

INSTRUCTIONS. Please read all the instructions below carefully.

- a) Please **DO NOT OPEN** the contest link until the Proctor has given permission to start.
- b) There are a total of 25 questions, which are divided into three parts. In the first part, choose only **ONE** correct answer among the 5 choices and darken its corresponding circle in your answer sheet. In the second part and third part, write the final answer for each question and darken their corresponding circles in your answer sheet.
- c) Write your answers in the respective blank.
 - ✔ When the answer is a 1-digit number, type "000" for the tens, the hundreds and the thousands place. Example: if the answer is 7, then type 0007.
 - ✔ When the answer is a 2-digit number, type "00" for the hundreds place and the thousands place. Example: if the answer is 23, then type 0023.
 - ✔ When the answer is a 3-digit number, type "0" for the thousands place. Example: if the answer is 191, then type 0191.
 - ✔ When the answer is a 4-digit number, type as it is. Example: if the answer is 6419, then type 6419.
- d) Dictionaries are allowed, but calculators are not.
- e) Figures may not be drawn to scale.

Remark. Counting numbers are whole numbers except 0, i.e. 1, 2, 3, 4, 5, ...

GOOD LUCK!



SECTION A (CORRECT ANSWER = 2 MARKS; NO ANSWER = 0; INCORRECT ANSWER = MINUS 1 MARKS)

Question 1. Find the value of the following:

$$\frac{1}{2} - \frac{5}{12} + \frac{7}{24} - \frac{9}{40} + \frac{11}{60} - \frac{13}{84} + \frac{15}{112} - \frac{17}{144}$$

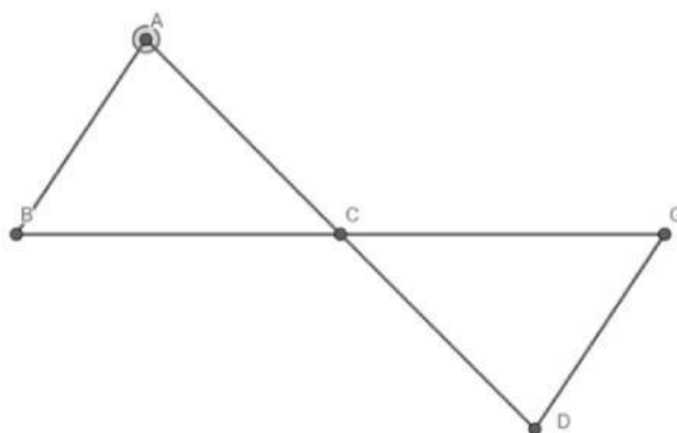
- (A) $\frac{7}{18}$
(D) $\frac{11}{36}$

- (B) $\frac{7}{36}$

- (C) $\frac{11}{18}$

- (E) None of the above.

Question 2. In the figure below, it is known that the side length of both squares is 2 cm. An ant, whose initial position is at point O starts crawling continuously for 2020 cm along the following path: “C – A – B – C – G – D – C – A – B – C – G – D – C – A – B – C – G – D – C...”. After completing the task, where will the ant arrive?



- (A) A.

- (B) B.

- (C) C.

- (D) D.

- (E) G.

Question 3. Find the last two digits of 74^{540} .

- (A) 16.

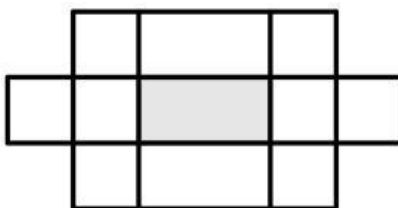
- (B) 76.

- (C) 64.

- (D) 84.

- (E) None of the above.

Question 4. Find the total number of rectangles that contain the shaded part in the figure below.



- (A) 21.

- (B) 22.

- (C) 23.

- (D) 24.

- (E) None of the above.

Question 5. The form teacher conducted a survey to find the distance of students' home from the school. The results are shown in the table below.

The readings of the Air Pollution Index (API) of a town in a period of seven days are as follows:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
API	70	82	76	x	64	53	58

The mean of the data is 65. Determine the value of x .

- ☐ A 65. ☐ B 62. ☐ C 52.
☐ D 40. ☐ E None of the above.

Question 6. Given that the 8-digit number 200820□□ is divisible by 12, find the smallest possible 2-digit number □□

- ☐ A 12. ☐ B 16. ☐ C 20.
☐ D 24. ☐ E None of the above.

Question 7. Find the least possible number such that it satisfies all of the following conditions:

- i) It leaves a remainder of 3 when divided by 5
- ii) It leaves a remainder of 4 when divided by 7
- iii) It leaves a remainder of 7 when divided by 9.

- ☐ A 82. ☐ B 84. ☐ C 86.
☐ D 88. ☐ E None of the above.

Question 8. Find the remainder when 345345...345345 (2010 groups of '345') is divided by 7.

- ☐ A 0. ☐ B 1. ☐ C 2. ☐ D 3. ☐ E 4.

Question 9. In a survey of 500 students of a college, it was found that 49% liked watching football, 53% liked watching hockey and 62% liked watching basketball. Also, 27% liked watching football and hockey both, 29% liked watching basketball and hockey both and 28% liked watching football and basket ball both. 5% liked watching none of these games. How many students like watching all the three games?

- ☐ A 60. ☐ B 65. ☐ C 70.
☐ D 75. ☐ E None of the above.

Question 10. A prime number is a whole number that has exactly two positive factors, 1 and itself. The sum of two prime numbers is 39. Find the product of these two numbers.

- ☐ A 35. ☐ B 39. ☐ C 74.
☐ D 12. ☐ E None of the above.

Question 11. Terence used a 4-digit code for his bicycle lock. Given that the code is a number that is divisible by 99, find the least possible 4-digit perfect square code.

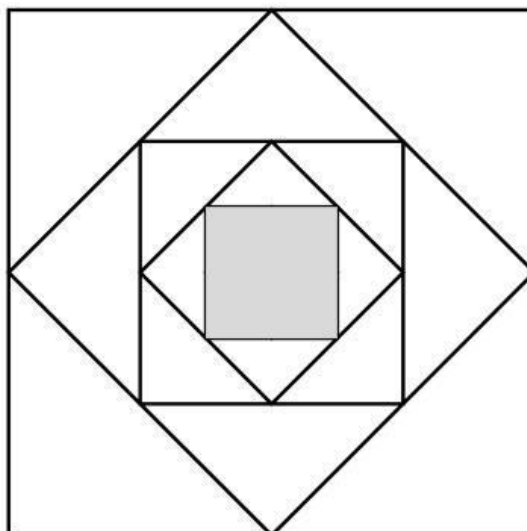
- ☐ A 8100. ☐ B 9801. ☐ C 1089.
☐ D 3993. ☐ E None of the above.

Question 12. Find the remainder when a 99-digit number 928928928...928 is divided by 9.

- ☐ A 0. ☐ B 3. ☐ C 6.
☐ D 7. ☐ E None of the above.

Question 13. The figure below is made up of squares of different sizes. The vertices of an inner square are the midpoints of the respective sides of the outer square. The sides of the largest square are 8 cm each.

8cm



- (A) 16. (B) 8. (C) 4.
(D) 2. (E) None of the above.

Question 14. Using only brackets, +, -, ×, we can form the number 48 from single-digits of 4 as follows:

$$(4 + 4) \times 4 + 4 \times 4 = 48$$

What is the minimum number of single-digits of 4 required to form the number 512?

- (A) 3. (B) 4. (C) 5.
(D) 6. (E) None of the above .

Question 15. Find the largest value n where $n \in \mathbb{N}$ such that

$$1 \times 2 + 2 \times 3 + 3 \times 4 + \dots + n \times (n + 1) \leq 999$$

- (A) 14. (B) 15. (C) 16.
(D) 17. (E) None of the above .

B

SECTION B: CORRECT ANSWER = 4 MARKS; INCORRECT OR NO ANSWER = 0

Question 16. In the following fraction sequence. If the 7^{th} term is $\frac{A}{B}$, find the sum of digits of B.

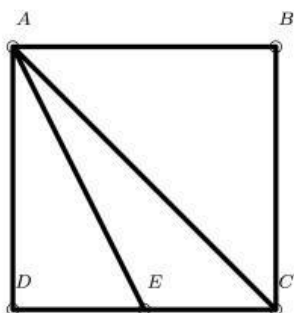
$$\frac{1}{1}, \frac{1}{12}, \frac{1}{108}, \frac{1}{864}, \frac{1}{6480}, \frac{1}{46656}, \dots$$

Question 17. John, Kathy and Lauren have 29 sweets altogether. John has 3 times as many sweets as Kathy. Lauren has 4 more sweets than Kathy. How many sweets does Lauren have?

Question 18. John was running after his friend Marry beside a stretch of railway. A train moving at a constant speed towards them, took 40 seconds to travel past Marry. 20 seconds later, the train then reached John and took 30 seconds to travel past him. How much longer would John take to catch up Marry?

Question 19. Today is Saturday. If we use 1 to represent Monday, 2 to represent Tuesday,..., 6 to represent Saturday and 7 to represent Sunday, what day will it be after 2009^{2009} days starting from today? [For example, if your answer is Monday, then shade your answer as "1". Similarly for the rest of the days of the week.]

Question 20. The figure below shows a square ABCD and E is the mid-point of CD. Given that the area of triangle ACE is 36 cm^2 . Find the perimeter (in cm) of the square ABCD.

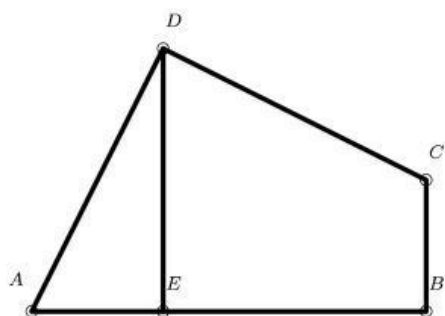


Question 21. Given that $|a+b| = 10$, $a \geq b > 0$. Find the smallest value of $\sqrt{2a^2 + 2ab + b^2 + 19}$

Question 22. Find the smallest of $\sqrt{x-1-2\sqrt{x-2}} + \sqrt{x+7-6\sqrt{x-2}}$

Question 23. Find how many numbers between 3267 and 5120 can be formed using the digits 1, 2, 3, 4, 5 and 6, with no digit begin repeated.

Question 24. ABCD is a quadrilateral with area 16 cm^2 such that $AD = CD$ and angle $CDA = 90^\circ$. E is a point on AB such that $DE = BE$, $AE = 2 \text{ cm}$ and angle $DEB = 90^\circ$. Find the area (in cm^2) of the quadrilateral BCDE.



Question 25. If A,C,M,T are distinct numbers chosen from set 3, 5, 7, and 9, what is the largest possible sum of

$$CAT + MAT + TAM?$$

THE END