16. Which one of the following is true?

(A) $\frac{1}{7}+\frac{1}{15}=\frac{1}{n}$ for some integer n

(B) $\frac{1}{6}+\frac{1}{9}=\frac{1}{n}$ for some integer n

(C) $\frac{1}{13}+\frac{1}{17}=\frac{1}{n}$ for some integer n

(D) If a and b are integers and $a=b$ then $\frac{1}{a}+\frac{1}{b}=\frac{1}{n}$ for some integer n

(E) $\frac{1}{a}+\frac{1}{b}=\frac{1}{3}$ for some integers a and b

17. How many positive integers less than 400 are there whose sum of the digits is not equal to 19?

(A) 302 (B) 387 (C) 394 (D) 395 (E) None of the given

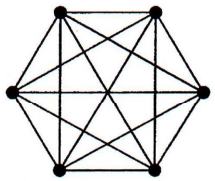
18. Let b be a positive integer and $3(54_b)=250_b$. Here b is the base of 54 and 250. What is the value of b?

(A) -1 (B) 6 (C) 7 (D) 8 (E) 16

19. Suppose that 41 numbers are picked randomly from the set {1, 2, ..., 100} such that their total sum is 2008. What is the least number of even numbers that can be picked?

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

20. Consider coloring the following logo of the *Sri Lanka Olympiad Mathematics Foundation* such that no two lines pointing to a dot are of the same color and a dot is colored differently from the colors of all the lines pointing at it.



What is the minimum number of colors needed?

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

21. For a positive integer n let $f(n)$ be the product of digits of n if $n \geq 10$ and $f(n)=n$ if $1 \leq n \leq 9$. Which of the following is/are true?

I. For all m and n, $f(m+n)=f(m)+f(n)$

II. Given any positive integer M, there is a positive integer n, such that $n > M$ and $f(n \times f(n))=1$

III. For all n, $f(n) \leq n$

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

22. Consider the following "Solution of $x^2+x+1=0$" and the resulting "Proof"

$x^2+x+1=0 \rightarrow (*)$

Step 1: Since $x \neq 0$ rearranging we get $x=\frac{-x-1}{x}$

Step 2: Substituting we get $x^2+\left(\frac{-x-1}{x}\right)+1=0$

Step 3: Simplifying we get $x^3=1$ and therefore $x=1$ is a solution of (*)

Step 4: Substituting back we get $1^2+1+1=0$ and this implies $3=0$

What can you conclude?

I. Step 2 is incorrect

II. Step 3 is incorrect

III. Step 4 is incorrect

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

23. In the *Land of Lliars*, *Red Clansmen* always lie and *White Clansmen* always tell the truth. Suppose thr people are talking and each one of them is a *Red* or a *White*.

Nimal: *Vimal* is a *White*

Vimal: *Nimal* and *Kamal* are both *Whites*

Kamal: *Nimal* is a *Red*

What can you conclude?

(A) All are *Reds*

(B) *Nimal, Vimal* are *Whites* and *Kamal* is a *Red*

(C) *Nimal* is a *Red* and *Vimal* and *Kamal* are *Whites*

(D) *Nimal* is a *White* and *Vimal* and *Kamal* are *Rea*

(E) *Kamal* is a *White* and *Nimal* and *Vimal* are *Reds*

24. At a late night party in the *Land of Liars* two people are chatting and one of them (person X) says " I always lie " and the other (person Y) says " That is a lie " . What can you conclude?

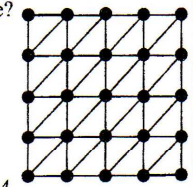
I. X is a *Red*

II. If Y is a *Red*, then X is also a *Red*

III. If Y is a *White*, then X tells the truth sometimes

(A) I only (B) II only (C) III only (D) II and III only (E) Nothing

25. An ant starts from A and crawls on the lines of the figure on the right such that it passes through all the lines and never crawls on the same line twice. Which of the following is/are true?



I. Ant can come back to A
II. Ant can not come back to A
III. Ant can come back to A if all the diagonal lines are removed in the figure

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

26. Consider the following three sequences.

I. For any n, $x_{n+1} \times x_n = 1$

II. For any n, $x_{n+2} = x_{n+1} + x_n$

III. For any n, $x_{n+1} = \dfrac{1+x_n}{x_n - 1}$

Then we can say that $x_n + x_{n+1}$ is a constant for any n:

(A) Only for I and II (B) Only for I and III
(C) Only for II and III (D) Only for I
(E) For none of I, II and III

27. *Shanthi* owns a mobile phone and she uses the password "*WAXSTOLM*". *Shanthi* at times writes the letters P or R instead of A and at times writes P or W or V instead of X and at times writes W or Q instead of S. What is the maximum number of distinct entries *Shanthi* has to enter in order to get the password right if she never enters a password with the same character next to each other?

(A) 30 (B) 32 (C) 33 (D) 36 (E) None of the given

28. Let ABC be a triangle and P be the mid point of AB. Let Q be a point on the plane of ABC. Which of the following is/are true?

I. If $AB = BC \neq AC$ then there are three different triangles APQ which are similar to the triangle ABC
II. If $AB = BC \neq AC$ then there are six different triangles APQ which are similar to the triangle ABC
III. If $AB = BC \neq AC$ then there are two different triangles APQ which are similar to the triangle ABC

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

29. In the correctly worked out addition problem on the right $F = 1$ and the ten remaining letters take digits 0, 1, 2, ..., 9 such that different letters take different digits with P, S and L are non zero. What is the value of A?

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

$$\begin{array}{cccccc} & & P & U & T \\ & & S & R & I \\ + & L & A & N & K & A \\ \hline F & I & R & S & T \end{array}$$

30. Consider all the sequences $x_1, x_2, x_3, \ldots$ where $x_i = 1$ or 2 for all $i = 1, 2, 3, \ldots$ which of the following is/are true about all such sequences?

i. For any sequence $n \leq x_1 + x_2 + \ldots + x_n \leq 2n$ for all positive integers n
ii. Number of sequences where only two terms are equal to 1 is finite
iii. All the sequence can be labeled using positive integers such that different sequences get different positive integers

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

1. How many distinct positive divisors does 2008 have inclusive of 1 and 2008?
[Hint: $2008 = 2^3 \times 251$ where 251 is a prime number]

(A) 4 (B) 5 (C) 6 (D) 7 (E) 8

2. The quotient when 2008 is divided by x is a 4 digit number less than 2008 and the remainder is zero. The value of x is

(A) 2 (B) 4 (C) 6 (D) 8 (E) 12

3. Which of the following is the correct order of $3, \sqrt{3}+\sqrt{5}$ and $\sqrt{15}$?

(A) $3 < \sqrt{3}+\sqrt{5} < \sqrt{15}$ (B) $3 < \sqrt{15} < \sqrt{3}+\sqrt{5}$ (C) $\sqrt{3}+\sqrt{5} < 3 < \sqrt{15}$
(D) $\sqrt{3}+\sqrt{5} < \sqrt{15} < 3$ (E) $\sqrt{15} < 3 < \sqrt{3}+\sqrt{5}$

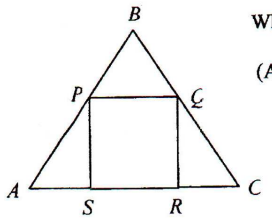
4. In the following correctly worked out problem letters k, l, p, q, s, t, u *and* v represent digits:

$$kl0000 - pq0000 = stuv + 2008$$

What is the value of s?

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

5. A rectangle $PQRS$ is inscribed in an equilateral triangle ABC of area 2008 as follows. P is the midpoint of AB.



What is the area of the rectangle?

(A) 502 (B) 1004 (C) 1000 (D) 500 (E) 1200

6. Consider all the positive integers which have only the digits ones and zeros. They are written in increasing order. Thus we get 1, 10, 11, 100, 101 etc. Then the number 1010011 is the
[Hint: Think binary]

(A) 69th number (B) 75th number (C) 83rd number
(D) 91st number (A) 94th number

7. A sniper fires 2008 bullets with 2/3 probability of hitting the target. The probability of at least one bullet hits the target is

(A) $1-\left(\frac{1}{3}\right)^{2008}$ (B) $2008\left(\frac{2}{3}\right)\left(\frac{1}{3}\right)^{2007}$ (C) $1-\left(\frac{2}{3}\right)^{2008}$
(D) $\left(\frac{1}{3}\right)^{2008}$ (E) $2008\left(\frac{2}{3}\right)^{2007}\left(\frac{1}{3}\right)$

8. The remainder when 2008^{2008} is divided by 10 is

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

9. The solution of $\frac{1-x}{1}+\frac{2-x}{2}+\frac{3-x}{3}+\ldots+\frac{2008-x}{2008}=2008$ is

(A) -3 (B) -2 (C) 0 (D) 2 (E) 3

10. Elements in $A = \{ 1, 2, 3, 4, 5 \}$ are paired off with the elements in $B = \{ 2, 4, 6, 8, 10 \}$ such that different elements in A are paired off with different elements in B.
For example:

1	2	3	4	5
↕	↕	↕	↕	↕
4	2	6	10	8

is such a pairing. The number of all such pairings is

(A)60 (B) 120 (C) 15 (D) 25 (E) 5^5

11. Let A be the set of positive integers and B be the set of positive even integers. Which one of the following is/are true? (See Problem 10)

	1 2 3 4 5 ...	
I.	↕ ↕ ↕ ↕ ↕ ...	is a pairing of elements of A with elements of B
	2 4 6 8 10 ...	
	1 2 3 4 5 ...	
II.	↕ ↕ ↕ ...	is a pairing of elements of A with elements of B
	2 4 6 8 10 ...	

III. Number of pairings of elements of A with elements of B is not finite

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

12. A leading bank in Sri Lanka issues 7 digit passwords for its clients. All these passwords satisfy the following three conditions.
a) The number must be a **palindrome**. (It should read the same from either end. For example: 1234321 is a palindrome)
b) It must start with 1, 3, 5 or 2
c) Third digit must be an even number
How many such even number passwords can the bank issue?

(A) 100 (B) 1000 (C) 2000 (D) 1500 (E) 500

13. If x is a positive number less than 1 then which one of the following is correct?

(A) $\frac{1}{4(x+1)^2}<\frac{1}{x^3(x+1)}<\frac{1}{4x^3}$ (B) $\frac{1}{4x^3}<\frac{1}{4(x+1)^2}<\frac{1}{x^3(x+1)}$
(C) $\frac{1}{4x^3}<\frac{1}{x^3(x+1)}<\frac{1}{4(x+1)^2}$ (D) $\frac{1}{4(x+1)^2}<\frac{1}{4x^3}<\frac{1}{x^3(x+1)}$
(E) $\frac{1}{x^3(x+1)}<\frac{1}{4(x+1)^2}<\frac{1}{4x^3}$

14. Among 500 GCE Ordinary Level students at a certain school 350 take the SLMC 2008 and 200 students take the Sri Lankan Physics Competition 2008. How many of them take both the competitions?

(A) 50 (B) 100 (C) 150 (D) 200 (E) Can not be concluded from the given information

15. The number 1234321 is

(A) a prime (B) a perfect square (C) an even number
(D) a multiple of 3 (E) a multiple of 7