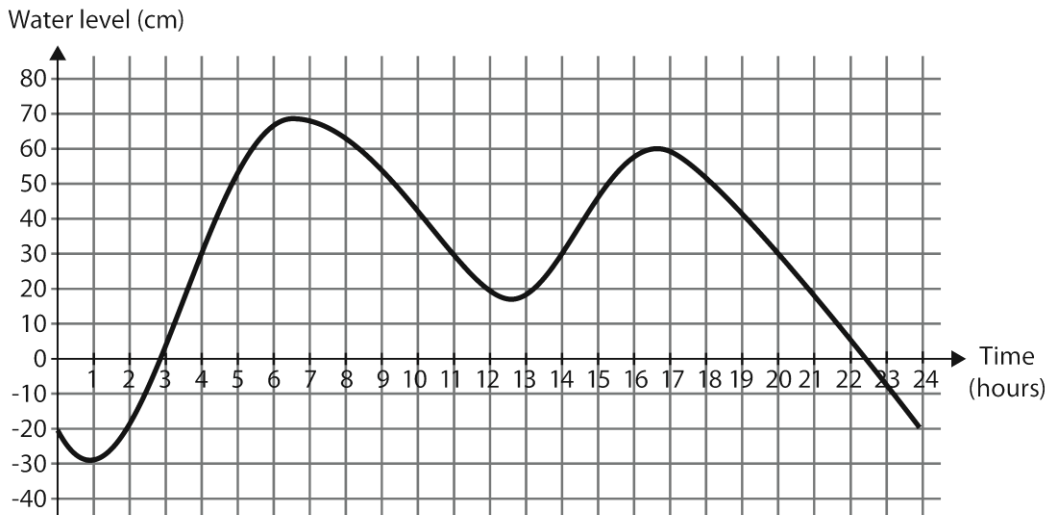




3 points

1.

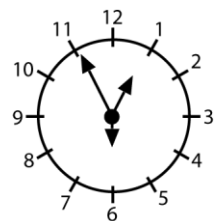
The water level in a port city rises and falls on a certain day as shown in the figure. For how many hours was the water level above 30 cm on that day?



- (A) 5 (B) 6 (C) 7 (D) 9 (E) 13

2.

A clock has 3 hands of different length (for hours, for minutes, and for seconds). We do not know which hand is which, but we know that the clock runs correctly. At 12:55:30 the hands were in the positions shown. Which of the pictures shows this clock at 8:10:00?



- (A) (B) (C) (D) (E)

3.

In a list of five numbers, the first number is 2 and the last number is 12. The product of the first three numbers is 30, the product of the three in the middle is also 30 and the product of the last three numbers is 120. Which number is in the centre of the list?

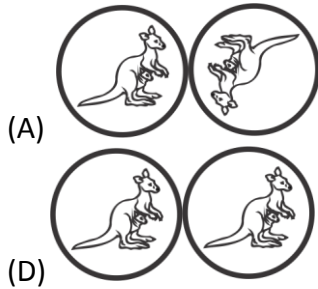
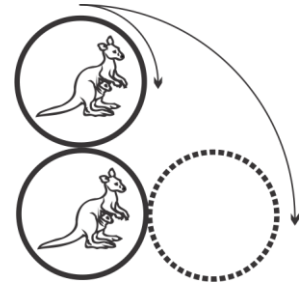


- (A) 3 (B) 4 (C) 5 (D) 6 (E) 10



4.

The upper coin is rotated without slipping around the fixed lower coin to the position shown on the picture. Which is the resulting relative position of the kangaroos?



(E) none of the previous

5.

In four of the following expressions we can replace each number 8 by another positive number (always using the same number for every replacement) and obtain the same result. Which expression does not have this property?

- (A) $(8 + 8 - 8) : 8$ (B) $8 + (8 : 8) - 8$ (C) $8 : (8 + 8 + 8)$
(D) $8 - (8 : 8) + 8$ (E) $8 \cdot (8 : 8) : 8$

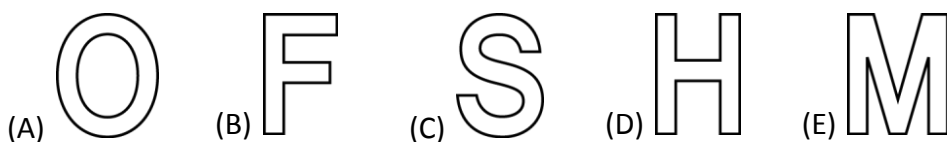
6.

The sum of the digits of a nine-digit integer is 8. What is the product of these digits?

- (A) 0 (B) 1 (C) 8 (D) 9 (E) 5040

7.

Mary has a pair of scissors and five cardboard letters. She cuts each letter exactly once (along a straight line) so that it falls apart in as many pieces as possible. Which letter falls apart into the most pieces?



8.

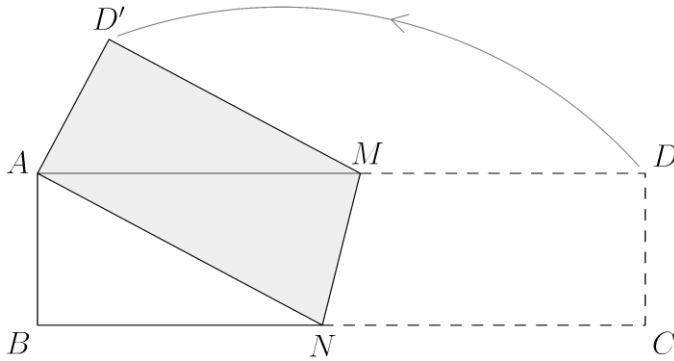
A real number x satisfies $x^3 < 64 < x^2$. Which statement is sure to be correct?

- (A) $0 < x < 64$ (B) $-8 < x < 4$ (C) $x > 8$ (D) $-4 < x < 8$ (E) $x < -8$



9.

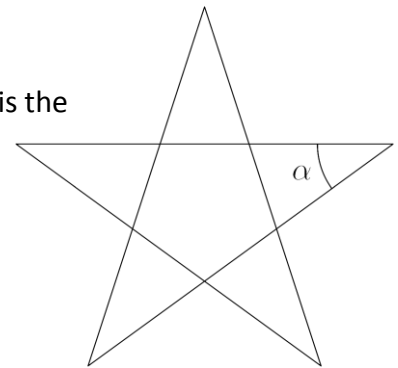
A rectangular piece of paper $ABCD$ measuring $4 \text{ cm} \times 16 \text{ cm}$ is folded along the line MN so that the vertex C coincides with vertex A , as shown in the picture. What is the area of the quadrilateral $ANMD'$?



- (A) 28 cm^2 (B) 30 cm^2 (C) 32 cm^2 (D) 48 cm^2 (E) 56 cm^2

10.

The vertices of the star in the picture form a regular pentagon. What is the size of the angle α ?



- (A) 24° (B) 30° (C) 36° (D) 45° (E) 72°

4 points

11.

My age is a two-digit integer, which is a power of 5, and my cousin's age is a two-digit integer, which is a power of 2. The sum of the digits of our ages is an odd number. What is the product of the digits of our ages?

- (A) 240 (B) 2010 (C) 60 (D) 50 (E) 300

12.

Which of the following functions satisfies

$$f\left(\frac{1}{x}\right) = \frac{1}{f(x)}?$$

- (A) $f(x) = \frac{2}{x}$ (B) $f(x) = \frac{1}{x+1}$ (C) $f(x) = 1 + \frac{1}{x}$ (D) $f(x) = \frac{1}{x}$ (E) $f(x) = x + \frac{1}{x}$



13.

A travel agency organized four optional tours of Sicily for a group of tourists. Each tour had a participation rate of 80 %. What is the smallest possible percentage of tourists who took part in all four tours?

- (A) 80 % (B) 60 % (C) 40 % (D) 20 % (E) 16 %

14.

What is the largest integer n that satisfies $n^{200} < 5^{300}$?

- (A) 5 (B) 6 (C) 8 (D) 11 (E) 12

15.

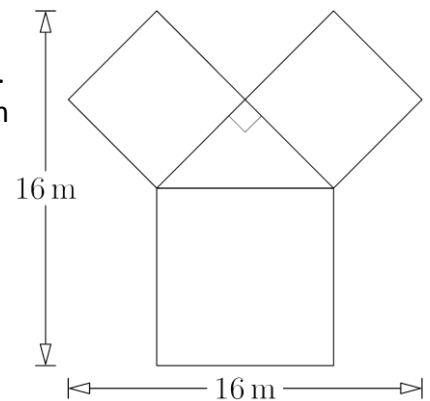
What is the solution to the inequality $|x| + |x - 3| > 3$?

- (A) $x < 0$ or $x > 3$ (B) $-3 < x < 3$ (C) $x < 3$ (D) $-3 < x$ (E) The inequality holds for all real values of x .

16.

The picture shows the plan of a rose bed. White roses grow in the two equal squares, and red roses grow in the third square. Yellow roses grow in the right-angled triangle. Both the length and width of the bed are 16 m. What is the total area of the rose bed?

- (A) 114 m^2 (B) 130 m^2 (C) 144 m^2 (D) 160 m^2 (E) 186 m^2



17.

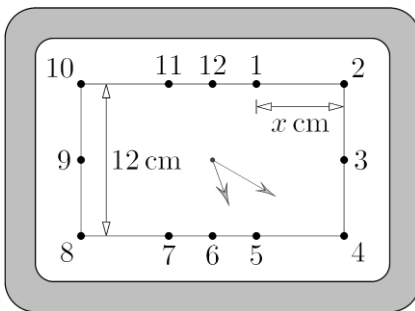
School marks in Slovakia are divided into five degrees, from 1 (the best) to 5. In one Slovak school, a test didn't turn out very well in the 4th class. The average mark was 4. Boys did a little better, their average mark was 3.6 while the average mark of the girls was 4.2. Which of the following statements about the class is correct?

- (A) There are twice as many boys as girls. (B) There are 4 times as many boys as girls.
(C) There are twice as many girls as boys. (D) There are 4 times as many girls as boys.
(E) There are as many girls as boys.



18.

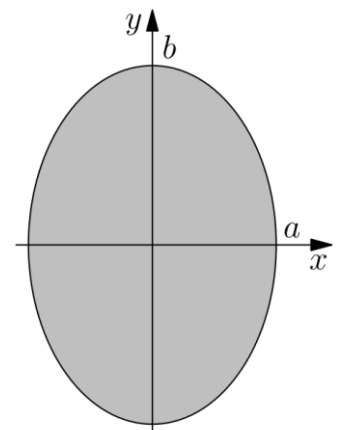
The clock in the picture is of unusual shape, but its hands move at a constant rate like in a normal clock. Therefore the numbers must have been placed unevenly. The distance between 8 and 10 is 12 cm and the distance between 1 and 2 is x cm. What is the value of x ?



- (A) $3\sqrt{3}$ (B) $2\sqrt{3}$ (C) $4\sqrt{3}$ (D) $2 + \sqrt{3}$ (E) $12 - 3\sqrt{3}$

19.

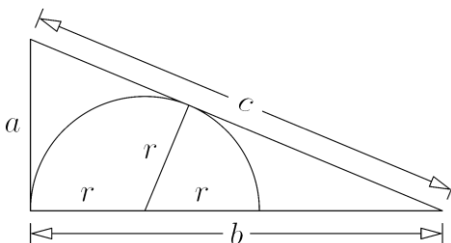
Let $b > a$. If the ellipse shown in the picture is rotated around the x -axis one obtains the ellipsoid E_x with the volume V_x . If the ellipse is rotated around the y -axis one obtains E_y with the volume V_y . Which of the following statements is true?



- (A) $E_x \neq E_y$ and $V_x < V_y$ (B) $E_x \neq E_y$ and $V_x > V_y$
(C) $E_x \neq E_y$ but $V_x = V_y$ (D) $E_x = E_y$ and $V_x = V_y$
(E) $E_x = E_y$ but $V_x \neq V_y$

20.

We are given a right-angled triangle with sides of length a , b and c . What is the radius r of the inscribed semicircle shown in the figure?



- (A) $\frac{a(c-a)}{2b}$ (B) $\frac{ab}{a+b+c}$ (C) $\frac{ab}{b+c}$ (D) $\frac{2ab}{a+b+c}$ (E) $\frac{ab}{a+c}$



5 points

21.

An isosceles triangle ABC has a median (a line segment connecting a vertex and the midpoint of the opposing side) that divides the triangle into two isosceles triangles. What is the least possible angle in ABC ?

- (A) 15° (B) $22,5^\circ$ (C) 30° (D) 36° (E) 45°

22.

Consider two operations which can be performed on a fraction:

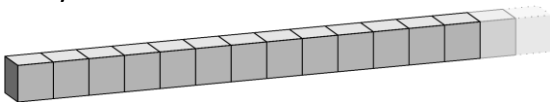
- 1) increase the numerator by 8
- 2) increase the denominator by 7.

We start with $\frac{7}{8}$ and then after a total number of n such operations we get a fraction equal to $\frac{7}{8}$. What is the smallest possible value of n ?

- (A) 56 (B) 81 (C) 109 (D) 113 (E) This situation is impossible.

23.

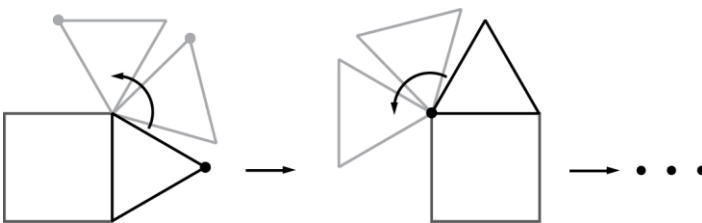
A kangaroo wants to build a row of standard dice (for a standard die, each pair of opposite faces has a total of 7 dots). He can glue two faces together if they have the same number of dots. He would like the total number of dots on the outer faces of the dice in the row to be 2012. How many dice does he need?



- (A) 70 (B) 71 (C) 142 (D) 143 (E) A total of 2012 dots is impossible.

24.

An equilateral triangle rolls without slipping around a square with side length 1 (see picture). What is the length of the path that the marked point covers until the triangle and the point reach their starting positions the next time?



- (A) 4π (B) $\frac{28}{3}\pi$ (C) 4π (D) $\frac{14}{3}\pi$ (E) $\frac{21}{2}\pi$

25.

Numbers 1, 2, 3, and 4 are renamed x_1, x_2, x_3 and x_4 in some order. In how many different ways can the naming be done if we want that $x_1x_2 + x_2x_3 + x_3x_4 + x_4x_1$ is divisible by 3?

- (A) 8 (B) 12 (C) 14 (D) 16 (E) 24



26.

After an algebra lesson, the following was left on the blackboard: the graph of the function $y = x^2$ and 2012 lines parallel to the line $y = x$, each of which intersects the parabola in two points. What is the sum of the x -coordinates of all the points of intersection?

- (A) 0 (B) 1 (C) 1006 (D) 2012 (E) not enough information given

27.

In the sequence 1, 1, 0, 1, -1, ..., the two first terms a_1 ja a_2 are both equal to 1. The third term is the difference of the previous two ($a_3 = a_1 - a_2$) and the fourth is the sum of the previous two ($a_4 = a_2 + a_3$). After this $a_5 = a_3 - a_4$, $a_6 = a_4 + a_5$, and so on. What is the sum of the first 100 terms of this sequence?

- (A) 0 (B) 3 (C) -21 (D) 100 (E) -1

28.

Three vertices of a cube (not all on the same face) are $P(3, 4, 1)$, $Q(5, 2, 9)$ and $R(1, 6, 5)$. Which point is the center of the cube?

- (A) (4, 3, 5) (B) (2, 5, 3) (C) (3, 4, 7) (D) (3, 4, 5) (E) (2, 3, 5)

29.

Ioana pick two numbers a and b from the set $\{1, 2, 3, \dots, 26\}$. The product ab is equal to the sum of the remaining 24 numbers. What is the value of $|a - b|$?

- (A) 10 (B) 9 (C) 7 (D) 6 (E) 2

30.

Every cat in Wonderland is either wise or mad. If a wise cat happens to be in one room with 3 mad ones it turns mad. If a mad cat happens to be in one room with 3 wise ones it is exposed by them as mad.

Three cats entered an empty room. Soon after the 4th cat entered, the 1st cat went out. After the 5th cat entered, the 2nd one went out, etc. After the 2012th cat entered, it happened for the first time that one of the cats was exposed as mad. Which of these cats could both have been mad after entering the room?

- (A) The 1st one and the 2011th one. (B) The 2nd one and the 2010th one.
(C) The 3rd one and the 2009th one. (D) The 4th one and the 2012th one.
(E) The 2nd one and the 2011th one.