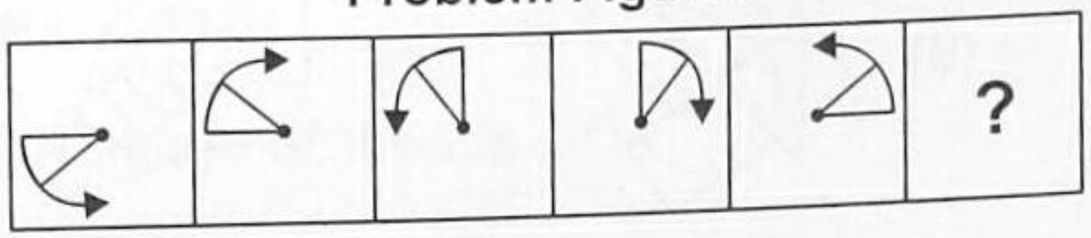
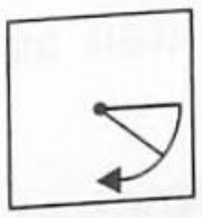
SECTION I : LOGICAL REASONING

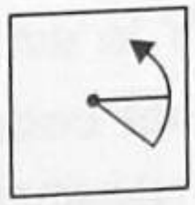
1. Select a figure from amongst the options which will continue the series established by the five problem figures.

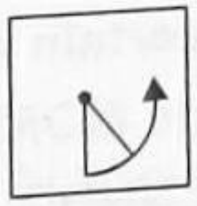
Problem Figures



(A) 

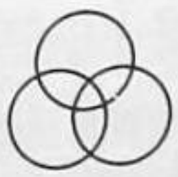
(B) 

(C) 

(D) 

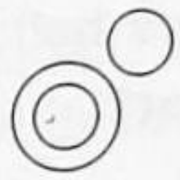
2. The relationship among the three words in the question can best be represented by one of the four diagrams. Select the correct diagram.

Professor, Researcher, Scientist

(A) 

(B) 

(C) 

(D) 

3. The sheet of paper shown in the figure (X) is folded to form a box. Choose the option that is similar to the box/boxes that will be formed.

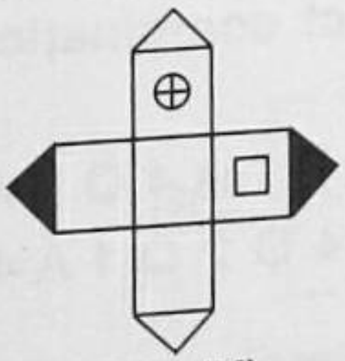
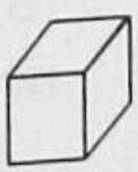


Fig. (X)



(a)

(b)

(c)

(d)

(A) a and b only (B) b and c only (C) b and d only (D) a, b, c and d

4. Sanjeev walks 10 metres towards the South. Turning to the left, he walks 20 metres and then moves to his right. After moving a distance of 20 metres, he turns to the right and walks 20 metres. Finally, he turns to the right and moves a distance of 10 metres. How far and in which direction is he from the starting point ?

(A) 10 metres North (B) 20 metres South

(C) 20 metres North (D) 10 metres South

5. **A fires 5 shots to B's 3 but A kills only once in 3 shots while B kills once in 2 shots. When B has missed 27 times, A has killed**

(A) 30 birds (B) 60 birds (C) 72 birds (D) 90 birds

6. **Select a figure from amongst the options which satisfies the same conditions of placement of the dots as in fig. (X).**

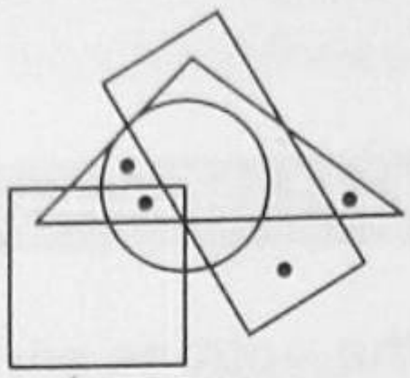
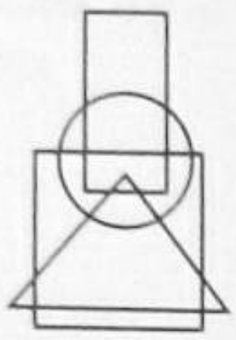
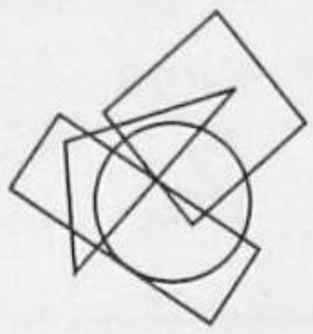
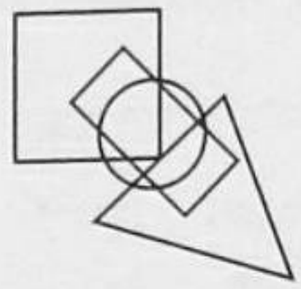
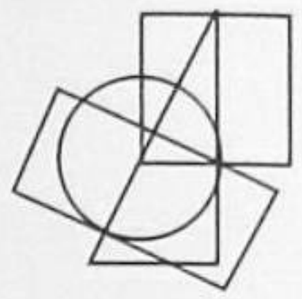


Fig. (X)

(A) 

(B) 

(C) 

(D) 

7. **In a certain code, POETRY is written as QONDSQX and OVER is written as PNUDQ. How is MORE written in that code language?**

(A) LNNQD (B) NNNQD (C) NLNQD (D) None of these

8. **The sum of the incomes of A and B is more than that of C and D taken together. The sum of the incomes of A and C is the same as that B and D taken together. Morever, A earns half as much as the sum of the incomes of B and D. Whose income is the highest?**

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

9. **If Addition : O; Subtraction : M; Multiplication : A; Division : Q; Equal to : X; Greater than : Y; Less than : Z, then select the correct combination using given letter symbols.**

(A) 2 Z 2 A 4 O 1 A 4 M 8 (B) 8 Y 2 A 3 A 4 Q 2 A 4

(C) 10 X 2 O 2 A 4 O 1 M 2 (D) 12 X 4 O 2 Q 1 A 4 A 2

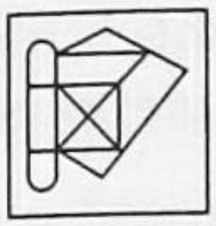
10. **If the positions of the first and the sixth letters in the word 'DISTRIBUTE' are interchanged; similarly the positions of the second and the seventh, the third and the eighth and so on. Which of the following letters will be the fifth from left after interchanging the positions?**

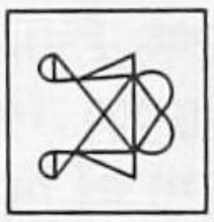
(A) E (B) I (C) S (D) T

11. **If the second day of a month is Friday, which of the following would be the last day of the next month which has 31 days?**

(A) Sunday (B) Monday (C) Tuesday (D) Data indequate

12. **Select the option in which the figure similar to given fig. (X) is embedded.**

(A) 

(B) 

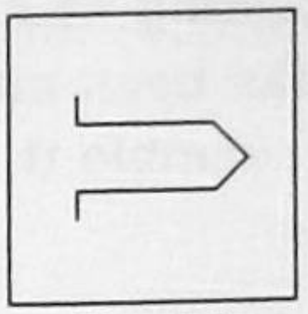
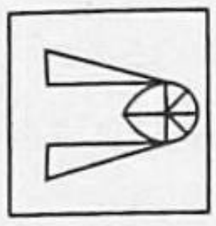
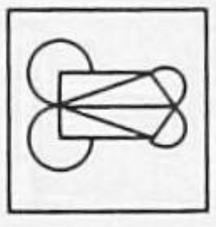


Fig. (X)

(C) 

(D) 

13. **Study the following arrangement of symbols, letters and numbers to answer the question.**

δ = β F 2 ★ K S 5 # $ P L V 8 @ M U E 6 ↑ Q G © 9 3 & T Y £

Based on the positions in the above arrangement, if β *F* δ : *T* & £, then K S 2 : ?

(A) © 9 Q (B) © G Q (C) Q ↑ © (D) © 9 ↑

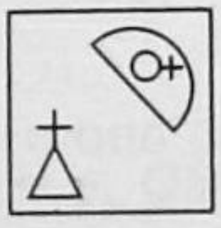
14. **Select the correct mirror-image of the Fig. (X).**

Fig. (X)

(A) 

(B) 

(C) 

(D) 

15. **A square transparent sheet with a pattern is given. Select the best answer, to how the pattern would appear when the transparent sheet is folded along the dotted line.**

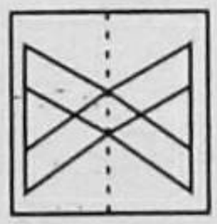
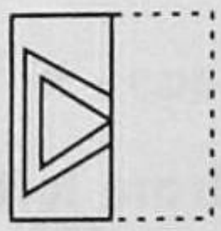
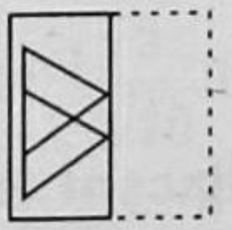
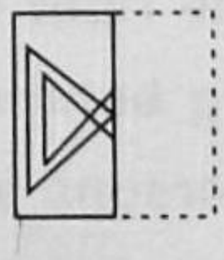
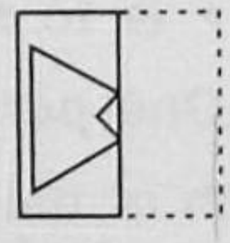


Fig. (X)

(A) 

(B) 

(C) 

(D) 

16. **Choose the alternative which most closely resembles the mirror-image of the given combination.**

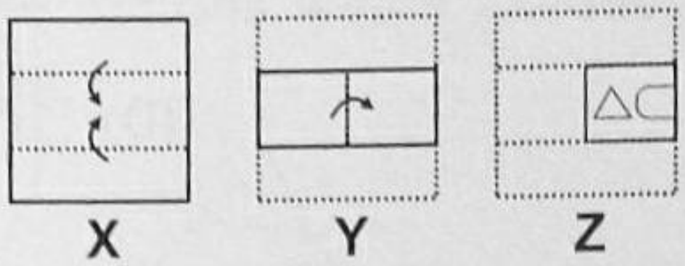
BR4AQ16HI

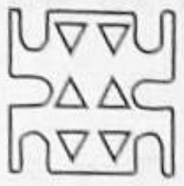
(A) IHƐ1QA4ЯB (B) IH61QA4ЯB (C) IHƐ1QA4ЯB (D) IH91QA4ЯB

17. **A cube is painted red on two adjacent faces, yellow on the two faces opposite to the red faces and green on the remaining faces. It is then cut into 64 smaller cubes of equal size. How many cubes are painted on all faces?**

(A) 16 (B) 8 (C) 4 (D) 10

18. The question consists of a set of three figures X, Y and Z showing a sequence of folding of a piece of paper. Fig. (Z) shows the manner in which the folded paper has been cut. Choose a figure from amongst the options which would most closely resemble the unfolded form of fig. (Z).



(A) 

(B) 

(C) 

(D) 

19. The sheet of paper shown in the figure (X) is folded to form a box. Select the box/ boxes that is/are similar to the box that will be formed.

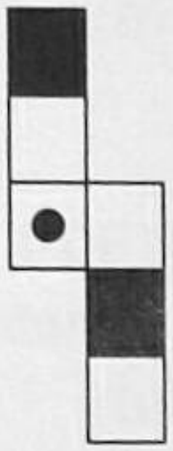
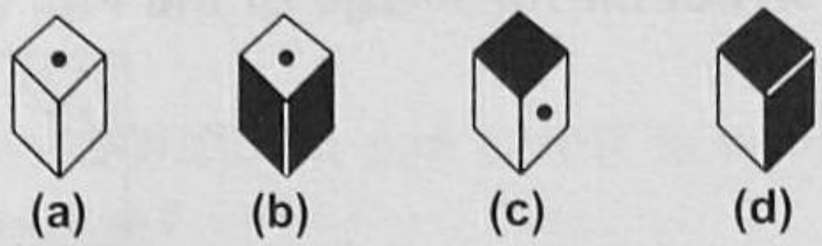


Fig. (X)



(A) b and c only (B) a, c and d only (C) b and d only (D) a and d only

20. **Read the following information to answer the given question.**

(i) A, B, C, D, E, F and G are sitting in a circle facing at the centre and playing cards.

(ii) E is neighbour of A and D.

(iii) G is not between F and C.

(iv) F is to the immediate right of A.

(v) One person is sitting between F and C.

Which of the following persons are sitting adjacent to each other from left to right in the order as shown?

(A) BGC (B) FBC (C) CDG (D) EDG

SECTION II : MATHEMATICAL REASONING

21. Let $\vec{p}$ and $\vec{q}$ be the position vectors of P and Q respectively, with respect to O and $|\vec{p}| = p$, $|\vec{q}| = q$. The points R and S divide PQ internally and externally in the ratio 2 : 3 respectively. If OR and OS are perpendicular then

(A) $9p^2 = 4q^2$ (B) $4p^2 = 9q^2$ (C) $9p = 4q$ (D) $4p = 9q$

22. Let a relation R' in the set R of real number be defined as $(a, b) \in R'$ if and only if $1 + ab \geq 0$ for all $a, b \in R$. Which of the following options is correct for relation R'.

(A) Reflexive and symmetric but not transitive

(B) Reflexive and transitive but not symmetric

(C) Transitive and symmetric but not reflexive

(D) An equivalence relation

23. If $f : R \to R$ and $g : R \to R$ are defined by $f(x) = 2x + 3$ and $g(x) = x^2 + 7$, then the values of x such that $g(f(x)) = 8$ are

(A) 1, 2 (B) −1, 2 (C) −1, −2 (D) 1, −2

24. The value of $(x+y)(x-y)+\frac{1}{2!}(x+y)(x-y)(x^2+y^2)+\frac{1}{3!}(x+y)(x-y)(x^4+y^4+x^2y^2)+$ .... + ∞ is _____.

(A) $e^{x^2}+e^{y^2}$ (B) $e^{x^2-y^2}$ (C) $e^{x^2}-e^{y^2}$ (D) None of these

25. If $f(x) = \int_0^{\sin x} \cos^{-1} t\, dt + \int_0^{\cos x} \sin^{-1} t\, dt, 0 < x < \frac{\pi}{2}$, then $f\left(\frac{\pi}{4}\right)$ is

(A) $\frac{\pi}{\sqrt{2}}$ (B) $1+\frac{\pi}{2\sqrt{2}}$ (C) 1 (D) $1-\frac{\pi}{\sqrt{2}}$

26. AOB is the positive quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ in which $OA = a$, $OB = b$. The area between the arc AB and the chord AB of the ellipse is

(A) $\frac{1}{2}ab(\pi+2)$ sq. units (B) $\frac{1}{4}ab(\pi-4)$ sq. units

(C) $\frac{1}{4}ab(\pi-2)$ sq. units (D) None of these

27. The number of positive integral solutions of the equation

$\tan^{-1} x + \cos^{-1}\frac{y}{\sqrt{1+y^2}} = \sin^{-1}\frac{3}{\sqrt{10}}$ is ___.

(A) One (B) Two (C) Zero (D) None of these

28. $\lim_{x \to \pi/6}\left[\frac{3\sin x - \sqrt{3}\cos x}{6x-\pi}\right]$

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

29. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors having magnitudes 1, 1 and 2 respectively. If $\vec{a}\times(\vec{a}\times\vec{c})+\vec{b}=\vec{0}$, then the acute angle between $\vec{a}$ and $\vec{c}$ is ____.

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) None of these

30. If $\sin^{-1}a + \sin^{-1}b + \sin^{-1}c = \pi$, then the value of $a\sqrt{(1-a^2)} + b\sqrt{(1-b^2)} + c\sqrt{(1-c^2)}$ will be

(A) $2abc$ (B) abc (C) $1/2\,abc$ (D) $1/3abc$

31. Let $A(x_1, y_1)$ and $B(x_2, y_2)$ be any two points on the parabola $y = ax^2 + bx + c$ and let $C(x_3, y_3)$ be the point on the arc AB where the tangent is parallel to the chord AB. What is the value of x_3 in terms of x_1 and x_2 ?

(A) $\frac{x_1 - x_2}{2}$ (B) $\frac{x_1 + x_2}{2}$ (C) $\frac{2x_1 + 3x_2}{2}$ (D) $\frac{x_1 + 2x_2}{3}$

32. If (2, –1, 3) is the foot of the perpendicular drawn from the origin to the plane, then the equation of the plane is

(A) $2x + y - 3z + 6 = 0$ (B) $2x - y + 3z - 14 = 0$

(C) $2x - y + 3z - 13 = 0$ (D) $2x + y + 3z - 10 = 0$

33. Observe the following statements :

$A : \int\left(\frac{x^2-1}{x^2}\right)e^{\frac{x^2+1}{x}}dx = e^{\frac{x^2+1}{x}} + C$ and $R : f'(x)e^{f(x)}dx = f(x) + C$

Then which of the following statements is true?

(A) Both A and R are true and R is not the correct reason for A.

(B) Both A and R are true and R is the correct reason for A.

(C) A is true, R is false.

(D) A is false, R is false.

34. A pair of fair dice are rolled together till a sum of either 5 or 7 is obtained. The probability that 5 comes before 7 is

(A) 0.45 (B) 0.4 (C) 0.5 (D) 0.6

35. If A is the set of even natural numbers less than 8 and B is the set of prime numbers less than 7, then the number of relations from A to B is

(A) 2^9 (B) 9^2 (C) 3^2 (D) $2^9 - 1$

36. $f(x) = \sqrt{\frac{(x+1)(x-3)}{(x-2)}}$ is a real valued function in the domain

(A) $(-\infty, -1] \cup [3, \infty)$ (B) $(-\infty, 1] \cup (2, 3]$

(C) $[-1, 2) \cup [3, \infty)$ (D) $[-1, 2) \cup [3, 6)$

37. If $f(x) = 2x^3 - 3x^2 + 1$, $g(x) = \begin{cases} \text{maximum } f(t), & 0 \le t \le x\ ; \quad 0 \le x \le 2 \\ x^2 + 3x + 7 & ; \quad 2 < x \le 3 \end{cases}$, which statement is true ?

(A) $g(x)$ is continuous at $x = 2$ (B) $g(x)$ is discontinuous at $x = \frac{3}{2}$

(C) $g(x)$ is discontinuous at $x = 2$ (D) $g(x)$ is continuous at $x = 2$

38. The probability distribution of a random variable X is given by

$X = x$	0	1	2	3	4
$P(X = x)$	0.4	0.3	0.1	0.1	0.1

The variance of X is

(A) 1.76 (B) 2.45 (C) 3.2 (D) 4.8

39. If $f(x) = x$ for $x \leq 1$, $f(x) = x^2 + bx + c$ for $x > 1$ and $f'(x)$ exists finitely for all $x \in R$, then

(A) $b = -1, c \in R$ (B) $c = 1, b \in R$ (C) $b = 1, c = -1$ (D) $b = -1, c = 1$

40. The curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ touches the straight line $\frac{x}{a} + \frac{y}{b} = 2$ at the point (a, b) for

(A) $n = 3$ (B) $n = 2$ (C) Any value of n (D) No value of n

SECTION III : EVERYDAY MATHEMATICS

41. In a survey among B-school students, 68% of those surveyed were in favour of atleast one of the three magazines-A, B and C. 38% of those surveyed favoured magazine A, 26% favoured magazine B and 36% favoured magazine C. If 11% of those surveyed favoured all three magazines. What percent of those surveyed favoured more than one of the three magazines?

(A) 25% (B) 33% (C) 21% (D) 26%

42. Farhan invested certain amount in three different schemes A, B and C with the rate of interest 10% p.a., 12% p.a. and 15% p.a. respectively. If the total interest occurred in one year was ₹ 3200 and the amount invested in Scheme C was 150% of the amount invested in Scheme A and 240% of the amount invested in Scheme B, what was the amount invested in Scheme B ?

(A) ₹ 5000 (B) ₹ 6500 (C) ₹ 7000 (D) ₹ 3500

43. Mr. Martin is holding a trivia contest. The 13 students who are participating randomly draw cards that are numbered with consecutive integers from 1 to 13.

- The student who draws number 1 will be the host
- The students who draw the other odd numbers will be on the Red team
- The students who draw the even numbers will be on the Blue team.

One student has already drawn a card and is on the Blue team. If Kevin is the next student to draw a card, what is the probability that he will be on the Red team ?

(A) $\frac{1}{13}$ (B) $\frac{1}{12}$ (C) $\frac{6}{13}$ (D) $\frac{6}{12}$

44. **Arjit being a party animal wants to hold as many parties as possible among his 20 friends. However, his father has warned him that he will be financing his parties under the following conditions only :**

(a)The invitees have to be among his 20 best friends

(b)He cannot call the same set of friends to a party more than once

(c)The number of invitees to every party have to be the same

Given these constraints, Arjit wants to hold the maximum number of parties. How many friends should he invite to each party?

(A) 11 (B) 8 (C) 10 (D) 12

45. **Dev and Tukku can do a piece of work in 45 and 40 days respectively. They began the work together, but Dev leaves after some days and Tukku finished the remaining work in 23 days. After how many days did Dev leave ?**

(A) 7 days (B) 8 days (C) 9 days (D) 11 days

46. **Twenty-seven persons attend a party. Which one of the following statements can never be true?**

(A) There is a person in the party who is acquainted with all the twenty six-others.

(B) Each person in the party has a different number of acquaintances.

(C) There is a person in the party who has an odd number of acquaintances.

(D) In the party, there is no set of three mutual acquaintances.

47. **Three Englishmen and three Frenchmen work for the same company. Each of them knows a secret not known to others. They need to exchange these secrets over person-to-person phone calls so that eventually each person knows all six secrets. None of the Frenchmen knows English and only one Englishman knows French. What is the minimum number of phone calls needed for the above purpose?**

(A) 5 (B) 10 (C) 9 (D) 15

48. **The following system of equations represents the profit margin of two major companies where x represents sales and y represents discounts to clients.**

$$\begin{cases} 3x - 4y = 12 \\ x - 2y = 2 \end{cases}$$

Which of the following is the best approach to solving this system of equations ?

(A) Multiply the expression $x - 2y$ by 3 and add the first equation to the second equation

(B) Substitute the expression $2 + 2y$ for x in the first equation of the system

(C) Add the first equation to the second equation

(D) Substitute the expression $x - 2y$ for x in the first equation of the system

49. **A husband and a wife appear in an interview for two vacancies for the same post. The probability of husband's selection is 1/7 and that of the wife's selection is 1/5. What is the probability that at least one of them will be selected?**

(A) $\frac{12}{35}$ (B) $\frac{11}{35}$ (C) $\frac{16}{35}$ (D) $\frac{1}{5}$

50. **The Lucknow Indore Express without its rake can go 24 km an hour, and the speed is diminished by a quantity that varies as the square root of the number of wagons attached. If it is known that with four wagons its speed is 20 km/h, the greatest number of wagons with which the engine can just move is**

(A) 144 (B) 140 (C) 143 (D) 124