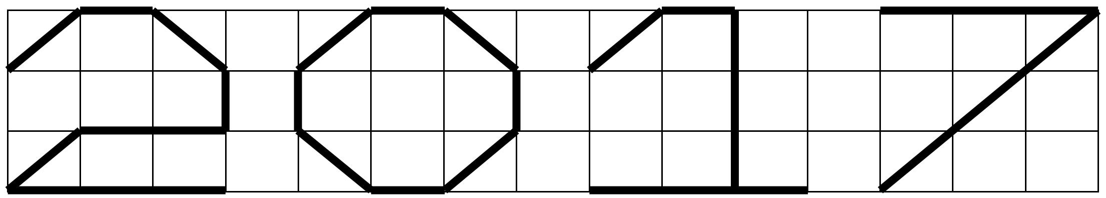
1. An artist has drawn 2017 in a square grid of side 1 cm squares using straight line segments as shown below. What is the total length of line segments in centimeters he has used?



(A) $20+10\sqrt{2}$ (B) $21+10\sqrt{2}$ (C) $20+11\sqrt{2}$ (D) $21+11\sqrt{2}$
(E) $21+12\sqrt{2}$

2. The smallest element in the set $\left\{\frac{2017}{2018},\frac{2018}{2019},\frac{2019}{2020},\frac{2020}{2021},\frac{2021}{2022}\right\}$ is

(A) $\frac{2017}{2018}$ (B) $\frac{2018}{2019}$ (C) $\frac{2019}{2020}$ (D) $\frac{2020}{2021}$ (E) $\frac{2021}{2022}$

3. 2017^2 is not equal to

(A) $2017\times 2018-2017$ (B) $2016\times 2017+2017$ (C) $2016\times 2018+1$
(D) $2016\times 2018+2$ (E) $2015\times 2019+4$

4. 2017 cubes of side 1 cm can be used to make a composite object by joining any two cubes by gluing two of their faces to coincide. What is the maximum possible surface area in square centimetres of such an object?

(A) $6\times 2017-2\times 2014$ (B) $6\times 2017-2016$ (C) $6\times 2017-2\times 2016$
(D) $6\times 2017-2\times 2017$ (E) $6\times 2017-2\times 2018$

5. If $A=\left\{\frac{2017}{2018},\frac{2018}{2019},\frac{2019}{2020},\dots\right\}$ then which of following statements is/are true?

I. A has infinitely many elements.
II. A does not have a largest element.
III. 1is the largest element of A.

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

27. Let $S=\{1,2,\dots,3000\}$. What is the least possible value of k such that any subset A of $S$with 101 elements contains two distinct numbers a and b such that $|a-b|\le k$

(A) 29 (B) 39 (C) 49 (D) 59 (E) 69

28. In the *Land of Liars* everyone lies 6 days a week and tells the truth on the remaining day, and this day of the week is the same for each inhabitant. How many days of a week an inhabitant of the *Land of Liars* can make the following statement?
If I did not tell the truth yesterday I will certainly tell the truth tomorrow.

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

29. Which of the following statements is /are true for the sequence $1,11,111,1111,\dots$?

I. Every fourth term is divisible by 1111.
II. At least one term except the first term is a perfect fourth power.
III. Every 3^n th term is divisible by 3^n.

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

30. In a 100×100 grid a corner cell is colored red and all the other cells are colored blue. Consider the following recoloring operation: In any row or column colors of the cells are interchanged – red cells are colored blue and blue cells are colored red. Which of the following can be done through the recoloring operation?

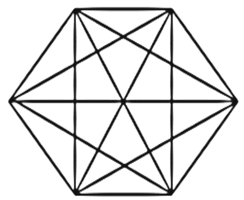
I. All the corner cells red.
II. All the corner cells blue.
III. One of the corner cells blue and the other corner cells red.

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

23. What is the largest positive integer n such that there is a prime number p such that $p,\ p+2,\ p+2^2,\ \dots,\ p+2^n$ are all prime?

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

24. How many triangles are there in the following figure obtained by connecting all the vertices of a regular hexagon with straight line segments?



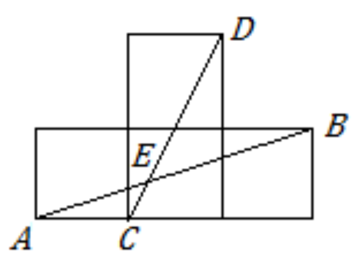
(A) 80 (B) 90 (C) 100 (D) 110 (E) 120

25. In a 100×100 grid a positive integer is written in each cell such that each number is the average of its neighbours; above, below, right and left. A number could have 2,3 or 4 neighbours. Which of the following statements is/are true?

I. All the numbers must be distinct.
II. All the numbers must be same.
III. Sum of all the numbers is divisible by 8.

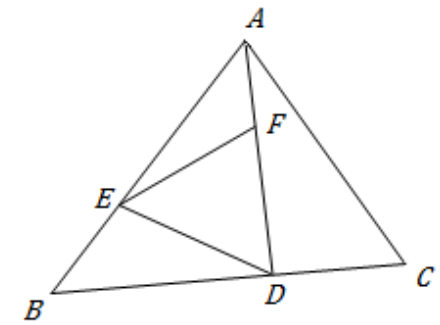
(A) I only (B) II only (C) III only (D) I and III only (E) II and III only

26. In the following diagram each square has the side length $1cm$. If E is the intersection point of line segments AB and CD what is the measure of $\angle DEB$ in degrees?



(A) 30° (B) 45° (C) 60° (D) 75°
(E) Cannot be determined from the given information

6. In the triangle ABC, D, E and F are points on the line segments BC, AB and AD respectively, such that $BD:DC = AE:EB = DF:FA = 2:1$. What is $\frac{Area\ of ABC}{Area\ of DEF}$?



(A) 3 (B) $1/3$ (C) $8/27$ (D) $27/8$ (E) $16/27$

7. If the mode of the positive integers $5, 6, 7, x, x$ equals their mean what is the mode?

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

8. $a_1, a_2, a_3, \dots, a_{100}$ are non-negative integers such that

$$(a_1 + a_3 + \cdots + a_{99})(a_2 + a_4 + \cdots + a_{100}) = 2017.$$

What is the sum $a_1 + a_2 + a_3 + \cdots + a_{100}$?

(A) 1008 (B) 2016 (C) 2017 (D) 2018 (E) 4034

9. What is the range of the values $a, 6, 6.5, 7, 12, 2a$ given in the increasing order?

(A) 5 (B) 6 (C) 7 (D) 8 (E) 9

10. Among the attendees at a Sinhala and Tamil New Year lunch the ratio of Sinhala men to Sinhala women is 2 : 3 and the ratio of Tamil men to Tamil women is 3 : 2. What is the ratio of men to women among the Sinhala and Tamil adult attendees if there is an equal number of Sinhala men and Tamil men?

(A) $6:9$ (B) $25:12$ (C) $12:25$ (D) $13:12$ (E) $12:13$

11. Each cell of a10×10 grid can be colored in red or blue. If each cell is distinct how many different coloring are there?

(A) 100 (B) 200 (C) 2^{10} (D) 2^{20} (E) 2^{100}

12. Let m and n be positive integers such that $3m + 7n$ is divisible by 11. Which of the following is always divisible by 11?

(A) $m+n$ (B) $m+n+5$ (C) $9m+4n$ (D) $4m-9n$ (E) $6m+4n$

13. A game is played by tossing a fair coin several times. If the outcome is a head, the player earns 1 point. If the outcome is a tail, the player earns -1 point.
Which of the following statements is/are true?

I. It is not possible to earn 5 points by tossing the coin 10 times.
II. There is only one way (one sequence of heads and tails) to earn 3 points by tossing the coin 5 times.
III. It is possible to earn 0 points only in an even number of tosses.

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

14. Five positive integers are such that any three numbers add up to at least 60. Which of the following statements is/are true?

I. Each integer is at least 20.
II. Product of three of the given integers is at least 20^3.
III. Product of any three of the given integers is at least 20^3.

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

15. The Martian alphabet has only 2 letters: X and Y. A word in the Martian language is an arbitrary sequence of letters. How many different words of at most 5 letters are there in the Martian language?

(A) 30 (B) 32 (C) 42 (D) 52 (E) 62

16. ABC is an equilateral triangle of side 10 cm and P is a point in the space. What is the minimum value in centimeters of $3PA + 4PB + 7PC$?

(A) 50 (B) 60 (C) 70 (D) 80 (E) 90

17. In the Martian language (see question 15) how many different words are there consisting of X ten times and Y five times such that between any two Y's there is at least one X?

(A) 221 (B) 442 (C) 462 (D) 542 (E) 562

18. For each positive integer n let $f(n) = k$, where k is the largest positive integer with 2^k divides $n(n+1)(n+2)$.Which of the following statements is/are true?

I. For each positive integer m, there is a positive integer n such that $f(n) = m$.
II. There is a positive integer n such that $f(n) = f(n+1)$.
III. There are infinitely many positive integer$n$ such that $f(n) = 1$

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

19. Number 1 is written 100 times on a whiteboard. Consider the following operation: Cross out any two numbers and write 0 if they are equal and 1 if they are not equal. What is the last number that will be written on the board?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

20. What is the greatest integer that divides $p^4 - 1$ for every prime number p greater than 5?

(A) 12 (B) 30 (C) 48 (D) 120 (E) 240

21. How many subsets $\{a, b\}$ of $\{1,2, \dots, 10\}$ are there such that $a < b - 4$?

(A) 10 (B) 15 (C) 20 (D) 25 (E) 30

22. Let $A = \{1, 2, 3, 4\}$ and $f$an assignment on A such that $f(i) \in A$ for $i = 1, 2, 3, 4$ and $f\big(f(i)\big) = i$ for each $i \in A$. How many such assignments are there?

(A) 9 (B) 10 (C) 12 (D) 13 (E) 19