

Kangaroo of Mathematics 2009
Level Kadett (Grades 7. and 8.)
Austria - 23.3.2009



- 3 point questions -

1) Which of the following is an even number?

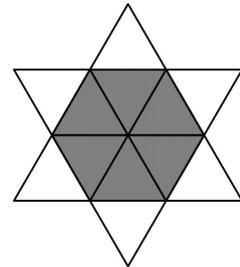
- A) 2009 B) $2 + 0 + 0 + 9$ C) $200 \div 9$ D) 200×9 E) $200 + 9$

2) At a party there were 4 boys and 4 girls. Boys only danced with girls and girls only danced with boys. At the end of the evening each person was asked how many people they had danced with. The boys gave the answers 3, 1, 2, 2 and three of the girls answered 2. Which answer did the fourth girl give?

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

3) The star shown in the picture is made by fitting together 12 congruent equilateral triangles. The perimeter of the star is 36cm. What is the perimeter of the grey hexagon?

- A) 6 cm B) 12 cm C) 18 cm D) 24 cm E) 30 cm

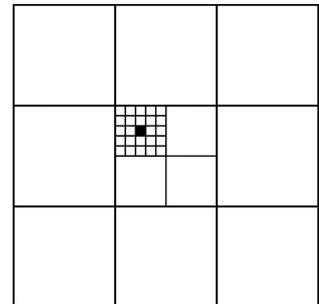


4) Harry delivers newspapers in Long street. He must deliver a paper to every house with an odd house number. If the first house is number 15 and the last is number 53, to how many houses does Harry deliver?

- A) 19 B) 20 C) 27 D) 38 E) 53

5) In the picture the large square has an area of 1. What is the area of the small black square?

- A) $\frac{1}{100}$ B) $\frac{1}{300}$ C) $\frac{1}{600}$ D) $\frac{1}{900}$ E) $\frac{1}{1000}$



6) The product of four different natural numbers is 100. What is the sum of the four numbers?

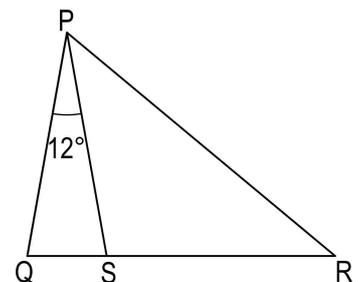
- A) 10 B) 12 C) 15 D) 18 E) 20

7) In a park there are some cats and dogs. The number of cats feet is double the size of the number of dogs noses. The number of cats is $\frac{1}{11} \frac{???}{11}$ of the number of dogs.

- A) double the size B) half the size C) the same size
D) a quarter the size E) a sixth of the size.

8) In the diagram QSR is a straight line. $\angle QPS = 12^\circ$ and $PQ = PS = RS$. How big is $\angle QPR$?

- A) 36° B) 42° C) 54° D) 60° E) 84°

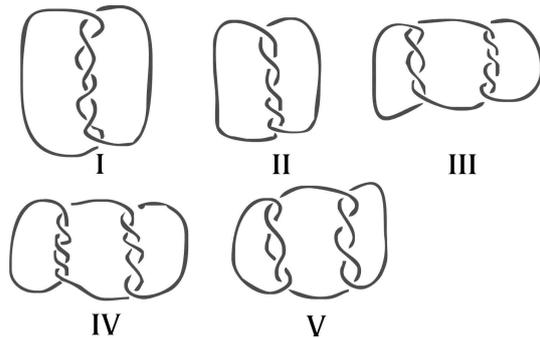


9) A lift can carry either 12 adults or 20 children. What is the maximum number of children that could travel in the lift with 9 adults?

- A) 3 B) 4 C) 5 D) 6 E) 8

10) Which of the following is made using more than one piece of string?

- A) I, III, IV and V B) I, III and V
C) III, IV and V D) all
E) None of these answers

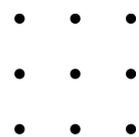


- 4 point questions -

11) For how many positive whole numbers does a^2 and a^3 have the same number of digits?

- A) 0 B) 3 C) 4 D) 9 E) infinitely many

12) What is the minimum number of dots that must be taken away from the picture so that no three of the remaining dots lie on a straight line?



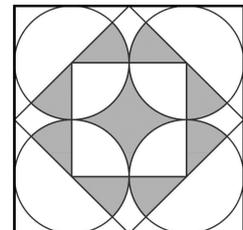
- A) 1 B) 2 C) 3 D) 4 E) 7

13) Nick measured all 6 angles in two triangles. One of the triangles was acute angled and the other obtuse angled. He noted four of the angles to be: 120° , 80° , 55° and 10° . What is the size of the smallest angle in the acute angled triangle?

- A) 45° B) 10° C) 5° D) 55° E) not possible to answer.

14) What fraction of the largest square is grey?

- A) $\frac{1}{4}$ B) $\frac{1}{5}$ C) $\frac{2}{5}$ D) $\frac{3}{8}$ E) $\frac{1}{3}$

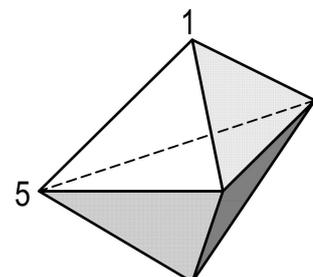


15) On the island of the truth tellers and the liars, there are 25 people standing in a line. The person at the front claims that everybody standing behind him is a liar. Everybody else claims that the person standing in front of them is a liar. How many liars are standing in the line? (Truth tellers always tell the truth and liar always lie.)

- A) 0 B) 12 C) 13 D) 24 E) not possible to answer.

16) In the diagram opposite there is an object with 6 triangular faces. On each corner there is a number (two are shown). The sum of the numbers on the corners of each face is the same. What is the sum of all 5 numbers?

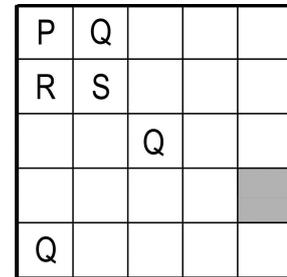
- A) 9 B) 12 C) 17 D) 18 E) 24



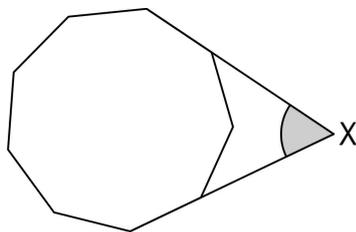
17) In the equation $\frac{E \times I \times G \times H \times T}{F \times O \times U \times R} = T \times W \times O$ each letter represents a certain digit (the same letter represents the same digit each time). How many different values can the expression $T \cdot H \cdot R \cdot E \cdot E$ have?

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

18) We want to paint each square in the grid with the colours P, Q, R and S, so that neighbouring squares always have different colours. (Squares which share the same corner point also count as neighbouring.) Some of the squares are already painted. In which colour(s) could the grey square be painted?



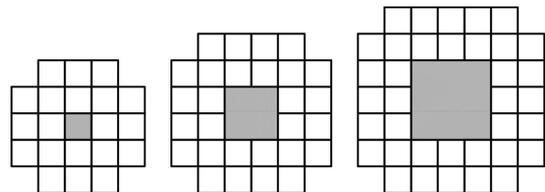
- A) only Q B) only R C) only S D) either R or S E) it is not possible.



19) The diagram opposite shows a regular nonagon. What is the size of the angle marked X?

- A) 40° B) 45° C) 50° D) 55° E) 60°

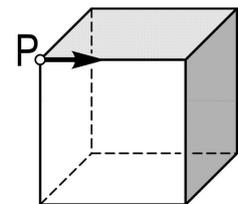
20) A pattern is made out of white, square tiles. The first three patterns are shown. How many tiles will be needed for the tenth pattern?



- A) 76 B) 80 C) 84 D) 92 E) 100

- 5 point questions -

21) A beetle walks along the edges of a cube. Starting from point P it first moves in the direction shown. At the end of each edge it changes the direction in which it turns, turning first right then left, then right etc. Along how many edges will it walk before it returns to point P?

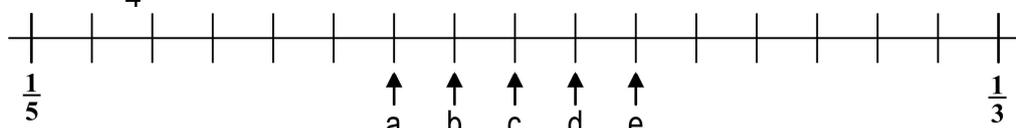


- A) 2 B) 4 C) 6 D) 9 E) 12

22) How many 10 digit numbers are there which use only the digits 1, 2 and 3 (not necessarily all) and are written in such a way that consecutive digits always have a difference of 1.

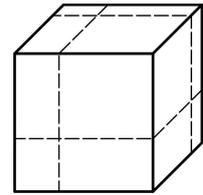
- A) 16 B) 32 C) 64 D) 80 E) 100

23) The fractions $\frac{1}{3}$ and $\frac{1}{5}$ are shown on the number line. In which position should $\frac{1}{4}$ be shown?



- A) a B) b C) c D) d E) e

24) A cube is cut in three directions as shown, to produce eight cuboids (each cut is parallel to one of the faces of the cube). What is the ratio of the total surface area of the eight cuboids to the surface area of the original cube?



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

25) All factors of a number N (with the exception of 1 and N itself) are written down one after the other. It turns out that the biggest factor is 45 times as big as the smallest factor. For how many numbers N is that true?

- A) 0 B) 1 C) 2 D) more than 2 E) not possible to answer.

26) A square is cut into 2009 smaller squares. The side length of each smaller square is a whole number. What is the minimum possible side length of the original square?

- A) 44 B) 45 C) 46 D) 503
E) Its not possible to cut a square into 2009 smaller squares.

27) In the quadrilateral PQRS $PQ = 2006$, $QR = 2008$, $RS = 2007$ und $SP = 2009$. At which corners must the interior angle definitely be smaller than 180° ?

- A) P, Q, R B) Q, R, S C) P, Q, S D) P, R, S E) P, Q, R, S

28) I have a $6\text{ cm} \times 6\text{ cm}$ square and a certain triangle. If I lay the square on top of the triangle I can cover up to 60% of the area of the triangle. If I lay the triangle on top of the square I can cover up to $\frac{2}{3}$ of the area of the square. What is the area of the triangle?

- A) 22.8 cm^2 B) 24 cm^2 C) 36 cm^2 D) 40 cm^2 E) 60 cm^2

29) Friday writes different positive whole numbers that are all less than 11 next to each other in the sand. Robinson Crusoe looks at the sequence and notices with amusement that adjacent numbers are always divisible by each other. What is the maximum amount of numbers he could possibly have written in the sand?

- A) 6 B) 7 C) 8 D) 9 E) 10

30) In triangle ABC the interior angle B equals 20° and C 40° . The length of the angle bisector through A is 2. What is the difference of the side lengths of BC and AB?

- A) 1 B) 1.5 C) 2 D) 4 E) Not possible to answer.