

1. How many ways are there to rearrange the letters in the word EDUVERSAL such that all the vowels are bunched up together without breaks?
- A) 720
 B) 17280
 C) 4320
 D) 8640
 (Benar +2, Salah 0, Kosong 0)

2. A sequence of real numbers is given $1, a, a + 1, 2a + 1, 3a + 2, 5a + 3, \dots$. If the sum of the first 10 terms is 99, what is a ?
- A) 0.5
 B) 1
 C) 0.125
 D) 0.2
 (Benar +2, Salah 0, Kosong 0)

3. Given four positive real numbers $a < b < c < d$, which of the following must be true?
- A) $ab < ac < bc < ad < cd$
 B) $ab < ac < bc < bd < cd$
 C) $ab < ac < bc < ad < bd$
 D) $ac < ad < bc < bd < cd$
 (Benar +2, Salah 0, Kosong 0)

4. If a_1, a_2, a_3, \dots is an arithmetic sequence with $a_8 = 9$ and $a_9 = 6$, then what is a_8 ?
- A) 8
 B) 7
 C) ∞
 D) 5
 (Benar +2, Salah 0, Kosong 0)

5. If $\frac{\pi}{4} < \theta < \frac{3\pi}{4}$, then which of the following options

MUST BE true?

- A) $\sin(\theta) > \cos(\theta)$
 B) all of the options
 C) $\tan(\theta) > 1$
 D) $\csc(\theta) < \sec(\theta)$
 (Benar +2, Salah 0, Kosong 0)

6. Two fair dice are rolled.
 What is the probability that the total score is a prime number?

- A) $\frac{1}{4}$
 B) $\frac{1}{2}$
 C) $\frac{5}{12}$
 D) $\frac{17}{36}$
 (Benar +2, Salah 0, Kosong 0)

7. How many ways can we choose three letters out of five usable letters A, B, C, D, E, if repetitions are allowed?

- A) 25
 B) 21
 C) 125
 D) 35
 (Benar +2, Salah 0, Kosong 0)

8. The solution set of the inequality $2^{x+1} \geq 4^x$ is ____.

- A) $[0, 1]$
 B) $(-\infty, 0]$
 C) $[1, \infty)$
 D) $(-\infty, 1]$
 (Benar +2, Salah 0, Kosong 0)

9. The figure shows two identical circles of radius 1 cm.
The distance between their centers is $\sqrt{2}$ cm.

The area of the shaded region is ____ cm^2 .

- A) $\pi - 2$
 B) $\frac{\pi}{16}$
 C) $\frac{\pi}{2} - 1$
 D) $\pi - 1$
 (Benar +2, Salah 0, Kosong 0)

10. Let a, b, c be integers.
If a divides b and b divides $c + a$, then what can we say for certain?

(note : in the options, the notation $m | n$ means that m divides n)

- A) $c | a$
 B) $b | a$
 C) $b | c$
 D) $a | c$
 (Benar +2, Salah 0, Kosong 0)

11. How many integers from 1 to 2021 are divisible by 20 or 21 but not both?

- A) 193
 B) 421
 C) 200
 D) 87
 (Benar +2, Salah 0, Kosong 0)

12. Andy walks 3 km north from his house, then he walks 4 km east, and then 5 km south.

How far is Andy now (in km) from his house?

- A) $\sqrt{5}$
 B) 6
 C) $2\sqrt{5}$
 D) 5
 (Benar +2, Salah 0, Kosong 0)

13. Given two points $A(a, a + 1)$ and $B(b + 1, b)$ on the Cartesian plane. The midpoint of AB turns out to be $C(a + b, a + b)$.

Find the coordinate of the midpoint.

- A) (1, 0)
- B) (1, 2)
- C) (1, 1)
- D) (2, 1)

(Benar +2, Salah 0, Kosong 0)

14. We are given three points $A(0, 4)$, $B(-2, 0)$, $C(2, 0)$ on the Cartesian plane.

Find the coordinate of a point D such that $DA = DB = DC$.

- A) $\left(0, \frac{4}{3}\right)$
- B) (0, 1)
- C) (0, 2)
- D) $\left(0, \frac{3}{2}\right)$

(Benar +2, Salah 0, Kosong 0)

15. The line $y = mx + n$ intersects another line $y = nx + m$ at the point $(mn, 3)$.

What is the value of $m^3 + n^3$?

- A) 8
- B) 18
- C) 2
- D) 36

(Benar +2, Salah 0, Kosong 0)

16. Given $a < -1 < b < 0 < c < 1$, which of the following must be true?

- A) $ac < b$
- B) $a < bc$
- C) $ab < c$
- D) $bc < a$

(Benar +2, Salah 0, Kosong 0)

17. The line $2x + 3y = 12$ intersects the x -axis at point P, and intersects the y -axis at point Q.

What is the coordinate of the midpoint of PQ?

- A) $(2, 3)$
 B) $(3, 2)$
 C) $\left(\frac{3}{2}, 3\right)$
 D) $\left(3, \frac{3}{2}\right)$

(Benar +2, Salah 0, Kosong 0)

18. The graph of $y = x^3 - x^2 - 2x$ intersects the x -axis at three points.

The sum of the x -coordinate of these points is ____

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

(Benar +2, Salah 0, Kosong 0)

19. Given three different single-digit nonzero numbers a, b, c .

Andy writes down all the possible 2-digit numbers whose digits are taken from a, b, c and repetition is allowed. Then he deletes one of the numbers, and finds that the sum of the undeleted numbers is 209.

What is one possibility for the deleted number?

- A) 14
 B) 89
 C) 32
 D) 22

(Benar +2, Salah 0, Kosong 0)

20. The digits of $N = 12345671234567 \dots 1234567$ consist of 2021 repetitions of 1234567.

What is the remainder when N is divided by 9?

- A) 5
 B) 1
 C) 8
 D) 0

(Benar +2, Salah 0, Kosong 0)

21. In the figure (not to scale), AB and CE are perpendicular to BC, while AC and DE are perpendicular to CD. The lengths are given in cm.

The area of the pentagon ABCDE is ____ cm^2 .

- A) $\frac{99}{4}$
- B) 20
- C) $\frac{74}{3}$
- D) 25

(Benar +2, Salah 0, Kosong 0)

22. The remainder when $1^1 - 2^2 + 3^3 - \dots + 9^9 - 10^{10}$ is divided by 4 is

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

(Benar +2, Salah 0, Kosong 0)

23. In the closed interval $[0, 2021\pi]$, how many times does the graph of $y = \sin(2x)$ intersect the x -axis?

- A) 1011
- B) 3021
- C) 1005
- D) 4043

(Benar +2, Salah 0, Kosong 0)

24. How many 3-digit positive integers \overline{abc} have the property that its digits can be rearranged to get a new number that is twice the old number?

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

(Benar +2, Salah 0, Kosong 0)

25. The number $x = \overline{123456pq789}$ is divisible by 99, where p, q are single-digit numbers.

What is the remainder when x is divided by the number $p + q$?

- A) 7
B) 11
C) 1
D) 0

(Benar +2, Salah 0, Kosong 0)

26. The graph of $x = y^2 - y$ intersects the line $y = kx$ at exactly one point that is not the origin $(0, 0)$.

That intersection point is _____

- A) $\left(\frac{k^2}{k+1}, \frac{k}{k+1} \right)$
B) $\left(\frac{k+1}{k^2}, \frac{k+1}{k} \right)$
C) $\left(\frac{k+1}{k}, \frac{k+1}{k^2} \right)$
D) $\left(\frac{k}{k+1}, \frac{k^2}{k+1} \right)$

(Benar +2, Salah 0, Kosong 0)

27. The units digit of $N = 1^5 + 2^5 + 3^5 + \dots + 2021^5$ is _____

- A) 5
B) 3
C) 7
D) 1

(Benar +2, Salah 0, Kosong 0)

28. A fair coin (Heads and Tails) is tossed repeatedly until two consecutive Heads are obtained for the first time and then we stop.

What is the probability that two consecutive Tails occurred during the tosses?

- A) $\frac{1}{4}$
B) $\frac{1}{2}$
C) $\frac{1}{6}$
D) $\frac{1}{3}$

(Benar +2, Salah 0, Kosong 0)

29. If m is a non-negative integer such that $\sqrt{\frac{2m}{m+2}}$ is also an integer, then the sum of all possible values of m is _____

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

(Benar +2, Salah 0, Kosong 0)

30. If x, y are two positive real numbers such that $\frac{1}{2} < \frac{x}{x+y} < \frac{2}{3}$ then the range of $\frac{x}{y}$ is _____

- A) $1 < \frac{x}{y} < 2$
- B) $1 < \frac{x}{y} < \frac{3}{2}$
- C) $\frac{2}{3} < \frac{x}{y} < 1$
- D) $\frac{2}{3} < \frac{x}{y} < \frac{3}{2}$

(Benar +2, Salah 0, Kosong 0)

31. When $1^1 + 2^2 + 3^3 + 4^4 + \dots + 101^{101}$ is divided by 5, the remainder is _____

(Benar +4, Salah 0, Kosong 0)

32. How many different values can we obtain by rearranging the seven symbols 1, 2, 3, 4, 5, +, + in a line?

For example, we can obtain 78 because $3 + 24 + 51 = 78$. Note that a plus sign must be placed between two numbers, for example + 2143 + 5 is an invalid arrangement.

(Benar +4, Salah 0, Kosong 0)

- 33.** There are 2021 coins on the table. Andy and Bruce take turns playing a game with the following rule : in every turn, the current player must take 1, 2, or 3 coins from the table. The player who cannot take any more coins loses. **What is the smallest total number of turns that the player who goes first can guarantee a win?**
 Note : every player's move is considered as one turn. For example, if Andy takes 2, Bruce takes 1, Andy takes 3, then the total number of turns is three.
 (Benar +4, Salah 0, Kosong 0)

- 34.** A sequence is given by $a_1 = 3$ and $a_{n+1} = a_n^{a_n}$ for each $n \geq 1$.
 For example $a_2 = a_1^{a_1} = 3^3 = 27$ and $a_3 = a_2^{a_2} = 27^{27}$.
What is the remainder when $a_{999999999999}$ is divided by 5?
 (Benar +4, Salah 0, Kosong 0)

- 35.** If a, b are two rational numbers such that $\frac{a + 3\sqrt{2} + (b + 1)\sqrt{3}}{2 + b\sqrt{2} + (a + 2)\sqrt{3}}$ is also a rational number, then $a + b$ is ____.
 (Benar +4, Salah 0, Kosong 0)

- 36.** How many different ways can we rearrange the seven symbols 1, 2, 3, 4, 5, 6, < to get a true statement?
 For example, **26 < 5143** and **361 < 524** are true statements, while **521 < 134** is false (therefore not counted), and **< 516342** is an invalid arrangement (also not counted).
 (Benar +4, Salah 0, Kosong 0)

37. A positive integer has the following property : its base-3 representation has three digits, and when the leftmost digit in its base-3 representation is erased then we get its base-12 representation.
How many positive integers have that property?
 (Benar +4, Salah 0, Kosong 0)

38. Each of nine people is given an ID number, a number from 1 to 9, in such a way so that the person with ID number x knows the person with ID number y if and only if \overline{xy} or \overline{yx} is a 2-digit number divisible by 13.
 For example, the person with ID number 9 knows the person with ID number 3 because 39 is divisible by 13.
 From these nine people, some will be chosen to form a team where everyone knows each other.
What is the greatest number of people in a team?
 (Benar +4, Salah 0, Kosong 0)

39. How many integer $a \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ gives the greatest number of integer pairs (b, c) satisfying $ab + bc + ca = 0$?
 (Benar +4, Salah 0, Kosong 0)

40. Three line segments AB, BC, CA are tangent to a circle of radius 4, with $BC : CA : AB = 5 : 6 : 7$.
What is the ratio $\frac{\text{Area}(ABC)}{\text{Perimeter}(ABC)}$?
 (Benar +4, Salah 0, Kosong 0)