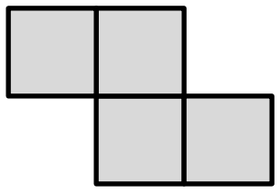
1. Four square tiles of side 10 cm are placed next to each other with adjacent tiles sharing an edge in its entirety on a floor to form a figure. An example of such a figure is shown below.



What is the maximum possible perimeter of such a figure they form, in cm?

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

2. If $2016 \times$ N is a perfect square then what is the smallest positive integer value of N ? Note. $2016 = 2^5 \times 3^2 \times 7$.

(A) 14 (B) 28 (C) 84 (D) 108 (E) 52

3. Let $ABCD$ be a square. How many equilateral triangles in the same plane as $ABCD$ share two vertices with the square?

(A) 4 (B) 6 (C) 8 (D) 12 (E) 16

4. Consider the sequence of 20 numbers $10,10,9,11,8,12,7,13,6,14,5,15,4,16,3,17,2,18,1,19$ Now consider the sequence obtained by decreasing the terms in the odd numbered positions by 1 and increasing the terms in the even numbered positions by 3. What is the average of the terms of the new sequence?

(A) 11 (B) 20 (C) 22 (D) 24 (E) 220

5. In the Land of Liars , "all politicians have a spine and a head" is false. Then which of the following is true in the Land of Liars?

(A) There is at least one politician who has no spine and no head.
(B) All politicians have no spine and no head.
(C) There is at least one politician who has no spine.
(D) There is at least one politician who has no head.
(E) If all politicians have a spine, then there is at least one who has no head.

27. Pencils from a box are to be distributed among Kasun and Supun. If they are given three pencils each first to Kasun and then to Supun and so on then Kasun will receive the last three pencils and there will be two pencils left in the box. If they are given five pencils each first to Supun and then to Kausn and so on then Kasun will receive the last five pencils and there will be three pencils left in the box. Which of the following is/are true?

I. If m and n are possible numbers of pencils in the box, then $m - n$ is divisible by 30.
II. Smallest possible value for the number of pencils in the box is larger than 20.
III. If m and n are possible numbers of pencils in the box, then $m - n$ is divisible by 60.

(A) II only (B) III only (C) I and II only (D) II and III only (E) I and III only

28. Consider the sequence of 2016 numbers

$$10 + 1, 10^2 + 1, 10^3 + 1, \dots, 10^{2015} + 1, 10^{2016} + 1.$$

Which of the following statements is/are true?

I. Every term in the sequence is divisible by 11.
II. At most 672 terms of this sequence are divisible by 1001.
III. Exactly 336 terms of this sequence are divisible by 1001.

(A) I only (B) II only (C) I and II only (D) II and III only (E) None of them

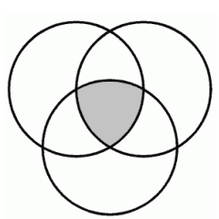
29. Euclid asked his five students whether they studied geometry yesterday.

Sumudu : No one studied geometry yesterday.
Sanjaya : One person studied geometry yesterday.
Abdul : Two people studied geometry yesterday.
Meena : Three people studied geometry yesterday.
Tharindu : Four people studied geometry yesterday.

Euclid knows that only those who studied would be telling the truth and those who didn't would be lying. Who was telling the truth?

(A) Sumudu (B) Sanjaya (C) Abdul (D) Meena (E) Tharindu

30. Three circles with radii 1 intersect as shown in the figure such that the center of each circle lies on the circumference of other two circles. What is the area of the shaded region?



(A) $\frac{(\pi-\sqrt{3})}{2}$ (B) $\frac{(\pi+\sqrt{3})}{2}$ (C) $\frac{\sqrt{3}}{4}$ (D) $\frac{\pi}{3}-\frac{\sqrt{3}}{4}$ (E) None of the above

21. If x and y are numbers such that $0 < x < y$, which of the following is/are true?

I. $x(x+y) < x^2 + y^2$

II. $y(x+y) < x^2 + y^2$

III. $\frac{x}{1+x} < \frac{y}{1+y}$

(A) I and II only (B) I and III only (C) I only (D) III only (E) All

22. p and q are prime numbers such that $p > q > 1$ and $p - q$ and $p + q$ are also prime numbers. Which of the following is/are true?

I. p can take more than one value.

II. q can take more than one value.

III. $p = 5$ and $q = 2$ are the only values p and q can take

(A) I only (B) I and II only (C) II and III only (D) III Only (E) None

23. Three yellow and two purple butterflies are flying together. Suddenly, they all randomly sit on a wire stretched between two poles. What is the probability that the two purple butterflies do not sit together?

(A) $\frac{2}{5}$ (B) $\frac{3}{5}$ (C) $\frac{4}{5}$ (D) $\frac{1}{2}$ (E) $\frac{1}{3}$

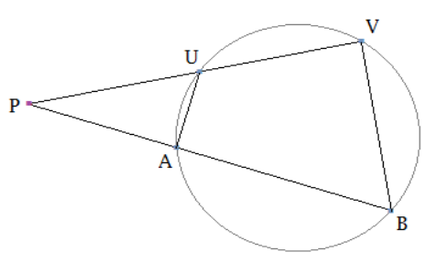
24. Let ABC be a right-angled triangle with integer side lengths and AB the hypotenuse. How many values can AC possibly take from the set $\{1, 3, 5, 7, 9, \ldots, 2017\}$?

(A) 0 (B) 1008 (C) 1009 (D) 6 (E) 7

25. The prime factorization of a positive integer is of the form p^2q^2 and sum of its all possible divisors 403. What is $p + q$?

(A) 8 (B) 16 (C) 13 (D) 31 (E) 18

26. In the figure given below, $AU = 4$, $BV = 6$ and area of $PAU = 15$. The area of the quadrilateral $ABVU$ is,



(A) $\frac{75}{4}$ (B) 24 (C) 48

(D) $\frac{75}{2}$ (E) $\frac{45}{2}$

6. In the correct multiplication problem $100{,}001 \times THINK = REFLECTING$, each letter stands for a non-zero digit. If $H = 1$ then what is the value of E ?

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

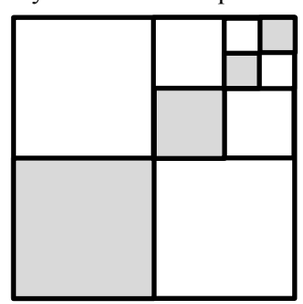
7. If $a \otimes b = a^b b^a + ab$ what is the remainder when $20 \otimes 16$ is divided by 100?

(A) 0 (B) 16 (C) 20 (D) 40 (E) 80

8. How many numbers from 1 to 2016 have the sum of their digits equal to 3?

(A) 8 (B) 12 (C) 18 (D) 24 (E) 30

9. In the figure shown below all the undivided regions bounded by four lines are squares. Then area of shaded region : area of unshaded region is



(A) $11:21$
(B) $1:2$
(C) $2:3$
(D) $21:31$
(E) $21:41$

10. If $n! = n \times (n-1) \ldots 3 \times 2 \times 1$, what is the units digit of 2!+4!+6!+8!+ …+ 2014!+2016! ?

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

11. What is the side length in cm of the square of least area formed by rectangular tiles of length 6 cm and width 4 cm without overlaps and gaps?

(A) 10 (B) 12 (C) 20 (D) 24 (E) 36

12. If $n! = n \times (n-1) \ldots 3 \times 2 \times 1$, what is the smallest integer n such that $\frac{n!}{10!}$ is a multiple of 2016?

(A) 15 (B) 16 (C) 18 (D) 27 (E) 32

13. One face of a polyhedron is a hexagon - a polyhedron is a solid figure with polygonal faces. What is the smallest number of edges the polyhedron can have?

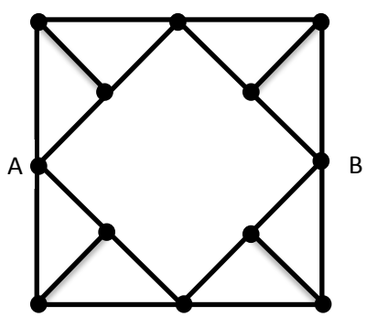
(A) 7 (B) 12 (C) 13 (D) 18 (E) 24

14. If a, b and c take only 1 and -1, what is the number of different values, $\frac{abc}{ab+bc+ca}$ can take?

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

15. How many paths are there from A to B which do not visit the same vertex twice?

(A) 8
(B) 16
(C) 20
(D) 24
(E) 32



16. Which is the smallest number in
{2012×2020, 2013×2019, 2014×2018, 2015×2017, 2016×2016} ?

(A) 2012×2020
(B) 2013×2019
(C) 2014×2018
(D) 2015×2017
(E) 2016×2016

17. In an equilateral triangle ABC, D and E are points on the sides AB and AC respectively such that $AD:DB = AE:EC = 2:1$. The lines CD and BE intersect at F. What is $\frac{Area\ of\ ABC}{Area\ of\ FBC}$?

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

18. What is the smallest positive integer that has exactly 14 divisors?

(A) 14 (B) 2^{14} (C) 2^{13} (D) 3×2^6 (E) $2^7 \times 3^2$

19. If a sequence of numbers $a_1, a_2, a_3, \ldots$ is given by $a_1 = 1, a_2 = 1$ and $a_{n+1} = a_n - a_{n-1}$ for $n \geq 2$ what is the sum of the first 2016 terms of this sequence?

(A) 0 (B) 1 (C) 16 (D) 504 (E) 1008

20. There are 2016 straight lines on a plane. Which of the following statements could be true?

I. Number of intersection points is 1.
II. Number of intersection points is 2.
III. Number of intersection points is $\frac{2016^2}{2}$.

(A) I and II only (B) II and III only (C) III only (D) I only (E) All