least one of the coordinate axes is the axis of symmetry of the square?

- A) 2 B) 3 C) 4 D) 5 E) 6

14. Which of the graphs below shows the set of all pairs of real numbers (x, y) that satisfy conditions: $xy \neq 0$ and $|x|^2 + |y|^2 = 4$?

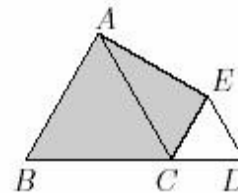


15. How many positive integers can be written in the form $a_0 + a_1 3 + a_2 3^2 + a_3 3^3 + a_4 3^4$ if $a_0, a_1, a_2, a_3, a_4 \in \{-1, 0, 1\}$?

- A) 5 B) 80 C) 81 D) 121 E) 243

16. Point C was indicated on side BD of quadrilateral ABDE in such a way that BCA and CDE are equilateral triangles with sides 2 and 1 respectively (see the figure). The area of quadrilateral ABCE is equal to:

- A) $\frac{3\sqrt{5}}{3}$ B) $\frac{4+5\sqrt{3}}{4}$ C) 3 D) $\frac{6+\sqrt{3}}{4}$ E) $\frac{3\sqrt{3}}{2}$



17. The number $(\sqrt{22+12\sqrt{2}} - \sqrt{22-12\sqrt{2}})^2$ is

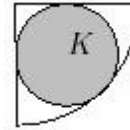
- A) Negative B) Equal to zero C) The fourth power of a positive integer
D) Equal to $11\sqrt{2}$ E) A positive integer divisible by 5

18. There is an equilateral triangle with side 4 and a circle with the center on the vertex of that triangle. The arc of that circle divides the triangle into two parts of equal areas. How long is the radius of the circle?

- A) $\sqrt{\frac{12\sqrt{3}}{\pi}}$ B) $\sqrt{\frac{24\sqrt{3}}{\pi}}$ C) $\sqrt{\frac{30\sqrt{3}}{\pi}}$ D) $\frac{6\sqrt{3}}{\pi}$ E) $\sqrt{\frac{48\sqrt{3}}{\pi}}$

19. Circle K is inscribed in a quarter of a circle with radius 6 (see the picture). What is the length of the radius of circle K?

- A) $\frac{6-\sqrt{2}}{2}$ B) $\frac{3\sqrt{2}}{2}$ C) 3.5 D) 3 E) $6(\sqrt{2}-1)$



20. What is the tens digit of the number 11^{2004} ?

- A) 0 B) 1 C) 2 D) 3 E) 4

5 points each

21. If a geometric sequence $(a_n)_{n \geq 1}$ satisfies the condition: $a_{2003} < a_{2002} < a_{2004}$ then:

- A) $a_{2003} \cdot a_{2004} > 0$ B) $a_{2002} \cdot a_{2003} < 0$ C) $a_{2002} \cdot a_{2004} < 0$ D) $a_{2002} < 0$ E) $a_{2002} \cdot a_{2003} > 0$

22. The digits a, b, c satisfy the condition $0 < a < b < c$. The sum of all three-digit numbers with different digits that can be formed by using only digits a, b, c is equal to 1554. What is the value of digit c ?

- A) 3 B) 4 C) 5 D) 6 E) 7

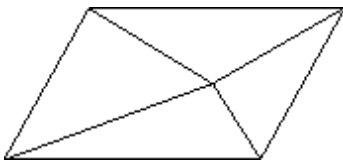
23. The figure shows graphs of functions $y = f(x)$ and $y = g(x)$ defined on real numbers. Each of these graphs consists of two perpendicular rays.

Which of the equalities below is true for all real numbers?

$$y = g(x)$$

- A) $f(x) = -g(x) + 2$ B) $f(x) = -g(x) - 2$ C) $f(x) = -g(x+2)$
 D) $f(x+2) = -g(x)$ E) $f(x+1) = -g(x-1)$

24. A parallelogram was divided into 4 triangles with a common vertex. The bases of these triangles are the sides of the parallelogram (see the figure). Which set of the four numbers below could be the areas of these triangles?

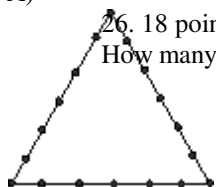


- A) 4, 5, 8, 9 B) 3, 5, 6, 7 C) 5, 6, 7, 12 D) 10, 11, 12, 19 E) 5, 6, 8, 10

25. The difference $\sin^8 75^\circ - \cos^8 75^\circ$ is equal to:

- A) $\frac{\sqrt{3}}{2}$ B) $\sqrt{3}$ C) $\frac{7\sqrt{3}}{16}$ D) 1 E) 0

26. 18 points are indicated on the perimeter of a triangle (see the figure). How many triangles are there with vertices at these points?



A) $\binom{18}{3}$

B) 711

C) 777

D) 717

E) 811

27. In Vegetableville, an election took place. Every one who voted for the Broccoli Party had eaten broccoli at least once in a lifetime. Among those who voted for other parties, 90% had never eaten broccoli. What percent of all the voters did the Broccoli Party get in the election if exactly 46% of all voters taking part in the election had eaten broccoli at least once in their lifetime?

A) 40%

B) 41%

C) 43%

D) 45%

E) 46%

28. The number $m = 999\dots 9$ consists of 999 nines. The sum of the digits of number m^2 is equal to:

A) 8982

B) 8991

C) 9000

D) 9009

E) 9018

29. There is a numerical sequence that consists of 200 zeros. The sequence is transformed into a different sequence with 200 terms in the following way: At the beginning we add 1 to each term of the sequence. In the second step we add 1 to all terms numbered with an even number in the sequence. In the third step we add 1 to all terms that are numbered with the number that is divisible by three, and so on. After 200 steps, we obtain a sequence with the 120th term equal to:

A) 16

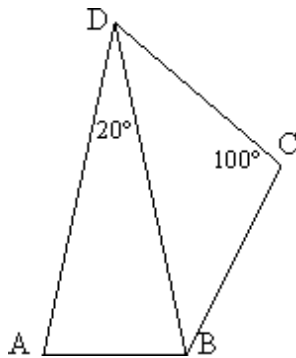
B) 12

C) 20

D) 24

E) 32

30. ABCD is a quadrilateral with an area of 1 and $\angle BCD = 100^\circ$, $\angle ADB = 20^\circ$, $|AD| = |BD|$, and $|BC| = |DC|$ (see the figure). The product $|AC| \times |BD|$ is equal to:



A) $\frac{\sqrt{3}}{3}$

B) $\frac{2\sqrt{3}}{3}$

C) $\sqrt{3}$

D) $\frac{4\sqrt{3}}{3}$

E) Other answer

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