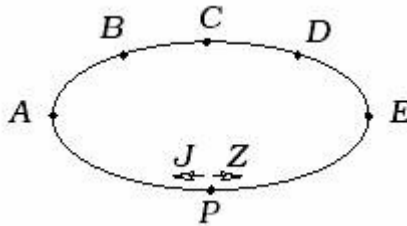


**Math Kangaroo 2002**  
**Level of grades 9 - 10**

**Problems 3 point each**

1. What is the last digit of the product of all natural numbers from 11 to 29 inclusive?  
 A/ 8                  B/ 6                  C/ 4                  D/ 2                  E/ 0

2.



Jack's running speed is three times greater than Zosia's speed. They start from point P at the same time but in opposite directions, as you can see in the picture. At what point will they meet ?

- A/ A                  B/ B                  C/ C                  D/ D                  E/ E

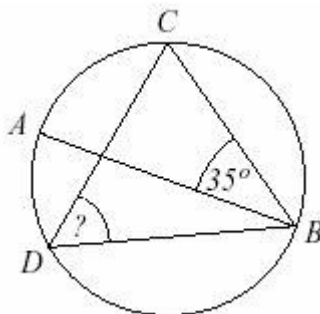
3. The volume and the surface area of a certain cube are expressed by the same number. What is the length of a side of this cube?

- A/ 216                  B/ 36                  C/ 6                  D/ 3                  E/ 1

4. The number  $10^{2002} + 2$  is divisible by

- A/ 4                  B/ 5                  C/ 6                  D/ 9                  E/  $10^{1001}$

5. In the figure below you can see points A, B, C, D on a circle. Chord AB is a diameter of this circle. The measure of angle ABC is  $35^\circ$ . What is the measure of angle BDC?



- A/  $35^\circ$                   B/  $45^\circ$                   C/  $55^\circ$                   D/  $60^\circ$                   E/  $65^\circ$

6. Janek has two more brothers than sisters. His sister Ania has three times more brothers than sisters. How many sisters does Janek have?

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

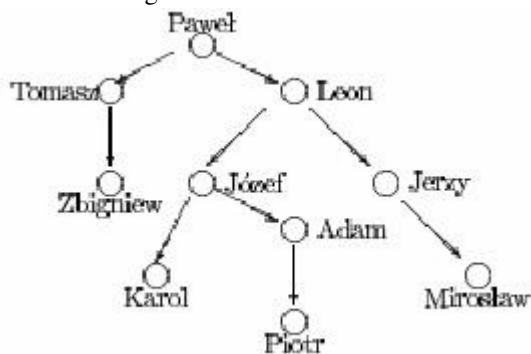
7. On a plane, figure F consists of 2002 points. Line l is a line of symmetry of figure F. Exactly k points of figure F belong to line l. Which of the following numbers cannot be the value of number k?

- A/ 2002                  B/ 0                  C/ 1001                  D/ 2000                  E/ 2

8. A computer virus destroys computer memory. On the first day it destroyed  $\frac{1}{2}$  of this memory. On the second day it destroyed  $\frac{1}{3}$  of the memory remaining after the first day; on the third day it destroyed  $\frac{1}{4}$  of the memory remaining after two days and on the fourth day it destroyed  $\frac{1}{5}$  of the memory remaining after three days. What part of all the computer memory was left after those four days?
- A)  $\frac{1}{5}$                       B)  $\frac{1}{6}$                       C)  $\frac{1}{10}$                       D)  $\frac{1}{12}$                       E)  $\frac{1}{24}$
9. There are four points  $(0,0)$ ,  $(1,0)$ ,  $(1,3)$ ,  $(4,3)$  on a plane. How many triangles with vertices in these points are there which have an area that is expressed with a whole number?
- A/ 4                      B/ 3                      C/ 2                      D/ 1                      E/ 0
10. The sum of five consecutive odd numbers is greater than 2002. The least possible value of this sum is:
- A/ 4005                      B/ 2010                      C/ 2003                      D/ 2004                      E/ 2005

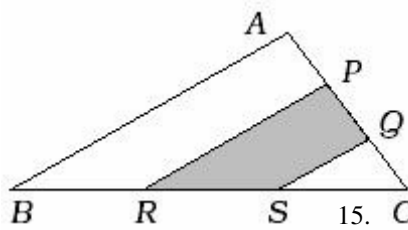
**Problems 4 points each**

11. There is an equilateral triangle  $ABC$  on a plane. How many points  $X$  can you find inside this triangle so that the areas of triangles  $ABX$ ,  $BCX$ ,  $ACX$  are equal?
- A/ 1                      B/ 2                      C/ 3                      D/ 6                      E/ Infinitely many
12. What is the last digit of the number:  $1 + 11 + 111 + \dots + 11\dots1$  ?  
2002 digits
- A/ 0                      B/ 1                      C/ 2                      D/ 3                      E/ 6
13. Piotr created a genealogical tree of the men in his family. The arrows go from a father to a son. What was the name of the son of the brother of the grandfather of Piotr's father's brother?



- A/ Józef                      B/ Mirosław                      C/ Leon                      D/ Zbigniew                      E/ the other answer

14. The area of triangle  $ABC$  is 1. Points  $P$ ,  $Q$ ,  $R$ ,  $S$  divide the sides of this triangle into equal segments. What is the area of the shaded region?



- A/  $\frac{1}{4}$       B/  $\frac{1}{3}$       C/  $\frac{1}{2}$   
D/  $\frac{2}{3}$       E/  $\frac{4}{9}$

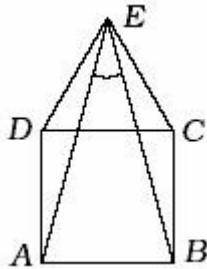
The difference between the greatest three-digit number written with all different digits, and the smallest three-digit number, also written with all different digits is equal:

- A/ 864      B/ 885      C/ 800      D/ 100      E/ 899

16. On a plane there are points (0,0), (2,0), (1,3), (3,3), (5,3). How many pairs of parallel lines can you find so that each of these lines contains at least two of these points?

- A/ 1      B/ 2      C/ 3      D/ 4      E/ Infinitely many

17. Square  $ABCD$  and equilateral triangle  $DCE$  are on a plane. (See the picture.) What is the measure of angle  $AEB$  ?



- A/  $15^\circ$       B/  $30^\circ$       C/  $45^\circ$       D/  $60^\circ$       E/  $90^\circ$

18. After 15 girls left the group there were twice as many boys as girls in the group. Then 45 boys left the group and there were five times as many girls as boys. How many girls were there in the group at the very beginning?

- A/20      B/ 25      C/35      D/ 40      E/75

19. Following the teacher's assignment the students drew four circles on sheets of paper. Then they counted the points of those circles' intersections. What was the greatest possible number of those points?

- A/ 8      B/ 6      C/ 10      D/ 18      E/12

20. The perimeter of a rectangle is 32. The measures of its sides are expressed with natural numbers. Which of the numbers below can be a measure of the area of this rectangle?

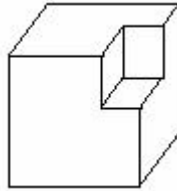
- A/ 24      B/ 48      C/ 76      D/ 192      E/ 384

**Problems 5 points each**

21. In a certain hotel on average 88% of rooms are occupied during three summer months and on average 44% of rooms are occupied during the other nine months. What is the average percent of rooms occupied during the whole year in that hotel?

- A/ 132%      B/ 66%      C/ 55%      D/ 44%      E/ The other answer

22.



From a stone cube with the volume of  $512 \text{ dm}^3$  a small rectangular solid was cut off, as you can see in the picture. What is the total surface area of the remaining solid?

- A/  $320 \text{ dm}^2$       B/  $336 \text{ dm}^2$       C/  $384 \text{ dm}^2$       D/  $468 \text{ dm}^2$   
 E/ It cannot be determined from the information given.

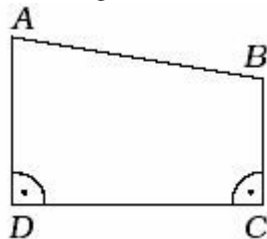
23. The letters  $a, b, c, d, e$  were written into the squares of a  $5 \times 5$  diagram. Each letter is placed just once in every row, every column and on each of the two diagonals. You can see a few of the written letters.

$c$	$d$			$e$
$b$				
		?		
				$d$

What letter was written into a square marked with "?" ?

- A/  $a$       B/  $b$       C/  $c$       D/  $d$       E/  $e$

24. In the convex quadrilateral  $ABCD$  the lengths of the sides are expressed with natural numbers and the perimeter is equal to 16 (see the picture). The interior angles  $C$  and  $D$  are right angles and angle  $B$  is obtuse.



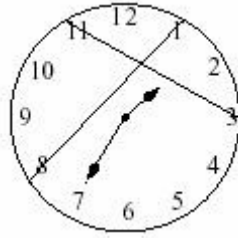
The length of side  $BC$  is equal to:

- A/ 1      B/ 2      C/ 3      D/ 4      E/ 5

25. Letters  $a$  and  $b$  represent natural numbers such that the graphs of the functions  $y = 2x + b$  and  $y = ax + 3$  intersect the axis  $Ox$  at the same point. How many different values can the expression  $a + b$  have?

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

26. The last earthquake destroyed the face of the clock on the tower. One line of the breakage goes from the number eleven to the number three; another connects numbers one and eight. Both lines of breakage are straight.



What is the measure of the angle between these lines?

- A/  $70^\circ$       B/  $75^\circ$       C/  $80^\circ$       D/  $85^\circ$       E/  $90^\circ$

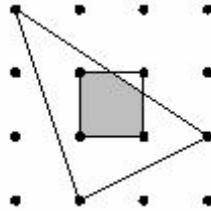
27. Let  $f$  be a function such that for each real number  $x$

$$f(x) = x^2(f(x - 1) - 1).$$

If  $f(1) = 10$ , then  $f(3)$  is equal to:

- A/ 9      B/ 15      C/ 225      D/ 315      E/ 512

28.



The distances between the dots in the figure are equal to 1, both

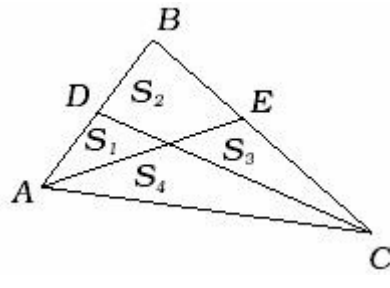
horizontally and vertically. What is the measure of the common area of the triangle and the square which you can see shaded in the figure?

- A/  $\frac{9}{10}$       B/  $\frac{15}{16}$       C/  $\frac{8}{9}$       D/  $\frac{11}{12}$       E/  $\frac{14}{15}$

29. An automatic machine transforms a given number  $x \neq 0$  into one of the numbers:  $x + 3$ ,  $x - 2$ ,  $\frac{1}{x}$ ,  $x^2$ . The number 1.99 was entered into this automatic machine and three such transformations were made, the first on this number and the next two on the consecutive results. Let  $y$  be the greatest number that could be obtained in that way. Then:

- A/  $y = (1.99)^8$       B/  $y = (4.99)^4$       C/  $y = (7.99)^2$       D/  $y > 1,000$       E/  $y > 20,000$

30. Triangle ABC was divided into four figures with areas  $S_1, S_2, S_3, S_4$  as you can see in the picture. Is it possible for numbers  $S_1, S_2, S_3, S_4$  to be the same?



- A/ No.
- B/ Yes, but only if the triangle is equilateral.
- C/ Yes, but only if the triangle is a right triangle.
- D/ Yes, but only if the triangle is obtuse.
- E/ Yes, when the triangle has angles:  $36^\circ, 72^\circ, 72^\circ$ .

[Back to all problems](#)