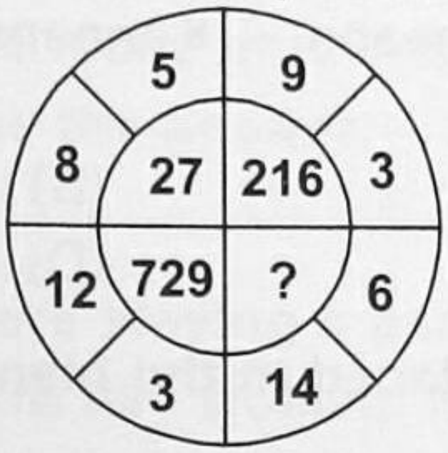
SECTION I : LOGICAL REASONING

1. **The missing character in the given number pattern is**



(A) 64 (B) 125 (C) 512 (D) 343

2. **Starting from a point P, Sachin walked 20 metres towards South. He turned left and walked 30 metres. He then turned left and walked 20 metres. He again turned left and walked 40 metres and reached a point Q. How far and in which direction is the point Q from the point P?**

(A) 20 metres West (B) 10 metres East (C) 10 metres West (D) 10 metres North

3. **In the following number series, one term is wrong. Find out the wrong term.**

1, 3, 7, 15, 27, 63, 127

(A) 7 (B) 15 (C) 27 (D) 63

4. **Rahul told Anand, "Yesterday I defeated the only brother of the daughter of my grandmother." Whom did Rahul defeat?**

(A) Son (B) Father (C) Brother (D) Father-in-law

5. **In an examination, Raj got more marks than Mukesh but not as many as Priya. Priya got more marks than Gaurav and Kavita. Gaurav got less marks than Mukesh but his marks are not the lowest in the group. Who is second in the descending order of marks ?**

(A) Priya (B) Kavita
(C) Raj (D) Cannot be determined

6. **Arrange the given words in the alphabetical order and select the one that comes last.**

Heredity, Hesitate, Heavy, Hedge

(A) Heredity (B) Hesitate (C) Heavy (D) Hedge

7. If the first ten letters of the English alphabet are written in reverse order and rest of the letters are left as it is, then which of the following letters will be the seventh to the left of the twelfth letter from the right end ?

(A) I (B) H (C) B (D) C

8. Select a figure which when placed in the blank space of Fig. (X) would complete the pattern.

A	I	T
E	B	D
X	?	O

Fig. (X)

(A) F (B) G

(C) L (D) Z

9. If – means ÷, + means ×, ÷ means –, × means +, then the mathematical expression which is equal to 56 is

(A) 12 – 96 ÷ 12 + 13 × 4 (B) 12 ÷ 96 – 12 × 13 + 4

(C) 12 × 96 – 13 ÷ 4 + 8 (D) 12 + 96 ÷ 13 – 4 × 8

10. Select a figure which when placed in the blank space of fig. (X) would complete the pattern.

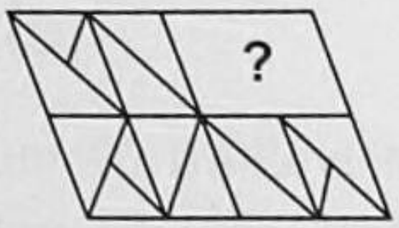
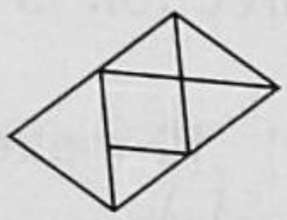
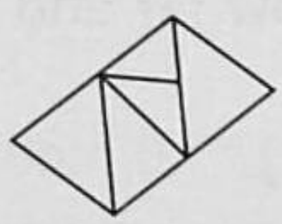
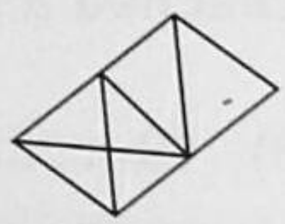
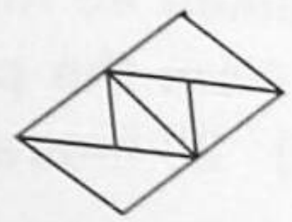


Fig. (X)

(A)  (B)  (C)  (D) 

11. In the following series, how many such even numbers are there which are divisible by 4 or 6, then followed by even number and preceded by odd number ?

4 7 3 16 2 9 2 6 6 5 9 18 4 3 8 7 1 8 14 2 6

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

12. Choose the correct water image of the Fig. (X) from the given options.

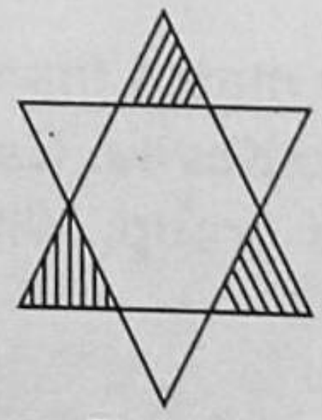
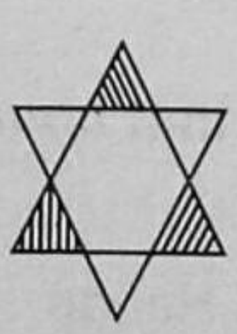
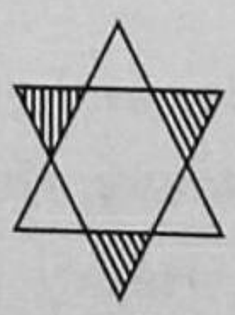
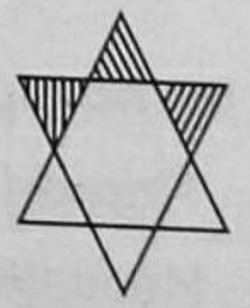
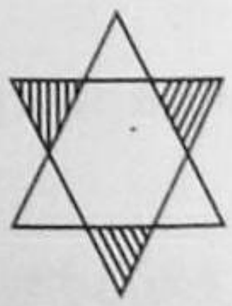
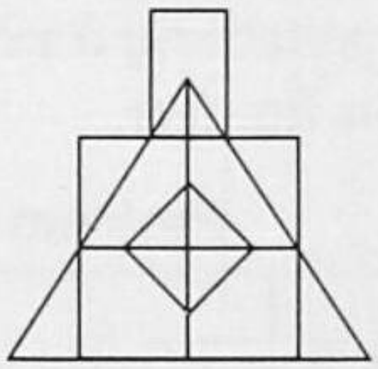


Fig. (X)

(A)  (B)  (C)  (D) 

13. **Count the number of triangles and squares in the given figure.**



(A) 28 triangles, 7 squares
(B) 18 triangles, 8 squares
(C) 20 triangles, 8 squares
(D) None of these

14. **If it is possible to make a meaningful word with the fourth, sixth, eighth and thirteenth letters of the word 'ENCULTURATION', which of the following will be the third letter of the word ? If no such word can be made give X as the answer and if more than one such word can be made, give M as the answer.**

(A) R (B) U (C) X (D) M

15. **Six persons A, B, C, D, E and F were playing a game of cards. A's father, mother and uncle were in the group. There were two women. B, the mother of A, got more points than her husband D got more points than E but less than F. Niece of E got lowest points. Father of A got more points than F but could not win the game. Who is the husband of B?**

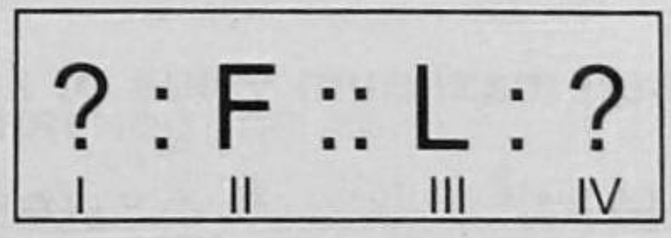
(A) C (B) D (C) E (D) F

16. **In a certain code language, 'rat cat dog' means 'Morning is pleasant'; 'dog rabbit snake rat' means 'night is not pleasant' and 'rabbit elephant cat snake' means 'morning does not irritate'. Which of the following means 'night' in that language ?**

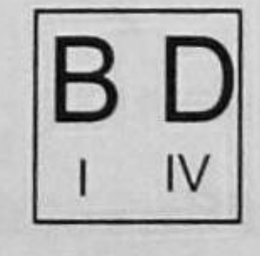
(A) rat (B) dog (C) snake . (D) rabbit

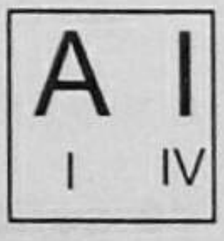
17. **There are four figures marked I, II, III and IV which constitute the Problem Set. Select a figure from the Answer Set, the contents of which may best substitute the question marks in Problem Set such that fig. III is related to fig. IV in the same way as fig. I is related to fig. II.**

Problem Set



(A) 

(B) 

(C) 

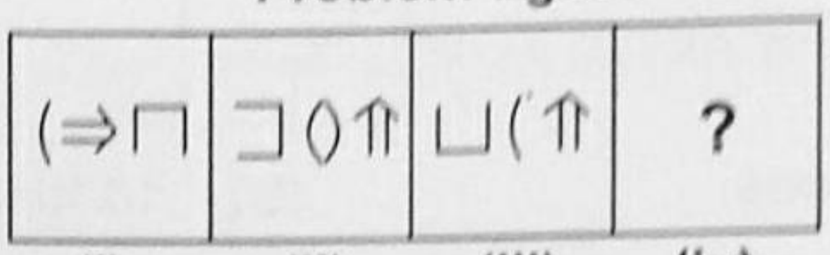
(D) 

18. **Ravi walks 2 km towards East and then he turns to South and walks 9 km. Again he turns to East and walks 3 km, after this he turns to North and walks 21 km, how far is he from his starting point ?**

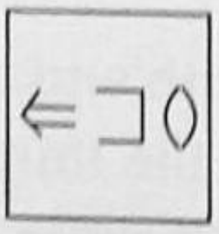
(A) 7 km (B) 11 km (C) 13 km (D) 15 km

19. There is a definite relationship between figures (i) and (ii). Establish a similar relationship between figures (iii) and (iv) by selecting a suitable figure from the given options that replace the question mark (?) in fig. (iv).

Problem figure

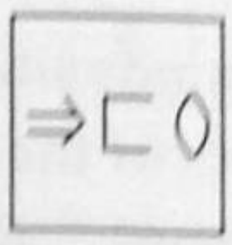


(i) (ii) (iii) (iv)

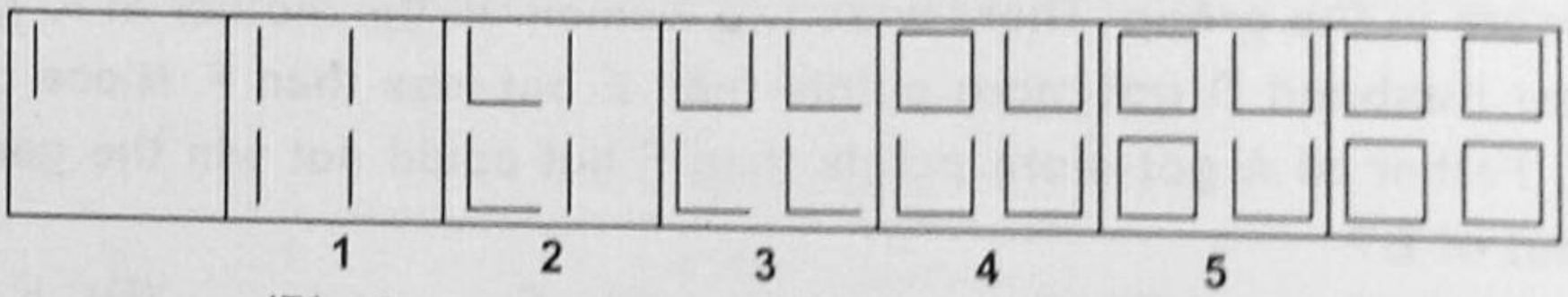
(A) 

(B) 

(C) 

(D) 

20. In the following question, there are seven figures, the first and last of which are unumbered and the remaining are numbered as 1, 2, 3, 4 and 5. These seven figures form a series. However, one of the five numbered figures does not fit into the series. The number of that figure is the answer.



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

SECTION II : MATHEMATICAL REASONING

21. The inverse of the function $f(x) = \dfrac{e^x - e^{-x}}{e^x + e^{-x}} + 2$ is given by

(A) $\log_e\left(\dfrac{x+2}{x-1}\right)^{1/2}$

(B) $\log_e\left(\dfrac{x-1}{3-x}\right)^{1/2}$

(C) $\log_e\left(\dfrac{x}{2-x}\right)^{1/2}$

(D) $\log_e\left(\dfrac{x-1}{x+1}\right)^{-2}$

22. If $\tan x = n \tan y$, $n \in R^+$, then maximum value of $\sec^2(x - y)$ is equal to _____.

(A) $\dfrac{(n+1)^2}{2n}$ (B) $\dfrac{(n+1)^2}{n}$ (C) $\dfrac{(n+1)^2}{2}$ (D) $\dfrac{(n+1)^2}{4n}$

23. Let $f(x) = \begin{cases} \dfrac{1}{|x|}; & |x| \geq 1 \\ ax^2 + b; & |x| < 1 \end{cases}$ be continuous and differentiable everywhere, then a and b are

(A) $\dfrac{-1}{2}, \dfrac{3}{2}$ (B) $\dfrac{1}{2}, \dfrac{-3}{2}$ (C) $\dfrac{1}{2}, \dfrac{3}{2}$ (D) $\dfrac{-1}{2}, \dfrac{-3}{2}$

24. The value of $f(0)$, so that the function $f(x) = \dfrac{2x - \sin^{-1}x}{2x + \tan^{-1}x}$ is continuous at each point on its domain is

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

25. If $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are defined as $\vec{p} = \dfrac{\vec{b} \times \vec{c}}{[\vec{b}\ \vec{c}\ \vec{a}]}, \vec{q} = \dfrac{\vec{c} \times \vec{a}}{[\vec{c}\ \vec{a}\ \vec{b}]}$ $\vec{r} = \dfrac{\vec{a} \times \vec{b}}{[\vec{a}\ \vec{b}\ \vec{c}]}$, then $(\vec{a} + \vec{b}) \cdot \vec{p} + (\vec{b} + \vec{c}) \cdot \vec{q} + (\vec{c} + \vec{a}) \cdot \vec{r}$ is equal to

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

26. $f(x) = \sin^p x \cos^p x$, $(p, q > 0, 0 < x < \pi/2)$ has point of maximum at

(A) $x = \tan^{-1}\left(\sqrt{\frac{p}{q}}\right)$ (B) $x = \tan^{-1}\left(\sqrt{\frac{q}{p}}\right)$

(C) $x = \tan^{-1}\left(\frac{p}{q}\right)$ (D) No such point exists

27. Let $\begin{vmatrix} x & 2 & x \\ x^2 & x & 6 \\ x & x & 6 \end{vmatrix} = Ax^4 + Bx^3 + Cx^2 + Dx + E$. Then the value of $5A + 4B + 3C + 2D + E$ is equal to

(A) 0 (B) –16 (C) 16 (D) –11

28. If $f(x) = \sqrt{1 - \sqrt{1 - x^2}}$, then at $x = 0$

(A) $f(x)$ is differentiable as well as continuous.

(B) $f(x)$ is differentiable but not continuous.

(C) $f(x)$ is continuous but not differentiable.

(D) $f(x)$ is neither continuous nor differentiable.

29. The normal to the curve $x = a(1 + \cos\theta)$, $y = a \sin\theta$ as 'θ' always passes through the fixed point

(A) $(a, 0)$ (B) $(0, a)$ (C) $(0, 0)$ (D) (a, a)

30. The equation of the plane containing the lines $\vec{r} = \vec{a}_1 + \lambda\vec{a}_2$ and $\vec{r} = \vec{a}_2 + \lambda\vec{a}_1$ is

(A) $[\vec{r}\ \vec{a}_1\ \vec{a}_2] = 0$ (B) $[\vec{r}\ \vec{a}_1\ \vec{a}_2] = \vec{a}_1 \cdot \vec{a}_2$ (C) $[\vec{r}\ \vec{a}_2\ \vec{a}_1] = \vec{a}_1 \cdot \vec{a}_2$ (D) None of these

31. If the solution of $\int_{\log 2}^{x} \dfrac{1}{e^x - 1}\,dx$ is given by $\log\frac{3}{2}$ then $x =$

(A) e^2 (B) 2 log 2 (C) log3 (D) e^3

32. The solution of the equation $\sin^{-1}(6x) + \sin^{-1}(6\sqrt{3}\,x) = \dfrac{-\pi}{2}$ is

(A) $-\frac{1}{12}$ (B) 12 (C) –2 (D) 6

33. If $f(x) = \cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \sin x \sin\left(x + \frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 3$, then $(gof)(x)$ is equal to ____.

(A) 1 (B) 2 (C) 3 (D) None of these

34. If A is a skew symmetric matrix of order n and C is a column matrix of order $n \times 1$, then $C^T AC$ is

(A) An identity matrix of order n (B) An identity matrix of order 1

(C) A zero matrix of order 1 (D) None of these

35. Suppose $p(x) = a_0 + a_1x + a_2x^2 + \ldots + a_nx^n$. If $|p(x)| \leq |e^{x-1} - 1|$ for all $x \geq 0$, then ____.

(A) $|a_1 + 2a_2 + 3a_3 + \ldots + na_n| \leq 1$ (B) $|a_1 + 2a_2 + 3a_3 + \ldots + na_n| \geq 1$

(C) $|a_1 + 2a_2 + 3a_3 + \ldots + na_n| \geq 0$ (D) $|a_1 + 2a_2 + 3a_3 + \ldots + na_n| \leq 0$

36. If $\lim_{x \to 0}\left(\frac{\cos 4x + a\cos 2x + b}{x^4}\right)$ is finite, then the value of a, b are respectively

(A) 5, –4 (B) –5, –4 (C) –4, 3 (D) 4, 5

37. If $\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \frac{3\pi}{2}$, then the value of

$x^{100} + y^{100} + z^{100} - \frac{3}{x^{101} + y^{101} + z^{101}}$ is

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

38. The area bounded by the curves $y = x^4 - 2x^3 + x^2 + 3$, the x-axis and two ordinates corresponding to the points of minimum of this function is

(A) $\frac{91}{30}$ sq.units (B) $\frac{11}{15}$ sq.units (C) $\frac{91}{60}$ sq.units (D) $\frac{61}{35}$ sq.units

39. The ratio in which the area bounded by the curves $y^2 = 12x$ and $x^2 = 12y$ is divided by the line $x = 3$, is

(A) 15 : 49 (B) 13 : 48 (C) 12 : 37 (D) None of these

40. If $f : [-6, 6] \to R$ is defined by $f(x) = x^2 - 3$ for $x \in R$, then $(fofof)(-1) + (fofof)(0) + (fofof)(1) =$

(A) $f(4\sqrt{2})$ (B) $f(3\sqrt{2})$ (C) $f(2\sqrt{2})$ (D) $f(\sqrt{2})$

SECTION III : EVERYDAY MATHEMATICS

Monti noticed a pattern on his cell phone bill when he read his text messaging charges. Which recursive definition describes Monti's text messaging charges ?

Cost
₹ 2.00
₹ 2.10
₹ 2.20
₹ 2.30

(A) $\begin{cases} t_1 = 2.10 \\ t_n = t_{n-1} - 0.10 \end{cases}$

(B) $\begin{cases} t_1 = 2.00 \\ t_n = t_{n-1} + 0.10 \end{cases}$

(C) $\begin{cases} t_1 = 2.10 \\ t_n = t_{n-1} - 2.00 \end{cases}$

(D) $\begin{cases} t_1 = 2.00 \\ t_n = t_{n-1} + 2.10 \end{cases}$

42. **In a business, Aman and Raj invested amounts in the ratio 2 : 1, whereas the ratio between amounts invested by Aman and Ansh was 3 : 2. If ₹ 1,57,300 was their profit, how much amount did Ansh receive?**

(A) ₹ 24,200 (B) ₹ 36,300 (C) ₹ 48,400 (D) ₹ 72,600

43. **An ant climbing up a vertical pole ascends 12 metres and slips down 5 metres in every alternate hour. If the pole is 63 metres high how long will it take it to reach the top ?**

(A) 18 hours (B) 17 hours
(C) 16 hours 35 minutes (D) 16 hours 40 minutes

44. **Amitabh has a list of 24 friends. He wishes to invite some of them in such a manner that he can enjoy maximum number of parties, but in each party the number of friends (i.e., invitees) be same and each party must have different set of persons. Then how many parties can Amitabh enjoy?**

(A) 2704156 (B) 357600 (C) 235763 (D) 270156

45. **A class prefect goes to meet the principal every week. His class has 30 people besides him. If he has to take groups of three every time he goes to the principal, in how many weeks will he be able to go to the principal without repeating the group of same three which accompanies him?**

(A) ${}^{30}P_3$ (B) ${}^{30}C_3$ (C) 30!/3 (D) None of these

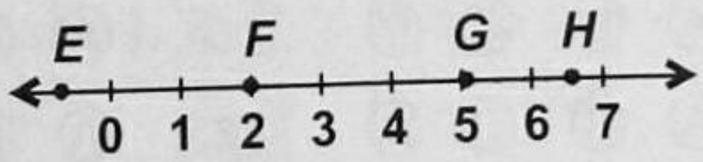
46. **Purnima borrowed a sum of money and returned it in three equal quarterly installments of ₹ 17576 each. Find the sum borrowed, if the rate of interest charged was 16% per annum compounded quarterly. Find also the total interest charged.**

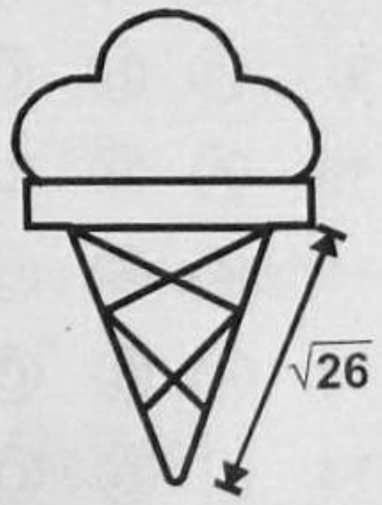
(A) ₹ 46900 and ₹ 4700 (B) ₹ 48775 and ₹ 3953
(C) ₹ 68320 and ₹ 1200 (D) None of these

47. **A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?**

(A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{1}{7}$

48. **Use the picture of the ice cream cone to answer the question below. Which letter best represents the location of the length of the slant height of the ice cream cone on the number line shown below ?**





(A) *F*
(B) *E*
(C) *H*
(D) G

49. The probability that a student will pass in Mathematics is 3/5 and the probability that he will pass in English is 1/3. If the probability that he will pass in both Mathematics and English is 1/8, what is the probability that he will pass in at least one subject?

(A) $\frac{97}{120}$ (B) $\frac{87}{120}$ (C) $\frac{53}{120}$ (D) $\frac{120}{297}$

50. A milkman mixes 20 litres of water with 80 litres of milk. After selling one-fourth of this mixture, he adds water to replenish the quantity that he has sold. What is the current proportion of water to milk?

(A) 2 : 3 (B) 1 : 2 (C) 1 : 3 (D) 3 : 4