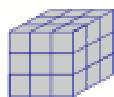


6 points questions

17. A cube with a side length of 3 cm is painted gray and cut into smaller cubes each with a side length of 1 cm. How many of the smaller cubes will have exactly 2 faces painted?



- A) 4 B) 6 C) 8 D) 10 E) 12
-

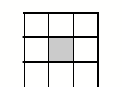
18. A palindrome is a number which remains the same when its digits are written in reverse order. For example 1331 is a palindrome. A car's odometer reads 15951. Find the least number of kilometers required for the next palindrome to appear.

- A) 100 B) 110 C) 710 D) 900 E) 1010
-

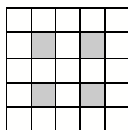
19. Romain, Fabien, Lise, Jennifer, Adrien are in a single file. Romain is after Lise. Fabien is before Romain and just after Jennifer. Jennifer is before Lise but she isn't the first. Where is Adrien?

- A) 1st B) 2nd C) 3rd D) 4th E) 5th
-

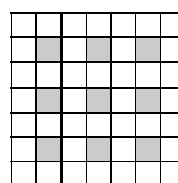
20. **Cells.** We count the number of white cells. How many white cells has the next square?



8 white cells



21 white cells



40 white cells

- A) 50 B) 60 C) 65 D) 70 E) 75
-

21. What is the perimeter of a figure made by cutting out four squares, one at each corner, with a perimeter of 8 cm from a 15 cm by 9 cm rectangle?

- A) 48 cm B) 40 cm C) 32 cm D) 24 cm E) 16 cm
-

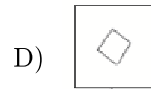
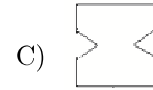
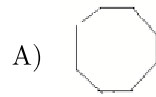
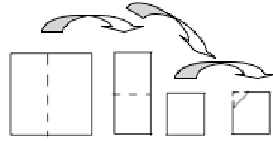
22. The seats on a children merry-go-round are numbered in the sequence 1, 2, 3, ... On this merry-go-round, Peter was sitting on seat numbered 11, exactly opposite Maria, who was sitting on seat number 4. How many seats are there on this merry-go-round?

- A) 13 B) 14 C) 16 D) 17 E) 22
-

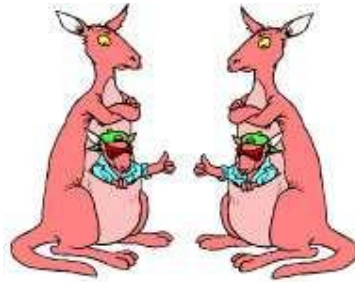
23. How many digits do you need to write down all numbers from 1 to 100?

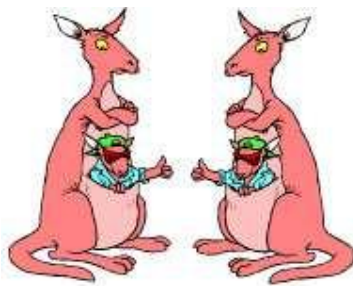
- A) 100 B) 150 C) 190 D) 192 E) 200
-

24. A square piece of paper will be folded twice in such a way that the result is square again. In this square one of the corners will be cut out, after which the paper will be folded out again. Which of the following pieces of paper can not be got in this way?



E) you can get all of those in this way



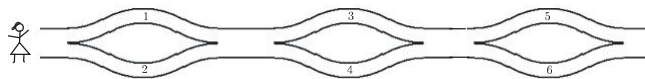


LEVEL 05 - 06

Attention! Questions from 1-10 carry 3 points each, questions 11-20 carry 5 points each and questions 21-30 carry 6 points each. The maximum score is 120 points.

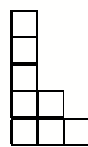
3 point questions

1. Zita walks from the left to the right and puts the numbers in her basket. What of the following numbers can be in her basket?

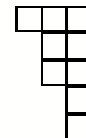
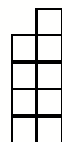
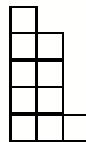
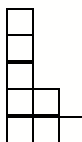


- A) 1, 2 and 4 B) 2, 3 and 4 C) 2, 3 and 5 D) 1, 5 and 6 E) 1, 2 and 5
-

2. What is the piece that fits together with the given one to form a rectangle?



- A) B) C) D) E)



3. In the square below the numbers 1, 2 and 3 must be written in the cells. In each row and in each column each of the numbers 1, 2 and 3 must appear. Harry started to fill in the square. In how many ways can he complete this task?

1		
2	1	

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

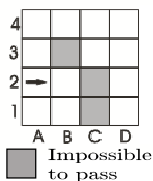
4. It takes kangaroo 6 seconds for every 4 jumps. How long does it take her to do 10 jumps?

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

5. How much is $2007 : (2 + 0 + 0 + 7) - 2 \times 0 \times 0 \times 7$?

- A) 1 B) 9 C) 214 D) 223 E) 2007
-



6. The robot starts walking on the table from the place *A2* and the direction of arrow, as shown on the picture. It can go always forward. If it meets with difficulties, it turns right. The robot will stop in case, if he can't go forward after turning right. On which place will it stop?

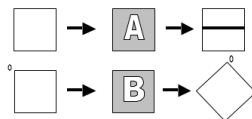


- A) *B2* B) *A1* C) *E1* D) *D1* E) it never stops
-

7. Basil, who is older than Pete by 1 year minus 1 day, was born on January 1, 2002. What is the date of Pete's birth?

- A) January 2, 2003 B) January 2, 2001 C) December 31, 2000
 D) December 31, 2002 E) December 31, 2003
-

8. The Carpenter's shop has two machines A and B. A is a "printing machine" and B is a "turning machine". What's the right sequence to obtain  starting from  ?



- A) BBA B) ABB C) BAB D) BA E) BABBB
-

9. If you cut a 1 meter cube into decimeter cubes and put one on the other, what height this structure will have?

- A) 100 m B) 1 km C) 10 km D) 1000 km E) 10 m
-

10. Vanda cut a paper in the shape of a square with perimeter 20 cm into two rectangles. The perimeter of one rectangle was 16 cm. What was the perimeter of the second rectangle?

- A) 8 cm B) 9 cm C) 12 cm D) 14 cm E) 16 cm
-

4 point questions

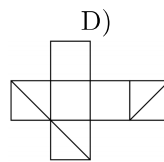
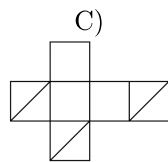
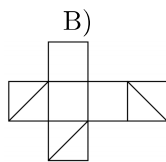
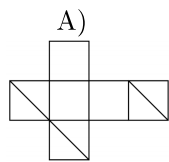
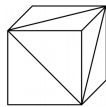
11. In a square grid Hanna colours the small squares that lie on the diagonals. What is the size of the grid if Hanna altogether colours 9 small squares?

- A) 3×3 B) 4×4 C) 5×5 D) 8×8 E) 9×9
-

12. Ana, Blanka, Cecilija and Diana each play a different sport: karate, soccer, volleyball and judo. Ana does not like sports played with a ball, the judo player Blanka often attends a soccer match to watch her friend play. Which of the following statements is true:

- A) Ana plays volleyball B) Blanka plays soccer C) Cecilija plays volleyball
D) Diana plays karate E) Ana plays judo
-

13. In three adjacent faces of a cube diagonals are drawn as shown in the figure. Which of the following net is that of the given cube?



E)

Other answer

14. There were 60 birds at three trees. In some moment 6 birds flew away from the first tree, 8 birds flew away from the second tree, and 4 birds flew away from the third tree. Then there were the same number of birds at each of the three trees. How many birds were there at the second tree at the beginning?

- A) 26 B) 24 C) 22 D) 21 E) 20
-

15. Kelly had a paper ribbon of length 27 cm. She divided it into four rectangles of different sizes and drew two segments in a way that both segments connected the centres of two adjacent rectangles (see picture). Find the sum of the lengths of the two segments.



- A) 12 cm B) 13,5 cm C) 14 cm
D) 14,5 cm E) the number depends on the division

16. Two $9\text{ cm} \times 9\text{ cm}$ squares overlap to form a $9\text{ cm} \times 13\text{ cm}$ rectangle as shown. Find the area of the region in which the two squares overlap.

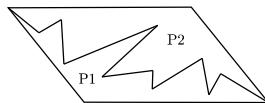


- A) 36 cm^2 B) 45 cm^2 C) 54 cm^2 D) 63 cm^2 E) 72 cm^2

17. Harry let an owl out at 7.30 a.m., to deliver a message to Ron. The owl delivered the envelope to Ron at 9.10 a.m. An owl flies 4 km in 10 minutes. What was the distance between Ron and Harry?

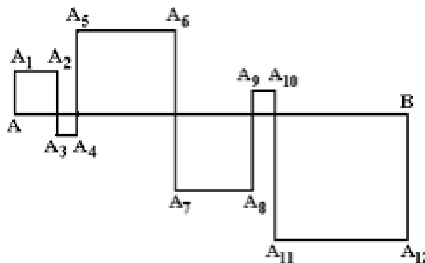
- A) 14 km B) 20 km C) 40 km D) 56 km E) 64 km

18. A parallelogram is divided in two parts P_1 and P_2 , as shown in the figure. What sentence is surely true?



- A) P_2 has a bigger perimeter than P_1 B) P_2 has a smaller perimeter than P_1
C) P_2 has a smaller area than P_1 D) P_1 and P_2 have the same perimeter
E) P_1 and P_2 have the same area

19. The squares are formed by intersecting the segment AB of 24 cm by the broken line $AA_1A_2 \dots A_{12}B$ (see the Fig.). Find the length of $AA_1A_2 \dots A_{12}B$.



- A) 48 cm B) 72 cm C) 96 cm D) 56 cm E) 106 cm

20. The 2007th letter in the sequence *KANGAROOKANGAROOKANG...* is

- A) *K* B) *A* C) *N* D) *R* E) *O*
-

5 point questions

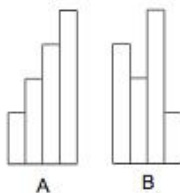
21. Agnes is 10 years old. Her mother Lisa is 4 times as old. How old will Lisa be when Agnes is twice as old as she is now?

- A) 40 years B) 50 years C) 60 years D) 70 years E) 80 years
-

22. To the right side of a given 2-digit number we write the same number obtaining 4-digit number. How many times the 4-digit number is greater than the 2-digit number?

- A) 100 B) 101 C) 1000 D) 1001 E) 10
-

23. One has four paper ribbons of width 10 cm and each of the ribbons is 25 cm longer than the previous one. By how many centimetres does the perimeter of figure *B* exceed it?



- A) 20 cm B) 25 cm C) 40 cm D) 50 cm E) 0 cm
-

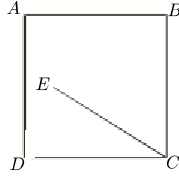
24. Bill thought of an integer. Nick multiplied it either by 5 or by 6. John added to the Nick's result either 5 or 6. Andrew subtracted from John's result either 5 or 6. The obtained result was 73. What number did Bill think of?

- A) 10 B) 11 C) 12 D) 14 E) 15
-

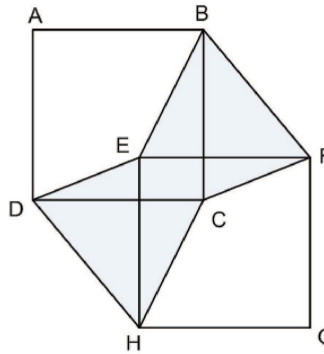
25. Five integers are written around a circle in such a way that no two or three adjacent numbers give a sum divisible by 3. Among those 5 numbers, how many are divisible by 3?

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

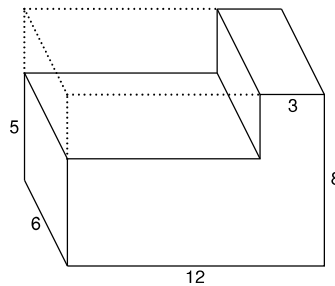
26. The angle $EAB = 75^\circ$, the angle $ABE = 30^\circ$ and the sides of the square are 10 cm. The length of section EC is:



- A) 8 cm B) 9 cm C) 9,5 cm D) 10 cm E) 11 cm
-
27. In the figure $ABCD$ and $EFGH$, with AB parallel to EF are two equal squares. The shaded area is equal to 1. What is the area of the square $ABCD$?

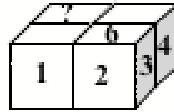


- A) 1 B) 2 C) $\frac{1}{2}$ D) $\frac{3}{2}$ E) It depends on the picture
-
28. A rectangular section was cut from a rectangular block as shown in the diagram. Determine the decrease percentage of the surface area.



- A) Less than 12,5%
 B) 12,5%
 C) Between 12,5% and 25%
 D) 25%
 E) More than 25%
-

29. A die is a cube, the faces of which are numbered by the numbers $1, 2, \dots, 6$, the sum of numbers in any two opposite faces being 7. Using 4 such identical dice, Nick compose a $2 \times 2 \times 1$ parallelepiped as shown in the figure, the numbers on any two touching faces of the dice being equal. The numbers on some faces are shown in the figure. Which the number should be written in the face signed by question mark?

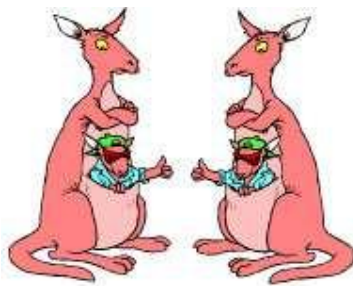


- A) 5 B) 6 C) 2 D) 3 E) not enough given
-

30. The multiplication $\square \square Y \square \times \square \square = 7\ 6\ 3\ 2$ uses each of the digits 1 to 9 exactly once. What is digit Y?

- A) 1 B) 4 C) 5 D) 8 E) 9
-





LEVEL 07 - 08

Attention! Questions from 1-10 carry 3 points each, questions 11-20 carry 5 points each and questions 21-30 carry 6 points each. The maximum score is 120 points.

3 points questions

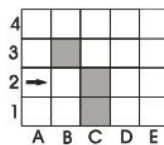
1. $\frac{2007}{2+0+0+7} =$

- A) 1003 B) 75 C) 223 D) 213 E) 123
-

2. Rose bushes were planted in a line on both sides of the path. The distance between each bush was 2 m. How many bushes were planted if the path is 20 m long?

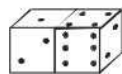
- A) 22 B) 20 C) 12 D) 11 E) 10
-

3. The robot starts walking on the table from the place *A2* and the direction of arrow, as shown on the picture. It can go always forward. If it meets with difficulties, it turns right. The robot will stop in case, if he can't go forward after turning right. On which place will it stop?



- A) *B2* B) *A1* C) *E1* D) *D1* E) nowhere
-

4. What is the sum of the points on the invisible faces of the dice?

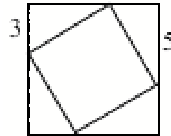


- A) 15 B) 12 C) 7 D) 27 E) another answer
-

5. The points $A = (2006, 2007)$, $B = (2007, 2006)$, $C = (-2006, -2007)$, $D = (2006, -2007)$ and $E = (2007, -2006)$ are marked on a coordinate grid. The line segment which is horizontal is

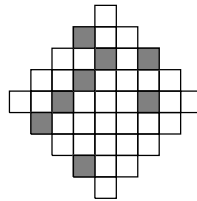
A) AD B) BE C) BC D) CD E) AB

6. A small square is inscribed in a big one as shown in the figure. Find the area of the small square



A) 16 B) 28 C) 34 D) 36 E) 49

7. At least how many little squares we have to shade in the picture on the right so that it has an axis of symmetry?

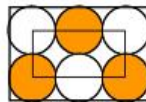


A) 4 B) 6 C) 5 D) 2 E) 3

8. A palindromic number is one that reads the same backwards as forwards, so 13931 is a palindromic number. What is the difference between the smallest 5-digit palindromic number and the largest 6-digit palindromic numbers?

A) 989989 B) 989998 C) 998998 D) 999898 E) 999988

9. On the picture, there are six identical circles. The circles touch the sides of a large rectangle and each other as well. The vertices of the small rectangle lie in the centres of the four circles. The circumference of the small rectangle is 60 cm. What is the circumference of the large rectangle?



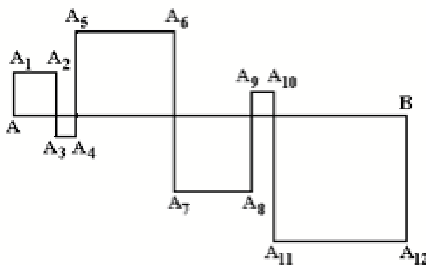
A) 160 cm B) 140 cm C) 120 cm D) 100 cm E) 80 cm

10. x is a strictly negative integer. Which is the biggest?

A) $x + 1$ B) $2x$ C) $-2x$ D) $6x + 2$ E) $x - 2$

4 points questions

11. The squares are formed by intersecting the segment AB of 24 cm by the broken line $AA_1A_2 \dots A_{12}B$ (see the Fig.). Find the length of $AA_1A_2 \dots A_{12}B$.



- A) 48 cm B) 72 cm C) 96 cm D) 56 cm E) 106 cm
-

12. On parallel lines x and y 6 points were drawn; 4 on line x and 2 on line y . What is the total number of triangles whose vertices are given points?

- A) 6 B) 8 C) 12 D) 16 E) 18
-

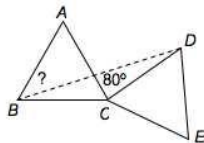
13. A survey found that $2/3$ of all customers buy product A and $1/3$ buy product B. After a publicity campaign for product B a new survey showed that $1/4$ of the customers who preferred product A are now buying product B. So now we have

- A) $5/12$ of the customers buy product A, $7/12$ buy product B
 B) $1/4$ of the customers buy product A, $3/4$ buy product B
 C) $7/12$ of the customers buy product A, $5/12$ buy product B
 D) $1/2$ of the customers buy product A, $1/2$ buy product B
 E) $1/3$ of the customers buy product A, $2/3$ buy product B
-

14. In order to obtain the number 8^8 , we must raise 4^4 to the power

- A) 2 B) 3 C) 4 D) 8 E) 16
-

15. ABC and CDE are equal equilateral triangles. If angle $ACD = 80^\circ$, what is angle ABD ?



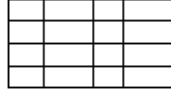
- A) 25° B) 30° C) 35° D) 40° E) 45°
-

16. **How many percent.** Look at the numbers $1, 2, 3, 4, \dots, 10.000$ How many percent of these numbers is a square?

A) 1% B) 1.5% C) 2% D) 2.5% E) 5%

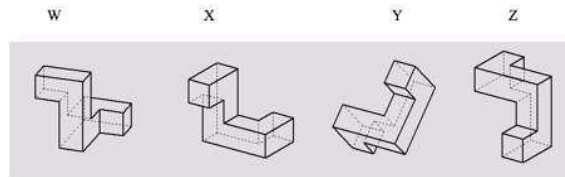
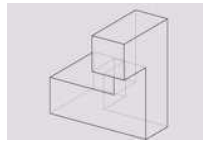
17. By drawing 9 lines (5 horizontal and 4 vertical) one has made a table of 12 cells. If he had used 6 horizontal and 3 vertical lines, he would have got 10 cells only. How many cells you can get

maximally if you draw at most 15 lines?



A) 22 B) 30 C) 36 D) 40 E) 42

18. Which of the following objects can be created by rotating the given object in space?



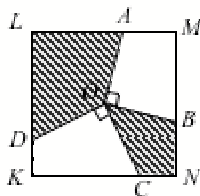
A) *W* and *Y* B) *X* and *Z* C) only *Y* D) none of these E) *W*, *X* and *Y*

19. If you choose three numbers from the grid shown, so that you have one number from each row and also have one number from each column, and then add the three numbers together, what is the largest total that can be obtained?

1	2	3
4	5	6
7	8	9

A) 12 B) 15 C) 18 D) 21 E) 24

20. The segments OA , OB , OC and OD are drawn from the center O of the square $KLMN$ to its sides so that $OA \perp OB$ and $OC \perp OD$ (as shown in the figure). If the side of the square equals 2 the area of the shaded part equals



- A) 1 B) 2 C) 2.5 D) 2.25 E) depends on the choice of the points B and C
-

5 points questions

21. A broken calculator does not display the digit 1. For example, if we type in the number 3131, only the number 33 is displayed, with no spaces. Mike typed a 6-digit number into that calculator, but only 2007 appeared on the display. How many numbers could have Mike typed?

- A) 12 B) 13 C) 14 D) 15 E) 16
-

22. A walker takes a 2 hours tour consisting of: first, a flat section, then an other one, climbing, and return (first going down then flat again). His speed is 4 km/h on the flat part, 3 km/h when going up and 6 km/h when going down. How long is the tour?

- A) We can't know B) 6 km C) 7.5 km D) 8 km E) 10 km
-

23. Al and Bill jointly weigh less than Charlie and Dan; Charlie and Ed jointly weigh less than Frank and Bill. Which one of the following sentences is certainly true?

- A) Al and Ed jointly weigh less than Frank and Dan
 B) Dan and Ed jointly weigh more than Charlie and Frank
 C) Dan and Frank jointly weigh more than Al and Charlie
 D) Al and Bill jointly weigh less than Charlie and Frank
 E) Al, Bill and Charlie jointly weigh as much as Dan, Ed and Frank
-

24. The first digit of a 4-digit number is equal to the number of noughts in this number, the second digit is equal to the number of digits 1, the third digit is equal to the number of digits 2, the fourth —the number of digits 3. How many such numbers exist?

- A) 0 B) 2 C) 3 D) 4 E) 5
-

25. An integer positive number n has 2 divisors, while $n + 1$ has 3 divisors. How many divisors does $n + 2$ have?

A) 2 B) 3 C) 4 D) 5 E) depends of n

26. The table 3×3 contains natural numbers (see picture). Nick and Pete crossed out four numbers each so that the sum of the numbers crossed out by Nick is three times as great as the sum of the numbers, crossed out by Pete. The number which remained in the table after crossing is:

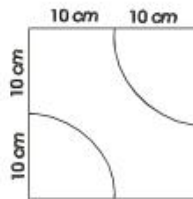
4	12	8
13	24	14
7	5	23

A) 4 B) 7 C) 14 D) 23 E) 24

27. Five integers are written around a circle in such a way that no two or three consecutive numbers give a sum divisible by 3. Among those 5 numbers, how many are divisible by 3?

A) 0 B) 1 C) 2 D) 3 E) impossible to determine

28. There is a tile on the picture, which dimension is $20 \text{ cm} \times 20 \text{ cm}$. We want to cover a surface, dimensions $80 \text{ cm} \times 80 \text{ cm}$ with these tiles. On the surface the curve lines (a fourth of the circular line) are connecting. At most, how long can be the connected curve line in cm?



A) 75π B) 100π C) 105π D) 110π E) 525π

29. A three-digit integer has been divided by 9. As a result, the sum of the digits decrease by 9. How many three-digit numbers possess this property?

A) 1 B) 2 C) 4 D) 5 E) 11

30. Given a number, a strange calculator can only do the following: multiply it by 2 or by 3, or to raise it to the power 2 or 3. Starting with the number 15, what can be obtained by applying this calculator 5 times consecutively?

A) $2^8 \cdot 3^5 \cdot 5^6$ B) $2^8 \cdot 3^4 \cdot 5^2$ C) $2^3 \cdot 3^3 \cdot 5^3$ D) $2^6 \cdot 3^6 \cdot 5^4$ E) $2 \cdot 3^2 \cdot 5^6$

LEVEL 09 - 10

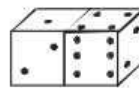
Attention! Questions from 1-10 carry 3 points each, questions 11-20 carry 5 points each and questions 21-30 carry 6 points each. The maximum score is 120 points.

3 points questions

1. Anh, Ben and Chen have 30 balls together. If Ben gives 5 to Chen, Chen gives 4 to Anh and Anh gives 2 to Ben, then the boys will have the same number of balls. How many balls has Anh at first?

A) 8 B) 9 C) 11 D) 13 E) 15

2. What is the sum of the points on the invisible faces of the dice?



A) 15 B) 12 C) 7 D) 27 E) another answer

3. When announcing the results of a tombola (raffle), the moderator said: “*The winning tickets are those, which contain at least 5-digit numbers such that at most three of their digits larger than 2.*” Subsequently, the speaker drew tickets with numbers 1022, 22222, 102334, 213343, 3042531. How many of them were winning ones?

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

4. In triangle ABC , D is the midpoint of AB , E is the midpoint of DB , F is the midpoint of BC . If area of $\triangle ABC$ is 96, then the area of $\triangle AEF$ is

A) 16 B) 24 C) 32 D) 36 E) 48

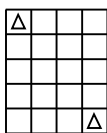
5. Frida has divided her 2007 marbles in three bags A , B and C in such a way that each bag contains exactly the same number of marbles. If Frida moves $\frac{2}{3}$ of the marbles from bag A to bag C , then the ratio between the number of marbles in bag A and C will be

A) 1: 2 B) 1: 3 C) 2: 3 D) 1: 5 E) 3: 2

6. An international organisation has 32 members. How many members will it have in three years time, if the number of members increases each year compared to the previous one by 50%?

A) 182 B) 128 C) 108 D) 96 E) 80

7. How many possible routes with the minimum number of moves are there for the king to travel from the top left square to the bottom right square of the grid (the king can move to any adjacent square, including diagonally)



A) 1 B) 4 C) 7 D) 20 E) 35

8. In the next table there must be two red squares and two green squares in each line and each column. What colours must be in squares X and Y ? $XY =$

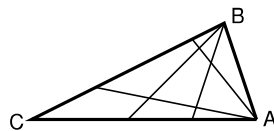
R		R	
		R	
	X		G
	Y		

A) RR B) RG C) GR D) GG E) it is impossible

9. Different letters represent different digits. Find the least possible value of the expression $2007 - KAN - GA - ROO$.

A) 100 B) 110 C) 112 D) 119 E) 129

10. The diagram on the right shows a triangle ABC where two lines are drawn to the opposite sides from each of two vertices. This divides the triangle into nine non-overlapping sections. If eight lines are drawn to the opposite sides, four from A and four from B , what is the number of non-overlapping sections into the triangle is divided?



A) 16 B) 25 C) 36 D) 42 E) 49

4 points questions

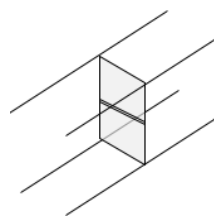
11. The island is inhabited by liars and nobles (the liars always tell lies and the nobles always tell the truth). One day 12 islanders, both liars and nobles, gathered together and issued a few statements. Two people said: "Exactly two people among us twelve are liars". The other four people said: "Exactly four people among us twelve are liars". The rest six people said: "Exactly six people among us twelve are liars". How many liars were there?

A) 2 B) 4 C) 6 D) 8 E) 10

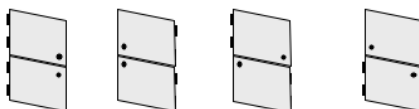
12. In order to obtain the number 8^8 , we must raise 4^4 to the power

A) 2 B) 3 C) 4 D) 8 E) 16

13. **Askew door.** A corridor is sagged on the right side.



As a consequence the profile is not a rectangle, but a parallelogram. Halfway the corridor one makes a door. The door has two halves, which one must can open separately. Where should one put the hinges?



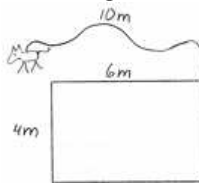
A) both left B) both right C) above left, below right D) below left, above right E) the door can never be opened properly

14. The students were solving an interesting problem at the "Kangaroo". As a result the number of the boys who had solved the problem turned out to be the same as the number of the girls who hadn't solved the problem. Which are more: those who had solved the problem or the girls?

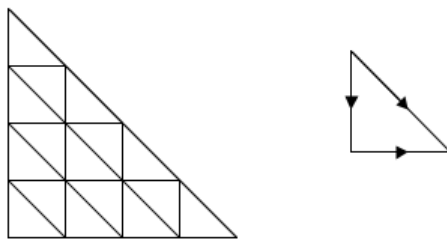
A) girls B) those who have solved the problem C) equal
D) impossible to find E) the situation is not possible

15. A 10 m long rope is fastened to the corner of the house. A dog is fastened to the rope. Find the

perimeter of the area, where the dog can be found.



- A) 20π B) 22π C) 40π D) 88π E) 100π
-
16. **Petrol.** Its 21.00 hours and I'm driving with velocity 100 km/h. With this velocity I have enough petrol for a distance of 80 km. The nearest petrol pump is 100 km away. The amount of petrol my car uses per km is inversely proportional to the velocity of the car. I want to reach the petrol pump as soon as possible. At what time can I arrive at the petrol pump?
- A) 22.12 B) 22.15 C) 22.20 D) 22.25 E) 22.30
-
17. A trapezium is formed by removing a corner of an equilateral triangle. Then two copies of this trapezium are placed side by side to form a parallelogram. The perimeter of the parallelogram is 10cm longer than the perimeter of the original triangle. What was the perimeter of the original triangle?
- A) 10 cm B) 30 cm C) 40 cm D) 60 cm E) more information needed
-
18. A sequence of letters KANGAROOKANGAROO...KANGAROO contains 20 words KANGAROO. First, all the letters in the odd places of the sequence were erased. Then, in the sequence obtained, once more all the letters in the odd places were erased, and so on. At the very end, only one letter remained. This Letter is
- A) K B) A C) N D) G E) O
-
19. Two schools should play one against the other table tennis. Five students should represent each of these schools. Doubles should only play. Each pair from one school should play against each pair from the other school just once. Each student should play
- A) 10 matches B) 20 matches C) 30 matches D) 40 matches E) 50 matches
-
20. How many different ways can you go from upper point of hypotenuse to lower point if you can go only down, right or down by hypotenuse?



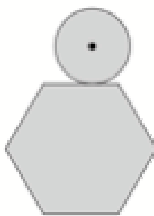
- A) 16 B) 27 C) 64 D) 90 E) 111

5 points questions

21. In a village there are not two people with the same number of hair. Nobody have exactly 2007 hairs. Joe has the most number of hairs in the village. The number of villagers is more than the number of Joe's hairs. What is the maximum number of villagers?

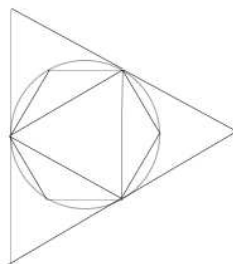
A) 0 B) 2006 C) 2007 D) 2008 E) 2009

22. A coin with diameter 1 cm rolls around the outside of a regular hexagon with edge length 1 cm, as shown. In centimetres, what is the length of the path traced out by the centre of the coin?



A) $6 + \frac{\pi}{2}$ B) $6 + \pi$ C) $12 + \pi$ D) $6 + 2\pi$ E) $12 + 2\pi$

23. An equilateral triangle and a regular hexagon are inscribed in a circle, inscribed himself in a equilateral triangle (see the figure). S_1 is the area of the big triangle, S_2 the one of the little and S_3 the one of the hexagon. What is true?



A) $S_3 = \sqrt{S_1 \times S_2}$ B) $S_3 = \frac{S_1 + S_2}{2}$ C) $S_1 = S_2 + S_3$

D) $S_3 = \sqrt{S_1^2 \times S_2^2}$ E) $S_1 = S_3 + 3S_2$

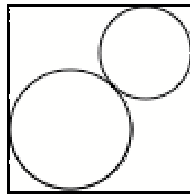
24. Let A the least number with the following property: $10 \cdot A$ is a perfect square and $6 \cdot A$ is a perfect cube. How many positive divisors has the number A ?

A) 30 B) 40 C) 54 D) 72 E) 96

25. In a safe-deposit there are some necklaces. All the necklaces have the same number of diamonds (at least two diamonds in each necklace). If the number of diamonds in the safe-deposit would be known, then the number of the necklaces would also be known without doubt. The number of diamonds is more than 200 but less than 300. How many necklaces are there in the safe-deposit?

A) 16 B) 17 C) 19 D) 25 E) other answer

26. Two circles have their centres on the same diagonal of a square. They touch each other and the sides of the square as shown. The square has side length 1cm. What is the sum of the lengths of the radius of the circles in centimetres?



A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{2}}$ C) $\sqrt{2} - 1$ D) $2 - \sqrt{2}$ E) It depends on the relative sizes of the circles

27. In a box there are three cards for each of the following colors: red, green, yellow and bleu. For each color, the three cards are numbered 1, 2 and 3. You take randomly three cards from the box. Which of the following events is the most probable one?

A) The three cards are of the same color
 B) The three cards, independently on their colors, have numbers 1, 2 and 3
 C) The three cards are of three different colors
 D) The three cards have the same number
 E) None, the four previous events have the same probability

28. In a party five friends are going to give each other gifts in such a way that everybody gives one gift and receives one (of course, no one should receive his own gift). In how many ways is this possible?

A) 5 B) 10 C) 44 D) 50 E) 120

29. The real solutions of the equation $x^2 - 3x + 1 = 0$ are a and b . What is the value of $a^3 + b^3$?

A) 12 B) 14 C) 16 D) 18 E) 24

30. The distance of two not-cutting edges of a regular tetrahedron is 6 cm. How many cm^3 is the volume of the tetrahedron?

A) 18 B) 36 C) 48 D) 72 E) 144

LEVEL 11 - 12

Attention! Questions from 1-10 carry 3 points each, questions 11-20 carry 5 points each and questions 21-30 carry 6 points each. The maximum score is 120 points.

3 points questions

1. Mike is building a race track.



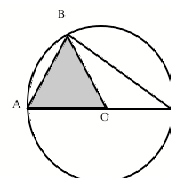
He noticed that the order of cars at the end is not the same as in the beginning. Which element should Mike take to replace element X at the beginning to get the correct order of cars at the end?



2. Three boys have 30 balls together. If Ben gives 5 to Chen, Chen gives 4 to Anh and Anh gives 2 to Ben, then the boys will each have the same number of balls. How many balls does Anh have at the beginning?

A) 8 B) 9 C) 11 D) 12 E) 13

3. The shaded area is equal to $\sqrt{3}$. What is the area of the triangle ABC ?

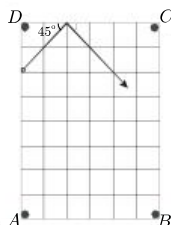


A) $2\sqrt{3}$ B) 2 C) 5 D) 4 E) $4\sqrt{3}$

4. $\frac{\sin 1^\circ}{\cos 89^\circ}$ equals

- A) 0 B) $\tan 1^\circ$ C) $\cot 1^\circ$ D) $\frac{1}{89}$ E) 1
-

5. The billiard ball meets the board under 45° as shown. Which pocket will it fall into?



- A) A B) B C) C D) D E) neither of the pockets
-

6. Some historians claim that the ancient Egyptians used a string with 2 knots to construct a right angle. If the length of the string is 12 m and one of the knots is at the point X , 3 m far from one end, at what distance from the other end of the string should the second knot be put in order to obtain a right angle at X ?

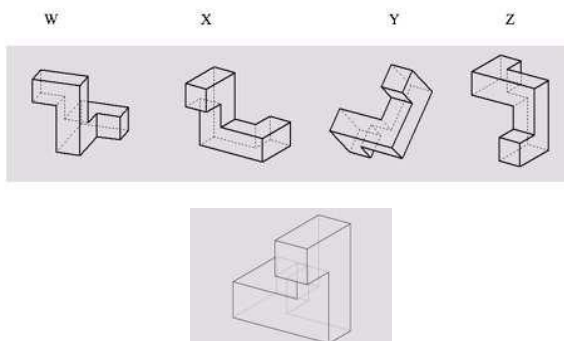


- A) 3 B) 4 C) 5 D) 6 E) another answer
-

7. At the entrance examination to a university, a student must answer at least 80% of the questions correctly. So far, Peter has worked on 15 questions. He did not know the answer to 5 of them, but he is sure that he has answered the other 10 questions correctly. If he answers all the remaining questions in the test correctly, he will pass the test at exactly 80%. How many questions are there in the test?

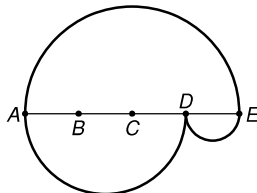
- A) 20 B) 25 C) 30 D) 35 E) 40
-

8. Which of the following objects can be created by rotating the given object in space?



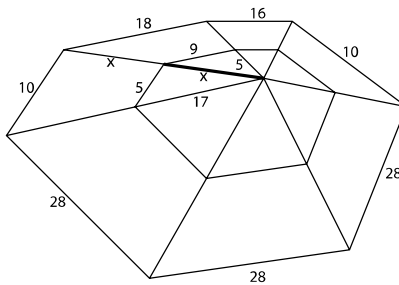
- A) W and Y B) X and Z C) only Y D) none of these E) W, X and Y
-

9. AE is divided into four equal parts and semicircles are drawn taking AE , AD and DE as diameters, creating paths from A to E as shown. Determine the ratio of the length of the upper path to the length of the lower path.



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

10. A mathematically skilled spider spins a web and some of the strings have lengths as shown in the picture. If x is an integer, determine the value of x .



- A) 11 B) 13 C) 15 D) 17 E) 19
-

4 points questions

11. Given a square $ABCD$ with side 1, all squares are drawn that share at least two vertices with $ABCD$. The area of the region of all points covered by at least one of these squares is

- A) 5 B) 6 C) 7 D) 8 E) 9
-

12. Angle β is 25% less than angle γ and 50% greater than angle α . Angle γ is:

- A) 25% greater than α
 B) 50% greater than α
 C) 75% greater than α
 D) 100% greater than α
 E) 125% greater than α
-

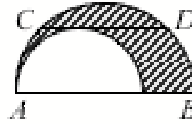
13. Given $2^{x+1} + 2^x = 3^{y+2} - 3^y$, where x and y are integers, the value of x is

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

14. What is the value of $\cos 1^0 + \cos 2^0 + \cos 3^0 + \dots + \cos 358^0 + \cos 359^0$?

- A) 1 B) π C) 0 D) 10 E) -1
-

15. Two semicircles are drawn as shown in the figure. The chord CD , of length 4, is parallel to the diameter AB of the greater semicircle and touches the smaller semicircle. Then the area of the shaded region equals



- A) π B) 1.5π C) 2π D) 3π E) not enough given
-

16. The sum of five consecutive integers is equal to the sum of the next three consecutive integers. The greatest of these eight numbers is:

- A) 4 B) 8 C) 9 D) 11 E) something else
-

17. Thomas was born on his mother's 20th birthday, and so they share birthdays. How many times will Thomas' age be a divisor of his mother's age if they both live long lives?

- A) 4 B) 5 C) 6 D) 7 E) 8
-

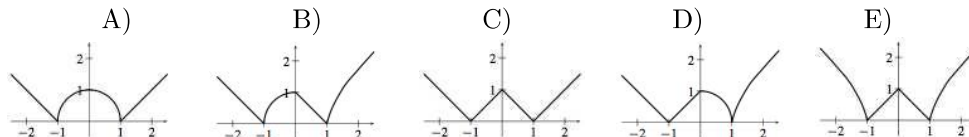
18. An island is inhabited by knights and liars. Each knight always tells the truth and each liar always lies. Once an islander A , when asked about himself and another islander B , claimed that at least one of A and B is a liar. Which of the following sentences is true?

- A) A is not able to make the above statement.
 B) Both are liars.
 C) Both are knights.
 D) A is a liar while B is a knight.
 E) B is a liar while A is a knight.
-

19. Consider a sphere of radius 3 with center at the origin of a cartesian coordinate system. How many points on the surface of this sphere have integer coordinates?

- A) 30 B) 24 C) 12 D) 6 E) 3
-

20. Find the graph of the function $\sqrt{|(1+x)(1-|x|)|}$.



5 points questions

21. Which of the following numbers can't be written as $x + \sqrt{x}$, if x is an integer?

- A) 870 B) 110 C) 90 D) 60 E) 30
-

22. If $f(x) = \frac{2x}{3x+4}$ and $f(g(x)) = x$, then $g(x) =$

- A) $g(x) = \frac{3x+4}{2x}$ B) $g(x) = \frac{3x}{2x+4}$ C) $g(x) = \frac{2x+4}{4x}$ D) $g(x) = \frac{4x}{2-3x}$ E) other answer
-

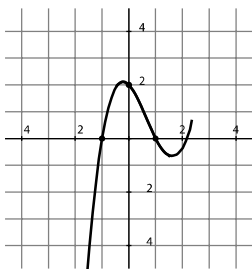
23. Ann, Belinda and Charles are throwing a die. Ann wins if she throws a 1, 2 or 3; Belinda wins if she throws a 4 or 5; Charles wins if he throws a 6. The die rotates from Ann to Belinda to Charles to Ann, etc., until one player wins. Calculate the probability that Charles wins.

- A) $\frac{1}{6}$ B) $\frac{1}{8}$ C) $\frac{1}{11}$ D) $\frac{1}{13}$ E) It is impossible for Charles to win
-

24. How many degrees are the acute angles of a rhombus, if its side is the geometrical mean of the diagonals?

- A) 15^0 B) 30^0 C) 45^0 D) 60^0 E) 75^0
-

25. In the diagram at the right we are shown a piece of the graphic of the function $f(x) = ax^3 + bx^2 + cx + d$. What is the value of b ?



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

26. Determine the number of real numbers a such that the quadratic equation $x^2 + ax + 2007 = 0$ has two integer roots.

- A) 3 B) 4 C) 6 D) 8 E) another answer
-

27. The sum

$$\frac{1}{2\sqrt{1} + 1\sqrt{2}} + \frac{1}{3\sqrt{2} + 2\sqrt{3}} + \dots + \frac{1}{100\sqrt{99} + 99\sqrt{100}}$$

is equal to:

- A) $\frac{999}{1000}$ B) $\frac{99}{100}$ C) $\frac{9}{10}$ D) 9 E) 1

28. In a party five friends are going to give each other gifts in such a way that everybody gives one gift and receives one (of course, no one should receive his own gift). In how many ways is this possible?

- A) 5 B) 10 C) 44 D) 50 E) 120

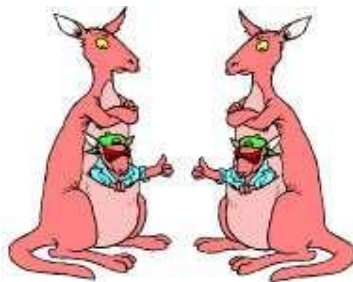
29. The digits of the sequence 123451234512345... fill the cells on a sheet of paper in a spiral-like manner beginning from the marked cell (see the figure). Which digit is written in the cell placed 100 cells above the marked one?

	1	2	3	.	.
	5	2	3	4	5
	4	1	1	2	1
	3	5	4	3	2
	2	1	5	4	3

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

30. The increasing sequence 1, 3, 4, 9, 10, 12, 13, ... includes all the powers of 3 and all the numbers that can be written as the sum of different powers of 3. What is the 100th element of the sequence?

- A) 150 B) 981 C) 1234 D) 2401 E) 3^{100}



KANGOUROU 2007