1.RELATIONS AND FUNCTIONS

1.If $n(A \times B) = 6$ and A = { 1,3 } then n (B) is

(1) 1 (2) 2 (3) 3 (4) 6

Sol:

n(A X B) = 6 , n(A) = 2 , n(B) = ?

n(A) X n(B) = n(A X B)

n(B) = $\frac{n(AXB)}{n(A)} = \frac{6}{2} = 3$

Ans : (3) 3

2. A = { a, b, p } , B = { 2, 3 } , C = { p, q, r, s } then $n[(A \cup C) \times B]$ is

(1) 8 (2) 20 (3) 12 (4) 16

Sol:

$A \cup C$ = { a, b, p, q, r, s } , B = { 2, 3 }

$n(A \cup C)$ = 6 , n(B) = 2

$n[(A \cup C) \times B]$ = $n(A \cup C)$ X n(B) = 6 X 2 = 12

Ans : (3) 12

3. If A = { 1, 2 } , B = { 1, 2, 3, 4 }, C = { 5, 6 } and D = { 5, 6, 7, 8 }, then state which of the following statement is true

(1).$(A \times C) \subset (B \times D)$ (2) $(B \times D) \subset (A \times C)$

(3).$(A \times B) \subset (A \times D)$ (4) $(D \times A) \subset (B \times A)$

Sol:

$A \times C$ = { **(1,5),(1,6), (2,5),(2,6)** }

$B \times D$ = { **(1,5) ,(1,6)**,(1,7),(1,8)**,(2,5),(2,6)**,(2,7),(2,8), (3,5),(3,6),(3,7),(3,8),(4,5),(4,6),(4.7),(4,8) }

So it is clearly $(A \times C) \subset (B \times D)$

Ans : (1) $(A \times C) \subset (B \times D)$

4.If there are 1024 relations from a set A={ 1,2,3,4,5} to a set B . Then the number of elements in B is

(1). 3 (2).2 (3) 4 (4) 8

Sol :

Let n(A)= 5=m n(B)= n n(A X B) =1024

Number of relations = 2^{mn} = 1024

$2^{5n} = 1024 \Rightarrow 2^{5n} = 2^{10}$

$\Rightarrow 5n = 10$

$\Rightarrow$ n =2

Ans : (2) 2

5. The range of the relations R = $\{(x, x^2) | x$ is a prime number less than13 } is

(1). {2,3,5,7} (2).{2,3, 5,7,11}

(3). {4,9,25,49,121} (4). {1,4,9,25,49,121}

Sol:

R = $\{(x, x^2) | x$ is a prime Number <13 }

Prime number <13 = { 2,3,5,7,11 }

f(x)=x^2 $\Rightarrow$ f(2)=4,f(3)=9,f(5)=25,f(7)=49,f(11)=121

Range of R = { 4, 9, 25, 49, 121 }

Ans : (3) { 4, 9, 25, 49, 121 }

6.If the ordered pairs $(a + 2, 4)$ and $(5, 2a + b)$ are equal then (a, b) is

(1).(2,-2) (2).(5, 1) (3). (2, 3) (4).(3, -2)

Sol:

$(a + 2, 4) = (5, 2a + b)$

a + 2 = 5 $\Rightarrow$ a = 5 – 2 $\Rightarrow$ a = 3

2a + b = 4 $\Rightarrow$ 2(3) + b = 4 $\Rightarrow$ 6 + b = 4 $\Rightarrow$ b = – 2

Ans : (4) (3, – 2)

7. Let n(A) = m, and n(B) = n, then the total number of non-empty relations that can be defined from A to B is

(1). m^n (2). n^m (3). $2^{mn} - 1$ (4). 2^{mn}

Sol:

If n (A) =m , n(B)= n , then

the total number of relations from A to B = 2^{mn}

$\left.\begin{matrix} \text{the total number of non empty} \\ \text{relations from A to B} \end{matrix}\right\} = 2^{mn} - 1$

Ans : (3) $2^{mn} - 1$

8. If {(a,8),(6,b)} represents an identity function, then the value of a and b are respectively.

(a). (8, 6) (b). (8,8) (c). (6,8) (d). (6,6)

Sol :

If { (a,8),(6,b) } represents identity function

a = 8 , b = 6

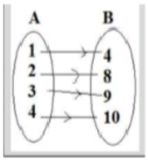
Ans : (1) (8, 6)

9.Let A={1,2,3,4} and B={4,8,9,10}. A function $f: A \to B$ given by $f = \{(1,4),(2,8),(3,9),(4,10)\}$ is a

(1). Many – one function (2).Identity function

(3). One to one function (4). Into function

Sol :



Different elements of A have different images in B. So it is a one to one function

Ans : (3) one to one function

10. If f(x) = $2x^2$ and g(x) = $\frac{1}{3x}$, then $f \circ g$ is

(1). $\frac{3}{2x^2}$ (2). $\frac{2}{3x^2}$ (3). $\frac{2}{9x^2}$ (4). $\frac{1}{6x^2}$

Sol :

f(x) = $2x^2$, g(x) = $\frac{1}{3x}$

$f \circ g$ = f(g(x)) $= f\left(\frac{1}{3x}\right) = 2\left(\frac{1}{3x}\right)^2$

$= 2\left(\frac{1}{9x^2}\right) = \frac{2}{9x^2}$

Ans : (3) $\frac{2}{9x^2}$

11. If $f: A \to B$ is a bijective function and if n(B)=7 , then n(A) is equal to

(1). 7 (2). 49 (3). 1 (4). 14

Sol :

If f is a bijective function (1- 1 and onto)

then n (A) = n (B) ∴ n(A) = 7

Ans : (1) 7

12. Let f and g be two functions given by

$f = \{(0,1),(2,0),(3,-4),(4,2),(5,7)\}$,

$g = \{(0,2),(1,0),(2,4),(-4,2),(7,0)$ then the range of $f \circ g$ is

(1).{0,2,3,4,5} (2). {-4,1,0,2,7} ,

(3).{1,2,3,4,5} (4). {0,1,2}

Sol:

$f \circ g$ (0) = f[g(0)] = f(2)=0

$f \circ g$ (1) = f[g(1)] = f(0)=1

$f \circ g$ (2) = f[g(2)] = f(4) = 2

$f \circ g$ (-4) = f[g(−4)] = f(2) = 0

$f \circ g$ (7) = f[g(7)] = f(0) = 1

∴ Range = { 0, 1, 2 }

Ans : (4) { 0, 1, 2 }

13. Let f(x)=$\sqrt{1+x^2}$ then

(1). $f(xy) = f(x).f(y)$ (2). $f(xy) \geq f(x).f(y)$

(3). $f(xy) \leq f(x).f(y)$ (4). None of these

Sol:

f(x)=$\sqrt{1+x^2}$, f(y)=$\sqrt{1+y^2}$, f(xy)=$\sqrt{1+x^2y^2}$

$f(x).f(y) = \sqrt{(1+x^2)(1+y^2)}$

$= \sqrt{1+x^2+y^2+x^2y^2}$

$\geq \sqrt{1+x^2y^2}$

$f(x).f(y) \geq f(xy)$

Ans : (3). $f(xy) \leq f(x).f(y)$

14. If g={(1,1), (2,3),(3,5),(4,7)} is function given by $g(x) = \alpha x + \beta$, then value of α and β are

(1). (-1,2) (2).(2,-1) (3). (-1,-2) (4). (1,2)

Sol:

g = {(1,1), (2,3),(3,5),(4,7)}

g(x) = αx + β ,

g(1) = 1 ⟹ $\alpha + \beta = 1$,……………………(1)

g(2) = 3 ⟹ $2\alpha + \beta = 3$…………………..(2)

subtract (1) from (2) $\alpha = 2$

substitute $\alpha = 2$ in (1) , $\beta = -1$

Ans : (2).(2,-1)

15. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is

(1). linear (2). cubic (3).reciprocal (4).quadratic

Sol :

$f(x) = (x+1)^3 - (x-1)^3$

$= (x^3+3x^2+3x+1) - (x^3-3x^2+3x-1)$

$= x^3+3x^2+3x+1-x^3+3x^2-3x+1$

$= 6x^2 + 2$ It is a quadratic function

Ans : (4).quadratic

2.NUMBERS AND SEQUENCES

1..Euclid's divisions lemma states that for positive integers a and b, there exists unique integers q and r such that a = bq + r , where r must satisfy

(1). $1 < r < b$ **(2).** $0 < r < b$

(3). $0 \le r < b$ **(4).** $0 < r \le b$

Sol:

By definition of Euclid's lemma $0 \le r < b$

Ans : (3). $0 \le r < b$

2. Using Euclid's division lemma , if the cube of any Positive integer is divided by 9 then the possible Remainders are

(1). 0,1,8 (2). 1,4,8 (3).0,1,8 (4). 1,3,5

Sol:

$x^3 \equiv y \pmod 9$

When x = 3 , y = 0 (27 is divisible by 9)

When x = 4 , y = 1 , (63 is divisible by 9)

When x = 5 , y = 8 , (117 is divisible by 9)

∴ The remainders are 0, 1, 8

Ans : (1). 0,1,8

3. If the HCF of 65 and 117 is expressible in the form of $65m - 117$ **then the value of m is**

(1).4 (2). 2 (3). 1 (4). 3

Sol:

HCF of 65 and 117 is 13

65m – 117 = 13 ⟹ 65m = 120 ⟹ m = 2

Ans: (2). 2

4. The sum of the exponents of the prime factors in the prime factorization of 1729 is

(1). 1 (2). 2 (3).3 (4). 4

Sol:

1729 = 7 X 13 X 19 ⟹ $7^1 \times 13^1 \times 19^1$

∴ sum of the exponents = 1 + 1 + 1 = 3

Ans : (3).3

5. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is

(1). 2025 (2).5220 (3). 5025 (4). 2520

Sol:

The required number is LCM of 1, 2, 3, ……..10

2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
2	1, 1, 3, 2, 5, 3, 7, 4, 9, 5
3	1, 1, 3, 1, 5, 1, 7, 2, 9, 5
5	1, 1, 1, 1, 5, 1, 7, 2, 3, 5
7	1, 1, 1, 1, 1, 1, 7, 2, 3, 1
2	1, 1, 1, 1, 1, 1, 1, 2, 3, 1
3	1, 1, 1, 1, 1, 1, 1, 1, 3, 1
	1, 1, 1, 1, 1, 1, 1, 1, 1, 1

∴ LCM of 1,2,3,…….10 = 2X2X3X5X7X2X3 = 2520

Ans : (4). 2520

6. $7^{4k} \equiv$ ___________ $(mod\ 100)$

(1). 1 (2). 2 (3). 3 (4). 4

Sol :

$7^{4k} \equiv$ __$(\text{mod}100) \Longrightarrow 7^{4X1} \equiv \underline{1} (\text{mod}100)$

If k =1 , 7^4 leaves remainder 1 mod 100

Ans : (1) 1

7. Given $F_1 = 1, F_2 = 3$ **and** $F_n = F_{n-1} + F_{n-2}$**, then** F_5 **is**

(1). 3 (2). 5 (3). 8 (4). 11

Sol :

$F_1 = 1, F_2 = 3$, $F_n = F_{n-1} + F_{n-2}$

$F_3 = F_2 + F_1 = 3 + 1 = 4$

$F_4 = F_3 + F_2 = 4 + 3 = 7$

$F_5 = F_4 + F_3 = 7 + 4 = 11$

Ans : (4). 11

8. The first term of an arithmetic progression is unity and the common difference is 4. Which of the following will be a term of this A.P.

(1).4551 (2).10091 (3).7881 (4).13531

Sol:

a = 1 , d = 4

∴ The A.P is 1, 5, 9, 13, 17 ………..leaves remainder 1 when divisible by 4

∴ 7881 leaves remainder 1 when divided by 4 .

Ans : (3).7881

9. If 6 times of 6^{th} **term of an A.P is equal to 7 times the** 7^{th} **term , then the** 13^{th} **term of the A.P is**

(1). 0 (2). 6 (3). 7 (4). 13

Sol:

$$6t_6 = 7t_7$$
$$6(a+5d) = 7(a+6d)$$
$$6a+30d = 7a+42d$$
$$7a+42d-6a-30d = 0$$
$$a+12d = 0 \implies t_{13} = 0$$

Ans : (1). 0

10. An A.P consists of 31 terms. If its 16th term is m, then the sum of all the terms of this A.P is

(1). 16m (2). 62m (3). 31m (4). $\frac{31}{2}$ m

Sol:

n = 31 , $t_{16} = a + 15d = m$

$S_{31} = \frac{31}{2}[2a+30d]$ $[S_n = \frac{n}{2}[2a+(n-1)d]$

$= \frac{31}{2} \times 2\,[a+15d] = 31[a+15d]$

$S_{31} = 31m$

Ans : (3). 31m

11. In an A.P, the first term is 1 and the common difference is 4. How many terms of the A.P must be taken for their sum to be equal to 120 ?

(1). 6 (2). 7 (3). 8 (4). 9

Sol:

a = 1, d = 4, $S_n = 120$

$\frac{n}{2}[2a+(n-1)\,d] = 120$

$\frac{n}{2}[2(1)+(n-1)4] = 120$

$\frac{n}{2}[2+4n-4] = 120$

$\frac{n}{2}[4n-2] = 120$

$2n^2 - n = 120$

$2n^2 - n - 120 = 0$

$(n-8)(2n+15) = 0$

$\therefore n = 8$ $n = \frac{-15}{2}$ (n is not negative)

	−240	
	$\frac{-16}{2} = -8$	$\frac{15}{2}$
	−1	

Ans : (3). 8

12. If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \cdots \ldots + 2^0$ Which of the following is true ?

(1). B is 2^{64} more than A (2). A and B are equal

(3). B is larger than A by 1 (4). A is larger than B by 1

Sol:

$A = 2^{65}$

$B = 2^{64} + 2^{63} + 2^{62} + \cdots \ldots + 2^0$

$B = 2^0 + 2^1 + 2^2 + \cdots \ldots + 2^{64}$

$B = 1 + 2^1 + 2^2 + \cdots \ldots + 2^{64}$. This is a G.P

a = 1 , r = 2 , n = 65

Sum of G.P $S_{65} = \frac{a(r^n-1)}{r-1}$

$= \frac{1(2^{65}-1)}{2-1} = 2^{65} - 1$

$S_{65} = B = 2^{65} - 1$

Ans : (4). A is larger than B by 1

13. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18} \ldots$ is

(1). $\frac{1}{24}$ (2). $\frac{1}{27}$ (3). $\frac{2}{3}$ (4). $\frac{1}{81}$

Sol :

$\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18} \ldots$

$r = \frac{1}{8} \times \frac{16}{3} = \frac{2}{3}$ $r = \frac{1}{12} \times \frac{8}{1} = \frac{2}{3}$

This is a G.P. Next term = $\frac{1}{18} \times \frac{2}{3} = \frac{1}{27}$

Ans : (2). $\frac{1}{27}$

14. If the sequence $t_1, t_2, t_3, \ldots$ are in A.P. then the Sequence $t_6, t_{12}, t_{18}, \ldots$ is

(1). a Geometric Progression

(2). An Arithmetic Progression

(3). Neither an A.P nor a G.P

(4). a constant sequence

Sol:

Obviously they should be in A.P

Ans : (2). An Arithmetic Progression

15. The value of $(1^3 + 2^3 + 3^3 + \cdots + 15^3) - (1+2+3+\cdots+15)$

(1). 14400 (2). 14200 (3). 14280 (4). 14520

Sol:

$(1^3 + 2^3 + 3^3 + \cdots + 15^3) - (1+2+3+\cdots+15)$

$= \left(\frac{15\times16}{2}\right)^2 - \left(\frac{15\times16}{2}\right) = (120)^2 - 120$

$= 14400 - 120 = 14280$

Ans : (3) 14280

3. ALGEBRA

1.A system of three linear equations in three Variables is inconsistent if their planes

(1).intersect only at a point (2). intersect in a line

(3). Coincides with each other (4). do not intersect

Sol:

System of equation is inconsistent if their planes do not intersect.

Ans : (4). do not intersect

2. The solution of the system $x + y - 3z = -6$, $-7y + 7z = 7$, $3z = 9$ is

(1). x=1, y=2, z=3 (2).x=-1, y=2, z=3

(3).x=-1, y=-2, z=3 (4). x= 1 , y=2, z=3

Sol:

$x + y - 3z = -6$..............(1)

$-7y + 7z = 7 \Rightarrow -y + z = 1$..............(2)

$3z = 9$..............(3)

$(3) \Rightarrow 3z = 9 \Rightarrow z = 3$

$(2) \Rightarrow -y + 3 = 1 \Rightarrow -y = -2 \Rightarrow y = 2$

$(1) \Rightarrow x + y - 3z = -6 \Rightarrow x + 2 - 9 = -6$

$\Rightarrow x = -6 + 7 \Rightarrow x = 1$

Ans : (1) x=1, y=2, z=3

3. If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ *and* $x^2 - kx - 6$ then the value of k is

(1).3 (2). 5 (3). 6 (4). 8

Sol:

$(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$

$\therefore (x - 6)$ is one of the factor of p(x)= $x^2 - kx - 6$

By factor theorem

p(6) = 0 $\Rightarrow 6^2 - 6k - 6 = 0$

$\Rightarrow 36 - 6k - 6 = 0 \Rightarrow 30 - 6k = 0$

$\Rightarrow -6k = -30 \Rightarrow k = 5$

Ans : (2). 5

4. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

(1). $\frac{9y}{7}$ (2). $\frac{9y^2}{(21y-21)}$

(3). $\frac{21y^2-42y+21}{3y^3}$ (4). $\frac{7(y^2-2y+1)}{y^2}$

Sol :

$$\frac{3y-3}{y} \div \frac{7y-7}{3y^2} = \frac{3(y-1)}{y} \times \frac{3y^2}{7(y-1)} = \frac{9y}{7}$$

Ans : (1). $\frac{9y}{7}$

5. $y^2 + \frac{1}{y^2}$ is not equal to

(1). $\frac{y^4+1}{y^2}$ (2). $\left(y + \frac{1}{y}\right)^2$

(3). $\left(y - \frac{1}{y}\right)^2 + 2$ (4). $\left(y + \frac{1}{y}\right)^2 - 2$

Sol :

$$y^2 + \frac{1}{y^2} \neq \left(y + \frac{1}{y}\right)^2$$

Ans : (2) $\left(y + \frac{1}{y}\right)^2$

6. $\frac{x}{x^2-25} - \frac{8}{x^2+6x+5}$ gives

(1). $\frac{x^2-7x+40}{(x-5)(x+5)}$ (2). $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$

(3). $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (4). $\frac{x^2+10}{(x^2-25)(x+1)}$

Sol :

$$\frac{x}{x^2-25} - \frac{8}{x^2+6x+5} = \frac{x}{(x+5)(x-5)} - \frac{8}{(x+5)(x+1)}$$

$$= \frac{x(x+1)-8(x-5)}{(x+5)(x-5)(x+1)} = \frac{x^2+x-8x+40}{(x+5)(x-5)(x+1)}$$

$$= \frac{x^2-7x+40}{(x^2-25)(x+1)}$$

Ans : (3). $\frac{x^2-7x+40}{(x^2-25)(x+1)}$

7.The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

(1). $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ (2). $16\left|\frac{y^2}{x^2z^4}\right|$

(3). $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ (4). $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

Sol:

$$\sqrt{\frac{256x^8y^4z^{10}}{25x^6y^6z^6}} = \frac{16}{5}\left|\frac{x^4y^2z^5}{x^3y^3z^3}\right| = \frac{16}{5}\left|\frac{xz^2}{y}\right|$$

Ans : (4). $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

8. Which of the following should be added to make $x^4 + 64$ a perfect square ?

(1). $4x^2$ (2). $16x^2$ (3). $8x^2$ (4). $-8x^2$

Sol :

$x^4 + 64 = (x^2)^2 + 8^2$

To add 2ab term , to get $(a+b)^2$ form

$(x^2+8)^2 = (x^2)^2 + 8^2 + \underline{2 \times x^2 \times 8}$

Ans : (2). $16x^2$

9. The solution of $(2x-1)^2 = 9$ is equal to

(1). -1 (2). 2 (3). $-1, 2$ (4). none of these

Sol:

$(2x-1)^2 = 9 \Rightarrow (2x-1)^2 = 3^2$

$\Rightarrow 2x - 1 = \pm 3$

$2x - 1 = 3$	$2x - 1 = -3$
$2x = 4$	$2x = -2$
$x = 2$	$x = -1$

Ans : (3). $-1, 2$

10. The values of a and b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square

(1).100,120 (2).10,12 (3). $-120, 100$ (4).12,10

Sol :

	$2x^2 - 6x + 10$
$2x^2$	$4x^4 - 24x^3 + 76x^2 + ax + b$
	$4x^4$
$4x^2 - 6x$	$-24x^3 + 76x^2$
	$-24x^3 + 36x^2$
$4x^2 - 12x + 10$	$40x^2 + ax + b$
	$40x^2 - 120x + 100$
	0

If given polynomial perfect square $a = -120, b = 100$

Ans : (3). $-120, 100$

11. If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$, then q, p ,r are in............

(1). A.P (2). G.P

(3). Both A.P and G.P (4). none of these

Sol:

Roots of $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$.

$\alpha^2 + \beta^2 = \frac{-p^2}{q^2}$, $\alpha^2\beta^2 = \frac{r^2}{q^2}$

$\alpha + \beta = \frac{-p}{q}$, $\alpha\beta = \frac{r}{q}$

w.k.t $(\alpha+\beta)^2 - 2\alpha\beta = \alpha^2 + \beta^2$

$\frac{p^2}{q^2} - \frac{2r}{q} = \frac{-p^2}{q^2}$

$\frac{2r}{q} = \frac{2p^2}{q^2}$

$r = \frac{p^2}{q}$

$p^2 = qr$

$\therefore q, p, r$ are in G.P

Ans : (2) G.P

12. Graph of a linear polynomial is a

(1). straight line (2). circle

(3). Parabola (4). hyperbola

Sol:

Graph of a linear polynomial is a straight line

Ans : (1). straight line

13. The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with X-axis is

(1). 0 (2). 1 (3). 0 or 1 (4). 2

Sol:

$x^2 + 4x + 4 = (x+2)^2$

$(x+2) = 0 \Rightarrow x = -2$

The polynomial will meet X-axis at (-2 , 0)

No.of point of intersection = 1

Ans : (2) 1

14. For the given matrix $A = \begin{bmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{bmatrix}$ The order of the matrix A^T is

(1). 2 X 3 (2). 3 X 2 (3).3 X 4 (4). 4 X 3

Sol :

$A = \begin{bmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 9 & 11 & 13 & 15 \end{bmatrix}$ $Order\ of\ A = 3\ X\ 4$

$A^T = \begin{bmatrix} 1 & 2 & 9 \\ 3 & 4 & 11 \\ 5 & 6 & 13 \\ 7 & 8 & 15 \end{bmatrix}$ $, Order\ of\ A^T = 4\ x\ 3$

Ans : (4) 4 X 3

15. If A is a 2 X 3 matrix and B is a 3 X 4 matrix, how many columns does AB have

(1). 3 (2) 4 (3) . 2 (4). 5

Sol:

Order of A = 2 X 3

Order of B = 3 X 4

Order of AB = 2 X 4

No.of columns of AB = 4

Ans : (2) 4

16. The number of columns and rows are not equal in a matrix then it is said to be a

(1). diagonal matrix (2). rectangular matrix

(3). Square matrix (4). identity matrix

Sol :

No.of columns ≠ No.of rows

Then , matrix is said to be rectangular matrix

Ans : (2). rectangular matrix

17. Transpose of a column matrix is

(1). unit marix (2). diagonal matrix

(3). Column matrix (4). row matrix

Sol:

Transpose of a column matrix is a row matrix

Ans : (4). row matrix

18. Find the matrix X if $2X + \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} 5 & 7 \\ 9 & 5 \end{bmatrix}$

(1). $\begin{bmatrix} -2 & -2 \\ 2 & -1 \end{bmatrix}$ (2). $\begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$

(3). $\begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ (4). $\begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$

Sol :

$$2X + \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} 5 & 7 \\ 9 & 5 \end{bmatrix}$$

$$2X = \begin{bmatrix} 5 & 7 \\ 9 & 5 \end{bmatrix} - \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix}$$

$$2X = \begin{bmatrix} 4 & 4 \\ 4 & -2 \end{bmatrix}$$

$$X = \begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$$

Ans : (2). $\begin{bmatrix} 2 & 2 \\ 2 & -1 \end{bmatrix}$

19. Which of the following can be calculated from the given matrices

$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

(i).. A^2 (ii). B^2 (iii). AB (iv). BA

(1). (i) and (ii) only (2).(ii) and (iii) only

(3).(ii) and (iv) only (4). all of these.

Sol:

Order of A = 3 X 2

(i). A^2 is not possible [A X A = (3 X 2)(3 X 2) is not possible]

Order of B = 3 X 3

(ii). B^2 is possible [B X B = (3 X 3)(3 X 3)]

(iii). AB is not possible [No.of columns of A ≠ No.of rows of B]

(iv). BA is possible. [No.of columns of B = No.of rows of A]

Ans : (3).(ii) and (iv) only

20. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 2 & -1 \\ 0 & 2 \end{bmatrix}$, $C = \begin{bmatrix} 0 & 1 \\ -2 & 5 \end{bmatrix}$

Which of the following statements are correct ?

(i).. $AB + C = \begin{bmatrix} 5 & 5 \\ 5 & 5 \end{bmatrix}$ (ii). $BC = \begin{bmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{bmatrix}$

(iii). $BA + C = \begin{bmatrix} 2 & 5 \\ 3 & 0 \end{bmatrix}$ (iv). $(AB)C = \begin{bmatrix} -8 & 20 \\ -8 & 13 \end{bmatrix}$

(1).(i) and (ii) only (2). (ii) and (iii) only

(3). (iii) and (iv) only (4). all of these

Sol :

(i). $AB + C = \begin{bmatrix} 1+4+0 & 0-2+6 \\ 3+4+0 & 0-2+2 \end{bmatrix} + \begin{bmatrix} 0 & 2 \\ -2 & 5 \end{bmatrix}$

$= \begin{bmatrix} 5 & 4 \\ 7 & 0 \end{bmatrix} + \begin{bmatrix} 0 & 2 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} 5 & 5 \\ 5 & 5 \end{bmatrix}$

(ii). $BC = \begin{bmatrix} 0+0 & 1+0 \\ 0+2 & 2-5 \\ 0-4 & 0+10 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{bmatrix}$

(iii). $BA + C \neq \begin{bmatrix} 2 & 5 \\ 3 & 0 \end{bmatrix}$ [$\because BA \text{ is of order } 3 X 3$]

(iv). $(AB)C = \begin{bmatrix} 5 & 4 \\ 7 & 0 \end{bmatrix}\begin{bmatrix} 0 & 1 \\ -2 & 5 \end{bmatrix} = \begin{bmatrix} 0-8 & 5+20 \\ 0+0 & 7+0 \end{bmatrix} = \begin{bmatrix} -8 & 25 \\ 0 & 7 \end{bmatrix}$

Ans : (1).(i) and (ii) only

4 . GEOMETRY

1.. If in triangle ABC and EDF , $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar , when

(1). $\angle B = \angle E$ (2). $\angle A = \angle D$

(3). $\angle B = \angle D$ (4). $\angle A = \angle F$

Sol:

$\Delta\, ABC \sim \Delta\, EDF$ if $\frac{AB}{DE} = \frac{BC}{FD}$ and

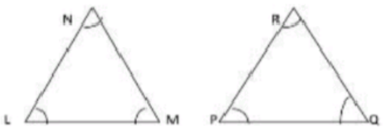
$\angle A = \angle E$, $\angle B = \angle D$, $\angle C = F$

Ans : (3). $\angle B = \angle D$

2. In $\Delta LMN, \angle L = 60°, \angle M = 50°$ .If $\Delta LMN \sim \Delta PQR$, then the value of $\angle R$ is

(1). $40°$ (2). $70°$ (3). $30°$ (4). $110°$

Sol:



$\Delta LMN \sim \Delta PQR$, then $\angle L = \angle P$, $\angle M = \angle Q$,

$\angle N = \angle R$

$\angle R = 180° - (\angle L + \angle M)$

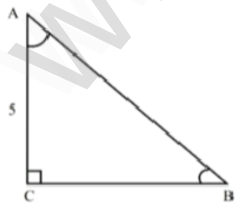
$\angle R = 180° - (60° + 50°) = 70°$

Ans : (2). $70°$

3. If ΔABC is an isosceles triangle with $\angle C = 90°$ *and* AC= 5 cm then AB is

(1). 2.5 cm (2) 5cm (3).10 cm (4).$5\sqrt{2}$ cm

Sol:



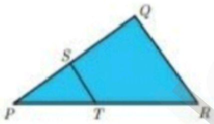
ΔABC is isosceles , $\angle B = \angle A = 45°$, $\angle C = 90°$

$\sin 45° = \frac{AC}{AB} = \frac{5}{AB}$

$\frac{1}{\sqrt{2}} = \frac{5}{AB} \Longrightarrow AB = 5\sqrt{2}$

Ans : (4).$5\sqrt{2}$ cm

4. In a given figure ST ∥ QR , PS = 2 cm and SQ = 3 cm. Then the ratio of the area of ΔPQR to the area of ΔPST is



(1). 25:4 (2). 25:7 (3). 25:11 (4). 25:13

Sol:

Ratio of the area of similar triangles is equal to the ratio of the square of their corresponding sides.

$\frac{\text{Area of } \Delta\text{ PQR}}{\text{Area of } \Delta\text{ PST}} = \frac{PQ^2}{PS^2} = \frac{5^2}{2^2} = \frac{25}{4}$

(Where PQ = PS + SQ =2 + 3= 5)

Ans : (1). 25:4

5. The perimeters of two similar triangle ΔABC and $\Delta\, PQR$ are 36 cm and 24 cm respectively. If PQ=10 cm. Then the length of AB is

(1). $6\frac{2}{3}$ cm (2). $\frac{10\sqrt{6}}{3}$ cm (3). $66\frac{2}{3}$ cm (4). 15 cm

Sol:

$\frac{\text{Perimeter of } \Delta\text{ ABC}}{\text{Perimeter of } \Delta\text{ PQR}} = \frac{AB}{PQ} \Longrightarrow \frac{36}{24} = \frac{AB}{10}$

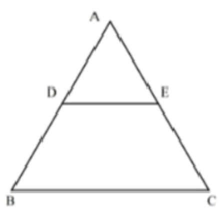
$AB = \frac{36}{24} \times 10 = 15 \text{ cm}$

Ans : (4). 15 cm

6. If in $\Delta\, ABC, DE \parallel BC,$ AB=3.6 cm, AC= 2.4 cm and AD=2.1 cm then the length of AE is

(1). 1.4 cm (2). 1.8 cm (3).1.2 cm (4). 1.05 cm

Sol:



By Basic Proportionality Theorem ,

$$\frac{AD}{AB} = \frac{AE}{AC} \Rightarrow \frac{2.1}{3.6} = \frac{AE}{2.4}$$

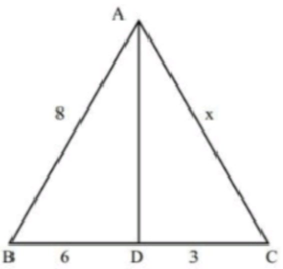
$$\Rightarrow AE = \frac{2.1}{3.6} \times 2.4 = 1.4\ cm$$

Ans : (1) 1.4 cm

7.In a ΔABC , AD is the bisector of $\angle BAC$. If AB=8 cm BD = 6 cm and DC = 3 cm .The length of the side AC is

(1). 6 cm (2). 4 cm (3). 3 cm (4).8 cm

Sol:



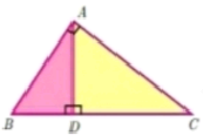
By Angle Bisector Theorem

$$\frac{AB}{AC} = \frac{BD}{DC} \Rightarrow \frac{8}{x} = \frac{6}{3}$$

$$\Rightarrow \frac{8}{x} = 2 \Rightarrow x = 4$$

Ans : (2) 4 cm

8. In the adjacent figure $\angle BAC = 90°$ and $AD \perp BC$, then



(1). $BD.CD = BC^2$ (2). $AB.AC = BC^2$

(3). $BD.CD = AD^2$ (4). $AB.AC = AD^2$

Sol:

$\Delta DBA \sim \Delta DAC$

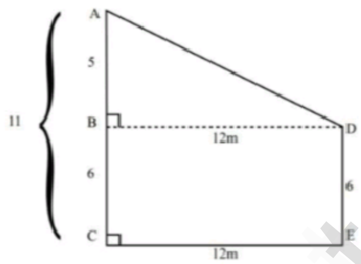
$$\frac{BD}{AD} = \frac{AD}{CD} \Rightarrow BD.CD = AD^2$$

Ans : (3). $BD.CD = AD^2$

9. The two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m. What is the distance between their tops ?

(1). 13 m (2).14 m (3).15 m (4).12.8 m

Sol:



$$AD^2 = AB^2 + BD^2$$

$$= 5^2 + 12^2 = 25 + 144 = 169$$

$$AD = \sqrt{169} = 13\ cm$$

Ans : (1) 13 m

10. In the given figure , PR= 26 cm, QR= 24 cm $\angle PAQ = 90°$, PA= 6 cm , and QA= 8 cm. Find $\angle PQR$

(1). 80° (2). 85° (3). 75° (4). 90°

Sol:

$\angle PAQ = 90°$, PA= 6 cm , and QA= 8 cm

$$PQ = \sqrt{PA^2 + QA^2}$$

$$= \sqrt{36 + 64} = \sqrt{100} = 10\ cm$$

PR= 26 cm, QR= 24 cm , PQ= 10 cm

Also, in ΔPQR ,

$$PQ^2 + QR^2 = 10^2 + 24^2$$

$$= 100 + 576$$

$$= 676$$

$$= 26^2$$

$$PQ^2 + QR^2 = PR^2 \quad \therefore \angle PQR = 90°$$

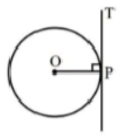
Ans : (4). 90°

11. A tangent is perpendicular to the radius at the

(1). centre (2). point of contact

(3). Infinity (4). chord

Sol:



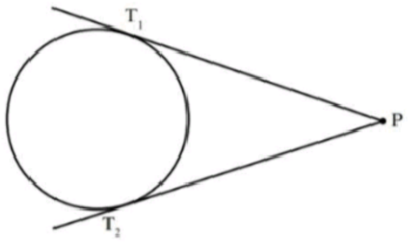
A tangent is perpendicular to the radius at the point of contact

Ans: (2) Point of contact

12. How many tangents can be drawn to the circle from an exterior point ?

(1). one (2). two (3).Infinite (4). zero

Sol:



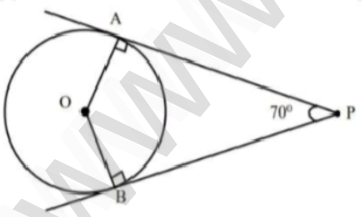
Two tangents can be drawn to the circle from an external point.

Ans : (2) two

13. The two tangents from an external point P to a circle with centre at O are PA and PB. If $\angle APB = 70°$ then the value of $\angle AOB$ is

(1). $100°$ (2). $110°$ (3). $120°$ (4). $130°$

Sol:



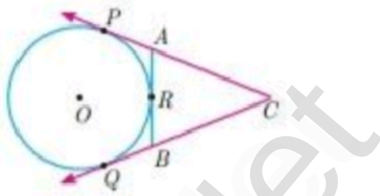
$OA \perp PA$, $OB \perp PB$

$\therefore \angle AOB + 90° + 90° + 70° = 360°$

$\Rightarrow \angle AOB = 360° - 250° = 110°$

Ans: (2) $110°$

14. In the figure CP and CQ are tangents to a circle with centre at O. ARB is the another tangent touching the circle at R. If CP= 11 cm and BC=7 cm then the length of BR is



(1). 6 cm (2). 5 cm (3). 8 cm (4). 4 cm

Sol:

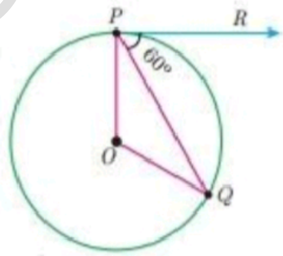
$CP = CQ = 11$ cm , $BC = 7$ cm

$BQ = CQ - BC = 11 - 7 = 4$ cm

$BQ = BR = 4$ cm

Ans : (4) 4 cm

15. In figure if PR is tangent to the circle at P and O is the centre of the circle. Then $\angle POQ$ is



(1). $120°$ (2). $100°$ (3). $110°$ (4). $90°$

Sol:

$\angle OPQ = \angle OPR - \angle QPR$

$\angle OPQ = 90° - 60°$

$\angle OPQ = 30°$

$OP = OQ$

$\angle OPQ = \angle OQP = 30°$

$\angle POQ = 180° - \angle OPQ - \angle OQP$

$\angle POQ = 180° - 30° - 30°$

$\angle POQ = 180° - 60° = 120°$

Ans : (1) $120°$

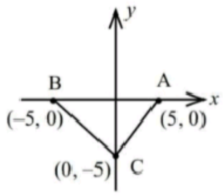
5. COORDINATE GEOMETRY

1.The area of triangle formed by the points $(-5,0),(0,-5)$ *and* $(5,0)$ is

(1). 0 sq.units (2). 25 sq.units

(3). 5 sq.units (4). none of these

Sol :



Area of $\Delta ABC = \frac{1}{2} \times b \times h = \frac{1}{2} \times 10 \times 5$

$= 25$ sq.units

Ans : (2). 25 sq.units

2. A man walks near a wall, such that distance between him and the wall is 10 units. Consider the wall to be Y-axis . The path travelled by the man is

(1). x=10 (2). y=10 (3). x=0 (4). y=0

Sol:

Equation of the path travelled by the man is x=10

Ans : (1). x=10

3.The straight line given by the equation x=11 is

(1). parallel to X-axis (2). parallel to Y-axis

(3). Passing through the orign

(4). passing through the point (0, 11)

Sol:

Equation straight line parelle to Y-axis is X = C

∴ The Equation X = 11 is parallel to Y-axis

Ans : (2). parallel to Y-axis

4. If (5, 7) , (3 , p) and (6, 6) are collinear , then the Value of p is

(1). 3 (2). 6 (3). 9 (4). 12

Sol:

A (5, 7) , B (3 , p) ,C (6, 6) are collinear.

∴ Slope of AB = Slope of BC

$\frac{p-7}{3-5} = \frac{6-p}{6-3}$ $\left[slope = \frac{y_2-y_1}{x_2-x_1}\right]$

$\frac{P-7}{-2} = \frac{6-p}{3}$

$3p - 21 = -12 + 2p$

$3p - 2p = -12 + 21$

$p = 9$

Ans : (3) 9

5. The point of intersection of $3x - y = 4$ *and* $x + y = 8$ is

(1).(5 , 3) (2).(2 , 4) (3).(3 , 5) (4).(4 , 4)

Sol:

$3x - y = 4$ .... (1)

$x + y = 8$ ....(2)

(1)+(2) $\Rightarrow 4x = 12 \Rightarrow x = 3$

(2) $\Rightarrow x + y = 8 \Rightarrow 3 + y = 8 \Rightarrow y = 5$

Point of intersection (3, 5)

Ans : (3).(3 , 5)

6. The slope of the line joining (12 , 3) , (4 , a) is $\frac{1}{8}$. The value of a is

(1). 1 (2). 4 (3). −5 (4). 2

Sol :

(12 , 3) , (4 , a) Slope = $\frac{1}{8}$

$slope = \frac{y_2-y_1}{x_2-x_1} \Rightarrow \frac{a-3}{4-12} = \frac{1}{8}$

$\frac{a-3}{-8} = \frac{1}{8} \Rightarrow 8a - 24 = -8$

$8a = -8 + 24 = 16 \Rightarrow a = 2$

Ans : (4). 2

7. The slope of the line which is perpendicular to line joining the points (0 , 0) and (−8 ,8) is

(1). −1 (2). 1 (3). $\frac{1}{3}$ (4). −8

Sol:

Slope of the line joining (0, 0) and (−8 ,8) $\Big\}$ $m_1 = \frac{y_2-y_1}{x_2-x_1}$

$= \frac{8-0}{-8-0} \Rightarrow \frac{8}{-8} = -1$

Slope of the line $\perp^r$ to the given line $m_2 = \frac{-1}{m_1}$

$m_2 = \frac{-1}{-1} = 1$

Ans : (2) 1

8. If slope of the line PQ is $\frac{1}{\sqrt{3}}$ then the slope of the perpendicular bisector of PQ is

(1). $\sqrt{3}$ (2) $-\sqrt{3}$ (3) $\frac{1}{\sqrt{3}}$ (4) 0

Sol:

Slope of line PQ $m_1 = \frac{1}{\sqrt{3}}$

Slope of $\perp^r$ $bisector\ of\ PQ\ m_2 = \frac{-1}{m_1}$

$m_2 = -\sqrt{3}$

Ans : (2) $-\sqrt{3}$

9. If A is a point on the Y-axis whose ordinate is 8 and B is a point on the X-axis whose abscissae is 5 then the equation of the line AB is

(1). $8x + 5y = 40$ (2). $8x - 5y = 40$

(3). $x = 8$ (4). $y = 5$

Sol:

abscissae a = 5 , ordinate b = 8

Equation of straight line $\Rightarrow \frac{x}{a} + \frac{y}{b} = 1$

$\Rightarrow \frac{x}{5} + \frac{y}{8} = 1$

$\Rightarrow \frac{8x+5y}{40} = 1$

$\Rightarrow 8x + 5y = 40$

Ans : (1). $8x + 5y = 40$

10. The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$

(1). $7x - 3y + 4 = 0$ (2). $3x - 7y + 4 = 0$

(3). $3x + 7y = 0$ (4). $7x - 3y = 0$

Sol:

Equation of the line $\perp^r$ to $7x - 3y + 4 = 0$ $\} = 3x + 7y + k = 0$

Since , this line passes through (0, 0)

3(0)+7(0)+k = 0 $\Rightarrow$ k = 0

Required Equation $3x + 7y = 0$

Ans : (3). $3x + 7y = 0$

11. Consider four straight lines

(i). $l_1: 3y = 4x + 5$ (ii). $l_2: 4y = 3x - 1$

(iii). $l_3: 4y + 3x = 7$ (iv). $l_4: 4x + 3y = 2$

Which of the following statement is true ?

(1). l_1 and l_2 are perpendicular

(2). l_1 and l_4 are parallel

(3). l_2 and l_4 are perpendicular

(4). l_2 and l_3 are parallel

Sol:

Slope = $\frac{-co.efficient.of\ x}{co.efficient\ of\ y}$

i). Slope of $l_1 = \frac{4}{3}$ ii). Slope of $l_2 = \frac{3}{4}$

iii). Slope of $l_3 = \frac{-3}{4}$ iv). Slope of $l_4 = \frac{-4}{3}$

Two lines are $\perp^r$, then $m_1 \times m_2 = -1$

Two lines are parallel , then $m_1 = m_2$

$\therefore l_2$ and l_4 are perpendicular

Ans : (3). l_2 and l_4 are perpendicular

12. A straight line has equation $8y = 4x + 21$. Which of the following is true ?

(1). The slope is 0.5 and y intercept is 2.6

(2). The slope is 5 and y intercept is 1.6

(3). The slope is 0.5 and y intercept is 1.6

(4). The slope is 5 and y intercept is 2.6

Sol:

Given Equation $8y = 4x + 21$

$y = \frac{4}{8}x + \frac{21}{8}$

$y = 0.5x + 2.6$

Slope m = 0.5 , y-intercept 2.6

Ans : (1). The slope is 0.5 and y intercept is 2.6

13.When proving that a quadrilateral is a trapezium, it is necessary to show ?

(1). Two sides are parallel

(2). Two parallel and two non-parallel sides

(3). Opposite sides are parallel

(4). All sides are of equal length

Sol:

A quadrilateral is trapezium if on pair of opposite sides are parallel and another pair is non parallel.

Ans: (2). Two parallel and two non-parallel sides.

14. When proving that a quadrilateral is a Parallelogram by using slopes you must find

(1). The slopes of two sides

(2). The slopes of two pair of opposite sides

(3). The length of all sides

(4). Both the lengths and slopes of two sides.

Sol:

We should find the slopes of all the sides when proving a quadrilateral is a parallelogram

Ans : (2).The slopes of two pair of opposite sides

15. (2 , 1) is the point of intersection of two lines

(1). $x - y - 3 = 0$; $3x - y - 7 = 0$

(2). $x + y = 3$; $3x + y = 7$

(3). $3x + y = 3$; $x + y = 7$

(4). $x + 3y - 3 = 0$; $x - y - 7 = 0$

Sol:

Substitute (2, 3) & check in all pair of lines.

Ans : (2). $x + y = 3$; $3x + y = 7$

6. TRIGONOMETRY

1.. The value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$ is equal to

(1). $\tan^2\theta$ (2). 1 (3). $\cot^2\theta$ (4). 0

Sol:

$$\sin^2\theta + \frac{1}{1+\tan^2\theta} = \sin^2\theta + \frac{1}{\sec^2\theta}$$

$$= \sin^2\theta + \cos^2\theta = 1$$

Ans : (2) 1

2. $\tan\theta\,\mathrm{cosec}^2\theta - \tan\theta$ is equal to

(1). $\sec\theta$ (2). $\cot^2\theta$ (3). $\sin\theta$ (4). $\cot\theta$

Sol:

$$\tan\theta\,\mathrm{cosec}^2\theta - \tan\theta = \tan\theta\,(\mathrm{cosec}^2\theta - 1)$$

$$= \tan\theta\ .\cot^2\theta$$

$$= \frac{1}{\cot\theta} \times \cot^2\theta = \cot\theta$$

Ans : (4). $\cot\theta$

3. If $(\sin\alpha + \mathrm{cosec}\,\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is

(1). 9 (2). 7 (3). 5 (4). 3

Sol:

LHS

$$(\sin\alpha + \mathrm{cosec}\,\alpha)^2 + (\cos\alpha + \sec\alpha)^2$$

$$= \sin^2\alpha + \mathrm{cosec}^2\alpha + 2\sin\alpha\,\mathrm{cosec}\,\alpha + \cos^2\alpha + \sec^2\alpha + 2\cos\alpha\sec\alpha$$

$$= \sin^2\alpha + \cos^2\alpha + 2(1) + 2(1) + \mathrm{cosec}^2\alpha + \sec^2\alpha$$

$$= 1 + 2 + 2 + 1 + \cot^2\alpha + 1 + \tan^2\alpha$$

$$= 7 + \tan^2\alpha + \cot^2\alpha$$

Compare to RHS k = 7

Ans : (2) 7

4. If $\sin\theta + \cos\theta = a$ *and* $\sec\theta + \mathrm{cosec}\,\theta = b$, then the value of $b(a^2 - 1)$ is equal to

(1). 2a (2). 3a (3). 0 (4). 2ab

Sol:

$$a = \sin\theta + \cos\theta\ ,\ b = \sec\theta + \mathrm{cosec}\,\theta$$

$$b(a^2 - 1) = (\sec\theta + \mathrm{cosec}\,\theta)[(\sin\theta + \cos\theta^2) - 1]$$

$$= (\sec\theta + \mathrm{cosec}\,\theta)(\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta - 1)$$

$$= (\sec\theta + \mathrm{cosec}\,\theta)(1 + 2\sin\theta\cos\theta - 1)$$

$$= \left(\frac{1}{\cos\theta} + \frac{1}{\sin\theta}\right)(2\sin\theta\cos\theta)$$

$$= \frac{1}{\cos\theta} \times 2\sin\theta\cos\theta + \frac{1}{\sin\theta}2\sin\theta\cos\theta$$

$$= 2\sin\theta + 2\cos\theta$$

$$= 2(\sin\theta + \cos\theta) = 2a$$

Ans : (1) 2a

5. If $5x = \sec\theta$ *and* $\frac{5}{x} = \tan\theta$, *then* $x^2 - \frac{1}{x^2}$ is equal to

(1). 25 (2). $\frac{1}{25}$ (3). 5 (4). 1

Sol:

$$5x = \sec\theta\ ,\ \frac{5}{x} = \tan\theta$$

$$\sec^2\theta - \tan^2\theta = 1$$

$$25x^2 - \frac{25}{x^2} = 1$$

$$25\left(x^2 - \frac{1}{x^2}\right) = 1$$

$$x^2 - \frac{1}{x^2} = \frac{1}{25}$$

Ans : (2) $\frac{1}{25}$

6. If $\sin\theta = \cos\theta$, *then* $2\tan^2\theta + \sin^2\theta - 1$ is equal to

(1). $\frac{-3}{2}$ (2). $\frac{3}{2}$ (3). $\frac{2}{3}$ (4). $\frac{-2}{3}$

Sol:

$\sin\theta = \cos\theta \implies \theta = 45°$

$2\tan^2\theta + \sin^2\theta - 1 = 2\tan^2 45° + \sin^2 45° - 1$

$= 2(1)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 - 1$

$= 2 + \frac{1}{2} - 1 = \frac{3}{2}$

Ans : (2). $\frac{3}{2}$

7. If $x = a\tan\theta$ *and* $y = b\sec\theta$ *then*

(1). $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ (2). $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

(3). $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (4). $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$

Sol:

$x = a\tan\theta \implies \tan\theta = \frac{x}{a}$

$y = b\sec\theta \implies \sec\theta = \frac{y}{b}$

$\sec^2\theta - \tan^2\theta = 1$

$\left(\frac{y}{b}\right)^2 - \left(\frac{x}{a}\right)^2 = 1$

$\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$

Ans : (1). $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$

8. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta)$ is equal to

(1). 0 (2). 1 (3). 2 (4) – 1

Sol:

$(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \operatorname{cosec}\theta)$

$= \left(1 + \frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta}\right)\left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right)$

$= \left(\frac{\cos\theta + \sin\theta + 1}{\cos\theta}\right)\left(\frac{\sin\theta + \cos\theta - 1}{\sin\theta}\right)$

$= \frac{((\cos\theta + \sin\theta) + 1)\,((\sin\theta + \cos\theta) - 1)}{\sin\theta\cos\theta}$

$= \frac{(\cos\theta + \sin\theta)^2 - 1^2}{\sin\theta\cos\theta}$

$= \frac{\cos^2\theta + \sin^2\theta + 2\cos\theta\sin\theta - 1}{\sin\theta\cos\theta} = \frac{1 + 2\cos\theta\sin\theta - 1}{\sin\theta\cos\theta}$

$= \frac{2\cos\theta\sin\theta}{\sin\theta\cos\theta} = 2$

Ans : (3) 2

9. $a\cot\theta + b\operatorname{cosec}\theta = p$, $b\cot\theta + a\operatorname{cosec}\theta = q$ then $p^2 - q^2$ is equal to

(1). $a^2 - b^2$ (2). $b^2 - a^2$

(3). $a^2 + b^2$ (4) $b - a$

Sol:

$p = a\cot\theta + b\operatorname{cosec}\theta$, $q = b\cot\theta + a\operatorname{cosec}\theta$

LHS: $p^2 - q^2$

$= (a\cot\theta + b\operatorname{cosec}\theta)^2 - (b\cot\theta + a\operatorname{cosec}\theta)^2$

$= a^2\cot^2\theta + b^2\operatorname{cosec}^2\theta + 2ab\cot\theta\operatorname{cosec}\theta -$

$(b^2\cot^2\theta + a^2\operatorname{cosec}^2\theta + 2ab\cot\theta \text{ cose } \theta)$

$= a^2(\cot^2\theta - \operatorname{cosec}^2\theta) + b^2(\operatorname{cosec}^2\theta - \cot^2\theta)$

$= a^2(-1) + b^2(1)$

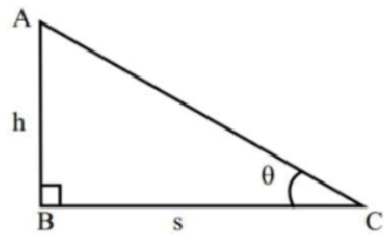
$= b^2 - a^2$

Ans : (2). $b^2 - a^2$

10. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure

(1). 45° (2). 30° (3). 90° (4). 60°

Sol :



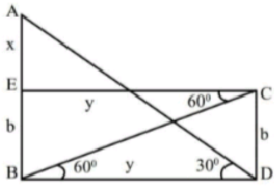
$\tan\theta = \frac{AB}{BC} = \frac{\sqrt{3}}{1} \implies \theta = 60°$

Ans : (4). 60°

11. The electric pole subtends an angle of 30° at a point on the same level as its foot. At a second point 'b' metres above the first, the depression of the foot of the tower is 60°. The height of the tower (metres) is equal to

(1). $\sqrt{3}\,b$ (2). $\frac{b}{3}$ (3). $\frac{b}{2}$ (4). $\frac{b}{\sqrt{3}}$

Sol:



AB – Pole Height of tower = x + b

Δ CBD

$\tan 60° = \frac{b}{y}$

$\sqrt{3} = \frac{b}{y}$

$y = \frac{b}{\sqrt{3}}$ ....(1)

Δ ABD

$\tan 30° = \frac{x+b}{y}$

$\frac{1}{\sqrt{3}} = \frac{x+b}{y}$

$y = \sqrt{3}(x+b)$......(2)

From (1) & (2) $\therefore \sqrt{3}(x+b) = \frac{b}{\sqrt{3}}$

$3(x+b) = b$

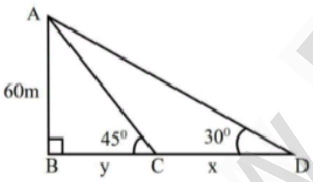
$x + b = \frac{b}{3}$

Ans : (2). $\frac{b}{3}$

12. A tower is 60 m height. Its shadows is x metres shorter when the sun's altitude is $45°$ than when it has been $30°$, then x is equal to

(1).41.92 m (2).43.92 m (3).43 m (4).45.6 m

Sol:



In ΔABC

$\tan 45° = \frac{AB}{BC} = \frac{60}{y}$

$1 = \frac{60}{y}$

$y = 60$........(1)

ΔABD

$\tan 30° = \frac{AB}{BD}$

$\frac{1}{\sqrt{3}} = \frac{60}{x+y}$

$x + y = 60\sqrt{3}$ ....(2)

(2) $\Longrightarrow$ $x + 60 = 60\sqrt{3}$

$x = 60\sqrt{3} - 60 = 60(\sqrt{3} - 1)$

$x = 60 \times 0.732 = 43.92\ m$

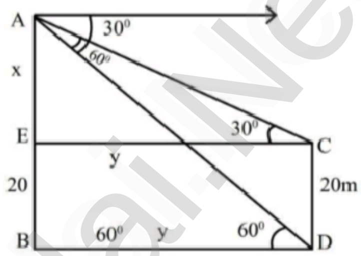
Ans : (2) 43.92 m

13. The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are 30 *and* 60° respectively. The height of the multistoried building and the distance between two buildings (in metres) is

(1). 20, $10\sqrt{3}$ (2). 30, $5\sqrt{3}$

(3). 20, 10 (4). 30, $10\sqrt{3}$

Sol:



In ΔACE

$\tan 30° = \frac{AE}{EC}$

$\frac{1}{\sqrt{3}} = \frac{x}{y}$

$y = \sqrt{3}x$ ....(1)

In $\Delta\ ADB$

$\tan 60° = \frac{AB}{BD}$

$\sqrt{3} = \frac{x+20}{y}$

$y = \frac{x+20}{\sqrt{3}}$.........(2)

From (1) & (2) $\sqrt{3}x = \frac{x+20}{\sqrt{3}}$

$3x = x + 20$

$2x = 20$

$\mathbf{x = 10\ m}$

(1).......... $y = \sqrt{3}x = 10\sqrt{3}\ m$

Height of multistoried building $\} = x + 20 = 10 + 20 = 30m$

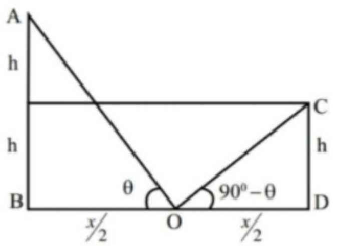
Distance between 2 buildings $y = 10\sqrt{3}$ m

Ans : (4). $30, 10\sqrt{3}$

14. Two persons are standing 'x' metres apart from each other and the height of the first person is double that of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary , then the height of the shorter person (in metres) is

(1). $\sqrt{2}\,x$ (2). $\frac{x}{2\sqrt{2}}$ (3). $\frac{x}{\sqrt{2}}$ (4). $2x$

Sol:



CD = h = Height of shorter person

AB = 2h = Height of taller person

$BD = x \Rightarrow BO = DO = \frac{x}{2}$

$In\ \Delta AOB$ $\quad$ $In\ \Delta\ COD$

$\tan\theta = \frac{2h}{x/2}$ $\quad$ $\tan(90-\theta) = \frac{h}{x/2}$

$\tan\theta = \frac{4h}{x}$ ....(1) $\quad$ $\cot\theta = \frac{2h}{x}$

$\tan\theta = \frac{x}{2h}$ ....(2)

From (1) & (2) $\frac{4h}{x} = \frac{x}{2h} \Rightarrow 8h^2 = x^2$

$\Rightarrow h^2 = \frac{x^2}{8} \Rightarrow h = \frac{x}{2\sqrt{2}}$

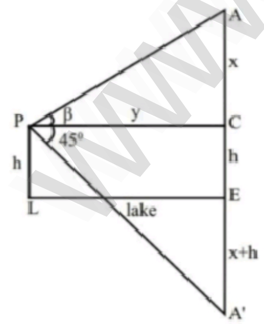
Ans : $(2).\frac{x}{2\sqrt{2}}$

15. The angle of elevation of a cloud from a point h metres above a lake is β.The angle of depression of its reflection in the lake is $45°$. The height of location of the cloud from the lake is

$(1).\frac{h(1+\tan\beta)}{1-\tan\beta}$ $\quad$ $(2).\frac{h(1-\tan\beta)}{1+\tan\beta}$

$(3).\ h\tan(45°-\beta)$ $\quad$ $(4).\ none\ of\ these$

Sol:



LE – Surface of the lake $\quad$ P – Point of observation

$A, A^{|}$ - Positions of cloud & its reflections

PL = CE = h , AC = x

$AE = A^{|}E = x + h$

$In\ \Delta\ APC$ $\quad$ $In\ \Delta\ A^{|}PC$

$\tan\beta = \frac{x}{y}$ $\quad$ $\tan 45° = \frac{x+2h}{y}$

$y = \frac{x}{\tan\beta}$...........(1) $\quad$ $1 = \frac{x+2h}{y}$

$y = x + 2h$......(2)

From (1) & (2)

$x + 2h = \frac{x}{\tan\beta} \Rightarrow 2h = \frac{x}{\tan\beta} - x$

$2h = x\left(\frac{1}{\tan\beta} - 1\right) \Rightarrow 2h = x\left(\frac{1-\tan\beta}{\tan\beta}\right)$

$\therefore x = \frac{2h\tan\beta}{1-\tan\beta}$

$\therefore$ Height of cloud $= h + x$

$= h + \frac{2h\tan\beta}{1-\tan\beta} = h\left(1 + \frac{2\tan\beta}{1-\tan\beta}\right)$

$= h\left(\frac{1-\tan\beta+2\tan\beta}{1-\tan\beta}\right) = h\left(\frac{1+\tan\beta}{1-\tan\beta}\right)$

Ans : $(1).\frac{h(1+\tan\beta)}{1-\tan\beta}$

7. MENSURATION

1..The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is

$(1).60\pi\ cm^2$ $\quad$ $(2).68\pi\ cm^2$

$(3).120\pi\ cm^2$ $\quad$ $(4).136\pi\ cm^2$

Sol :

h = 15 cm , r = 8 cm

$l = \sqrt{h^2 + r^2} = \sqrt{15^2 + 8^2} = \sqrt{225 + 64} = \sqrt{289} = 17$

CSA of cone $= \pi rl = \pi \times 8 \times 17 = 136\pi\ cm^2$

Ans : $(4).136\pi\ cm^2$

2. If two solid hemisphere of same base radius r units are joined together along their bases, then curved surface area of this new solid is

$(1).4\pi r^2\ sq.units$ $\quad$ $(2).6\pi r^2\ sq.units$

$(3).3\pi r^2\ sq.units$ $\quad$ $(4).8\pi r^2\ sq.units$

Sol:

CSA of new solid = CSA of a sphere = $4\pi r^2\ sq.units$

Ans : $(1).4\pi r^2\ sq.units$

3. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be

(1). 12 cm (2). 10 cm (3). 13 cm (4). 5 cm

Sol:

r = 5 cm , l = 13 cm

$h = \sqrt{l^2 - r^2} = \sqrt{169 - 25} = \sqrt{144} = 12\ cm$

Ans : (1). 12 cm

4. If the radius of the base of a right circular cylinder is halved keeping the same height , then the ratio of the volume of the cylinder thus obtained to the volume of original cylinder is

(1). 1 : 2 (2). 1 : 4 (3). 1 : 6 (4). 1 : 8

Sol:

$\frac{Volume\ of\ New\ cylinder}{Volume\ of\ old\ cylinder} = \frac{\pi R^2 h}{\pi r^2 h}$ where $R = \frac{r}{2}$

$= \frac{R^2}{r^2} = \frac{\left(\frac{r}{2}\right)^2}{r^2} = \frac{r^2}{4} \times \frac{1}{r^2} = \frac{1}{4}$

Ans : (2). 1 : 4

5. The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is

(1). $\frac{9\pi h^2}{8}$ *sq.units* **(2).** $24\pi h^2$ *sq.units*

(3). $\frac{8\pi h^2}{9}$ *sq.units* **(4).** $\frac{56\pi h^2}{9}$ *sq.units*

Sol:

TSA of cylinder $= 2\pi r(h + r)$, where $r = \frac{1}{3}h$

$= 2\pi \times \frac{h}{3}\left(h + \frac{h}{3}\right) = \frac{2\pi h}{3} \times \frac{4h}{3}$

$= \frac{8\pi h^2}{3}$ sq.units

Ans : (3). $\frac{8\pi h^2}{9}$ *sq.units*

6. In a hollow cylinder , the sum of the external and internal radii is 14 cm and the width is 4 cm . If its height is 20 cm , the volume of the material in it is

(1). $5600\pi\ cm^3$ **(2).** $11200\pi\ cm^3$

(3). $56\pi\ cm^3$ **(4).** $3600\pi\ cm^3$

Sol:

R+r = 14 cm , w = R – r = 4 cm , h = 20 cm

Volume of hollow cylinder $= \pi h(R^2 - r^2)$

$= \pi h(R + r)(R - r)$

$= \pi \times 20 \times 14 \times 4$

$= 1120\pi\ cm^3$

Ans ; (2) $1120\pi\ cm^3$

7. If the radius of the base of a cone is tripled and the height is doubled then the volume is

(1). made 6 times (2). made 18 times

(3). made 12 times (4). unchanged

Sol:

r = 3r , h = 2h

Volume of new cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times (3r)^2 \times (2h)$

$= \frac{1}{3}\pi \times 9r^2 \times 2h$

$= 18\left[\frac{1}{3}\pi r^2 h\right]$

Ans : (2). made 18 times

8. The total surface area of a hemi-sphere is how much times the square of its radius.

(1). π **(2).** 4π **(3).** 3π **(4).** 2π

Sol:

TSA of hemisphere $= 3\pi r^2$

$= 3\pi$(squqre of its radius)

$= 3\pi\ times\ r^2$

Ans : (3). 3π

9. A solid sphere of a radius 'x' cm is melted and cast into a shape of a solid cone of same radius. the height of the cone is

(1). 3x cm (2). x cm (3). 4x cm (4). 2x cm

Sol:

Radius r = x

Volume of Sphere = Volume of Cone

$\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$

$\frac{4}{3}\pi x^3 = \frac{1}{3}\pi x^2 h$

$h = \frac{4}{3}\pi x^3 \times \frac{3}{\pi x^2}$

$h = 4x$

Ans : (3). 4x cm

10. A frustum of a right circular cone is of height 16 cm with radii of its end s as 8 cm and 20 cm. Then the volume of the frustum is

(1). $3328\pi\ cm^3$ (2). $3228\pi\ cm^3$

(3). $3240\pi\ cm^3$ (4). $3340\pi\ cm^3$

Sol:

h=16 cm , R = 20 cm , r = 8 cm

Volume of frustum $= \frac{1}{3}\pi h[R^2 + r^2 + Rr]$

$= \frac{1}{3}\pi \times 16[20^2 + 8^2 + 20 \times 8]$

$= \frac{1}{3}\pi \times 16[400 + 64 + 160]$

$= \frac{1}{3}\pi \times 16 \times 624 = 3328\ cm^3$

Ans : (1). $3328\pi\ cm^3$

11. A shuttle cock used for playing badmintons has the shape of the combinations of

(1). a cylinder and a sphere

(2). a hemisphere and a cone

(3). A sphere and a cone

(4). frustum of a cone and a hemisphere

Sol:

Ans : (4) frustum of a cone and a hemisphere

12. A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2. then $r_1 : r_2$ is

(1). 2 : 1 (2). 1 : 2 (3). 4 : 1 (4). 1 : 4

Sol:

Volume of sphere = 8 [volume of new identical sphere]

$\frac{4}{3}\pi {r_1}^3 = 8\left(\frac{4}{3}\pi {r_2}^3\right)$

$\frac{{r_1}^3}{{r_2}^3} = \frac{8}{1} = \frac{2^3}{1^3}$

$r_1 : r_2 = 2 : 1$

Ans : (1). 2 : 1

13. The volume (in cm^3) of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is

(1). $\frac{4}{3}\pi$ (2). $\frac{10}{3}\pi$ (3) 5π (4). $\frac{20}{3}\pi$

Sol:

r = 1 cm , h = 5 cm

Volume of sphere $= \frac{4}{3}\pi r^3$

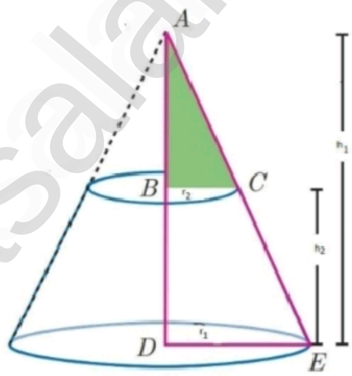
$= \frac{4}{3}\pi(1)^3 = \frac{4}{3}\pi$

Ans : (1) $\frac{4}{3}\pi$

14. The height and radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units. If $h_2 : h_1 = 1 : 2$ then $r_2 : r_1$ is

(1). 1 : 3 (2). 1 : 2 (3). 2 : 1 (4). 3 : 1

Sol



$AD = h_1 , BD = h_2 , AB = h_1 - h_2$

$DE = r_1 , BC = r_2$

Given $h_2 : h_1 = 1 : 2$

$\Rightarrow \frac{h_2}{h_1} = \frac{1}{2}$

$\Delta ABC \sim \Delta ADE$

$\frac{AB}{AD} = \frac{BC}{DE}$

$\frac{h_1 - h_2}{h_1} = \frac{r_2}{r_1}$ $[\because h_1 - h_2 = 2 - 1 = 1]$

$\frac{1}{2} = \frac{r_2}{r_1} \Rightarrow r_2 : r_1 = 1 : 2$

Ans : (2) 1 : 2

15. The ratio of the volume of a cylinder , a cone and a sphere , if each has the same diameter and same height is

(1).1 : 2 : 3 (2).2 : 1 : 3 (3).1 : 3 : 2 (4).3 : 1 : 2

Sol:

$\left.\begin{matrix}\text{Ratio of volume of}\\ \text{cylinder, cone, sphere}\end{matrix}\right\} = \pi r^2 h : \frac{1}{3}\pi r^2 h : \frac{4}{3}\pi r^3$

Since each of them has same diameter and same height, so h =2r

$= \pi r^2 (2r) : \frac{1}{3}\pi r^2 (2r) : \frac{4}{3}\pi r^3$

$= 2\pi r^3 : \frac{2}{3}\pi r^3 : \frac{4}{3}\pi r^3$

$= 2 : \frac{2}{3} : \frac{4}{3}$

$= 6 : 2 : 4$

$= 3 : 1 : 2$

Ans : (4).3 : 1 : 2

8.STATISTICS AND PROBABILITY

1.Which of the following is not a measure of dispersion ?

(1). Range (2). Standard deviation

(c3). Arithmetic mean (4). Variance

Sol:

Arithmetic mean is not a measure of dispersion and it is a measure of central tendency

Ans: (3). Arithmetic mean

2. The range of the data 8,8,8,8,8.........8 is

(1). 0 (2). 1 (3). 8 (4). 3

Sol :

Range = L – S

= 8 – 8 = 0

Ans : (1). 0

3. The sum of all deviations of the data from its mean is

(1). Always positive (2) . always negative

(3) . zero (4). non-zero integer

Sol:

Sum of all deviation of the data from the mean is equal to zero. That is $\sum(x - \bar{x}) = 0$

Ans : (3) . zero

4. The mean of 100 observations is 40 and their standard deviation is 3 . The sum of squares of all deviations is

(1). 40000 (2).160900 (3). 160000 (4).30000

Sol:

$n = 100, \quad \bar{x} = \frac{\sum x}{n} = 40, \ \sigma = 3$

$\sigma^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2$

$9 = \frac{\sum x^2}{100} - (40)^2$

$\frac{\sum x^2}{100} = 1600 + 9 = 1609$

$\sum x^2 = 160900$

Ans : (2).160900

5. Variance of first 20 natural numbers is

(1).32.25 (2). 44.25 (3).33.25 (4). 30

Sol:

$\left.\begin{matrix}\text{Variance of first 20}\\ \text{natural numbers}\end{matrix}\right\} \sigma^2 = \frac{n^2-1}{12}$

$\sigma^2 = \frac{20^2-1}{12}$

$= \frac{400-1}{12}$

$= \frac{399}{12}$

$= 33.25$

Ans : (3).33.25

6. The standard deviation of a data is 3. If each value is multiplied by 5 then the new variance is

(1). 3 (2). 15 (3). 5 (4).225

Sol:

S.D $\sigma = 3$

If each value is multiplied by 5, then the new S.D is multiplied by 5.

The new S.D $\sigma = 3 \times 5 = 15$

Variance $\sigma^2 = (15)^2 = 225$

Ans : (4) 225

7.If the standard deviations of x , y , z is p, then the Standard deviation of 3x+5 , 3y+5 , 3z+5 is

(1). 3p + 5 (2). 3p (3). p + 5 (4). 9p + 15

Sol :

(i). The S.D of a distribution remains unchanged when each value is added or subtracted by the same quantity.

(ii).If each value of a collection of data is multiplied or divided by a non-zero constant k , then the S.D of the new data is obtained by multiplying or dividing the S.D by the same quantity k .

∴ S.D of 3x+5 , 3y+5 , 3z+5 = 3p

Ans : (2) 3p

8. If the mean and co-efficient of variation of a data are 4 and 87.5 % , then the standard deviation is

(1). 3.5 (2). 3 (3). 4.5 (4). 2.5

Sol:

$\bar{x} = 4$, C.V $= 87.5$, $\sigma = ?$

$C.V = \frac{\sigma}{\bar{x}} \times 100$

$87.5 = \frac{\sigma}{4} \times 100$

$\sigma = \frac{87.5 \times 4}{100}$

$\sigma = \frac{350}{100} = 3.5$

Ans : (1) 3.5

9. Which of the following is incorrect ?

(1). $P(A) > 1$ (2). $0 \le P(A) \le 1$

(3). $P(\emptyset) = 0$ (4). $P(A) + P(\bar{A}) = 1$

Sol:

$P(A) > 1$ is incorrect .Since $0 \le P(A) \le 1$

Ans : (1). $P(A) > 1$

10. The probability a red marble selected at random from a jar containing p red , q blue and r green marble is

(1). $\frac{q}{p+q+r}$ (2). $\frac{p}{p+q+r}$

(3). $\frac{p+q}{p+q+r}$ (4). $\frac{p+r}{p+q+r}$

Sol:

No.of Red = p ,

No.of Blue = q ,

No.of Green = r

n(S) = p + q + r

Required Probability P(A) $= \frac{n(Red)}{n(S)}$

$= \frac{p}{p+q+r}$

Ans : (2). $\frac{p}{p+q+r}$

11. A page is selected at random from a book. The probability that the digit at unit place of the page number chosen is less than 7 is

(1). $\frac{3}{10}$ (2). $\frac{7}{10}$ (3). $\frac{3}{9}$ (4). $\frac{7}{9}$

Sol:

Unit place digits S={0,1,2,.......9} n(S) = 10

Unit place digit less than 7, A={0,1,2,....6} n(A)=7

Probability P(A) $= \frac{n(A)}{n(S)} = \frac{7}{10}$

Ans : (2). $\frac{7}{10}$

12. The probability of getting a job for a person is $\frac{x}{3}$, If the probability of not getting the job is $\frac{2}{3}$, Then the value of x is

(1). 2 (2). 1 (3). 3 (4). 1.5

Sol:

$P(A) = \frac{x}{3}$, $P(\bar{A}) = \frac{2}{3}$

$P(A) + P(\bar{A}) = 1$

$\frac{x}{3} + \frac{2}{3} = 1$

$\frac{x+2}{3} = 1$

$X + 2 = 3$

$X = 1$

Ans : (2) 1

13.Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is

(1). 5 (2). 10 (3). 15 (4). 20

Sol:

n(S)=135 , P(A) = $\frac{1}{9}$, Let n(A)= x

Sol :

(i). The S.D of a distribution remains unchanged when each value is added or subtracted by the same quantity.

(ii).If each value of a collection of data is multiplied or divided by a non-zero constant k , then the S.D of the new data is obtained by multiplying or dividing the S.D by the same quantity k .

∴ S.D of 3x+5 , 3y+5 , 3z+5 = 3p

Ans : (2) 3p

8. If the mean and co-efficient of variation of a data are 4 and 87.5 % , then the standard deviation is

(1). 3.5 (2). 3 (3). 4.5 (4). 2.5

Sol:

$\bar{x} = 4$, C.V $= 87.5$, $\sigma = ?$

$$C.V = \frac{\sigma}{\bar{x}} \times 100$$

$$87.5 = \frac{\sigma}{4} \times 100$$

$$\sigma = \frac{87.5 \times 4}{100}$$

$$\sigma = \frac{350}{100} = 3.5$$

Ans : (1) 3.5

9. Which of the following is incorrect ?

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(3). $P(\emptyset) = 0$ (4). $P(A) + P(\bar{A}) = 1$

Sol:

$P(A) > 1$ is incorrect .Since $0 \le P(A) \le 1$

Ans : (1). $P(A) > 1$

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(1). $\frac{q}{p+q+r}$ (2). $\frac{p}{p+q+r}$

(3). $\frac{p+q}{p+q+r}$ (4). $\frac{p+r}{p+q+r}$

Sol:

No.of Red = p ,

No.of Blue = q ,

No.of Green = r

n(S) = p + q + r

Required Probability P(A) $= \frac{n(Red)}{n(S)}$

$= \frac{p}{p+q+r}$

Ans : (2). $\frac{p}{p+q+r}$

11. A page is selected at random from a book. The probability that the digit at unit place of the page number chosen is less than 7 is

(1). $\frac{3}{10}$ (2). $\frac{7}{10}$ (3). $\frac{3}{9}$ (4). $\frac{7}{9}$

Sol:

Unit place digits S={0,1,2,…….9} n(S) = 10

Unit place digit less than 7, A={0,1,2,….6) n(A)=7

Probability P(A) $= \frac{n(A)}{n(S)} = \frac{7}{10}$

Ans : (2). $\frac{7}{10}$

12. The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$, Then the value of x is

(1). 2 (2). 1 (3). 3 (4). 1.5

Sol:

$P(A) = \frac{x}{3}$, $P(\bar{A}) = \frac{2}{3}$

$$P(A) + P(\bar{A}) = 1$$

$$\frac{x}{3} + \frac{2}{3} = 1$$

$$\frac{x+2}{3} = 1$$

$$X + 2 = 3$$

$$X = 1$$

Ans : (2) 1

13.Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is

(1). 5 (2). 10 (3). 15 (4). 20

Sol:

n(S)=135 , P(A) = $\frac{1}{9}$, Let n(A)= x

$$P(A) = \frac{n(A)}{n(S)}$$

$$\frac{1}{9} = \frac{x}{135}$$

$$x = \frac{135}{9} = 15$$

Ans : (3) 15

14. If a letter is chosen at random from the English Alphabets { a, b, c, ...z } . then the probability that the letter chosen precedes x

(1). $\frac{12}{13}$ (2). $\frac{1}{13}$ (3). $\frac{23}{26}$ (4). $\frac{3}{26}$

Sol:

S = { a,b,c,.....z} n(S) = 26

A = alphabets before x = {a,b,c,.....w} n(A) = 23

P(A) = $\frac{23}{26}$

Ans : (3). $\frac{23}{26}$

15. A purse contains 10 notes of Rs.2000, 15 notes of Rs. 500 and 25 notes of Rs.200.One note is drawn at random . What is the probability that the note is either Rs.500 or Rs. 200 note ?

(1). $\frac{1}{5}$ (2). $\frac{3}{10}$ (3). $\frac{2}{3}$ (4). $\frac{4}{5}$

Sol:

Rs.2000 note n(A) = 10

Rs.500 note n(B) = 15

Rs.200 note n (C) = 25

n(S) = 10+15+25=50

P(BUC) = P(B)+P(C) $-P(B \cap C)$

$$= \frac{15}{50} + \frac{25}{50} - 0$$

$$= \frac{40}{50} = \frac{4}{5}$$

Ans : (4). $\frac{4}{5}$