International Contest-Game
MATH KANGAROO

Part A: Each correct answer is worth 3 points.

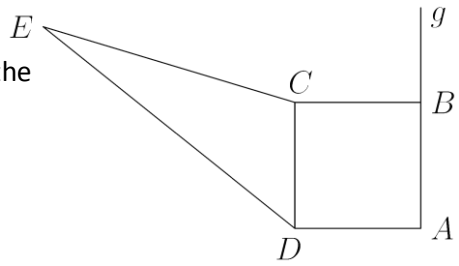
1. What is the value of $11.11-1.111$?
(A) 9.009 (B) 9.0909 (C) 9.99 (D) 9.999 (E) 10

2. The values of the following expressions except one are equal. Which one is different?
(A) $(8+8-8)\div 8$ (B) $8+(8\div 8)-8$ (C) $8\div(8+8-8)$ (D) $8\times(8\div 8)\div 8$ (E) $8-(8\div 8)+8$

3. In a Frisbee competition, 16 teams participate in playoffs, i.e. only the winner of each game continues to play in the next round. The tournament ends after the ultimate winner is determined. How many games were played in this tournament?
(A) 12 (B) 15 (C) 17 (D) 31 (E) 32

4. The sum of the digits of a seven-digit number is 6. What is the product of these digits?
(A) 0 (B) 5 (C) 6 (D) 7 (E) $1\times2\times3\times4\times5\times6\times7$

5. The square $ABCD$ has side length of 4 cm. The square has the same area as the triangle ECD. What is the distance from the point E to the line g?



(A) 8 cm (B) $(4+2\sqrt{3})$ cm (C) 12 cm
(D) $10\sqrt{2}$ cm (E) Depends on the location of E

6. Which of the numbers is not a factor of the difference $200012-2012$?
(A) 2 (B) 5 (C) 11 (D) 3 (E) 7

7. Given is a right-angled triangle ABC whose legs are 6 cm and 8 cm long. The points K, L, and M are the midpoints of the sides of the triangle. What is the perimeter of the triangle KLM?
(A) 10 cm (B) 12 cm (C) 15 cm (D) 20 cm (E) 24 cm

8. Alice and Bob use an encoding system for the messages they exchange. First, each letter of the alphabet is assigned a number, as follows: A=1, B=2, …Z=26. In the message, each letter is converted to a number calculated by the formula 2n+9, where n is the number originally assigned to the letter. One morning, Bob receives a sequence of numbers 25-19-45-38. What is Alice' s original message?
(A) HERO (B) HELP (C) HEAR (D) HERS (E) Alice has made a mistake

9. The lengths of two sides of a quadrilateral are equal to 1 and 4. One of the diagonals has a length of 2 and divides the quadrilateral into two isosceles triangles. What is the perimeter of the quadrilateral?
(A) 8 (B) 9 (C) 10 (D) 11 (E) 12

10. Each of the numbers 144 and 220 gives a remainder of 11 when divided by the same positive integer N. What is the value of N?
(A) 7 (B) 11 (C) 15 (D) 19 (E) 38

Part B: Each correct answer is worth 4 points.

11.If Adam stands on the table and Mike stands on the floor, Adam is 80 cm taller than Mike. If Mike stands on the same table and Adam is on the floor, Mike is one metre taller tham Adam. How high is the table?

(A) 20cm (B) 80cm (C) 90cm (D) 100cm (E) 120cm

12. Denis and Mary were tossing a coin: if the coin showed heads the winner was Mary, and Denis had to give her 2 candies. If the coin showed tails the winner was Denis, and Mary had to give him three candies. After 30 games each of them had as many candies as before the game. How many times did Denis win?

(A) 6 (B)12 (C) 18 (D) 24 (E) 30

13. Three runners, Kan, Ga and Roo took part in a cross country race. Prior to the race, four spectators from the audience, A, B, C, and D, made their prognoses, as follows:

A: Either Kan or Ga will win.
B: If Ga is the second, Roo will win.
C: If Ga is the third, Kan will not win.
D: Either Ga or Roo will be the second.

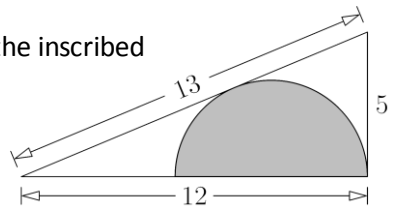
After the race, it turned out that all four statements were correct. In what order did the runners finish?

(A) Kan, Ga, Roo (B)Kan, Roo, Ga (C) Roo, Ga, Kan (D) Ga, Roo, Kan (E) Impossible to determine

14. There are four clocks in Billy's room. Each clock is either slow or fast. One clock is wrong by 2 minutes, another clock is wrong by 3 minutes, a third clock is wrong by 4 minutes, and the fourth clock is wrong by 5 minutes. One day Billy wanted to know the exact time by his clocks, which read 6 minutes to 3, 3 minutes to 3, 2 minutes past 3, and 3 minutes past 3. What was the exact time then?

(A) 3:00 (B) 2:57 (C) 2:58 (D) 2:59 (E) 3:01

15. The diagram shows a right triangle with sides 5, 12, and 13. What is the radius of the inscribed semicircle?



(A) $\frac{7}{3}$ (B) $\frac{10}{3}$ (C) 4 (D) $\frac{13}{3}$ (E) $\frac{17}{3}$

16. Kanga is writing twelve numbers chosen from 1 to 9 in the cells of a 4×3 grid, so that the sum of the numbers in every row is the same, and the sum of the numbers in every column is the same. Kanga has already written some of the numbers, as shown. What number should Kanga write in the shaded square?

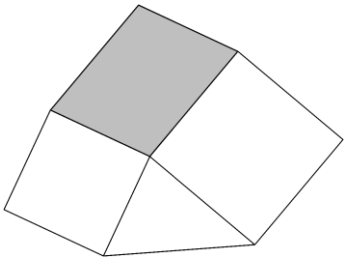
2	4		2
	3	3	
6		1	

(A) 4 (B) 9 (C) 6 (D) 1 (E) 8

17. The positive integers A and B satisfy the equation: $2012 = A^A \times (A^B - B)$. What is the value of B?

(A) 9 (B) 4 (C) 3 (D) 2 (E) another number

18. The diagram shows a polygon formed from two squares with sides 4cm and 5cm, a triangle with area 8cm^2, and a shaded parallelogram. What is the area of the parallelogram?



(A) 15 cm^2 (B) 16 cm^2 (C) 18 cm^2 (D) 20 cm^2 (E) 21 cm^2

19. A rectange is inscribed in a circle with radius 10. One of the sides of the rectangle is along the diameter of the circle. What must be the ratio of the rectangle's length and width for its area to be the greatest?

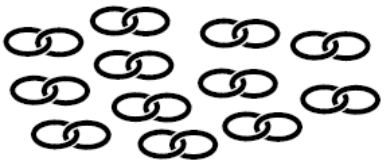
(A) 1:1 (B) 1:2 (C) 1:3 (D) 2:3 (E) another ratio

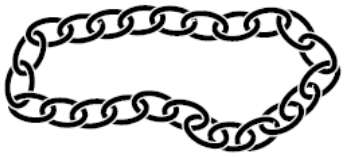
20. The following ingredients are recommended for making a baby's mashed vegetarian meal: potato, carrot, cauliflower, broccoli, and squash. The meal may contain one or more of these incredients. How many different me als is it possible to make?

(A) 27 (B) 28 (C) 29 (D) 30 (E) 31

Part C: Each correct answer is worth 5 points.

21. A jeweller has 12 pieces of chain, each with two links. He wants to make one big closed necklace of them, as shown. To do this, he has to open some links (and close them afterwards). What is the smallest number of links he has to open?





(A) 8 (B) 9 (C) 10 (D) 11 (E) 12

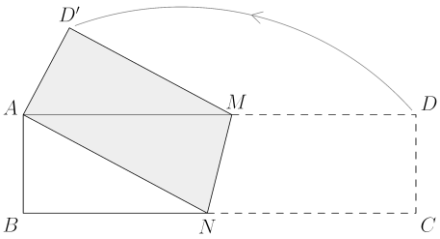
22. What is the rightmost non-zero digit of the number $K = 2^{59} \times 3^4 \times 5^{53}$?

(A) 1 (B) 2 (C) 4 (D) 6 (E) 9

23. How many integers K exist, such that (K+3) is a multiple of (K-3)?

(A) 0 (B) 2 (C) 4 (D) 6 (E) 8

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

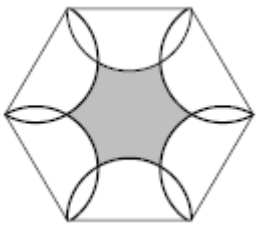


(A) 17 cm^2 (B) 27 cm^2 (C) 37 cm^2
(D) 47 cm^2 (E) 57 cm^2

25. There are 5 lamps; each of them can be either in 'on' or 'off' position. Ben chooses any lamp and switches its position. After this, Dan chooses any lamp and switches its position. The boys take 10 turns each applying this procedure. At the beginning, all the lamps are 'off'. Which of the following statements is now certainly true?

(A) It is impossible for all lamps to be 'off'.
(B) All lamps are definitely 'on'.
(C) It is impossible for all the lamps to be 'on'.
(D) All the lamps are definitely 'off'.
(E) None of the statements A to D is correct.

26. On each side of a hexagon, as on a diameter a circle is constructed. Given that the length of the side of the hexagon is 1, what is the area of the grey region (i.e. the region that belongs to the hexagon but not to any circle)?



(A) $\frac{6-\pi}{4}$ (B) $\frac{3(2\sqrt{3}-\pi)}{4}$ (C) $\frac{3\sqrt{3}-\pi}{4}$

(D) $\frac{6\sqrt{3}-\pi}{4}$ (E) $\frac{3(3\sqrt{3}-\pi)}{4}$

27. Six different positive integers are given, the greatest of them being N. There exists exactly one pair of these integers such that the smaller number of the pair does not divide the greater one. What is the smallest possible value of N?

(A) 18 (B) 20 (C) 24 (D) 36 (E) 45

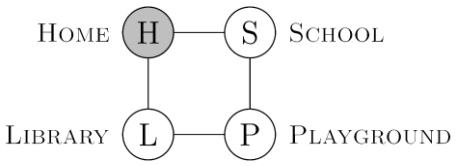
28. Train G passes a milestone in 8 seconds before meeting train H. The two trains pass each other in 9 seconds. Then train H passes the same milestone in 12 seconds. Which of the following statements about the lengths of the trains is true?

(A) G is twice as long as H (B) G and H are of equal length (C) H is 50% longer than G
(D) H is twice as long as G (E) Nothing can be certainly deduced about the lengths of G and H

29. Let A, B, C, D, E, F, G, H be the eight vertices of a convex octagon, taken in order. Randomly choose a vertex from C, D, E, F, G, H and draw the line segment connecting it with vertex A. Once more, randomly choose a vertex from the same six vertices, but now draw the line segment connecting it with vertex B.
What is the probability that the octagon is cut into exactly three regions by these two line segments?

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{4}{9}$ (D) $\frac{5}{18}$ (E) $\frac{1}{3}$

30. Peter creates a Kangaroo computer game. The picture represents the board of the game. At the start, Kangaroo is at the School (S). According to the rules of the game, from any position except Home (H) Kangaroo can jump to either of the two neighbouring positions. When Kangaroo lands on H the game is over.
In how many ways can Kangaroo move from S to H in exactly 13 jumps?



(A) 12 (B) 32 (C) 64 (D) 144 (E) 1024