

*8th International Mathematics Assessments for Schools
(2018-2019)*

Upper Primary Division Round 2

Time: 120 minutes

Printed Name: _____ *Code:* _____ *Score:* _____

Instructions:

- Do not open the contest booklet until you are told to do so.
- Be sure that your name and code are written on the space provided above.
- Round 2 of IMAS is composed of three parts; the total score is 100 marks.
- Questions 1 to 5 are given as a multiple-choice test. Each question has five possible options marked as A, B, C, D and E. Only one of these options is correct. After making your choice, fill in the appropriate letter in the space provided. Each correct answer is worth 4 marks. There is no penalty for an incorrect answer.
- Questions 6 to 13 are a short answer test. Only Arabic numerals are accepted; using other written text will not be honored or credited. Some questions have more than one answer, as such all answers are required to be written down in the space provided to obtain full marks. Each correct answer is worth 5 marks. There is no penalty for incorrect answers.
- Questions 14 and 15 require a detailed solution or process in which 20 marks are to be awarded to a completely written solution. Partial marks may be given to an incomplete presentation. There is no penalty for an incorrect answer.
- Use of electronic computing devices is not allowed.
- Only pencil, blue or black ball-pens may be used to write your solution or answer.
- Diagrams are not drawn to scale. They are intended as aids only.
- After the contest the invigilator will collect the contest paper.

**The following area is to be filled in by the judges;
the contestants are not supposed to mark anything here.**

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Upper Primary Division Round 2

Questions 1 to 5, 4 marks each

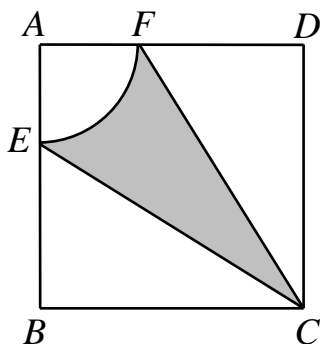
1. How many different prime divisors does $(2019 - 2018) \times (2019 - 2017) \times \cdots \times (2019 - 2012) \times (2019 - 2011)$ have?
(A) 2 (B) 3 (C) 4 (D) 5 (E) 8

Answer : _____

2. Four students went mountain climbing together. They spent \$50 in total on bus fare. While at the mountain top, each of them spent \$5 on beverages. What is the average expense for each student?
(A) \$12.5 (B) \$13.75 (C) \$17.5 (D) \$30 (E) \$55

Answer : _____

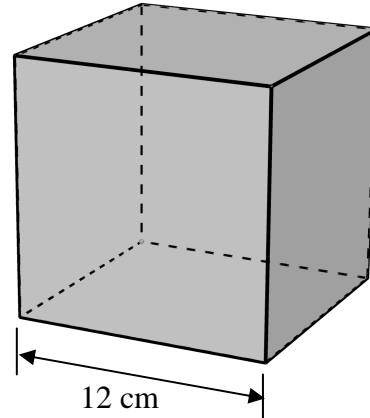
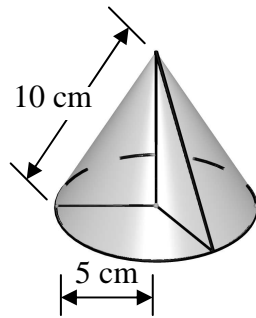
3. In the figure below, the side length of the square $ABCD$ is 8 cm and the radius of the sector AEF is 3 cm. What is the area, in cm^2 , of the shaded region? (Take π as 3.14, and round off to TWO decimal places)



- (A) 16.94 (B) 19.38 (C) 24.38 (D) 26.94 (E) 31.07

Answer : _____

4. In the figure below, a circular cone and a cube are shown. If a solid shape is formed by attaching the two shapes together, what is the least surface area, in cm^2 , of the resulting shape? (Take π as 3.14,, and round off to ONE decimal place)



- (A) 785.5 (B) 942.5 (C) 1000.5 (D) 1021.0 (E) 1099.5

Answer : _____

5. Given four distinct non-zero digits a, b, c and d , if $\overline{ab} + \overline{cd} = \overline{dc} + \overline{ba}$, then this expression is called a palindrome expression and the sum of the two numbers $\overline{ab} + \overline{cd}$ is called a palindrome sum. For example, $53 + 46 = 64 + 35 = 99$. What is the minimum possible value of a palindrome sum?

- (A) 22 (B) 33 (C) 44 (D) 55 (E) 99

Answer : _____

Questions 6 to 13, 5 marks each

6. There are a total of 40 students in a class. 23 of them are able to ride bikes, 33 of them are able to swim and 5 of them are unable to do either. How many students in this class are able to ride bikes but are not able to swim?

Answer : _____ students

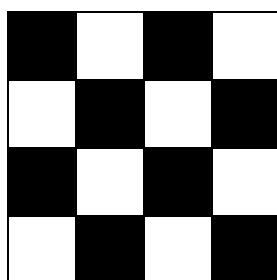
7. One day, Adam drove from Town A to Town B at a speed of 60 km/h. After an hour, the car stopped because of a breakdown, and because of this, Adam immediately called Bob for help. Bob then drove from A along the same route at a speed of 80 km/h. When Bob met Adam, he towed Adam's car to B, at a speed of 40 km/h. The distance between A and B is 180 km. How long did Adam spend travelling for the whole trip?

Answer : _____ hours

8. How many different prime numbers a 's are there such that $a + 20$ and $a + 40$ are also prime numbers?

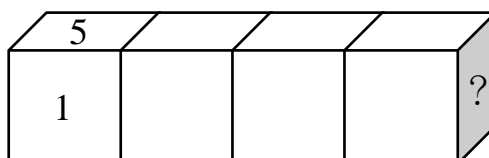
Answer : _____

9. Four identical chess pieces are to be placed into a 4×4 chess board that is colored black and white alternately, as shown in the figure below. You can place at most one chess piece on each square. All chess pieces must be placed in squares of the same color and no two pieces are on the same row or on the same column. In how many different ways can the chess pieces be placed?



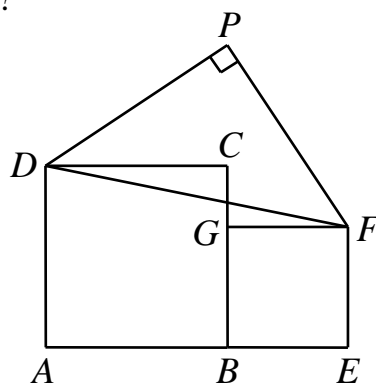
Answer : _____ ways

10. The numbers 1, 2, 3, 4, 5 and 6 are written on the six faces of a unit cube without repetition. Each face contains one number and the sum of the numbers in every two opposite faces is 7. Put four such cubes side by side as shown in the figure below, such that sum of every two numbers of every two touched faces is 8. Find the number marked with “?” in the figure.



Answer : _____

11. In the figure below, the side lengths of squares $ABCD$ and $BEFG$ are 6 cm and 4 cm respectively and triangle DFP is an isosceles right triangle. What is the area, in cm^2 , of triangle DFP ?



Answer : _____ cm^2

12. A mouse starts from the top left-most unit square marked with “I”, follows a route to form the word “IMAS2019” by moving from one square to another square that share a common side. How many different routes of eight squares are there?

I	M	A	S	
M	A	S	2	0
A	S	2	0	1
S	2	0	1	9
	0	1	9	

Answer : _____ routes

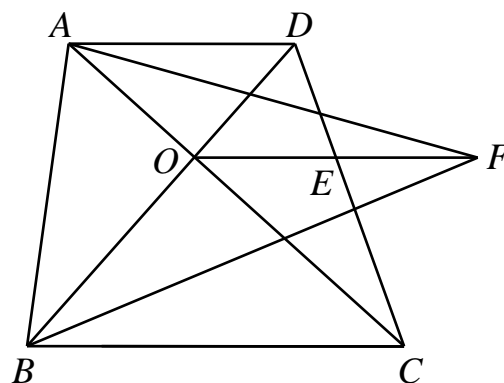
13. If a and b are positive integers such that $1 \leq a < b \leq 60$ and $a \times b$ is divisible by 5. How many different ordered pairs of (a, b) are there?

Answer : _____ pairs

Questions 14 to 15, 20 marks each

(Detailed solutions are needed for these two problems)

14. In the figure, $ABCD$ is a trapezoid, with side AD that is parallel to BC , diagonals AC and BD intersect at point O , and line OE is parallel to BC and intersects CD at point E . Now, extend OE to point F such that $OE = EF$. If $AD = 6$ cm, $BC = 10$ cm and the area of trapezoid $ABCD$ is 64 cm^2 , what is the area, in cm^2 , of triangle ABF ?



Answer : _____ cm^2

15. A robot can generate a set of digit codes according to user's reasonable instructions. Wayne gives out the following commands:

- (1) Each code is a three-digit number (nonzero for the left-most digit).
- (2) Every two codes in the set have identical digits at no more than one corresponding positions.

Find the maximum number of codes in a set the robot can generate.

Answer : _____ codes
