PART A: Quantitative Aptitude and Numerical Ability

(20 x 2=40 Marks)

Answer the following questions by putting a Tick mark (√) on the correct answer. The following questions carry 2 marks each.

1) If $\bar{a}, \bar{b}$ and $\bar{c}$ are unit vectors such that $\bar{a} + \bar{b} + \bar{c} = 0$, then the value of $\bar{a}.\bar{b} - \bar{b}.\bar{c} + \bar{c}.\bar{a}$ is

   a) 1

   b) 3

   c) $-\dfrac{3}{2}$

   d) None of these

2) For all real values of x $\left| \dfrac{12x}{4x^2 + 9} \right|$ is

   a) ≤ 1

   c) > 1

   b) ≤ 2

   d) > 2

3) The two consecutive terms in the expansion of $(3 + 2x)^{74}$ whose co-efficients are equal, are

   a) 11, 12

   c) 30, 31

   b) 7, 8

   d) None of these

4) The range of the function $f(x) = x^2 + \dfrac{1}{x^2+1}$ is

   a) $[1, \alpha)$

   c) $[\frac{3}{2}, \alpha)$

   b) $[2, \alpha)$

   d) None of these

5) The solution of the equation $y - x \dfrac{dy}{dx} = a\left(y^2 + \dfrac{dy}{dx}\right)$ is

   a) $y = c(x + a)(1 - ay)$

   c) $y = c(x - a)(1 + ay)$

   b) $y = c(x + a)(1 + ay)$

   d) None of these

6) If A is a skew – symmetric matrix, then trace of A is

   a) 1

   c) 0

   b) -1

   d) 2

7) For the equation $cos^{-1}x - cos^{-1}2x + \pi = 0$, the number of real solution is

   a) 1

   c) 0

   b) 2

   d) α

8) The value of the integral $\int \dfrac{sin^8 x - cos^8 x}{1 - 2 sin^2 x cos^2 x} dx$ is

   a) $-\dfrac{1}{2}\sin 2x + c$

   c) 0

   b) $\sin 2x + c$

   d) $\dfrac{1}{2}\sin 2x + c$

9) A focus of an ellipse is at the origin. The directrix is the line $x = 4$ and the eccentricity is $\dfrac{1}{2}$, then the length of semi – major axis is

   a) $\dfrac{5}{3}$

   c) $\dfrac{2}{3}$

   b) $\dfrac{8}{3}$

   d) $\dfrac{4}{3}$

10) If A and B are square matrices of size n x n such that $A^2 - B^2 = (A - B)(A - B)$, then which of the following will be always true?

a) AB = BA

b) Either of A or B is a zero matrix

c) Either of A or B is an identity matrix

d) A = B

11) If the roots of the equation $x^2 - bx + c = 0$ is two consecutive integers, then $b^2 - 4c$ is equal to

a) 1

b) 2

c) 3

d) -2

12) If $|z^2 - 1| = |z|^2 + 1$, then z lies on

a) the real axis

b) the imaginary axis

c) a circle

d) an ellipse

13) The number of ways in which 6 men and 5 women can dine at a round table, is if no two women are to sit together, is given by

a) $6! \times 5!$

b) 30

c) $5! \times 4!$

d) $7! \times 5!$

14) 5th term of a GP is 2, then the product of its 9th term is

a) 256

b) 512

c) 1024

d) None of these

15) Suppose that two cards are drawn at random from a deck of cards. Let X be the number of aces obtained. Then the expectation of X i.e. E(X) is

a) $\dfrac{37}{221}$

b) $\dfrac{5}{13}$

c) $\dfrac{1}{13}$

d) $\dfrac{2}{13}$

16) If $x^m y^n = (x + y)^{m+n}$, then $\dfrac{dy}{dx}$ is

a) $\dfrac{x+y}{xy}$

b) xy

c) $\dfrac{x}{y}$

d) $\dfrac{y}{x}$

17) The distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z - 5 = 0$ is

a) $\dfrac{3}{2}$

b) $\dfrac{5}{2}$

c) $\dfrac{7}{2}$

d) $\dfrac{9}{2}$

18) $\text{Lim}_{x \to 0} \dfrac{(1-\cos 2x)(3+\cos x)}{x \tan 4x}$ is equal to

a) $-\dfrac{1}{4}$

b) $\dfrac{1}{2}$

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c) 1

d) 2

19) If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately

a) 24.0

b) 25.5

c) 20.5

d) 22.0

20) The value of $\int_3^6 \dfrac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}}\, dx$ is

a) $\dfrac{3}{2}$

b) 2

c) 1

e) $\dfrac{1}{2}$

SPACE FOR ROUGH WORK

PART B: Logical Reasoning

(4 x 15 = 60 Marks)

Write the steps to arrive at the correct answer to the following questions. The answer alone is not sufficient. Each correct complete answer will carry 4 marks.

1) In a certain code, RIPPLE is written as 613382 and LIFE is written as 8192. How is PILLER written in that code?
   a) 318826
   b) 318286
   c) 618826
   d) 328816

2) In a code language,
   "sky looks cloudy" means "pa zek ra"
   "stars twinkle" means "vik tek"
   "sky is vast" means "zek ta ri"
   "stars are bright" means "tek na ba"
   Which of the following is the code for "twinkle"?
   a) pa
   b) vik
   c) tek
   d) cannot be determined

3) A's son B is married with C whose sister D is married to E the brother of B. How D is related to A?
   a) Sister
   b) Daughter-in-law
   c) Sister-in-law
   d) Cousin

Directions for questions 4 and 5: These questions are based on the following information. Six persons A, B, C, D, E and F are comparing their weights and each of them is having a different weight. D is heavier than only two persons. E is the only person heavier than F and lighter than D. C's weight is less than only B's weight. The third heaviest weight is 100kgs and the fifth heaviest weight is 60kgs.

4) What is the possible weight of D?
   a) 60 Kg
   b) 100 Kg
   c) 105 Kg
   d) 75 Kg

5) Who is the third heaviest?
   a) D
   b) E
   c) A
   d) B

Directions for the questions 6 and 7: Read the following information and answer the questions given below it:
Eleven students named as A, B, C, D, E, F, G, H, I, J and K are sitting in the first row of the entrance test hall. All of them sit only in a single row facing the black board. D is to the immediate left of F. D is also second to the right of C. A is second to the right of E; and E is at one of the extreme ends. J is the immediate neighbour of A and B; J is also second to the left of G. H is at the immediate left of D and H is also second to the right of I. Use a diagram to depict the Seating Arrangement.

6) Who are at the two extreme ends viz. extreme left and extreme right?
   a) E and K
   b) F and D
   c) E and A
   d) E and F

7) Write the names of the friends who are sitting to the right of H.
   a) D and C
   b) H and D
   c) D and E
   d) D and F

8) A number is called as an 'Armstrong Number' if the sum, of the cubes of each digit of the number, is equal to the given number itself. For example, $1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153$.
   Which of the following sets of numbers are Armstrong numbers?
   a) 1, 153, 300
   b) 1, 2, 153, 370, 371
   c) 10, 100, 1000
   d) 1, 407

9) The diagram given below represents those students who play Cricket, Football and Kabaddi.
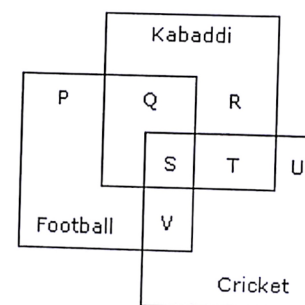
   Study the diagram and identify the students who play all the three games.

   a) P + Q + R
   b) V + T
   c) S + T + V
   d) S

10) In the figure given below, the square represents doctors, the triangle represents ladies and the circle represents surgeon. Which letter will represent the ladies who are both doctors and surgeons?
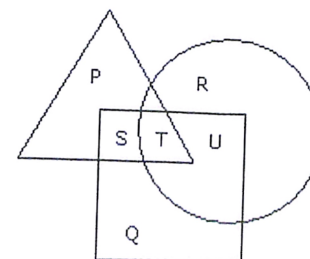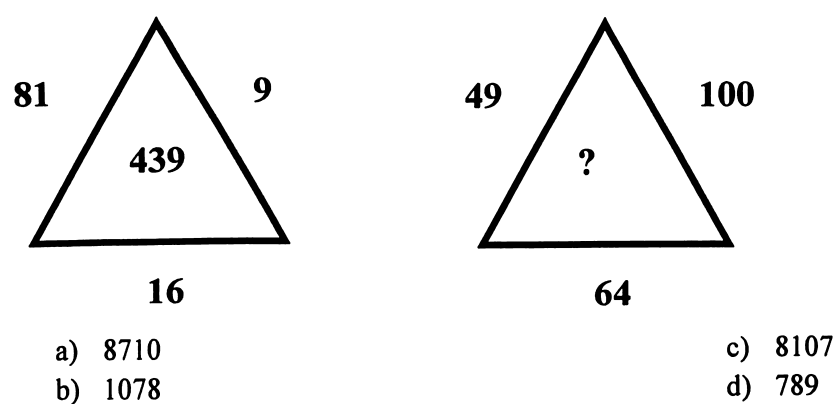

   a) U
   b) T
   c) S
   d) P

11) In the following diagram the boys who are athletic and are disciplined are indicated by which number?

→ Boys   ○ → Athletics

△ → Girls   □ → Disciplined

a) 1
b) 2

c) 10
d) 6
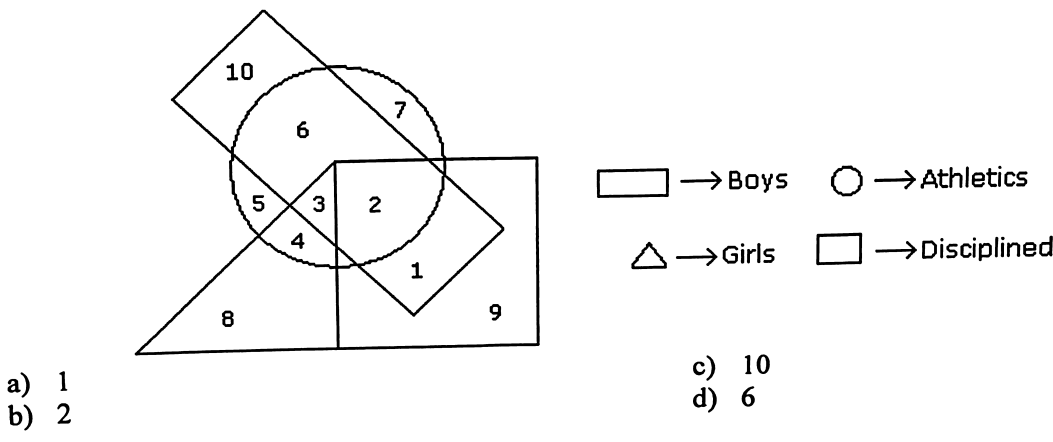
12) Find the missing number

81   9
439
16

49   100
?
64

a) 8710
b) 1078

c) 8107
d) 789

13) Find the final values of A and B if the steps below are repeated thrice. Initially the values of A = 1 and B = 0, and for the rest of the steps consider the values of A and B from the previous step.
   Step 1: If A < B, then B = B - 1 and A = A + 1
   Step 2: If A > B, then B = B + 1 and A = A - 1

a) A = 0 and B = 1
b) A = 1 and B = 0

c) A = 0 and B = 0
d) None of these.

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14) Find the final value of A, with initial values of A and B as 5 and 5 respectively.

Step 1: If B is not equal to 0, then A = 5 + B x (A - 1) and B = B – 1

Step 2: Repeat step 1 until B = 0.

a) 617

b) 517

c) 616

d) None of these.

15) Follow the steps below to find the final value of S, if the initial values of R = 1 and C = 1, for the rest of the steps consider the values of R and C from the previous step. Note that the value of C will become 1 every time the value of R is increased by 1.

Step 1: If R is less than 3 and at the same time C too is less than or equal to 2, then
S = R + C.

Step 2: Now increase the value of C by adding one.

Step 3: If C is less than or equal to 2 repeat Step 1 and 2 or else go to next step.

Step 4: Now increase the value of R by adding one.

Step 5: If R is less than or equal to 3 repeat Step 1 and 2 or else go to next step.

Step 6: Repeat the steps 1 and 2 until the value of R is equal to 3.

a) 5

b) 6

c) 7

d) None of these.