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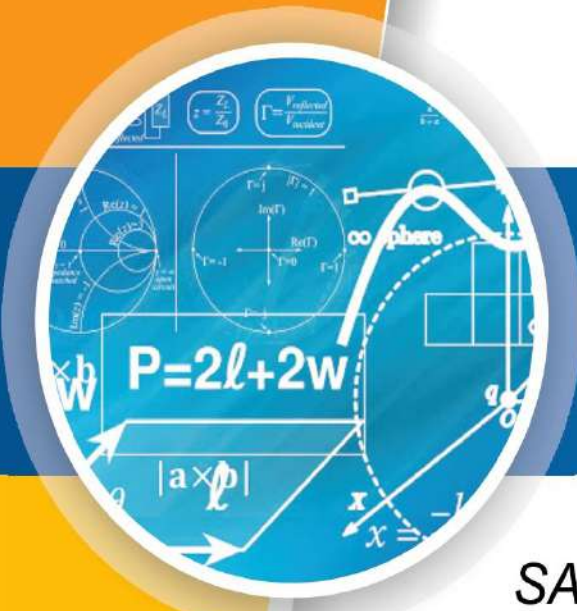


SAMPLE PAPER MATHEMATICS

For Annual Exam
Class - XI

Q1 – Q.20 (1 mark each)

Q.1 x-intercept of the line $2x - 3y + 6 = 0$

(a) 2 (b) 3 (c*) –3 (d) none

Q.2 Which of the following is not equal to $cos\ 2x$

(a) $cos^2x - sin^2x$ (b) $1 - 2sin^2x$ (c*) $1 - 2cos^2x$ (d) $\frac{1-tan^2x}{1+tan^2x}$

Q.3 If x is real number and $|x| < 5$, then

(a) $-3 < -x < 3$ (b) $x > 3$ (c*) $-5 \leq x \leq 5$ (d) $x \geq -3$

Q.4 In how many ways can 5 persons stand in queue?

(a) 420 (b*) 120 (c) 620 (d) 720

Q.5 No. of terms in the expansion of $\left(x + \frac{3}{y}\right)^9$ is

(a) 3 (b) 4 (c) 5 (d*) 10

Q.6 If x is real number and $|x| \geq 7$, then

(a*) $x \geq 7$ or $x \leq -7$ (b) $x \geq 7$

(c) $x \leq -7$ (d) $-7 \leq x \leq 7$

Q.7 The sum of the infinite GP $1 + \frac{2}{3} + \frac{4}{9} + \frac{8}{27} + ...\infty$ is equal to

(a) 1.95 (b*) 3 (c) 1.75 (d) None

Q.8 The slope of equation $2x+y+6 = 0$ is equal to

(a*) – 2 (b) 4 (c) – 1 (d) 3

Q.9 Centre and radius of circle $x^2 + y^2 + 4x + 6y - 3 = 0$ respectively :

(a) (-4, -5) , 7 (b) (4 , 5) , 8 (c) (5 , 4) , 7 (d*) (-2 , -3) , 4

Q.10 The least value of $\sin^2 x + \text{cosec}^2 x$ is

(a) 0 (b*) 2 (c) 3 (d) 1

Q.11 If $\frac{x-2}{x+5} > 1$, then

$(a*).\ x \in (-\infty, -5)$ (b) $x \in (5, \infty)$ (c). $x \in (-5, 5)$ (d) None

Q.12 Diameter of circle $x^2 + y^2 - 2x - 4y - 4 = 0$

(a) 2 (b) 3 (c*) 6 (d) none

Q.13 ${}^nP_4 : {}^nP_5 = 1:2$ then find n.

(a) 4 (b) 5 (c*) 6 (d) 7

Q.14 1.1^{10000} is _____ 1000

(a) less than (b*) greater than (c) equal to (d) None of these

Q.15 The 3rd term of a GP is $\frac{2}{3}$ and the 6th term is $\frac{2}{81}$, then the 1st term is

(a) 2 (b*) 6 (c) 9 (d) $\frac{1}{3}$

Q.16 The distance between the line 2x-3y+ 9 = 0 and the point (2,1) is

(a*) $\frac{10}{\sqrt{3}}$ (b) $\frac{28}{13}$ (c) $\frac{1}{\sqrt{3}}$ (d) $\frac{14}{\sqrt{13}}$

Q.17 Focus and directrix of parabola $2y^2 = 9x$ are

(a*) $\left(\frac{9}{8}, 0\right)$, 8x + 9 = 0 (b) $\left(-\frac{9}{8}, 0\right)$, 8x + 9 = 0

(c) $\left(-\frac{9}{8}, 0\right)$, 8x – 9 = 0 (d) none

Q18. No. of terms in $(x+y)^7 - (x-y)^7$ is

(a) 6 (b*) 4 (c)12 (d) 3

Q.19 If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P; the x, y, z are in:

(a*) A.P. (b) G.P (c) Both (a) & (b) (d) None

Q.20 $^{15}C_8 + {}^{15}C_9 - {}^{15}C_7 - {}^{15}C_6$

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

Q.21. Equation of ellipse whose length of major and minor axes are 10 and 8 respectively is

(a*) $\frac{x^2}{25} + \frac{y^2}{16} = 1$ (b) $\frac{x^2}{25} - \frac{y^2}{16} = 1$ (c) $\frac{x^2}{50} + \frac{y^2}{32} = 1$ (d) None

Q.22 Find the distance of point (3,–5) from the line 3x – 4y = 26

(A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C*) $\frac{3}{5}$ (D) none

Q.23 The number of dissimilar terms in the expansion of $(1 - x^4 - 2x^2)^{15}$ is

(A) 21 (B*) 31 (C) 41 (D) 61

Solution : $(1 - x^2)^{30}$

Therefore number of dissimilar terms = 31.

Q.24 Find term which is independent of x in $\left(x^2 - \frac{1}{x^6}\right)^{16}$

(A*) 4 (B) 5 (C) 6 (D) 7

Sol.

$T_{r+1} = {}^{16}C_r\,(x^2)^{16-r}\left(-\frac{1}{x^6}\right)^r$

For term to be independent of x, exponent of x should be 0

$32 - 2r = 6r \quad \Rightarrow \quad r = 4 \quad \therefore \quad T_5$ is independent of x.

Q.25 The total number of distinct terms in the expansion of, $(x + y)^{100} + (x - y)^{100}$ after simplification is :

(A) 50 (B) 202

(C*) 51 (D) none of these

Q.26 Distance between the lines $x + y + 3 = 0$ and $2x + 2y - 4 = 0$ is

(A*) $\frac{5}{\sqrt{2}}$ (B) $\frac{7}{\sqrt{2}}$ (C) $\frac{1}{\sqrt{2}}$ (D) None

For Q.27 and Q.28, two statements are given Assertion (A) and Reason (R). select the correct answer of these questions from the codes (A),(B),(C) and (D) a given below.

A) Both A and R is true and R is the correct explanation of A.

B) Both A and R is true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true

Q.27 Assertion (A): The expansion of $(1 + x)^n$ is

$(1+x)^n = {}^nC_0x^0 + {}^nC_1x^1 + {}^nC_2x^2 + \ldots\ldots + {}^nC_rx^r + \ldots\ldots + {}^nC_nx^n$

Reason (R) :$If\ x = -1$, then the above expansion is zero

Ans. **(A)**

Q.28 Assertion(A): The inclination of the line l may be acute or obtuse.

Reason(R): Slope of x-axis is zero and of y-axis is slope not defined

Ans. **(B)**

<u>Q29 – Q.41 (2 mark each)</u>

Q.29 Prove that : $\tan\left(\frac{\pi}{4} + A\right) - \tan\left(\frac{\pi}{4} - A\right) = 2\tan 2A$

Sol.

$$\tan\left(\frac{\pi}{4}+\theta\right)-\tan\left(\frac{\pi}{4}-\theta\right)$$

$$=\left[\frac{\tan\left(\frac{\pi}{4}\right)+\tan\theta}{1-\tan\frac{\pi}{4}\tan\theta}\right]-\left[\frac{\tan\left(\frac{\pi}{4}\right)-\tan\theta}{1+\tan\frac{\pi}{4}\tan\theta}\right]$$

$$=\left[\frac{1+\tan\theta}{1-\tan\theta}\right]-\left[\frac{1-\tan\theta}{1+\tan\theta}\right]$$

$$=\left[\frac{(1+\tan\theta)^2-(1-\tan\theta)^2}{(1-\tan\theta)(1+\tan\theta)}\right]$$

$$=\left[\frac{1^2+\tan^2\theta+2\times\tan\theta-(1^2+\tan^2\theta-2\times\tan\theta)}{1-\tan^2\theta}\right]$$

$$=\left[\frac{1+\tan^2\theta+2\tan\theta-1-\tan^2\theta+2\tan\theta}{1-\tan^2\theta}\right]$$

$$=\left[\frac{4\times\tan\theta}{1-\tan^2\theta}\right]=2\left[\frac{2\tan\theta}{1-\tan^2\theta}\right]$$

$$=2\tan 2\theta=RHS$$

Q.30. If the first term of G.P. is 7, its nth term is 448 and sum of first n terms is 889, then find the fifth term of G.P.

Sol. $a_1 = 7,\ \ a_n = 448 = 7.R^{n-1}$

$64 = R^{n-1}$

$$889 = \frac{7(R^{n-1}-1)}{R-1}$$

$$127 = \frac{R^{n-1}-1}{R-1}$$

$127R - 127 = 64 - 1$

$63R = 126$

$R = 2$

$\Rightarrow \quad n = 7$

$a_5 = 7 \times 2^4 = 112$

Q.31 If ${}^nC_4 = {}^nC_6$, find ${}^{11}C_n$.

Ans.1

Q.32 Solve :$\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$

Sol.

$\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$

$\Rightarrow \frac{3x-4}{2} \geq \frac{x+1-4}{4}$

$\Rightarrow 3x - 4 \geq \frac{x-3}{2}$

$\Rightarrow 6x - 8 \geq x - 3$

$5x \geq 5$

$x \geq 1$

Q.33 In a G.P, the 3rd term is 24 and the 6th term is 192. Find 10th term

Sol.

Let the first term is a and the common ratio is r

Then,

$ar^2 = 24$ .... (i)

and $ar^5 = 192$ .... (ii)

Dividing (ii) by (i), we get

$\frac{ar^5}{ar^2} = \frac{192}{24}$

$r^3 = 8$

$r = 2$

Now,

$ar^2 = 24$

$\Rightarrow a.2^2 = 24$

$\Rightarrow a = 6$

Thus the 10th term will be $ar^9 = 6.2^9 = 3072$

Q.34 Find the value of x for which the point (x,2) (– 1,3) and (– 2,4) are collinear.

Sol. If the point are colinear then area of $\Delta = 0$

$\Rightarrow x(3 - 4) + 1(2 - 4) - 2(2 - 3) = 0$

$-x - 2 + 2 = 0$

$x = 0$

Q.35 A person has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of his ancestors during the ten generations preceding his own.

Sol. Here a = 2, r = 2 and n = 10

Using the sum formula $S_n = \frac{a(a^n - 1)}{r-1}$

We have $S_{10} = 2(10^{10} - 1) = 2046$

Hence, the number of ancestors preceding the person is 2046.

Q.36 Let $S = 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + ...$ find the sum of infinite terms of the series.

Ans. $S_\infty = \frac{1}{1 - \frac{1}{2}} = 2$

Q.37 Find the focus, axis ,directrix and latus rectum of parabola $y^2 = 16x$

Ans. focus : (4, 0)

axis : y = 0

directrix : x + 4 = 0

latus rectum: 16

Q.38 Prove that : $\tan\left(\frac{\pi}{4} + \theta\right)\tan\left(\frac{3\pi}{4} + \theta\right) = -1$

Sol. $\tan\left(\frac{\pi}{4} + \theta\right) \times \tan\left(\frac{3\pi}{4} + \theta\right) = \frac{1 + \tan\theta}{1 - \tan\theta} \times \frac{-1 + \tan\theta}{1 + \tan\theta} = -1$

Q.39 Solve : $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

Sol.

Given,

$$\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5} = \frac{x}{4} < \frac{5(5x-2) - 3(7x-3)}{15}$$

On simplifying we get

$$= \frac{x}{4} < \frac{25x - 10 - 21x + 9}{15}$$

$$= \frac{x}{4} < \frac{4x - 1}{15}$$

$= 15x < 4(4x - 1)$

$= 15x < 16x - 4$

$= 4 < x$

Q.40 Find the slope of the line, which passes through origin, and the mid point of the line segment joining the point (6,4) and (8,2).

Sol. Mid point of (6,4) and (8,2) is $\Rightarrow$ (7,3)

slope of line joining origin and (7,3) is m = $\frac{3-0}{7-0} = \frac{3}{7}$

Q.41 Prove that : cot4x (sin5x + sin3x) = cotx (sin 5x – sin 3x)

Sol. Since LHS = $\frac{\cos 4x}{\sin 4x}$ (2 sin4x cosx) = 2cos4x cosx

Since RHS = $\frac{\cos x}{\sin x}$ (2 cos4x sinx) = 2cos4x cosx

hence LHS = RHS

Q42 – Q.52(3 mark each)

Q.42 Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11

Sol.

Let

x be the smaller odd positive integer. Then, the larger consecutive odd integer is $x+2$.

It is given that,

$x<10$ (1)

$x+2<10$ (2)

$x+(x+2)>11$ (3)

Solve equation (2),

$x<10-8$ $x<8$ (4)

Solve equation (3),

$x+(x+2)>11$ $2x+2>11$ $2x>9$ $x>9\ 2$ (5)

From equation (4) and (5),

$4.5<x<8$

Since, x is an odd number therefore it will take only different sets of odd integers.

Thus, the pairs are (5,7),(7,9).

Q.43 In how many ways 5 boys and 3 girls can be seated in a row so that no two girls are together?

Sol. Therefore, the total number of seating arrangements possible

=5P5 x 6P3

= 5 x 4 x 3 x 2 x 1 x 6 x 5 x 4 ways

=14400 ways

Q.44 Expand $(x-3)^5$

Ans. $x^5 - 15x^4 + 90x^3 - 270x^2 + 405x - 243$

Q.45 The sum of some terms of G.P. is 315, whose first term and the common ratio are 5 and 2, respectively. Find the last term and the number of terms.

Sol.

Let there be n terms in the G.P. with first term a = 5 and common ratio r = 2.
Then,

Sum of n terms = 315

$a(\frac{r^n - 1}{r - 1}) = 315$

$5(\frac{2^n - 1}{2 - 1}) = 315$

$2^n - 1 = 63$

$2^n = 64$

$n = 6$

Therefore, last term = $ar^{n-1} = 5 \times 2^{6-1} = 160$

Q.46 Find the acute angle between the lines $x - 2y + 2 = 0$ and $3x - y + 3 = 0$

Ans. 45°

Q.47 Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$

Ans. focus : $(\pm\sqrt{11}, 0)$

vertex : $(\pm 6, 0)$

length of major axis : 12

length of minor axis : 10

eccentricity : $\frac{\sqrt{11}}{6}$

latus rectum: $\frac{25}{3}$

Q.48 Prove that $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

Sol. We have

$$\text{L.H.S.} = \frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \frac{\sin 5x - \sin x + 2\sin 3x}{\cos 5x - \cos x}$$

$$= \frac{2\sin 3x \cos 2x - 2\sin 3x}{-2\sin 3x \sin 2x} = \frac{\sin 3x(\cos 2x - 1)}{\sin 3x \sin 2x}$$

$$= \frac{1 - \cos 2x}{\sin 2x} = \frac{2\sin^2 x}{2\sin x \cos x} = \tan x = \text{R.H.S.}$$

Q.49 Rahul obtained 70 and 75 marks in the first two unit tests. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

Sol.

Let us assume that x is the marks obtained by Ravi in his third unit test.

According to the question, all the students should have an average of at least 60 marks

$(70 + 75 + x)/3 \geq 60$

$= 145 + x \geq 180$

$= x \geq 180 - 145$

$= x \geq 35$

Hence, all the students must obtain 35 marks in order to have an average of at least 60 marks

Q.50 Insert three numbers between 1 and 256 so that resulting sequence is a G.P.

Sol. Let G_1, G_2, G_3 be three numbers between 1 and 256 such that $1, G_1, G_2, G_3, 256$ is a G.P.

Therefore $256 = r^4$ giving $r = \pm 4$ (Taking real roots only)

For $r = 4$, we have $G_1 = ar = 4$, $G_2 = ar^2 = 16$, $G_3 = ar^3 = 64$

Similarly, for $r = -4$, numbers are -4, 16 and -64.

Hence, we can insert 4, 16, 64 between 1 and 256 so that the resulting sequence are in G.P.

Q.51 In what ratio, the line joining (–1,1) and (6,7) is divided by the line x + y = 4

Sol. Let the ratio be k :1

$$P = \left(\frac{6k-1}{k+1}, \frac{7k+1}{k+1}\right)$$

P will be on the line x + y = 4

6k – 1 + 7k + 1 = 4k + 4

$9k = 4 \Rightarrow k = \frac{4}{9}$ ratio is 4:9

Q.52 If $\cos x = -\frac{3}{5}$, x lies in the third quadrant, find the values of other five trigonometric functions.

Sol. Since $\cos x = -\frac{3}{5}$, we have $\sec x = -\frac{5}{3}$

Now $\sin^2 x + \cos^2 x = 1$, i.e. $\sin^2 x = 1 - \cos^2 x$

or $\sin^2 x = 1 - \frac{9}{25} = \frac{16}{25}$

Hence $\sin x = \pm \frac{4}{5}$

Since x lies in third quadrant, sin x is negative. Therefore

$$\sin x = -\frac{4}{5}$$

which also gives

$$\text{coses } x = -\frac{5}{4}$$

Further, we have

$$\tan x = \frac{\sin x}{\cos x} = \frac{4}{3} \text{ and } \cot x = \frac{\cos x}{\sin x} = \frac{3}{4}$$

Q53 – Q.56 (5 mark each)

Q.53 Prove that $\sqrt{2+\sqrt{2+\sqrt{2+2cos\ 8x}}} = 2\cos x$

Sol.

L.H.S. $= \sqrt{2+\sqrt{2+\sqrt{2+2\cos 8x}}}$

$= \sqrt{2+\sqrt{2+\sqrt{2[1+\cos 2(4x)]}}}$

$= \sqrt{2+\sqrt{2+\sqrt{2\times 2\cos^2 4x}}}$

$\ldots[\because\ 1+\cos 2\theta = 2\cos^2\theta]$

$= \sqrt{2+\sqrt{2+2\cos 4x}}$

$= \sqrt{2+\sqrt{2[1+\cos 2(2x)]}}$

$= \sqrt{2+\sqrt{2\times 2\cos^2 2x}}$

$= \sqrt{2+2\cos 2x} = \sqrt{2(1+\cos 2x)}$

$= \sqrt{2\times 2\cos^2 x}$

= 2 cos x

= R.H.S.

OR

Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4cos^2\left(\frac{x+y}{2}\right)$

Sol.

$= (\cos^2 x + \cos^2 y + 2\cos x \cos y) + (\sin^2 x + \sin^2 y - 2\sin x \sin y)$

$= (\cos^2 x + \sin^2 y) + (\cos^2 x + \sin^2 y) + 2(\cos x \cos y - \sin x \sin y)$

$= 1 + 1 + 2\cos(x+y)$

$= 2 + 2\cos(x+y)$

$= 2[1+\cos(x+y)]$

$= 4\ cos^2(\frac{x+y}{2})$ = RHS

Q.54 Find $(x+1)^6+(x-1)^6$. Hence , evaluate $\left(\sqrt{2}+1\right)^6+\left(\sqrt{2}-1\right)^6$

Sol.

$(x + 1)^6 + (x - 1)^6 = [({}^6C_0 x^6 + {}^6C_1 x^5 + {}^6C_2 x^4 + {}^6C_3 x^3 + {}^6C_4 x^2 + {}^6C_5 x + {}^6C_6) +$
$({}^6C_0 x^6 - {}^6C_1 x^5 + {}^6C_2 x^4 - {}^6C_3 x^3 + {}^6C_4 x^2 - {}^6C_5 x + {}^6C_6)]$

$= 2 [{}^6C_0 x^6 + {}^6C_2 x^4 + {}^6C_4 x^2 + {}^6C_6]$

$= 2 [x^6 + 15x^4 + 15x^2 + 1]$

Putting $x = \sqrt{2}$

$(x + 1)^6 + (x - 1)^6 = 2 [(\sqrt{2})^6 + 15 (\sqrt{2})^4 + 15 (\sqrt{2})^2 + 1]$

$= 2 [8 + 15 \times 4 + 15 \times 2 + 1]$

$= 2 [8 + 60 + 30 + 1]$

$= 2 \times 99$

$= 198$

OR

Expand using binomial theorem $\left(1+\frac{x}{2}-\frac{2}{x}\right)^4, x \neq 0$

Sol.

$$= {}^4C_0\left(1+\frac{x}{2}\right)^4 + {}^4C_1\left(1+\frac{x}{2}\right)^3\left(-\frac{2}{x}\right) + {}^4C_2\left(1+\frac{x}{2}\right)^2\left(-\frac{2}{x}\right)^2 + {}^4C_3\left(1+\frac{x}{2}\right)\left(-\frac{2}{x}\right)^3 + {}^4C_4\left(-\frac{2}{x}\right)^4$$

$$=\left(1+\frac{x}{2}\right)^4-\frac{8}{x}\left(1+\frac{x}{2}\right)^3 + \frac{24}{x^2}\left(1+\frac{x}{2}\right)^2-\frac{32}{x^3}\left(1+\frac{x}{2}\right)+\frac{16}{x^4}$$

$$=\left\{1+4\cdot\frac{x}{2}+6\left(\frac{x}{2}\right)^2+4\left(\frac{x}{2}\right)^3+\left(\frac{x}{2}\right)^4\right\}$$

$$-\frac{8}{x}\left(1+\frac{3x}{2}+\frac{3x^2}{4}+\frac{x^3}{8}\right)$$

$$+\frac{24}{x^2}\left(1+x+\frac{x^2}{4}\right)-\frac{32}{x^3}\left(1+\frac{x}{2}\right)+\frac{16}{x^4}$$

$$=1+2x+\frac{3x^2}{2}+\frac{x^3}{2}+\frac{x^4}{16}-\frac{8}{x}-12-6x-x^2 + \frac{24}{x^2}+\frac{24}{x}+6-\frac{32}{x^3}-\frac{16}{x^2}+\frac{16}{x^4}$$

$= x^4/16 + x^3/2 + x^2/2 - 4x - 5 + 16/x + 8/x^2 - 32/x^3 + 16/x^4$

Q.55 Find the sum of the sequence $7 + 77 + 777 +, \dots$ to n terms.

Ans. S = 7 + 77 + 77 + ...

S = 7/9 (9 + 99 + 999 + ...)

S = 7/9 [(10 – 1) + (100 – 1) + (1000 – 1) + ...]

$$S = 7/9 \left[\frac{10(10^n - 1)}{10 - 1} - n\right]$$

$$S = 7/9 \left[\frac{10^{n+1} - 10 - 9n}{9}\right]$$

$$S = 7/81\,(10^{n+1} - 9n - 10)$$

Or

The sum of the second and third terms of a G.P. is 280 and the sum of the 5th and 6th terms is 4375. Find the 4th term of G.P.

Sol. $T_2 + T_3 = 280$

$ar + ar^2 = 280$ ..... (1)

$T_5 + T_6 = 4375$

$ar^4 + ar^5 = 4375$

$r^3 (ar + ar^2) = 4375$

from eq. (1) use $ar + ar^2 = 280$, $r^3 (280) = 4375$, $r = \frac{5}{2}$

Now in eq. (1) put $r = \frac{5}{2}$, we get a = 32

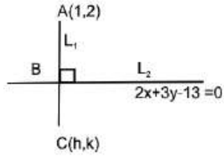
so $T_4 = ar^3 = 32 \times \frac{125}{8} = 500$

Q.56 Assuming that the straight line work as a plane mirror for a point, find the image of the point (1,2) in the line 2x +3y – 13 = 0.

Sol.

B is the mid point AC

$B = \left(\frac{h+1}{2}, \frac{k+2}{2}\right)$



B will lie on the line

$$2\left(\frac{h+1}{2}\right)+3\left(\frac{k+2}{2}\right) = 13$$

$2h + 3k = 18$ ...(1)

and product of slope of line L_1 and L_2 = – 1

$$\left(\frac{k-2}{h-1}\right).\left(-\frac{2}{3}\right) = -1$$

$2k - 4 = 3h - 3 \Rightarrow 3h - 2k + 1 = 0$ ...(2)

now solve (1) and (2)

$3h - 2k + 1 = 0$

$2h + 3k - 18 = 0$

$(h, k) = \left(\frac{33}{13}, \frac{56}{13}\right)$

Or

Find the value of 'a' so that three lines $3x + 2y - 4 = 0$, $ax + 2y - 3 = 0$ and $2x + y - 5 = 0$. may intersect at one point

Sol.

If the line are concurrent $\begin{bmatrix} 3 & 2 & -4 \\ a & 2 & -3 \\ 2 & 1 & -5 \end{bmatrix} = 0$

$3(-10 + 3) - a(-10 + 4) + 2(-6 + 8) = 0$

$-21 + 6a + 4 = 0 \qquad \Rightarrow a = \frac{17}{6}$

<u>Case Base Study (4 mark each)</u>

Q.57 During the Mathematics class, A teacher clears the concept of permutations and combinations to the 11^{th} class students. After the class was over he asks the students some more questions. (1+1+2 marks)

On the basis of the information given above answer the following:-

(a) Find the number of arrangements of the letters of the word INDEPENDENCE.

In word INDEPENDENCE,

3Ns, 4Es, 2Ds and 1I, 1P and 1C are there (repetition)

$n = 12, P_1 = 3, P_2 = 4$ and $P_3 = 2$

$\therefore$ Total arrangements $= \frac{n!}{P_1!P_2!P_3!}$

$= \frac{12!}{3!4!2!}$

$= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4!}{3 \times 2 \times 1 \times 4! \times 2 \times 1}$

$= 1663200$

(b) In How many of these do the words begin with I and end in P.

(iv) Let I and P fix at extreme ends.

I - - - - - - - - - - -P

10 letters in which 2D, 4E and 3N → repetition

So, $n = 10, P_1 = 2, P_2 = 4$ and $P_3 = 3$

$\therefore$ Required number of arrangements

$= \frac{10!}{2!4!3!} = 12600.$

(c) In How many of these do all the vowels never occur together.

(iii) Number of arrangements when vowels never occur together = total number of arrangements (without any restriction) − the number of arrangements where all the vowels occur together

= 1663200 − 16800 = 1646400

OR

In How many of these do all the four E's do not occur together

Sol. $\frac{12!}{4!3!2!} - \frac{9!}{3!2!} = \mathbf{1632960}$

Q.58 An old monk blessed the king and said – "Do the desire of the monk. The rule of taking my alms is like this, what I take on the first day, double it on the second day, then double it on the third day. In the same way, I take twice daily. This is my way of begging." He further said – "Give me one rupee today, then give me the order to keep

doubling for twenty days." The king was ready. As per the orders of the king, Raj Bhandari started giving alms to the monk. After giving alms for two weeks, he calculated that he saw a lot of money coming out .

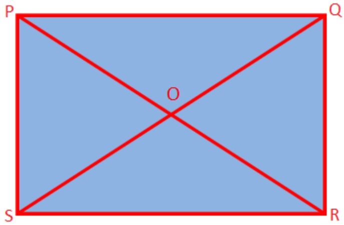
(a). How much alms did the old monk get on 14th day? (2)

(b). What are total alms would get by monk according the order of king?

(2)

Ans. (a) Rs. 8192 (b) $2^{20}-1$

Q.59 For an EMC project students need rectangular sheets, therefore they made Eco friendly rectangular sheets PQRS from the paper waste such that on the Cartesian plane equation of QR is $3x + 4y = 12$ and point P is (2,4) while point R is $\left(\frac{16}{5}, a\right)$.



On the basis of the information given above answer the following:-

(a) Find the equation of PS. **(1)**

Ans. (a) $3x + 4y - 22 = 0$;

(b) Find the value of a. **(1)**

Ans. (b) $a = \frac{3}{5}$

(c) Find the area of rectangular sheet. **(2)**

Ans. (c) $\frac{12}{5}$ $sq\ units$

OR

Find the perimeter of rectangular sheet. (2)

Ans. $\frac{32}{5}$

Q.60

A state cricket authority has to choose a team of 11 members, to do it so the authority asks 2 coaches of a government academy to select the team members that have experience as well as the best performers in last 15 matches. They can make up a team of 11 cricketers amongst 15 possible candidates. In how many ways can the final eleven be selected from 15 cricket players if:

1. there is no restriction
    1. 1365
    2. 2365
    3. 1465
    4. 1375
2. one of then must be included
    1. 1002
    2. 1003
    3. 1001
    4. 1004
3. one of them, who is in bad form, must always be excluded
    1. 480
    2. 364
    3. 1365
    4. 640

Ans. **(1) 1** **(2) 3** **(3) 2**