1. $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ is equal to

(a) $1+\tan\theta\ sec\ \theta$ (b)$1+\sec\theta\ cosec\ \theta$

(c) $1+\sec\theta$ (d)none

$$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$$
$$=\frac{\tan^2\theta}{\tan\theta-1}+\frac{\cot\theta}{\tan\theta-1}$$
$$=\frac{\tan^2\theta+\tan\theta+1}{\tan\theta}$$
$$=\tan\theta+1+\cot\theta$$
$$=\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}+1$$
$$=1+\frac{1}{\cos\theta\sin\theta}$$
$$=1+\sec\theta\,\mathrm{cosec}\,\theta$$

2. An arithmetic has 3 as it first term also the sum of the first 8 term is twice the sum of the 5 term. Find the common difference?

(a)$\frac{3}{4}$ (b)$\frac{3}{2}$ (c)$\frac{4}{3}$ (d)none

We must write an equation using the formula $S_n=\frac{n}{2}(2a+(n-1)d)$, in order to solve for d, the common difference .

We know that $S_8=2(s_5)$, and that $a=3$, so our equation will be :

$$\frac{8}{3}(2(3)+(8-1)d)=2\left(\frac{5}{2}(2(3)+(5-1)d)\right)$$
$$4(6+7d)=5(6+4d)$$
$$24+28d=30+20d$$
$$-8d=-6$$
$$d=\frac{3}{4}$$

3. $f(x)=\int_{-2}^{2}(ax^5+bx^3+c)\ dx$ integral value depend on

(a)c (b)a & b (c)only b (d)none

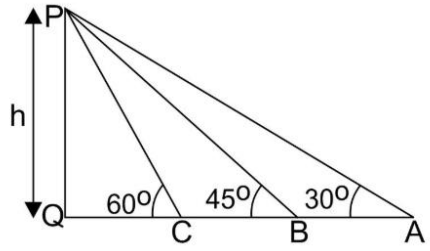
We note that the function ax^5, bx^3 and cx and odd function . so, their indivisual integral in the limits -2 and 2 are 0 Therefore, the given integral reduces to

$$\int_{-2}^{2}k\ dx=[kx]_{x=-2}^{x=2}=6k$$

So the given integral only depends upon k.

4. If the angles of elevation of the top of a tower from three collinear points A, B and C, on a line leading to the foot of the tower, are30°,45°,60°respectively, then the ratio, AB : BC

(a)$\sqrt{3}:1$ (b)$\sqrt{3}:2$(c) $1:\sqrt{3}$ (d)none



In ΔPQA,

$$\tan 30=\frac{PQ}{AQ}$$
$$AQ=\sqrt{3}h\ \ldots 1$$

In ΔPQB,

$$\tan 45=\frac{PQ}{BQ}$$
$$BQ=h\ \ldots 2$$

In ΔPQC,

$$\tan 60 = \frac{PQ}{CQ}$$
$$CQ = \frac{h}{\sqrt{3}}$$

Now,

$$\frac{AB}{BC} = \frac{AQ - BQ}{BQ - CQ} = \frac{\sqrt{3} - 1}{1 - \frac{1}{\sqrt{3}}} = \frac{\sqrt{3}}{1}$$

5. Forces acting on a particle have magnitudes of 5,3,1 units act in the direction of vectors $6i + 2i + 3k, 3i - 2j + 6k$ & $2i - 3j - 6k$ respectively they remain constant while the particle is displaced from if $A(2,-1,-3), B(5,-1,1)$ the work done is equal to

(a)30 (b)33 (c)36 (d)none

The unit vectors in the direction of the given vectors are

$$\frac{6i + 2j + 3k}{\sqrt{36 + 4 + 9}} = \frac{6i + 2j + 3k}{7}, \frac{3i - 2j + 6k}{7}$$

And $\frac{2i-3j-6k}{7}$

Since F_1, F_2 *and* F_3 are the forces of magnitude 5,3, and 1 units, we have

$$F_1 = \frac{5}{7}(6i + 2j + 3k)$$
$$F_2 = \frac{3}{7}(3i - 2j + 6k)$$
$$F_3 = \frac{1}{7}(2i - 3j - 6k)$$

Therefore the resultant is

$R = F_1 + F_2 + F_3 = \frac{1}{7}(41i + j + 27k)$ and $AB = 3i + 4k$,

Hence the work done is $R.AB = \frac{1}{7}(41 \times 3 + 27 \times +4) = \frac{231}{7} = 33\ units.$

6. The angle between the two circles of $x^2 + y^2 = 4$ and $x^2 + (y-1)^2 = 4$

(a) $cos^{-1}\left(\frac{5}{8}\right)$ (b)$cos^{-1}\left(\frac{7}{8}\right)$

(c) $cos^{-1}\left(\frac{3}{8}\right)$ (d)none

$$s_1 = x^2 + y^2 = 4\ (0,0)\ r = 2$$
$$s_2 : x^2 + (y-1)^2 = 4\ (0,1)\ r = 2$$
$$\cos\theta = \frac{r_1^2 + r_2^2 - d^2}{2r_1r_2}$$
$$\cos\theta = \frac{2^2 + 2^2 - 1}{2.2.2} = \frac{7}{8}$$
$$\theta = \cos^{-1}\left(\frac{7}{8}\right)$$

7. $\sin 10° \sin 50° \sin 70°$ is equal to

(a)1/8 (b)1/4 (c)1/16 (d)none

$$\sin 10° \sin 50° \sin 70°$$

Multiply & divide by 2

$$\frac{1}{2}(2 \sin 10° \sin 50° \sin 70°)$$
$$\frac{1}{2}\sin 10°(\cos 20 - \cos 120)$$
$$\frac{1}{2}\sin 10 \cos 20 + \frac{1}{4}\sin 10$$

Again multiply & divide by 2

$$\frac{1}{4}(2 \sin 10 - \cos 20) + \frac{1}{4}\sin 10$$
$$\frac{1}{4}(\sin 30 - \sin 10) + \frac{1}{4}\sin 10$$
$$\frac{1}{4}.\sin 30 = \frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

8. $x^2 + 16y^2 = 16$, is is the equation of ellipse find an equation of tangent to the ellipse having an angle of $60°$ with x −axis .

(a)$\sqrt{3}y + x - 8 = 0$ (b)$\sqrt{3}y + x - 7 = 0$ (c)$\sqrt{3}x - y + 7 = 0$ (d)none

$$\frac{x^2}{16} + \frac{y^2}{1} = 1$$
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 (a > b)$$
$$a^2 = 16, b^2 = 1$$
$$y = mx \pm \sqrt{a^2m^2 + b^2}$$
$$y = mx \pm \sqrt{16 \times 2 + 1}$$
$$y = \sqrt{3}x \pm 7$$
$$\sqrt{3}x - y + 7 = 0$$

9. A child had a birthday party in which he invited 3 of his friend there are 10 game in the party of which every game has a prize if every child get at least one prize find in how many ways prize distributed among children.
(a)24 (b)84 (c)90 (d)none
Here, the number of objects is n = 10 and the number of people is r = 4.

Since, every person must get at least one object, the total number of possible distributions is:

$$^{n-1}C_r - 1 = 10-^1C_4 - 1 = {}^9C_3$$
$$\frac{\{9!\}}{\{3!\,(9-3)!\}} = \frac{\{7 \times 8 \times 9\}}{\{3 \times 2 \times 1\}} = 84.$$

10. If $\frac{\tan x}{2} = \frac{\tan y}{3} = \frac{\tan z}{5}$ and $x + y + z = \pi$ then value of $\tan^2 x + \tan^2 y + \tan^2 z$ is
(a)38/3 (b)38 (c)114 (d)none
here, $x + y + z = \pi$
$\Rightarrow tan(x + y + z) = tan\pi$
$\Rightarrow \frac{\{tanx + tany + tanz - tanx\,tany\,tanz\}}{\{1 - tanx\,tany - tany\,tanz - tanz\,tanx\}} = 0$
$\Rightarrow tanx + tany + tanz = tanx\,tany\,tanz$.....(1)
now $\tan\frac{x}{2} = \tan\frac{y}{3} = \tan\frac{z}{5} = k$ (let)

$$\Rightarrow tanx = 2k, tany = 3k, tanz = 5k$$

putting above terms in equation (1) we get,

$$2k + 3k + 5k = 2k.3k.5k$$
$$\Rightarrow 10k = 30k^3$$
$$\Rightarrow k^2 = 1/3$$
$$\Rightarrow k = 1/\sqrt{3}$$

now, $tanx = \frac{2}{\sqrt{3}}, tany = \frac{3}{\sqrt{3}}$ and $tanz = \frac{5}{\sqrt{3}}$
so, $tan^2x + tan^2y + tan^2z$

$$= (2/\sqrt{3})^2 + (3/\sqrt{3})^2 + (5/\sqrt{3})^2$$
$$= \frac{2^2 + 3^2 + 5^2}{3}$$
$$= \frac{4 + 9 + 25}{3}$$
$$= \frac{38}{3}$$

Therefore the value of $tan^2x + tan^2y + tan^2z = \frac{38}{3}$

11. A and B play a game where each is asked to select a no from 1 to 25. If the 2 no. match, both of them win the prize. The probability that they will not win a prize in single trial
(a)1/25 (b)24/25 (c)2/25 (d)not
They win a prize if the number chosen by A matches with that of B.
Thus, probability of winning a prize $= \frac{1}{25} \times 1 = \frac{1}{25}$
Thus, probability of not winning$= 1 - \frac{1}{25} = \frac{24}{25}$

12. $\int e^x \left(\frac{1+\sin x \cos x}{\cos x}\right) dx$
(a)$e^x \tan x + c$ (b)$e^x \sec x + c$ (c)$e^x \sec x \tan x + c$ (d)none
Let $I = \int e^x \sec x\,(1 + \tan x)dx = \int e^x(\sec x + \sec x \tan x)dx$
Also, let $\sec x = f(x) \Rightarrow \sec x \tan x = f'(x)$

We know that, $\int e^x\{f(x)+f'(x)\}$

$$I = e^x f(x) + c$$

13. $a+b+c=0$ then find $\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}$ =?

(a)4 (b)3 (c)2 (d)none

Using the formula , $a^3+b^3+c^3=(a+b+c)(a^2+b^2+c^2\ ab\ \ bc\ \ ca)+3abc$ if $a+b+c=0$

Then $a^3+b^3+c^3=3abc$

$$\frac{a^3+b^3+c^3}{abc}=3$$
$$\frac{a^3}{abc}+\frac{b^3}{abc}+\frac{c^3}{abc}=3$$
$$\frac{a^3}{bc}+\frac{b^3}{ca}+\frac{c^3}{ab}=3$$

14. $A=\{1,2,3\}$ no. of subset of powerset of A.

(a)7 (b)8 (c)9 (d)none

Suppose A has n elements. Power set B of a set A consists of all subsets of A. Since for each element in A, we have two possibilities it is either in the subset or not, there are 2^n different subsets of A. Therefore, when A ={1,2,3} , power set of A has 8 elements, i.e. B has 8 elements. So, power set of B has 2^8 elements.

15. If $a+b+c$ collinear with d & $b+c+d$ collinear with a then $a+b+c+d$ =?

(a)0 (b)AB (c)A (d)none

16. $\tan\left(\frac{\pi}{4}+\frac{\theta}{2}\right)$is equal to

(a)$\sec\theta-\tan\theta$ (b)$-\tan\theta$

(c)$\sec\theta+\tan\theta$ (d)none

17. $sin^2x-sin\,x-2=0$ then value of x is if x is belong to $[0,2\pi]$ is

(a)$-\frac{\pi}{2}$ (b)$\frac{\pi}{2}$ (c)$\frac{\pi}{3}$ (d)none

18. $\cos x=\tan y$, $\cos y=\tan z$, $\cos z=\tan x$then $\sin x$ =?

(a)$\frac{(\sqrt{5}-1)}{2}$ (b)$\frac{(\sqrt{5}-1)}{4}$ (c)$\frac{(\sqrt{5}+1)}{2}$ (d)none

$$\cos x=\tan y$$
$$\cos^2 x=\tan^2 y$$
$$\cos^2 x=\sec^2 y-1$$
$$\cos^2 x=\cot^2 z$$
$$1+\cos^2 x=\cot^2 z$$
$$=\frac{\cos^2 z}{\sin^2 z}$$
$$1+\cos^2 x=\frac{\tan^2 x}{1-\tan^2 x}$$
$$=\frac{\sin^2 x}{\cos^2 x-\sin^2 x}$$
$$2\sin^4 x-6\sin^2 x+2=0$$
$$\sin^2 x=\frac{6\pm\sqrt{36-16}}{2.2}$$
$$\sin x=\frac{\sqrt{5}-1}{2}$$
$$\sin 18=\frac{\sqrt{5}-1}{4}$$
$$=\frac{\sqrt{5}-1}{2}.\frac{1}{2}$$
$$2\sin 18=\sin x$$

19. $f(x)=\begin{cases}x^2 & ,\ x\le 0\\ x\sin x & ,\ x>0\end{cases}$ is and $x=0$ it is n point of

(a)maxima (b)minima (c)discontinuity (d)none

20. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vector, then $(\vec{a}+\vec{b}+\vec{c}).[(\vec{a}+\vec{b})\times(\vec{a}+\vec{c})]$ equals

(a)0 (b)$[\vec{c}\vec{b}\vec{c}]$(c)2$[\vec{c}\vec{b}\vec{c}]$ (d)$-[\vec{a}\vec{b}\vec{c}]$

$$(\vec{a}+\vec{b}+\vec{c}).[(\vec{a}+\vec{b})\times(\vec{a}+\vec{c})]$$
$$(\vec{a}+\vec{b}+\vec{c}).(-\vec{a}\times\vec{b}+\vec{b}\times\vec{c}-\vec{c}\times\vec{a})$$

$$= -[\vec{a}\vec{b}\vec{c}]$$

21. $i - 2j + 2k, 2i + j - k, 3i - j + 2k$ vertices which type of Δ is
(a)right angle (b)obtuse (c)equilateral (d)none

22. If $A = \{4^n - 3n - 1, n \in N\}$ and $B = \{9(n-1), n \in N\}$ then
(a)$A \subset B$(b)$A \subseteq B$(c)$B \subseteq A$ (d)none
Given

$$A = \{4^n - 3n - 1 : n \in N\}$$
$$B = \{9(n-1), n \in N\}$$

Set A can be expressed as $= (3+1)^n - 3n - 1$

$$= 3n + {}^nC_1 3^{n-1} + {}^nC_2 3^{n-2} + \cdots + {}^nC_{2-1} 3 + {}^nC_n - 3n - 1$$

$4^n - 3n - 1$ is multiple of 9 for $n \geq 2$.
For $n = 1, 4^n - 3n - 1 = 4 - 3 - 1 = 0$
For $n = 2, 4^n - 3n - 1 = 16 - 6 - 1 = 9$
$4^n - 3n - 1$ is a multiple of 9 for all $n \in N$.

$$A \subset B$$

23. In a class of 50 students, it was found that 30 students read "Hitavad", 35 students read "Hindustan" and 10read neither. How many students read both: "Hitavad" and "Hindustan" newspapers?
(a)25 (b)20 (c)15 (d) 30

24. There is a young boy's birthday party in which 3 friends have attended. The mother has arranged 10 games where a prize is awarded for winning game. The prizes are identical. If each of the 4 children receives at least one prize, then how many distributions of prizes are possible?
(a) 80 (b) 84 (c) 70 (d) 72
No. of non zero solution of the equation
$x_1 + x_2 + x_3 + \cdots + x_r = n$ is ${}^{n-1}C_{r-1}$
Given $A + B + C + D = 10$

$${}^{10-1}C_{4-1} = {}^9C_3$$
$$= 84$$

25. A set of consecutive positive integers beginning with 1 is written on the blackboard. A student came along and erased one number. The average of the remaining numbers is $35\frac{7}{17}$. What was the number erased?
(a)7 (b) 8
(c)9 (d) None of the above
Now we have given that a student came and erased one number. The average of the remaining numbers is 35(7/17).
The sum will be an integer as all of the values are Integers.
So the sum will be the product of number and average.
The average is 35 + 7/17.
The number of integers must be a multiple of 17
Now for any evenly spaced set, average is always equal to median.
Now the number of integers = 4 x 17 = 68
Sum = 68 x (35 + 7/17) = 2408.
Now for original set:
68 integers remain after one of the integers is removed, then the original set will contain 69 integers.
Sum of the first n positive integers $= \frac{(n)(n+1)}{2}$

$$\frac{69 \times 70}{2}$$
$$= 2415.$$

So now, removed integer will be:
Original sum - sum after one integer is removed

$$2415 - 2408 = 7$$

26. For the two circles $x^2 + y^2 = 16$ and $x^2 + y^2 - 2y = 0$, there is / are
(a) One pair of common tangents
(b) Two pair of common tangents
(c) Three common tangents
(d) No common tangents
The equation of circles are given as $x^2 + y^2 = 16$

$$(x-0)^2 + (y-0)^2 = 4^2$$

And

$$x^2 + y^2 - 2y = 0$$
$$(x-0)^2 + (y-1)^2 = 1^2$$

circles are $c_1(0,0)$ *and* $c_2(0,1)$ and radius $r_1 = 4, r_2 = 1$

$$now\ C_1C_2 = \sqrt{(0-0)^2 + (0-1)^2} = \sqrt{2}$$
$$and\ r_1 - r_2 = 4 - 1 = 3$$
$$c_1c_2 < r_1 - r_2$$

So circles $x^2 + y^2 - 2y = 0$ is completely within $x^2 + y^2 = 16$ hence, there is no common tangent.

27. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x \sin\frac{1}{x}, & x > 0 \\ 0 & , x \le 0 \end{cases}$, then

(a)f is neither continuous nor differentiable at 0.
(b)f is continuous and differentiable at 0.
(c) f is continuous but not differentiable at 0.
(d) f is not continuous but differentiable at 0.

We observe that $\lim_{x\to 0^-} f(x) = 0, f(0) = 0$

$$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} x \sin\left(\frac{1}{x}\right)$$
$$\lim_{x\to 0} h \sin\left(\frac{1}{h}\right) = 0$$
$$\lim_{x\to 0^-} = \lim_{x\to 0^+} = f(0)$$

So, $f(x)$ is continuous at $x = 0$
Again $\sin(\infty)$
An oscillating value between -1 and 1

28. A particle P starts from the point $z_0 = 1 + 2i$, where $i = \sqrt{-1}$. It moves first horizontally away from the origin by 5 units and then vertically away from the origin by 3 units to reach a point z_1 from z_2 the particle moves $\sqrt{2}$ units in the direction on a circle with centre at the origin, to reach a point z_2 . the point z_2 is given by

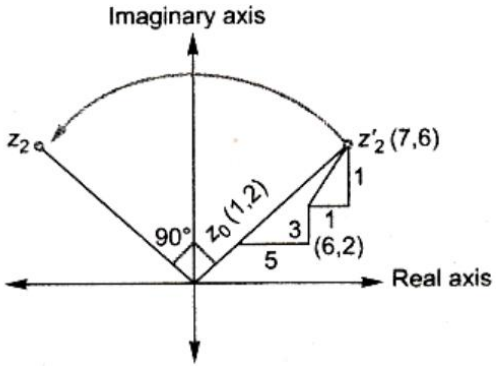
(a)$6 + 7\hat{\imath}$ (b)$-7 + 6\hat{\imath}$
(c)$7 + 6\hat{\imath}$ (d)$-6 + 7\hat{\imath}$

It is given the CE is in the direction of vector $i + j$ which makes 45° with $x - axis$. also, $CE = \sqrt{2}$

$$CD = DE = 1unit$$

So, the coordinates of E are (7,6).
OE is rotated through an angle $\frac{\pi}{2}$ in anticlockwise
Direction to reach an point $F(z_2)$

$$z_2 = OEe^{\frac{in}{2}}$$
$$= (7 + 6i)i$$
$$-6 + 7i$$



29. Let $x_i, i = 1,2, \ldots n$ be n observations and $w_i = px_i + k, i = 1,2, \ldots n$ where p and k are constants. If the mean of $x_i's$ is 48 and standard deviation is 12, whereas the mean of $w_i's$ is 55 and standard deviation is 15, then values of p and k should be

(a)$p = 1.25, k = -5$ (b) $p = -1.25, k = 5$
(c) $p = 2.5, k = -5$ (d) $p = 25, k = 5$

We have

$$w_i = px_i + k, i = 1,2, \ldots n$$
$$\sum_{i=1}^{n} w_i = p\sum_{i=1}^{n} x_i + nk$$

$$\frac{1}{n}\sum_{i=1}^{n} w_i = p\left(\frac{1}{n}\sum_{i=1}^{n} x_i\right) + k$$
$$55 = 48p + k \quad \ldots i$$

Again, $w_i = px_1 + k$

$$\text{var}(w_i) = p^2\,\text{var}(x)$$
$$\sigma_w = |p|\sigma_x$$
$$15 = 12\,|p|$$
$$p = \pm 125$$
$$p = 1.25 \Rightarrow k = -5$$
$$p = -1.25 \Rightarrow k = 115$$

30. If $a, a_1, a_2, a_3, \ldots, a_{2n-1}, b$ are in AP, $a, b_1, b_2, b_3, \ldots, b_{2n-1}, b$ are in GP and $a, c_1, c_2, c_3, \ldots, c_{2n-1}$ are in HP, where a,b are positive, then the equation $a_n x^2 - b_n x + c_n = 0$ has its roots
(a)Real and equal (b) Real and unequal
(c)imaginary (d) one real and one imaginary
As odd number of AM, G .M and H.M. are inserted between a & b.
So, middle term of AP is $AM = a_n$

middle term of GP is $GM = b_n$
middle term of HP is $HM = c_n$
$\therefore a_n, b_n, c_n$ are in GP
are in G.P.
$\therefore$D= discriminant of quadratic equation < 0
$\therefore$ roots are imaginary.

31. If a, b, c are in GP and $\log a - \log 2b, \log 2b - \log 3c$ and $\log 3c - \log a$ are in AP , then a,b,c are the lengths of the sides of a triangle which is
(a)Acute angled(b) obtuse angled
(c)Right angled (d)Equilateral
We have a, b, c are in GP

$$b^2 = ac$$

Also , $\log a - \log 2b$, $\log 2b - \log 3c$, $\log 3c - \log a$ are in AP
$$= (\log 2b - \log 3c)(\log a - \log 2b)$$
$$= 2\log 2b - \log 3c - \log a$$
$$= 2\log 3c - \log a - \log 2b$$
$$\log 2b = \log 3c$$
$$2b = 3c$$
$$b = \frac{3}{2}c$$
$$b^2 = ac$$
$$a = \frac{9}{4}c$$

A is greatest side
Now , $\cos A = \frac{b^2+c^2-a^2}{2bc} < 0$
$\angle A$ is obtuse angle.
$so, \Delta ABC$ is obtuse angled triangle.

32. If $(1 + x - 2x^2)^6 = 1 + a_1 x + a_2 x^2 + \cdots + a_{12} x^{12}$ the of $a_2 + a_4 + a_6 + \cdots + a_{12}$ is
(a) 29 (b) 30 (c) 31 (d)32

$$(1 + x - 2x^2)^6 = 1 + a_1 x + a_2 x^2 + \cdots + a_{12} x^{12}$$

$put\ x = 1$ we get

$$(1 + 1 - 2x^2)^6 = 1 + a_1 + a_2 + \cdots + a_{12}$$
$$1 + a_1 + a_2 + \cdots + a_{12} = 0 \quad \ldots i$$

Put $x = -1$, we get

$$1 - a_1 + a_2 + \cdots + a_{12} = 64 \quad \ldots ii$$

Add equ. 1 and ii, we get

$$2(1 + a_1 + a_2 + \cdots + a_{12}) = 64$$
$$a_2 + a_4 + \cdots + a_{12} = 31$$

33. If a man purchases a raffle ticket, he can win a first prize of Rs. 5,000 or a second prize of Rs. 2,000 with probabilities 0.001 and 0.003 respectively. What should be a fair price to pay for the ticket ?

(a)Rs. 11 (b) Rs. 15
(c)Rs. 2000 (d) none

Let the winning price be x and $P(X)$ be its probability, then

x	5000	2000
P(x)	0.001	0.003

Now, fair price of the cricket = E(x)

$$\Sigma x P(x)$$
$$= 5000 \times 0.001 + 2000 \times 0.003$$

Fair price of the ticket is Rs11.

34. If the mean deviation of the number $1, 1+d, 1+2d, \ldots, 1+100d$ from their mean is 255 , then d is equal to
(a) 10.1 (b) 10.2 (c) 10.3 (d) 10.4

$$mean\ \bar{x} = \frac{sum\ of\ quantities}{n}$$
$$\frac{\frac{n}{2}(a+1)}{n} = \frac{1}{2}[1+1+100d] = 1+50d$$

M.D= $\frac{1}{n}\Sigma|x_i - \bar{x}|$

$$255 = \frac{1}{101}[50d + 49d + 48d + \cdots d + 0 + d + \cdots + 50d]$$
$$\frac{2d}{101}\left[\frac{50 \times 51}{2}\right]$$
$$d = \frac{255 \times 101}{50 \times 51} = 10.1$$

35. Let S be the set $\{a \in Z^+ : a \leq 100\}$. if the equation $[\tan^2 x] - \tan x - a = 0$ has real roots (where [.] is the greatest integer function), then the number of element in S is
(a)10 (b)8 (c)9 (d)0

$$[\tan^2 x] - \tan x - a = 0$$

$[\tan^2 x]$ and 'a' are integers, so $\tan x$ must be integer, so

$$[\tan^2 x] = \tan^2 x$$

Now, $[\tan^2 x] - \tan x - a = 0$

$$a = \tan x\,(\tan x - 1)$$

$a \in z^+$ and $a \leq 100$ and $\tan x \in I$
Possible values of

$$a = 2,6,12,20,30,42,56,72,90$$
$$n(S) = 9$$

36. $\vec{a}$ and $\vec{b}$are non zero non collinear vectors such that $|\vec{a}| = 2, \vec{a}.\vec{b} = 1$ and the angle between $\vec{a}$ and$\vec{b}$ is $\frac{\pi}{3}$. if $\vec{r}$ is any vector satisfying $\vec{r}.\vec{a} = 2, \vec{r}.\vec{b} = 8, (\vec{r} + 2\vec{a} - 10\vec{b}).(\vec{a} \times \vec{b}) = 6$ and $\vec{r} + 2\vec{a} - 10\vec{b} - \lambda(\vec{a} \times \vec{b})$, then $\lambda =$
(a)1/2 (b)2 (c)3 (d)$\frac{4}{\sqrt{3}}$

$(\vec{r} + 2\vec{a} - 10\vec{b}).(\vec{a} \times \vec{b}) = 6$ and $\vec{r} + 2\vec{a} - 10\vec{b} - \lambda(\vec{a} \times \vec{b})$
Putting value of $(\vec{r} + 2\vec{a} - 10\vec{b})$
$\lambda(a \times b)$ in equ. I

$$\lambda(a \times b).(a \times b) = 6$$
$$\lambda(a \times b)^2 = 6$$
$$\lambda|a \times b|^2 = 6$$

Now, from Lagrange's identity theorem,

$$|a \times b|^2 = |a|^2|b|^2 - (a.b)^2$$

Given ,$|a| = 2, a.b = 1$ and angle between a and b is $\frac{\pi}{3}$.

$$a.b = 1$$
$$|a||b|\cos\theta = 1$$
$$2\,|b|\cos\frac{\pi}{3} = 1$$
$$|b| = 1$$

Putting all the values in equ. Iii, we get

$$\lambda[(2)^2(1)^2 - 1^2] = 6$$
$$\lambda[4-1] = 6$$

$$3\lambda = 6$$
$$\lambda = 2$$

37. If $\int_{\log 2}^{x} \frac{1}{\sqrt{e^x-1}}dx = \frac{\pi}{6}$, then x =
(a)log 4 (b)2 log 2 (c)3 log 2 (d)4 log 2

$$\int_{\log 2}^{x} \frac{1}{\sqrt{e^x-1}}dx = \frac{\pi}{6}$$
$$e^x - 1 = t^2$$
$$e^x = t^2 + 1$$
$$e^x dx = 2t\,dt$$
$$dx = \frac{2t}{t^2+1}dt$$

Now , as

$$x = \log 2$$
$$t^2 = e^{\log 2} - 1$$
$$e^t - 1 = t^2$$
$$t = \sqrt{e^x - 1}$$
$$e^x = 4$$

Taking log on both sides,

$$x \log_e e = \log_e 4$$
$$x = 2\log_e 2$$

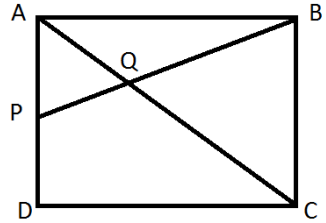
38. If S and S' are foci of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ B is the end of the minor axis and BSS' is an equilateral triangle , then the eccentricity of the ellipse is
(a)1/2 (b)1/3 (c)1/4 (d)1/5
$s = (ae, 0), T = (-ae, 0)$ and $B = (0, b)$
Since triangle is ewquilateral

$$ST = TB \Rightarrow ST^2 = TB^2$$
$$(2ae)^2 = (ae)^2 + b^2$$
$$\frac{b^2}{a^2} = 3e^2 \ \ldots i$$

thus eccentricity of the ellipse is,

$$e^2 = 1 - \frac{b^2}{a^2} = 1 - 3e^2$$
$$e = \frac{1}{2}$$

39. In a parallelogram ABCD, P is the midpoint of AD. Also, BP and AC intersect at Q. then AQ : QC=
(a)1:3 (b)3:1 (c)2:1 (d)1:2



Join AC and BP. Then clearly $\angle AQP = \angle CQB$

$$AD = BC$$
$$\frac{AP}{BC} = \frac{AP}{AD} = \frac{1}{2}$$
$$\frac{AQ}{QC} = \frac{1}{2}$$

40. Let $p(x)$ be a quadratic polynomial such that $p(0) = 1$. if $p(x)$ leaves remainder 4 when divided by $x - 1$ and it leaves remainder 6 when divided by $x + 1$, then
(a)$p(-2) = 11$ (b)$p(2) = 11$
(c)$p(2) = 19$ (d)$p(-2) = 19$

$$P(x) = ax^2 + bx + c$$
$$P(0) = 1 \Rightarrow c = 1$$
$$P(1) = 4$$

$$P(-1) = 6$$
$$a + b + c = 4$$
$$a - b + c = 6$$

Subtracting the above equation, we get $2b = -2 \Rightarrow b = -1$
Adding the above two equation and putting values of c, we get

$$2(a + c) = 10$$
$$a = 4$$

Putting the value in the specified general equation,

$$P(x) = 4x^2 - x + 1$$

$$P(-2) = 16 + 2 + 1 = 19$$

41. The tangent at the point (2,-2) to the curve $x^2y^2 - 2x = 4(1 - y)$ does not pass through the point
(a)$(-2, -7)$ (b)$(-4, -9)$
(c)$\left(4, \frac{1}{3}\right)$ (d)(8,5)

$$x^2y^2 - 2x = 4(1 - y)$$
$$2xy^2 + 2y.x^2.\frac{dy}{dx} - 2 = -4.\frac{dy}{dx}$$
$$\frac{dy}{dx}(2y - x^2 + 4) = 2 - 2x.y^2$$
$$\frac{dy}{dx}_{2,-2} = \frac{2 - 2 \times 2 \times 4}{2(-2) \times 4 + 4} = \frac{+14}{+12} = \frac{7}{6}$$

Equ. Of tangent : $(y + 2) = \frac{7}{6}(x - 2) \Rightarrow 7x - 6y = 26$
$(-2, -7)$ does not satisfy above eq.

42. The curve satisfying the differential equation, $ydx - (x + 3y^2)dy = 0$ and passing through the point (1,1) also passes through the point
(a)$\left(\frac{1}{4}, \frac{1}{2}\right)$ (b)$\left(\frac{1}{4}, -\frac{1}{2}\right)$
(c)$\left(-\frac{1}{3}, \frac{1}{3}\right)$ (d)$\left(\frac{1}{3}, -\frac{1}{3}\right)$
Write the given differential equation as

$$\frac{dx}{dy} + \left(-\frac{1}{y}\right)x = 3y$$
$$e^{\int -\frac{1}{y}dy} = e^{-\ln y} = \frac{1}{y}$$

Multiply 1 by $\frac{1}{y}$ to obtain

$$\frac{d}{dy}\left(\frac{1}{y}x\right) = 3$$
$$\frac{x}{y} = 3y + c$$

As it passes through (1,1), we get

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

It passes through $\left(-\frac{1}{3}, \frac{1}{3}\right)$

43. $\lim_{x \to 3} \frac{\sqrt{3x} - 3}{\sqrt{2x - 4} - \sqrt{2}}$ is equal to
(a)$\sqrt{3}$ (b)$\frac{\sqrt{3}}{2}$ (c)$\frac{1}{2\sqrt{2}}$ (d)$\frac{1}{\sqrt{2}}$

$$= \lim_{x \to 3} \frac{\sqrt{3x} - 3}{\sqrt{2x - 4} - \sqrt{2}}$$

Rationalize

$$= \lim_{x \to 3} \frac{(3x - 9) \times (\sqrt{2x - 4} + \sqrt{2})}{\{\sqrt{2x - 4} - \sqrt{2}\} \times (\sqrt{3x} + 3)}$$
$$\frac{3}{2} \times \frac{2\sqrt{2}}{6} = \frac{1}{\sqrt{2}}$$

44. Number of onto (surjective) functions from A to B if $n(A) = 6$ and $n(B) = 3$ is
(a)$2^6 - 2$ (b)$3^6 - 3$

(c)340 (d)540

Number of onto functions from A to B if $(A) = m, n(B) = n$ and $1 \leq n \leq m$ are equal to $\sum_{r=1}^{n}(-1)^{n-r} \quad {}^{n}C_r r^m$ here $n = 3, m = 6$

$$number\ of\ onto\ functions = \sum_{r=1}^{3}(-1)^{3-r} \quad {}^{3}C_r r^6$$

$$(3)^6 - 3 \times 2^6 + 3 = 3((3)^5 - 2^6 + 1) = 540$$

45. If $A > 0, B > 0$ and $A + B = \frac{\pi}{6}$, then the minimum value of $\tan A + \tan B$ *is*

(a)$\sqrt{3} - \sqrt{2}$ (b)$4 - 2\sqrt{3}$

(c)$2/\sqrt{3}$ (d)$2 - \sqrt{3}$

We have $A > 0, B > 0$ and $A + B = \frac{\pi}{6}$ therefore,

$$\tan A + \tan B = \frac{\sin A}{\cos A} + \frac{\sin B}{\cos B}$$
$$= \frac{\sin(A+B)}{\cos A \cos B}$$
$$= \frac{1}{2\cos A \cos B}$$
$$= \frac{1}{\cos(A+B) + \cos(A-B)}$$
$$= \frac{1}{\frac{\sqrt{3}}{2} + \cos(A-B)}$$

For the maximum value of $\tan A + \tan B$, $A = B$. therefore , from the above equation we get

$$\frac{1}{\frac{\sqrt{3}}{2} + 1} = \frac{2}{2 + \sqrt{3}}$$
$$= 2\left(2 - \sqrt{3}\right) = 4 - 2\sqrt{3}$$

46. The mean of 5 observations is 5 and their variance is 124. if three of the observations are 1, 2,6 then the mean deviation from the mean of the data is

(a) 2.5 (b) 2.6 (c) 2.8 (d) 2.4

Let the other two number be x and y.

Given, Variance, $\sigma^2 = 12.4$

Mean $\bar{x} = 5$

$$n = 5$$
$$\frac{1 + 2 + 6 + x + y}{5} = 5$$
$$x + y = 16$$

Now,

$$12.4 = \frac{16 + 9 + 1 + (x-5)^2 + (y-5)^2}{5}$$
$$= (x-5)^2 + (16 - x - 5)^2 = 12.4 \times 5 - 26$$
$$x^2 - 16x + 55 = 0$$
$$x = 5\ or\ x = 11$$

Hence, $y = 11\ or\ y = 5$

So, mean deviation $= \frac{(4+3+1+0+6)}{5} = 2.8$

47. In a beauty contest, half the number of experts voted Mr. A and two thirds voted for Mr. B. 10 voted for both and 6 did not for either. How many experts were there in all?

(a) 18 (b) 36 (c) 24 (d) none

Let the total number of experts be N.

E is the set of experts who voted for miss A.

F is the set of experts who voted for miss B.

Since 6 did not vote for either, $n(E \cup F) = N - 6$.

$n(E) = \frac{N}{2}, n(F) = \frac{2}{3}N$ and $n(E \cup F) = 10$

Solving the above equation gives $\frac{N}{6} = 4 \Rightarrow N = 24$

48. The value of non zero scalars α and β such that for all vectors $\vec{a}$ and $\vec{b}$ such that $\alpha\left(\vec{a} + 2\vec{b}\right) - \beta\vec{a}\left(4\vec{b} - \vec{a}\right) = 0$ is

(a)$\alpha = 0, \beta = 0$ (b) $\alpha = -2, \beta = -3$

(c) $\alpha = 1, \beta = 3$ (d) *none*

$$\alpha(\vec{a} + 2\vec{b}) - \beta\vec{a}(4\vec{b} - \vec{a}) = 0$$
$$(\alpha + \beta)a + (2\alpha - 4\beta)b = 0$$
$$(\alpha + \beta) = 0, (2\alpha - 4\beta) = 0$$
$$(\alpha + \beta) = 0, and\ (\alpha - 2\beta) = 0$$
$$\alpha = \beta = 0$$

49. A force of 78 grams acts at the point (2,3,5)the direction ratios of the line of action being 2,2,1 the magnitude of its moment about the line joining the origin to the point (12,3,4) is
(a)24 (b)36 (c)136 (d)0
Let F be the force
Then $F = \frac{78(2i+2i+k)}{\sqrt{4+4+1}} = \frac{78}{3}(2i + 2j + k)$

$$F = 28(2i + 2j + k)$$

Force acts at point $P(2,3,5)$ the moment of F acting at P about a line in the direction $(12i + 3j + 4k)$ is equal to $OP = 2i + 3j + 5k$

$$M = OP \times F = 26\begin{vmatrix} i & j & k \\ 2 & 3 & 5 \\ 2 & 2 & 1 \end{vmatrix}$$
$$= 26(-7i + 8j - 2k)$$

Let a be unit vector in the direction $12i + 3j + 4k$

$$a = \frac{12i + 3j + 4k}{|12i + 3j + 4k|} = \frac{1}{13}(12i + 3j + 4k)$$

The moment of F about the given line is $M.a = 26(-72i + 8j - 2k).\frac{1}{13}(12i + 3j + 4k)$

$$2(-84 + 24 - 8) = -136$$

50. Number of real solutions of the equation $\sin e^x = 5^x + 5^{-x}$ is
(a)1 (b)2 (c)0 (d)infinitely many

$$\sin e^x = 5^x + 5^{-x}$$
$$L.H.S = \sin e^x < 1$$

And R.H.S $= 5^x + 5^{-x} \geq 2$
Therefore
$\sin e^x = 5^x + 5^{-x}$ has no solution

51. **Statement – I :** out of total of 200 readers, 100 read Indian express, 120 read times of India and 50 read Hindu
Statement – II: out of a total of 200 readers 100 read Indian express, 120 read times of India and 50 read neither.
How many people (from the group surveyed)read both Indian Express and Times of India?
(a)the question can be answered with the help of statement II. Alone
(b)Both , statement I and Statement Ii are needed to answer the question
(c)the question can be answered with the help of statement I alone
(d)the question cannot be answered even with the help of both the statements.

52. Study the information carefully and answer the question given below:
If we arrange the alphabets in the word "RATE" in the English alphabetical order, word "AERT" is formed. Then the third alphabet form the left in this word is "R" form the word "OPEN" we get – "ENOP" and the third alphabet from left is "O". from the word "CHEF" we get – "CEFH" and the third alphabet form left is "F" . form the word "TYER" we get "ERTY" and the third alphabet from left is "T: from the word "TOY" we get – "OTY" and the third alphabet from left is "Y" if we use all these letters, then a meaningful English word "FORTY" can be formed .
Now find which of the following word set DOES NOT give a meaningful word in the similar way
(a)SAME, ROOM, BEST, AUTO
(b)GOAT, PEST, WATT, ARMY
(c)MALE, FIND, LOST, THAT
(d)JUMP, LIME, DUMB, SOME

53. If the point $P(a^2, a)$ lie in the region corresponding to the acute angle between the lines, $2y = x\ and\ 4y = x$, then find the value of a or the range in which a lies.
(a)$a \in (2,6)$ (b) $a \in (4,6)$
(c)$a \in (2,4)$ (d)$a \in (10,14)$

$$u = x - 2y, v = x - 4y$$

Joint eq's

$$u.v = 0$$
$$(x - 2y)(x - 4y) = 0$$
$$x(x, y) = x^2 - 6xy + 8y^2 = 0$$

If point $p(a^2, a)$, lies in interior of awte angle formed by these
Then $s(x, y)\ at\ p(a^2, a) < 0$

$$(a^2)^2 \mp a^2 - a + 8a^2 < 0$$
$$a^2(a^2 - 6a + 8) < 0$$
$$(a^2 - 6a + 8) < 0$$
$$(a - 2)(a - 4) < 0$$
$$a \in (2,4)$$

54. Some friends planned to contributes equally to jointly buy a CD player. However, two of them decided to withdraw at the last minute. As a result, each of the others had shell out one rupee more than what they had planned for. If the price (in Rs.) of the CD player is an integer between 1000 and 1100 , find the number of friends who actually contributed?
(a)44 (b)23 (c)21 (d)46
We will assume the friends to be x and the contribution they are going to make be y
so,

$$xy = (x - 2)(y + 1)$$
$$= xy - 2y + x - 2$$
$$x = 2(y + 1)$$

Here are the possible values of y,x and yx:

$$y = 21,22,23,24$$
$$x = 44,46,48,50$$
$$xy = 920, 1012, 1104, 1200$$
$$1000 < xy < 1100\ (y, x)$$
$$= (22,46)$$

which will be x = 46
So the number of friends would be $x - 2 = 44$

55. Two liquids A and B are in the ratio 5 : 1 in container 1 and 1 : 3 in container 2 respectively. In what ratio should the contents of the two containers be missed so as to obtain a mixture of A and B in the ratio 1 : 1?
(a)2:3 (b)4:3 (c)3:2 (d)3:4
Let each part be x.

$$Vol\ of\ A = 5x;$$
$$Vol\ of\ B = x;\ Total\ Vol = 6x.$$

Container 2:
Let each part be y.

$$Vol\ of\ A = y;$$
$$Vol\ of\ B = 3y;$$
$$Total\ Vol = 4y.$$

After Mixing:

$$Vol\ of\ A = 5x + y$$
$$Vol\ of\ B = x + 3y$$

As Ratio of A:B is 1:1, hence

$$5x + y = x + 3y$$
$$2x = y$$

So,
Ratio of Total Vol 1 : Total Vol 2 =

$$\frac{6x}{4y}$$
$$= 6x / 4(2x)$$
$$= 6/8 = 3/4.$$

56. Fresh grapes contain 90% by weight while dried grapes contain 20% water by weight. What is the weight of dry grapes available from 20 kg of fresh grapes?
(a)2.5kg (b)2.4kg (c)2kg (d)10kg
The weight of non-water in 20 kg of fresh grapes (which is 100-90=10% of whole weight) will be the same as the weight of non-water in x kg of dried grapes (which is 100-20=80% of whole weight), so

$$20 * 0.1 = x * 0.8$$
$$20 * 0.1 = x * 0.8 \text{ --> } x = 2.5$$
$$x = 2.5.$$

DIRECTIONS FOR QUESTIONS 61 AND 62 ANSWER THE QUESTIONS ON THE BASIS OF TE IMFORMATION GIVEN BELOW:

A,B,C,D,E, and F are a group of friends . there are two housewives, on professor, on engineer, one accountant and one lawyer in the group . there are only two married couples in the group . the lawyer is married to D, who is a housewife. No woman in the group is either an engineer or an accountant. C, the accountant, is married to F, who is a professor. A is married to a housewife. E is not a housewife.

57. What is E's profession ?
(a)Accountant (b)Lawyer
(c)Professor (d)Engineer

58. How many members of the group are males?
(a)4 (b)2 (c)3 (d)cannot be determined

59. How may 4 digit numbers can be formed from the digit 2,3,5,6,7 and 9 , which are divisible by 5 and none of the digits is repeated?
(a)216 (b)60 (c)24 (d)25
Here given the required digit number is 4 digit.
It must be divisible by 5. Hence, the unit's digit in the required 4 digit number must be 0 or 5. But here only 5 is available.
x xx 5
The remaining places can be filled by remaining digits as 5 x 4 x 3 ways.
Hence, number 4-digit numbers can be formed are 5 x 4 x 3 = 20 x 3 = 60.

60. A dealer offers a cash discount of 20% and still makes a profit of 20% when he further allows 16 articles to a dozen to a particularly sticky bargainer. How much above the actual price was the listed price of the article?
(a)100% (b)80%(c)75% (d)66%
Let the cost price (CP) be x.
As dealer makes a profit of 20%,
selling price (SP) = 1.2x
But the dealer incurs loss by selling 16 articles at the cost of 12 articles.
So, SP of 16 articles = CP of 12 articles
Loss = 25%
Now, SP = 1.6x
80% of marked (or list) price (MP) = 1.6x
MP = 2x
Hence, list price is 100% above cost price.

Question 56,57 and 58 are based on the following :
Twelve classmates A, B, C, D, E, F, G, H, I, J, K and L are sitting on a square table with 3 persons on each side, ABC and GJK are sitting on opposite side A and L are adjacent to each other but not on the same side. D and E are on the same side but not adjacent to each other. K is sitting diagonally opposite to C .

61. If F is sitting between D and E , who is sitting to the left of K ?
(a)H (b)I (c)H or I(d)None

62. If H is sitting between L and F, then he will be facing
(a)D (b)E (c)G (d)I

63. If G and E are facing C and H respectively , the neighbors of k are
(a)J and H (b)J and E
(c)H and J (d)H and E

64. A clock is set right at 5 AM. The clock loses 16m in 24th . what will be the night time when the clock indicates 10pm on the 4th day?
(a)11.15pm (b)11.00 pm
(c)12.00pm (d)12.30pm
Time from 5 am. on a day to 10 pm. on 4th day = 89 hours.
Now 23 hrs 44 min. of this clock = 24 hours of correct clock.
356/15 hrs of this clock = 24 hours of correct clock
89 hrs of this clock = (24 x 31556 x 89) hrs of correct clock.
= 90 hrs of correct clock.
So, the correct time is 11 p.m

65. A train overtakes two persons who are walking in the same direction in which the train is moving at the rate of 2kmph and 2kmph and passes them completely in 9 and 10 seconds respectively . then length of the train is
(a)72m (b)54m(c)50m (d)45m
2 kmph= $\left(2 \times \frac{5}{18}\right) \frac{m}{sec} = \frac{5}{9} \frac{m}{sec}$
4 kmph= $\left(4 \times \frac{5}{18}\right) \frac{m}{sec} = \frac{10}{9}\ m/sec$

Let the length of the train be x metres and its speed by y m/sec

Then , $\left(\frac{x}{y-\frac{5}{9}}\right) = 9 \; and \; \left(\frac{x}{y-\frac{10}{9}}\right) = 10$

$$9y - 5 = x \; and \; 10(9y - 10) = 9x$$

$9y - x = 5$ and $90y - 9y = 100$

On solving, we get : $x = 50$

Length of the train is 50m.

66. Ten point are marked on a straight line and eleven point are marked on another straight line. How many triangles can be constructed with vertices from among the above points?

(a)495 (b)550 (c)1045 (d)2475

Triangle is formed by picking 3 point 2 from 1st line and 1 from 2nd of 1 point from 1st line or 2 from 2nd i.e.

$$^{10}C_2 \times \; ^{11}C_1 + \; ^{10}C_1 \times \; ^{11}C_2$$

$$\frac{10!}{2!\,8!} \times \frac{11!}{1!\,10!} + \frac{10!}{1!\,9!} \times \frac{11!}{2!\,9!}$$

$$45 \times 22 + 10 \times 55$$

$$495 + 550 = 1045$$

67. Three cities A, B, C are equidistant from each other. A motorist travels from A to B at 30km/hour, from B to Cat 40km/hour and from C to A at 50km/hour. Then the average speed is

(a)39km/hour (b)40km/hour (c)38.3km/hour (d)37.6km/hour

68. Four friends A, B, C and D need to cross a bridge in the night. A maximum of 2 people can cross at a time. They have only one lamp. A takes one minute to cross the bridge. B takes 2 minutes, C takes 8 minutes and D takes11 minutes to cross the bridge respectively. A pair must walk together at the speed of the person who walks slowly. What is the minimum time required to cross the bridge by all the four people?

(a)23 minutes (b) 20 minutes (c)18 minutes (d) 16 minutes

A, being the fastest among them will working for showing path, all the time.

At first,

A___ time = 2 min(time by B)

B __/

Now, A comes back , taking 1 minute. Total till now = 2 + 1 = 3 min

A___ time = 8 min(time by C)

C__/

Now, again A come back, taking 1 min, total = 3 + 8 + 1 = 12 min

A___ time = 11 min(time by D)

D__/

As, now, there is none left. A won't return. So total time = 12 + 11 = 23 min

69. In a city, 40.1% of the adults are illiterate while 85.1%of the children are literate. If the ratio of the adults to that of the children is 2:3, then what percent of the population is literate?

(a)20% (b) 25% (c)50% (d) 75%

Percentage of illiterate adults = 40.1% ≈ 40%

Percentage of literate children = 85.1% ≈ 85%

The ratio of the adults to that of children = 2 : 3

Calculations:

Let the total adult be 2x and children be 3x

Total population = 2x + 3x = 5x

Total illiterate adults = 2x × 40/100 = 4x/5

Total literate adults = 2x – 4x/5 = 6x/5

Total literate children = 3x × 85/100 = 51x/20

Total literate = (6x/5) + (51x/20)

⇒ (24x + 51x)/20 = 75x/20

Percent of the literate population = ((75x/20) ÷ 5x) × 100 = 75%

∴ Percent of the literate population is 75%

70. A runs $1\frac{2}{3}$ times as fast as B. If A gives B a start of 80m,how far must the winning post be so that A and B mightreach it at the same time?

(a)200 m (b) 400 m (c)300 m (d) 160 m

Ratio of speeds of A and $B = \frac{5}{3} : 1 = 5 : 3$

Thus, in race of 5m, A gains 2m over B 2m are gained by A in a race of 5m 80m will be gained by A in a race of

$$\left(\frac{5}{2}\times 80\right)m = 200\,m$$

∴ Winning post is 200 m away from the starting point

71. A person's present age is two fifth of the age of his mother. After 8 years, he will be one-half of the age of his mother. What is the present age of his mother?
(a)60 years (b) 50 years (c)40 years (d) 30 years
Let the mother's present age be x years.
Then, the person's present age

$$= \frac{2}{5}x\ years$$

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

72. Mr. Kumar drives to work at an average speed of 48Km/hr. The time taken to cover the first 60% of the distance is 10 minutes more than the time taken to
cover the remaining distance. How far is his office?
(a)30 Kms (b) 40 Kms
(c)45 Kms (d) 48 Kms
Let the total distance to cover = x
Speed = 48km
60 % distance = 0.6x
remaining = 0.4 x

$$Time = \frac{distance}{speed}$$

Time taken to cover 60% distance is 10 min more than to cover 40% distance
Thus

$$\frac{0.6x}{48} = \frac{0.4x}{48} + \frac{10}{60}$$
$$\frac{0.2x}{48} = \frac{1}{6}$$
$$0.2x = 8$$
$$x = 40$$

so office is 40 km far.

73. Two pipes A and B can fill the cistern in 37.5 minutes And 45 minutes respectively. Both pipes are opened. The Cistern will be filled in just half an hour, if the B is turned off after:
(a)5 minutes (b) 9 minutes
(c)10 minutes (d) 15 minutes
Let B be turned off after x minutes.
Then, Part filled by (A + B) in x min. + Part filled by A in (30 - x) min. = 1

$$x\left(\frac{2}{75}+\frac{1}{45}\right) + (30-x).\frac{2}{75} = 1$$
$$\frac{11x}{225} + \frac{60-2x}{75} = 1$$
$$11x + 180 - 6x = 225$$
$$x = 9$$

74. In a certain code, DOES is written as 5$3% and SITE is written as %4#3. How is EDIT written in that code?
(a)3#4$ (b) %3#5
(c)354# (d) 4#5$

75. In a shower, 5 cm of rain falls. The volume of water that falls on 1.5 hectares of ground is:
(a)75 cubic meter (b)750 cubic meter (c)7500 cubic meter (d)75000 cubic meter
1 hectare $= 10000m^2$
So, Area $= (1.5 \times 10000)m^2$

$$= 15000m^2$$
$$Depth = \frac{5}{100}m = \frac{1}{20}m$$
$$volume = (Area \times Depth)$$

$$\left(15000 \times \frac{1}{20}\right) m^3$$
$$750\ m^3$$

Direction(60-61) Eight friends A through H, are sitting around a circular table, playing a game of cards. They belong to two different teams X and Y. No two persons of the same team sit in adjacent seats.

- A sits neither opposite to D nor to H but is sitting in between C and G.
- B sits neither opposite to A nor to G but is sitting in Between F and D.
- B and H belong to team X and D sits opposite to E

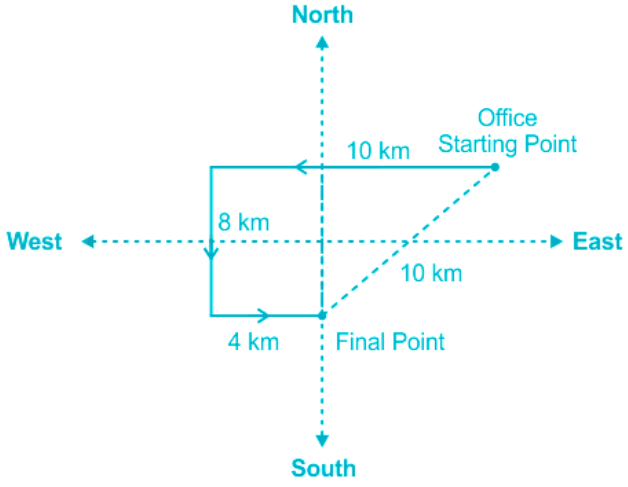
76. Who are the members of team X?
(a)A, D, F and E (b) B, H, C and E (b)B, D, H and G (d) B, H, C and G

77. Who are sitting adjacent to E?
(a)B and H (b) B and G (c)H and G (d) H and C

78. Fill in the blank in the series: ELFA, GLHA, ILJA, _____,MLNA:
(a)OLPA (b) KLMA
(c)LLMA (d) KLLA
The second and forth letters in the series, L and A, are static. The first and third letters consist of an alphabetical order beginning with the letter E.

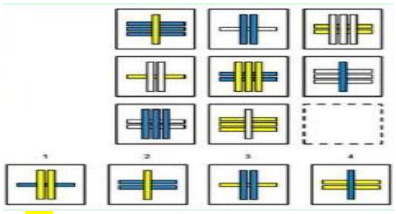
79. It was 9.35 AM in Garvita's watch, which kept correct time, when Manya informed her that the last bus left the bus stop at 9.25 am. Manya's watch is 5 min fast. The frequency of the bus is every 20 min. For how long Garvita must wait to catch the next bus?
(a)5 min (b) 10 min
(c)15 min (d) 20 min
It was 9.35 AM in Garvita's watch, which kept correct time.
Manya informed her that the last bus left the bus stop at 9.25 am. Manya's watch is 5 min fast.
So, the actual time when the bus left the bus stop = 9:25 – 0:05 AM
= 9:20 AM
The frequency of the bus is every 20 min.
So, the next bus will arrive at bus stop at 9:40 AM.
As it was 9.35 AM in Garvita's watch, she should wait 5 more minutes to catch the next bus.
Hence, '5 min' is the correct answer.

80. Rishabh stops after going 10 Km towards west from his office. Then he goes 8 Km turning to his left. After this he goes 4 Km turning to his left. How far is he from the fixed point?
(a)18 Km (b) 8 Km
(c)10 Km (d) None of these



Distance between his starting point and final point = $\left(\sqrt{\{\{8^2\} + \{6^2\}\}}\right) km$
$= \left(\sqrt{\{64 + 36\}}\right) km$
$= \left(\sqrt{\{100\}}\right) km$
= 10 km
Hence, '10 km' is the correct answer

81. Which of the four options should fill the missing cell?



(a)1 (b) 2 (c)3 (d) 4

82. If there are no dancers that aren't slim and no singers that aren't dancers, then which statements are always true? Choose the correct answer.
(a)There is not one slim person that isn't a dancer.
(b)All singers are slim.
(c)Anybody slim is also a singer.
(d)None of the above.
If there are no dancers that aren't slim → Implies all dancers are slim.
No singers that aren't dancers → All singers are dancers.
Thus from the above two it can be concluded that all singers are dancers and all dancers are slim, so all singers are slim.
1) There is not one slim person that isn't a dancer. → False (It is possible but not definite)
2) All singers are slim → True (It is definite)
3) Anybody slim is also a singer → False (It is possible but not definite)
4) None of the above. → False (As option 2 is true)
Hence, 'All singers are slim' is the correct answer.

83. If in a certain language, ITNIETAM is the code for INTIMATE, which word has the code TREVNIETARBI?

(a)INVRETIBRATE (b) INVERTIBARTE (c)INVERTIBRATE (d) INVERTIBRETA

84. Sum of ages of Anu and Bhanu is 10 years more than sum of ages of Bhanu, Chanu and Dhanu. Average age of Chanu and Dhanu is 19 years. Find the average age of Anu and Dhanu if Dhanu is 10 years elder than Chanu.
(a)36 years (b) 30 years (c)25 years (d) 31 years
Sum of ages of Anu and Bhanu is 10 years more than sum of ages of Bhanu, Chanu and Dhanu.
Bhanu + Chanu + Dhanu + 10 = Anu + Bhanu
=>Chanu + Dhanu + 10 = Anu ____ <i>
Average age of Chanu and Dhanu is 19 years.
(Chanu + Dhanu) / 2 = 19
Chanu + Dhanu = 19 × 2 years
Chanu + Dhanu = 38 years ____ <ii>
Putting the value of <ii> in <i>, we get:
38 + 10 = Anu
So, age of Anu is 48 years
Dhanu is 10 years elder than Chanu.
Dhanu – 10 = Chanu ___ <iii>
Putting the value of <iii> in <ii>, we get:
Dhanu – 10 + Dhanu = 38
=> 2Dhanu = 38 + 10
=> 2Dhanu = 48
=>Dhanu = 24 years
Average age of Anu and Dhanu = (48 + 24) ÷ 2 years
= 72 ÷ 2 years
= 36 years
Hence, '36 years' is the correct answer.

85. Read the information given below and answer the questions that follow:
- A * B means -> A and B are of the same age
- A – B means -> B is younger than A

- A + B means -> A is younger than B
  Sachin * Madan – Reena means?
  (a)Reena is youngest (b)Reena is oldest
  (c)Madan is younger than Reena (d)Madan is the youngest
  Sachin * Madan - Reena means Sachin and Madan are of the same age and Reena is younger than Madan. This means that Reena is the youngest.

86. Find out the wrong number in the following number series: 56, 58, 62, 70, 84, 118, 182
  (a)58 (b) 62 (c)86 (d) 118
  The correct pattern is $+2, +4, +8, +16, +32, +64$
  i.e. $+2, +2^2, +2^3, +2^4, +2^5, +2^6$.
  So, $(70 + 16)\ i.e.\ 86$.
87. In an examination, 78% of the total students who appeared were successful. If the total number of failures was 176 and 34% got first class, then how many students got first class?
  (a)272 (b) 112 (c)210 (d) 254
  Given:
  Students who were successful = 78%
  Total number of failures = 176
  Students who got first class = 34%
  Calculation:
  Students who failed = (100 – 78)% = 22%
  22% of total students = 176
  1% of total students = 176/22 = 8
  34% of total students = 8 × 34 = 272
  ∴ The number of students who got first class are 272
88. Which number should come in place of the question mark (?) in the following chart:

1	7	9
2	14	?
3	105	117

  (a)16 (b) 26 (c)20 (d) 12
89. If a man walks at the rate of 4 km/hr, he misses a train by only 6 minutes. However, if he walks at the rate of 5 km/hr, he reaches the station 6 minutes before the arrival of the train. The distance covered by him to reach the station is:
  (a)4 km (b) 7 km (c)9 km (d) 5 km
  Required distance= $\left(\frac{product\ of\ speeds}{difference\ of\ speeds} \times difference\ in\ time\right)$

$$= \left(\frac{4 \times 5}{5-4} \times \frac{6 \times 6}{60}\right) km$$
$$= \frac{20}{1} \times \frac{12}{60}$$
$$= 4$$

90. If the numerator of a fraction is increased by 25% and denominator decreased by 20%, the new value is 5/4. What is the original value?
  (a)3/5 (b) 4/5 (c)7/8 (d) 3/7
  Let the initial value of fraction be x
  Then new value of fraction is $\frac{5}{4}$

$$\frac{5}{4} = x \times \frac{1.25}{.8}$$
$$\frac{5}{4} = x \times \frac{25}{16}$$
$$x = \frac{5}{4} \times \frac{16}{25}$$
$$x = \frac{4}{5}$$

91. Which of the following is a Noun?
(a)Carelessness (b) Careless
(c)Carelessly (d) Caring
92. Choose the word that accurately signifies a student who avoids attending classes.
(a)Diligent (b) Callous
(c)Morose (d) Truant
93. Identify the type of error in the following sentence:
Some of the books were destroyed.
(a)Syntactical error
(b)Punctuation error
(c)Grammatical error
(d) Conflicting error
94. Pick the word similar in meaning: ALLEVIATE
(a)Clear (b) Lessen
(c)Match (d) Incite
95. Pick the word opposite in meaning: ABSURD
(a)Cruel (b) Sensible
(c)Calm (d) Sturdy
Identify the meaning of the following:
96. It was all Greek to me…. .
(a)Difficult to speak
(b)Difficult to write
(c)Difficult to arrange
(d)Difficult to understand
97. ''To hold your horses'' means
(a)To be ready(b) To be patient
(c)To be eager (d) To be impatient
98. He was accused ……. theft.
(a)on (b) about
(c)in (d) of
99. I never listen …… the radio.
(a)to (b) of
(c)about (d) in
100. I don't think I've ever ……on that sofa.
(a)been sitting (b) sat
(c)sit (d) sitting
101. Choose the correct sentence of the following:
(a)I prefer coffee to tea.
(b)I prefer coffee for tea.
(c)I prefer coffee than tea.
(d)I prefer coffee by tea.
102. Choose a phrasal verb to replace the explanation in brackets.
"We must (be quick) _____ or we'll be late for school"
(a)Act up (b)Hurry up (c)Fasten on (d)Speed in
103. Anne had to pay for everything because as usual, peter_____ his wallet at home.
(a)had left (b)was leaving (c)left (d)leave
104. Extreme old age when a man behaves like a child.
(a)Imbecility (b)Senility
(c)dotage (d)superannuation
105. Which of the following is the correct passive of the sentence, "JOHN HAS EATEN THE APPLES?"
(a)the apples are being eaten by john
(b)the apples are eaten by john
(c)the apples have been eaten by john
(d)the apples will be eaten by john.
106. Choose one of the word that is most nearly same as meaning of the given word indemnify
(a)Insure (b)Compensate for loss
(c)assure (d)Sue for damages

107. Select the most suitable synonym from the given choices for the word: "ANTEDILUVIAN":
(a)Recluse (b)Maverick
(c)Archaic (d)Bellicose

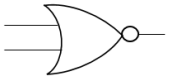
108. Select the most suitable antonym from the given choices for the word: "SANGFROID":
(a)Equanimity (b)Steadiness
(c)Aplomp (d) turbulence

109. Use the appropriate phrasal verb and complete the sentence given below .
The new system in education is aimed at____ the differences between rich and poor.
(a)Goof around (b)Evening out
(c)Glossing over (d)Give over

110. Choose the right option.
Blessing in disguise is .....?
(a)Something good
(b)Something unrecognized
(c)Something known to all
(d)Something good but not recognized at first

111. $(243.125)_{10} = (?)_2$ is
(a)11110011.001 (b)11110010.010 (c) 11110010.110 (d)none

112.



how minimum number of NAND gate required
(a)4 (b)5 (c)3 (d)2

113. $X + \bar{X}Y$ solve the Boolean expression
(a)$X + Y$ (b)$\bar{Y}$ (c)$\bar{X}$ (d)$X + \bar{Y}$

114. $\bar{X}\bar{Y} + XY + \bar{X}Y$ solve the equation
(a)$\bar{X} + Y$ (b)$\bar{Y}$ (c)$\bar{X}$ (d)$X + \bar{Y}$

115. Dynamic RAM requires _____ power and is _____ than satatic RAM
(a)less, faster (b)more, slower
(c)more, faster (d)less, slower

116. $(4326421)_{10}$ octal conversion is
(a) 20400225 (b) 20402024
(c) 20402002 (d)none

117. The times required for the fetching and execution of one simple machine instruction is
(a)Delay time (b)CPU cycle
(c)Real time (d)seek time

118. The base (or radix) of the number system such that the following equation holds 312/20 = 13.1
(a)3 (b)4 (c)5 (d)6

119. Which of the following represents $(D4)_{16}$
(a)$(4E)_{16} - (5B)_{16}$(b)$(14E)_{16} - (7A)_{16}$
(c)$(15C)_{16} - (6D)_{16}$(d)$(1E4)_{16} - (A7)_{16}$

120. How many Boolean expression can be formed with 3 Boolean variables?
(a)16 (b)1024 (c)32 (d)256
For three Boolean variable $(n = 3)$, there are $2^3 = 8$ different cases, giving us a total of $2^8 = 256$ Boolean function 3 variables.