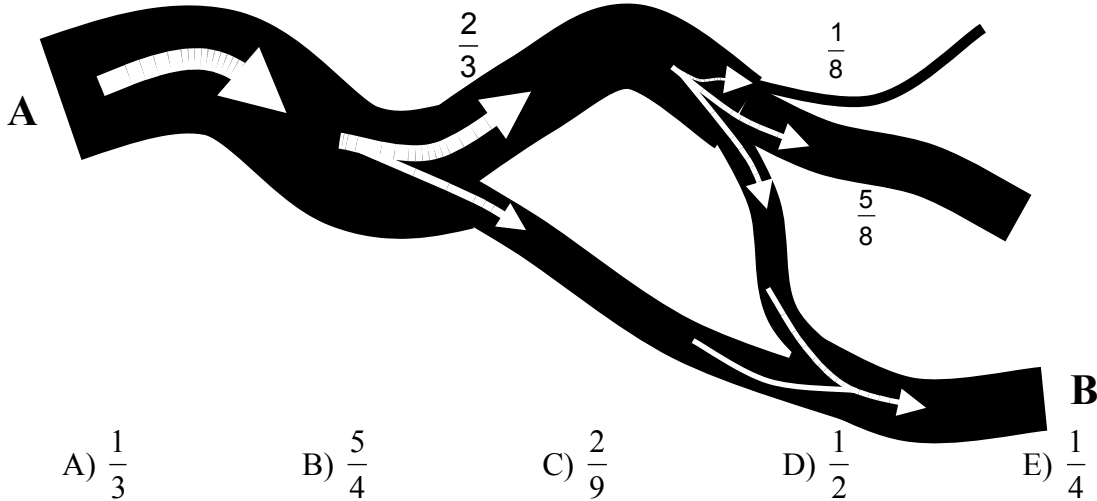
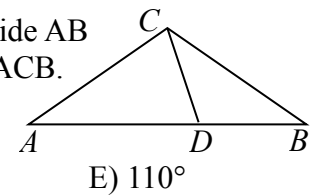


5) A river starts at point A. As it flows the river splits in two. The first branch takes $\frac{2}{3}$ of the water and the second takes the rest. Later the first branch splits in three, one taking $\frac{1}{8}$ th of the branch's water, the second $\frac{5}{8}$ ths and the third the rest. Further down this last branch meets again a branch of the river. The map below shows the situation. What proportion of the original water flows at the point B?



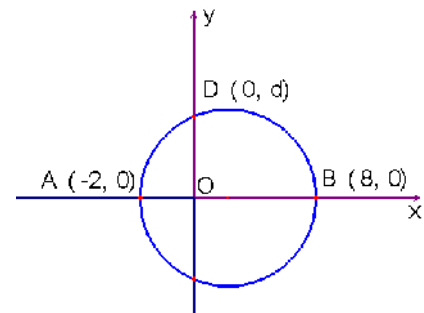
6) In an isosceles triangle ABC ($CA = CB$) the point D is marked on the side AB so that $AD = AC$ and $DB = DC$ (see the fig.). Find the value of the angle ACB.



7) The maximum value of $f(x) = |5 \sin x - 3|$ for $x \in \mathbf{R}$ is

- A) 2 B) 3 C) π D) 5π E) 8

8) The figure shows a circle with the diameter AB and point D on it. Find d.



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

9) We have five different points A_1, A_2, A_3, A_4 and A_5 , placed in this order on a straight line (with some distances that can be different between the points). Another point P is placed on the same line so that the sum of the distances $PA_1 + PA_2 + PA_3 + PA_4 + PA_5$ is minimal. Then the point P is

- A) A_1 B) A_2 C) A_3
 D) Any point between A_2 and A_4 E) Any point between A_1 and A_5

10) Nora wants to have on the empty places of $2_ _ 8$ two such digits that the complete number is divisible by 3. How many possibilities are there?

- A) 29 B) 30 C) 19 D) 20 E) 33

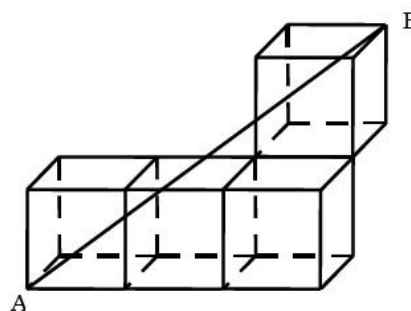
4 points

11) Here are seven numbers: $\{-9, 0, -5, 5, -4, -1, -3\}$. We arranged six of them in groups of two so that the sum in each group is the same. Which number was not used in the sums?

- A) 5 B) 0 C) -3 D) -4 E) -5

12) Each of the cubes in the figure has the length of edge equal to 1. What is the length of the segment AB ?

- A) $\sqrt{17}$ B) 7 C) $\sqrt{13}$
 D) $\sqrt{7}$ E) $\sqrt{14}$



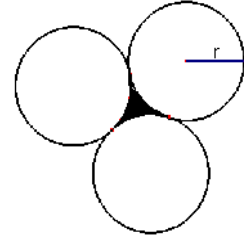
13) Five problems are proposed on a Mathematical Competition. Since the problems have different difficulty levels, no two of them have the same point value (all point values are positive integers). Bill solved all five problems and he obtained a total of 10 points for the two problems with the lowest point value and a total of 18 points for the two problems with the highest point value. How many points did Bill obtain?

- A) 30 B) 32 C) 34 D) 35 E) 40

14) Mathilde drew 36 kangaroos using three different colours. 25 of the kangaroos contain some yellow, 28 contain some brown and 20 contain some black colour. Only 5 of them have all the three colours. How many single-colour kangaroos did she draw?

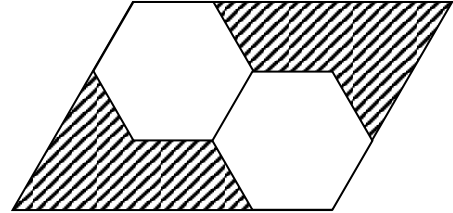
- A) None B) 4 C) 12 D) 31 E) It's impossible to know.

15) Three circles touch each other as shown. The radius of each circle is r . The dark area in the middle is



- A) $\left(\sqrt{3} - \frac{1}{2}\pi\right)r^2$ B) $\left(\frac{1}{2}\pi - \frac{1}{2}\sqrt{3}\right)r^2$
 C) $\frac{1}{8}\pi r^2$ D) $\left(\sqrt{3} - \frac{3}{2}\right)\pi r^2$ E) $\left(\frac{1}{3}\pi - \frac{1}{2}\sqrt{3}\right)r^2$

16) In the figure the two regular hexagons are equal to each other. What fraction of the parallelogram's area is shaded?



- A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{1}{4}$ D) $\frac{1}{5}$ E) $\frac{1}{6}$

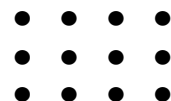
17) The numerator and the denominator of a fraction are negative numbers, and the numerator is larger by one than the denominator. Which of the following is true about the fraction?

- A) The fraction is a number less than -1.
 B) The fraction is a number between -1 and 0.
 C) The fraction is a positive number less than 1.
 D) The fraction is a number greater than 1.
 E) It cannot be determined whether the fraction is positive or negative.

18) Suppose $x^2yz^3 = 7^3$ and $xy^2 = 7^9$. Then $xyz =$

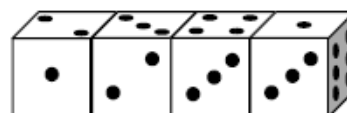
- A) 7^4 B) 7^6 C) 7^8 D) 7^9 E) 7^{10}

19) Three points are selected at random from the grid (see the fig.). What is the probability that they are collinear?



- A) $\frac{1}{12}$ B) $\frac{1}{11}$ C) $\frac{1}{16}$ D) $\frac{1}{8}$ E) $\frac{3}{12}$

20) Four identical dice are arranged in a row (see the fig.). Each dice has faces with 1, 2, 3, 4, 5 and 6 points, but the dice are not standard, i. e. the sum of the points on the opposite faces of the dice does not necessarily equal 7. What is the total sum of the points in all 6 touching faces of the dice?



- A) 19 B) 20 C) 21 D) 22 E) 23

5 points

21) The lengths of the edges of a block (rectangular parallelepiped) in centimetres are integers and they form a geometric sequence with quotient $q = 2$. Which of the following can be the volume of this solid?

- A) 120 cm^3 B) 188 cm^3 C) 216 cm^3 D) 350 cm^3 E) 500 cm^3

22) In the figure each asterisk stands for one digit. The sum of the digits of the product is equal to

$$\begin{array}{r}
 \\
 \times \\
 \hline
 \\
 \\
 + \\
 \hline
 \\
 \\
 \\
 \hline

 \end{array}$$

- A) 16 B) 20 C) 26 D) 30 E) Another answer

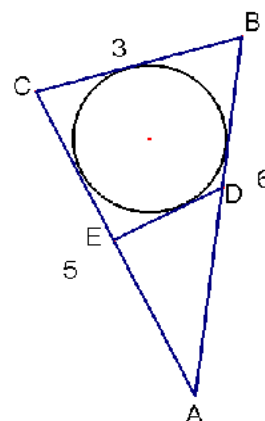
23) Find the value of the expression $x^2 + y^2 + z^2$, if $x + y + z = 1$ and $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$.

- A) 0 B) 1 C) 2 D) 3
E) It is impossible to determine.

24) The first element of a sequence is $a_1 = 0$, and if $n \geq 1$ then $a_{n+1} = a_n + (-1)^n \cdot n$. If $a_k = 2008$ then the value of k is

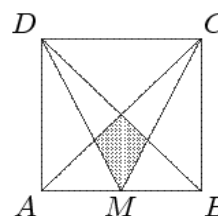
- A) 2008 B) 2009 C) 4017 D) 4018 E) Other

25) A circle is inscribed in the triangle ABC, as in the figure on the right, and $|AC| = 5$, $|AB| = 6$, $|BC| = 3$. The segment ED is tangent to the circle. The perimeter of the triangle ADE is



- A) 7 B) 4 C) 9 D) 6 E) 8

26) The square ABCD has a side of length 1 and M is the midpoint of AB. The area of the shaded region is

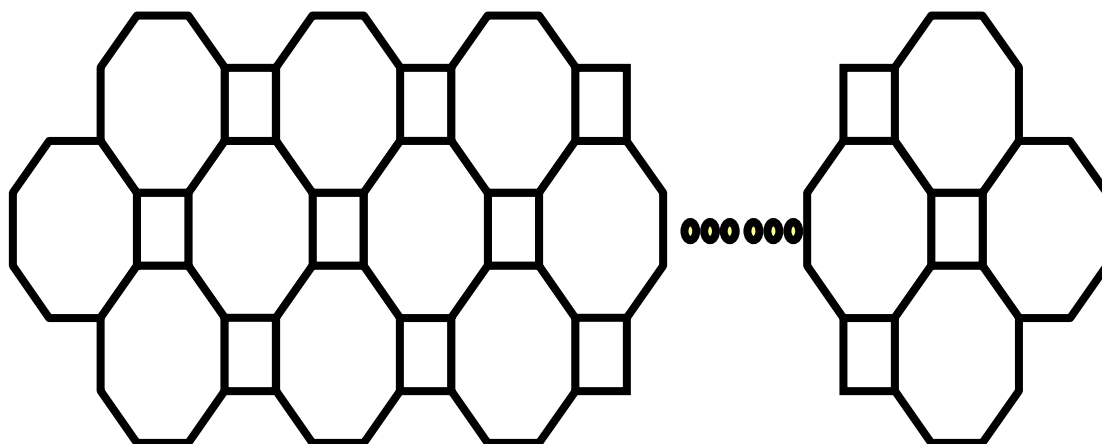


- A) $\frac{1}{24}$ B) $\frac{1}{16}$ C) $\frac{1}{8}$ D) $\frac{1}{12}$ E) $\frac{2}{13}$

27) How many prime numbers p have the property that $p^4 + 1$ is prime as well? Note: Number 1 is not a prime!

- A) None B) 1 C) 2 D) 3 E) Infinitely many

28) We used metal rods to build this nice ensemble. We know there are 61 octagons, how many rods are there?



- A) 488 B) 400 C) 328 D) 244 E) 446

29) The number $3^{32} - 1$ has exactly two divisors which are larger than 75 and smaller than 85. What is the product of these two divisors?

- A) 5852 B) 6560 C) 6804 D) 6888 E) 6972
-

30) If $\sin x + \cos x = m$, then $\sin^4 x + \cos^4 x =$

- A) $1 - \frac{(1 - m^2)^2}{2}$ B) $1 + \frac{(1 - m^2)^2}{2}$ C) $\frac{1 - (1 - m^2)^2}{2}$ D) m^4 E) $m^4 + 1$
-