GREENLAWNS SCHOOL, WORLI
Terminal Examination 2017
MATHEMATICS

STD: X — Marks: 80
Date: 26/09/2017 — Time: 2½hrs

Section A

(Attempt all questions of this section)

Question 1

a. Monica has a C.D. Account in Union Bank of India & deposited ` 600 per month. If the maturity value of this account is ` 24930 & the rate of interest is 10% p.a. Find the time (in yrs.) for which the account was held. **[3]**

b. Identical cards are marked 1 to 75. When a card is drawn at random, what is the probability that it is;
(i) a multiple of 11.
(ii) a perfect square.
(iii) a factor of 75. **[3]**

c. If (x – 3) is a factor of $2x^3 + 3x^2 + px + 15$
(i) Find the value of p
(ii) Hence Factorise the expression completely. **[4]**

Question 2

a. Represent the solution set of the following inequation on the number line.

$x + \frac{1}{5} < 1\frac{1}{3}x + \frac{8}{15} \leq \frac{x}{5} + 1\frac{2}{3}$, $x \in R$ **[3]**

b. Mean of the following set of distribution is 18,
Calculate the numerical value of x. **[3]**

Marks	5	10	15	20	25	30
No. of Students	6	4	6	12	x	4

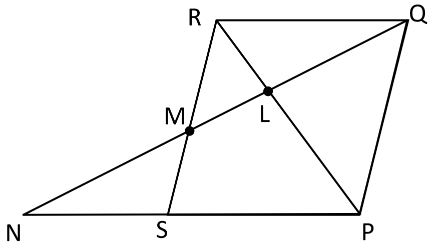
c. The point P is the foot of perpendicular from A(-5, 7) to the line whose equation is 2x – 3y + 18 = 0.
Determine: (i) The equation of the line AP.
(ii) The co-ordinates of P. **[4]**

Question 3.

a. If $\begin{bmatrix} 3 & -24 \\ -1 & 4 \end{bmatrix}\begin{bmatrix} x \\ 2 \end{bmatrix} + 3 \begin{bmatrix} -4 \\ 5 \end{bmatrix} = 2\begin{bmatrix} -3 \\ 9y \end{bmatrix}$, find x and y. **[3]**

b. Prove that: $\frac{\cot A + \tan B}{\cot B + \tan A}$ = cot A tan B. **[3]**

c. In the figure, PQRS is a ||^{gm} with PQ = 16cm, QR = 10cm. L is a point on PR such that RL : LP = 2 : 3 QL produced meets RS at M & PS produced at N. Find the lengths of PN & RM. **[4]**



Question 4

a. Solve the quadratic equation and give your answer correct to two significant figures:
$3x - 1 = \frac{7}{x}$ **[3]**

b. Prove: $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta . \cos^2\theta$ **[3]**

c. Use graph paper for this question. A point P is reflected to P' in the Y-axis.
The co-ordinates of its image are (-2, 3).
(i) Find the co-ordinate of P.
(ii) Find P", the reflection of P under X-axis.
(iii) Find the co-ordinates of Q' of Q(0, 2) after reflecting under PP".
(iv) Write the special name of PP'QQ'.
Also, find the area of the figure obtained. **[4]**

Section B (40 marks)
(Attempt any ***Four*** question from this Section**)**

Question 5

a. Using properties of proportion, Solve for 'x' **[3]**
$\frac{x^2 + 3x - 4}{3x - 4} = \frac{3x^2 + 2x + 9}{2x + 9}$

b. Find the value of 'K' if (x – 2) is a factor of $x^3 + 2x^2 - kx + 10$. Hence determine whether (x + 5) is also a factor**.** **[3]**

c. The line joining P (–4, 5) & Q(3, 2) intersects y-axis at point R. PM & QN are perpendicular from P & Q on x-axis. Find:
i) Ratio PR: RQ
ii) Co-ordinates of R
iii) Area of ☐ PMNQ **[4]**

Question 6

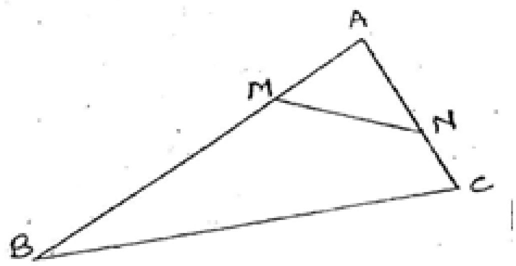
a. If $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$; prove that $\frac{x^3}{a^2} + \frac{y^3}{b^2} + \frac{z^3}{c^2} = \frac{(x+y+z)^3}{(a+b+c)^2}$ **[3]**

b. If A = $\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find 'k' if $A^2 = 8A + kI$ **[3]**

c. In what ratio is the line joining the points (4, 2) and (3, -5) divided by the x axis? Find the co-ordinates of the point of intersection. **[4]**

Question 7

a. In ΔABC, M and N are points on AB and AC such that AM = 2cm, MB = 4 cm, AN = 3 cm and NC = 1 cm.
Prove that: ΔAMN ~ΔACB
Also, find $\frac{\text{Area of } \Delta AMN}{\text{Area of } \Delta ACB}$ **[3]**



b. Ravina deposits ` 600 per month in a recurring deposit scheme for 2 years. If she receives ` 15,450 at the time of maturity, calculate the rate of interest per annum. **[3]**

c. Estimate the mode by drawing the histogram. **[4]**

Class Interval	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Frequency	10	6	8	12	5	9

Question 8

a. If (3x + 4) : (x + 5) is the duplicate ratio of 8 : 5, find the value of x. **[3]**

b. Find the values of x, which satisfy the inequation:

$-2 \leq \frac{1}{2} - \frac{2x}{3} \leq 1\frac{5}{6}$, $x \in N$.

Graph the solution on number line. **[3]**

c. A hermisphere is surmounted by a right circular cone of same base radius. If the common radius is 7 cm and slant height is 25 cm. **[4]**
Find :
(i) the height of the cone,
(ii) the volume of the solid,
(iii) the total surface area of the solid.

Question 9

a. A shopkeeper buys an article whose marked price is ` 40,000 from a Manufacturer at a discount of 10%. The rate of sales tax(under VAT) on the article is 5%. If he sells the article to a consumer at a discount of 5%, find:
(i) the VAT paid by the shopkeeper
(ii) the amount paid by the consumer. **[3]**

b. Draw a circle of radius 4 cm. Construct two tangents to this circle so that the angle between the tangents is 45^o. **[3]**

c. Sum of two natural numbers is 8 and the difference of their reciprocal is $\frac{2}{15}$. Find the number. **[4]**

Question 10

a. Show that the points (3, 3), (9, 0), (12, 21) are the vertices of a right angled triangle. **[3]**

b. The Top of an unfinished dam subtends an angle of elevation at a point 100 m from its base of 30^o. How much higher should the dam be raised so that the angle of elevation becomes 45^o. **[3]**

c. Jayant sold some `100 shares at ` 90 and invested in 15%` 50 shares at ` 33. If he sold this shares at`110 instead of ` 90, he would have earned ` 450 more. Find the number of shares sold by him. **[4]**

Question 11

a. Given: $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$.
Show that: $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$. **[4]**

b. The results of an examination are tabulated below: **[6]**

Marks(less than)	10	20	30	40	50	60	70	80	90	100
No. of Candidates	8	20	40	75	125	160	188	192	197	200

Taking 2 cm. = 10 marks on one axis and 2 cm. = 20 students on the other, draw an ogive for the above data and from it determine:

(i) The median marks.
(ii) The lower quartile.
(iii) The inter quartile.
(iv) The number of candidates who failed if pass mark is 35.
(v) The number of candidates who obtained grade A, if the lowest mark for grade A is 75.

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ANSWER KEY
SECTION A

Question 1

a.

Solution: Monthly Installment = ` 600 ,Let No. of months be 'n'.

Equivalent Principal for 1 month

$(P) = MI \times \frac{n(n+1)}{2}$

$= 600 \times \frac{n(n+1)}{2}$

$\therefore P = 300n(n+1)$

Rate (R) = 10% p.a.

Time (T) = $\frac{1}{12}$ yr.

$I = \frac{P \times R \times T}{100}$

$= \frac{300\,n(n+1) \times 10 \times 1}{100 \times 12}$

$I = \frac{5n(n+1)}{2}$

Actual deposit = MI × n

= ` 600n

Maturity Value = $\begin{pmatrix} \text{Actual} \\ \text{deposit} \end{pmatrix} + \text{Interest}$

$24930 = 600n + \frac{5n(n+1)}{2}$

$24930 = \frac{1200\,n + 5n^2 + 5n}{2}$

$\therefore 5n^2 + 1205n = 49860$

$\therefore 5n^2 + 1205n - 49860 = 0$

Divide each term by 5, we get,

$n^2 + 241n - 9972 = 0$

$n^2 + 277n - 36n - 9972 = 0$

$n(n + 277) - 36(n + 277) = 0$

$(n + 277)(n - 36) = 0$ … (Factorizing left side)

n+ 277 – 0 =0 or n – 36 = 0… (Zero product rule)

n = –277 or n = 36

'n' cannot be negative

$\therefore n = 36$ months

$\therefore$ Time = $\frac{36}{12}$ = 3 yrs.

b. Total Number of outcomes = 73

(i) Favorable outcomes = {11, 22, 33, 44, 55, 66}

No. of favourable outcomes = 6

Probability = $\frac{\text{No.of favourable outcomes}}{\text{Total number of outcomes}} = \frac{6}{75} = \frac{2}{25}$

(ii) Favorable outcomes = {1, 2, 3, 4, 5, 6, 7, 8}

No. of favourable outcomes = 8

Probability =$\frac{\text{No.of favourable outcomes}}{\text{Total number of outcomes}} = \frac{8}{75}$

(iii) Favorable outcomes = {1, 3, 5, 15, 25, 75}
No. of favourable outcomes = 6

Probability = $\frac{6}{75} = \frac{2}{25}$

c. $f(x) = 2x^3 + 3x^2 + px + 15$
Given x – 3 = 0 = x = 3
By factor theorem $f(3) = 0$
$2x3^3 + 3x3^2 + 3p + 15 = 0$
$54 + 27 + 3p + 15 = 0$ = $3p = 96$
P = $\frac{-96}{3}$= p = -32
$\therefore f(x) = 2x^3 + 3x^2 - 32x + 15$

$2x^2 + 9x - 5$
$x - 3\ )\ \overline{2x^3 + 3x^2 - 32x + 15}$
$2x^3 - 6x^2$
$-\quad +$
$9x^2 - 32x$
$9x^2 - 27x$
$-+$
$-5x + 15$
$-5x + 15$
$+\quad -$
0

$\therefore f(x) = (x - 3)\ (2x^2 + 9x - 5)$
$= (x - 3)\ (2x^2 - x + 10x - 5)$
$= (x - 3)\ [x(2x - 1) + 5(2x - 1)]$
$= (x - 3)\ (2x - 1)\ (x + 5)$

Q.2.

a. $x + \frac{1}{5} < 1\frac{1}{3}x + \frac{8}{15} \le \frac{x}{5} + 1\frac{2}{3}$, $x \in R$

$\frac{5x+1}{5} < \frac{4x}{3} + \frac{8}{15} \le \frac{x}{5} + \frac{5}{5}$

$\frac{5x+1}{5} < \frac{20x+8}{15} \le \frac{3x+25x}{15}$

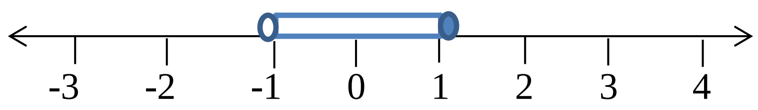
$\frac{5x+1}{5} < \frac{20x+8}{15}$ and $\frac{20x+8}{15} \le \frac{3x+25x}{15}$

$15x + 3 < 20x + 8$ and $17x \le 17$

$-5 < 5x$ and $x \le 1$

$-1 < x$

Solution set $\{x : -1 < x \le 1 \ \ x \in R\}$



b. Mean = 18

x	f	fx
5	6	30
10	4	40
15	6	90
20	12	240
25	X	25x
30	4	120
	32 + x	520 + 25x

Mean $= \frac{efx}{ef}$

$18 = \frac{520+25x}{32+x}$ $=$ $576 + 18x = 52 + 25x$

$56 = 7x$

$x = 8$

c. $2x - 3y + 18 = 0$ ….. (i)

$3y = 2x + 18$

$y = \frac{2}{3}x + 6$

Slope of AP $= \frac{-3}{2}$

Equation of AP

$y - y_1 = m(x - x_1)$

$y - 7 = \frac{-3}{2}[x - (-5)]$

$2y - 14 = -3x - 15$

$3x + 2y + 1 = 0$

$3x + 2y = -1$ ….(i)

$2x - 3y = -18$ ….(ii)

Multiplying eg. (i) by 3 an d(ii) by 2

$9x + 6y = -3$ ….(iii)

$4x - 6y = -36$ ….(iv)

Adding (i) & (ii)

$13x = -39$

$x = -3$

Substituting value of x in eg. (i)

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

$-9 + 2y = -1$

$2y = 8$

$y = 4$

p(-3, 4)

Q.3.

a. $\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}\begin{pmatrix} 4x \\ 2 \end{pmatrix} + 3\begin{pmatrix} -4 \\ 5 \end{pmatrix} = 2\begin{pmatrix} -3 \\ 9y \end{pmatrix}$

$$\begin{bmatrix} 3(4x) & -2(2) \\ -1(4x) & +4(2) \end{bmatrix} + \begin{pmatrix} -12 \\ 15 \end{pmatrix} = \begin{pmatrix} -6 \\ 18y \end{pmatrix}$$

$$\begin{bmatrix} 12x & -4 \\ -4x & +8 \end{bmatrix} + \begin{pmatrix} -12 \\ 15 \end{pmatrix} = \begin{pmatrix} -6 \\ 18y \end{pmatrix}$$

$$\begin{bmatrix} 12x & -4 + (-12) \\ -4x & +8 + 15 \end{bmatrix} = \begin{pmatrix} -6 \\ 18y \end{pmatrix}$$

$$\begin{bmatrix} 12x & -16 \\ -4x & +23 \end{bmatrix} = \begin{pmatrix} -6 \\ 18y \end{pmatrix}$$

Equating the matrices

$12x - 16 = -6$

$12x = 10$

$x = \frac{10}{12}$

$x = \frac{5}{6}$

$-4x + 23 = 18y$

$-4\left(\frac{5}{6}\right) + 23 = 18y$

$\frac{-10}{3} + 23 = 18y$

$-10 + 69 = 54y$

~~$\frac{59}{54} = y$~~

$\frac{5}{54} = y$

b. **Solution:**

L.H.S. $= \dfrac{\cot A + \tan B}{\cot B + \tan A}$

$= \dfrac{\cot A + \tan B}{\dfrac{1}{\tan B} + \dfrac{1}{\cot A}}$ … $\tan\theta = \dfrac{1}{\cot\theta}$, $\cot\theta = \dfrac{1}{\tan\theta}$

$= (\cot A + \tan B) \div \left(\dfrac{\cot A + \tan B}{\cot A \cdot \tan B}\right)$

$= (\cot A + \tan B) \times \dfrac{\cot A \cdot \tan B}{(\cot A + \tan B)}$

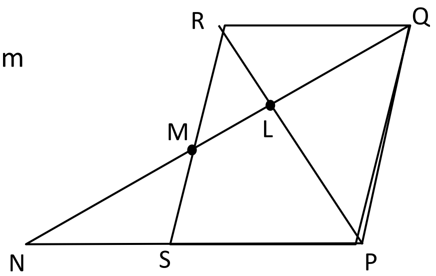
$= \cot A \cdot$ tab B

$\therefore$ L.H.S. = R.H.S.

… hence proved.

c. **Solution:**

☐PQRS is a parallelogram



PQ = 16 cm

QR = 10 cm

RL : LP = 2 : 3

To find: PN, RM

Proof:

	Statement	Reason
1)	In ΔRQL & ΔPNL, $\angle$RQL = $\angle$PNL $\angle$RLQ = $\angle$PLN	 Alternate angles are equal V.O.As
2)	$\Delta RQL \sim \Delta PNL$	By AA axiom of similarity
3)	$\dfrac{RQ}{PN} = \dfrac{RL}{PL}$	c.s.s.t.p.
4)	$\dfrac{10}{PN} = \dfrac{2}{3}$	Substitution

	$\therefore$ PN = $\frac{10 \times 3}{2}$ PN = 15 cm	Simplification
5)	In ΔRLM &ΔPLQ, $\angle$RLM = $\angle$PLQ $\angle$LRM = $\angle$LPQ	 (V.O.As) alternate angles are equal
6)	ΔRLM ~ ΔPLQ	By AA axiom of similarity
7)	$\frac{RL}{PL} = \frac{RM}{PQ}$	c.s.s.t.p.
8)	$\frac{2}{3} = \frac{RM}{16}$	Substitution
9)	RM = $\frac{16 \times 2}{3}$ RM = $\frac{32}{3}$ = $10\frac{2}{3}$ cm	Simplification

m^2

Q.4.

a. $3x - 1 = \frac{7}{x}$

$3x^2 - x = 7$

$3x^2 - x = 0$

a = 3 b = -1 c = -7

$$x = -b + \frac{\sqrt{b^2 - 4ac}}{2a}$$

$$= -(-1) \pm \frac{\sqrt{(-1)^2 - 4 \ x \ 3 \ x \ (-7)}}{2 \ x \ 3}$$

$$= +1 \pm \frac{1 + \sqrt{85}}{6} = \frac{1 \pm 9.22}{6}$$

$x = \frac{1 + 9.22}{6}$ or $x = \frac{1 - 9.22}{6}$

$= \frac{10.22}{6}$ or $x = \frac{1(9.22 - 1)}{6}$

= 1.703 or $x = \frac{-8.22}{6}$ =

= 1.7 or x = -1.37 = x = -1.4

b. Prove: $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta . \cos^2\theta$

LHS = sin60 + cos60

$= (\sin^2\theta)^3 + (\cos^2\theta)^3$

$= (\sin^2\theta^- + \cos^2\theta) \ (\sin^4\theta^- - \sin^2\theta\cos^2\theta + \cos^4\theta)$

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

$= \sin^4\theta^- + \sin^2\theta\cos^2\theta + \cos^4\theta$

$= \sin^4\theta^- + \cos^2\theta - \sin^2\theta\cos^2\theta$

$= (\sin^2\theta)^2 + (\cos^2)\theta^2 - \sin^2\theta^2\cos^2\theta$

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

= $(\sin^2\theta + (\cos^2\theta)$ - 2 $\sin^2\theta\cos^2\theta$- $\sin^2\theta\cos^2\theta$
= 1 -3$\sin^2\theta\cos^2\theta$
= RHS
Hence Proved.

c. (i) p(2, 3)
(ii) p''(2, -3)
(iii) 9'(4, 2)
(iv) Parallelogram
Area x = $\frac{1}{2}$x 6 x 4 +
(graph paper)

Section B (40 marks)

Q.5.

a. $\frac{x^2+3x-4}{3x-4} = \frac{3x^2+2x+9}{2x+9}$

Componendo&Dividendo

$$\frac{x^2+3x-4+3x-4}{x^2+3x-4-3x+4} = \frac{3x^2+2x+9+2x+9}{3x^2+2x+9-2x-9}$$

$$\frac{x^2+6x-8}{x^2}=\frac{3x^2+4x+18}{3x^2}$$

$$\frac{3x^2}{x^2}=\frac{3x^2+4x+18}{x^{2+6x-8}}$$

$3x^2 + 18x – 24 = 3x^2 + 4x + 18$

14x = 42

x = $\frac{42}{14}$

x = 3

b.

Solution:

f(x) = $x^3 + 2x^2 – kx + 10$

By remainder theorem,

when f(x) is divided by (x – 2), the remainder is f(2).

f(2) = $(2)^3 + 2(2)^2 – k(2) + 10$

= 8 + 8 – 2k + 10

f(2) = 26 – 2k ... (i)

(x – 2) is a factor of f(x) ... given

∴ from (i) & (ii)

26 – 2k = 0

∴ 2k = 26

∴ k = 13

∴ f(x) = $x^3 + 2x^2 – 13x + 10$

By remainder theorem, when f(x) is divided by (x + 5), the remainder is f(–5).

∴ f(–5) = $(–5)^3 + 2(–5)^2 – 13(–5) + 10$

= –125 + 50 + 65 + 10

= –125 + 125

$f(-5) = 0$

By factor theorem $\because f(-5) = 0$

$(x + 5)$ is a factor of $f(x)$.

C. **Solution:**

R(0, y) is point on y-axis

$P(-4, 5) \equiv (x_1, y_2)$ & $Q(3, 2) \equiv (x_2, y_2)$

By section formula,

$$R(0, y) = \left\{\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right\}$$

$$R(0, y) = \left\{\frac{m_1(3) + m_2(-4)}{m_1 + m_2}, \frac{m_1(2) + m_2(5)}{m_1 + m_2}\right\}$$

$$R(0, y) = \left\{\frac{3m_1 - 4m_2}{m_1 + m_2}, \frac{2m_1 + 5m_2}{m_1 + m_2}\right\}$$

Equating x & y co-ordinates, we get,

$$0 = \frac{3m_1 - 4m_2}{m_1 + m_2} \quad \& \quad y = \frac{2m_1 - 5m_2}{m_1 + m_2}$$

$\therefore 0 = 3m_1 - 4m_2$

$\therefore 3m_1 = 4m_2$

$$\frac{m_1}{m_2} = \frac{4}{3}$$

$$y = \frac{2(4) + 5(3)}{4 + 3}$$

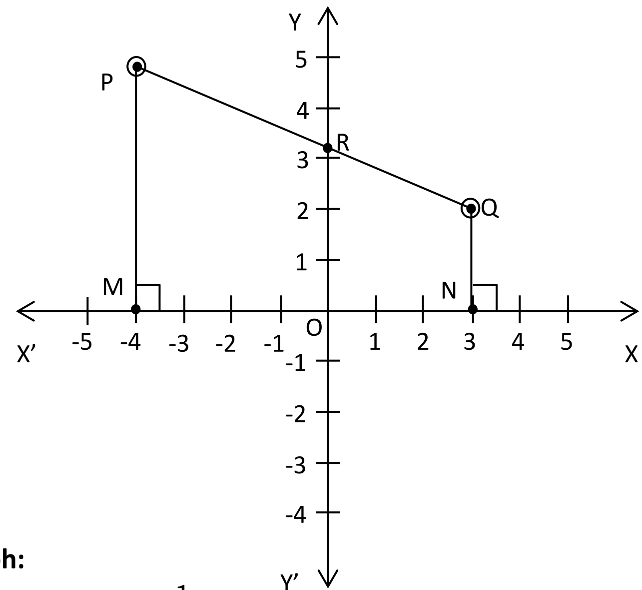
$$y = \frac{8 + 15}{7}$$

$$y = \frac{23}{7}$$

i) PR : RQ = $m_1 : m_2 = 4 : 3$

ii) Co-ordinates of R(0, y) = $\left(0, \frac{23}{7}\right)$

iii)



For graph:

$$\text{Area} \square PMNQ = \frac{1}{2}(\text{sum} \square \text{sides}) \times h$$

$$= \frac{1}{2}(5 + 2) \times 7$$

$$= \frac{49}{2}$$

Area $\square$ PMNQ = <u>24.5 sq. units</u>

Q.6.

a. Let $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$ = k

k = aky=bk z=ck

To prove = $\frac{x^3}{a^2} + \frac{y^3}{b^2} + \frac{z^3}{c^2} = \frac{(x+y+z)^3}{(a+b+c)^2}$

LHS =$\frac{a^3b^3c^3}{a^2b^2c^2}$

= k^3(a + b + c)

RHS =$\frac{(ak+bk+ck)^3}{(a+b+c)^2}$

= $\frac{((k^3(a+b+c))^3}{(a+b+c)^2}$

= $\frac{k^3(a+b+c))^3}{(a+b+c)^2}$

= k^3 (a + b + c)
= LHS Hence proved

b. A = $\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

A^2 = 8A + kI

According to the given condition:
A^2 = 18A + KI
A^2 – 8A = KI

$\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ - 8$\begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ = k $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & 0 \\ -8 & 49 \end{bmatrix}$ - $\begin{bmatrix} 8 & 0 \\ 8 & 56 \end{bmatrix}$ = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$

$\begin{bmatrix} 1-8 & 0 \\ -8+8 & 49-56 \end{bmatrix}$ = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$

$\begin{bmatrix} -7 & 0 \\ 0 & -7 \end{bmatrix}$ = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$

By equality of matrices corresponding values are equal
∴ k = -7

c. Let A = (4, 2)

Let B = (3, -5)
Let k on x-ax
By section formulas
(x, 0) =

Q.7.

a. In ΔAMN and ΔACB

∠A = ∠A (common angle)

$\frac{AM}{AC} = \frac{AN}{AB} = \frac{1}{2}$

∴ ΔAMN~ΔACB

$$\frac{\text{Area of } \Delta AMN}{\text{Area of } \Delta ACB} = \left(\frac{AM}{AC}\right)^2$$

$$= \left(\frac{2}{4}\right)^2$$

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

$$\frac{\text{Area of } \Delta AMN}{\text{Area of } \Delta ACB} = \frac{1}{4}$$

b. P = ` 600

N = 24 months

MV = ` 15,450

R = ?

$$MV = p \text{ x } n + p \text{ x } \frac{n(n+1)}{100} \text{ x } \frac{1}{12 \, x \, 2}$$

$$15450 = 600 \text{ x } 24 + \frac{600 \text{ x } 24 \text{ x } 25 \text{ x } r}{100 \text{ x } 12 \text{ x } 2}$$

15450 = 14400 + 25 X 6

15450 = 150r

r = 7%

c. (graph paper)

Q.8.

a. $\frac{3x+4}{x+5} = \left(\frac{8}{5}\right)^2$

$\frac{3x+4}{x+5} = \frac{64}{25}$

$75x + 100 = 64x + 320$

$11x = 220$

$x = 20$

b. **Solution:**

$-2 \leq \frac{1}{2}\times 6 - \frac{2x}{3}\times 6$ & $\frac{1}{2}\times 6 - \frac{2x}{3}\times 6 \leq \frac{11\times 6}{6}$

$-12 \leq 3 - 4x$ $\quad\quad$ $3 - 4x \leq 11$

$\therefore 4x \leq 3 + 12$ $\quad\quad$ $3 - 11 \leq 4x$

$\therefore 4x \leq 15$ $\quad\quad$ $\therefore -8 \leq 4x$

$\therefore x \leq \frac{15}{4}$ $\quad\quad$ i.e. $4x \geq -8$

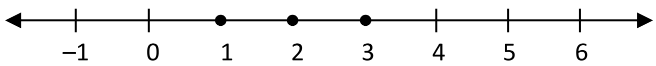
$\therefore x \leq 3.75$ $\quad\quad$ $x \geq -\frac{8}{4}$

$\therefore x \geq -2$

$\therefore -2 \leq x \leq 3.75, x \in N$

$\therefore$ S.S. = {1, 2, 3}

The graph of the solution is:



c. (i) $l^2 = h^2 + v^2$

$(25)^2 = h^2 + (7)^2$

$625 = h^2 + 49$

$h^2 = 576$

$h = 24$ cm

(ii) Volume of the solid = v of conc+ v of hemisphere

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

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

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 (24 + 2(7))$

$= \frac{1}{3} \times 22 \times 7 \times 38$

$= \frac{5852}{3}$

$= 1950.666 \text{ cm}^2$

$= 1950.67 \text{ cm}^2$

(iii) SA of solid = CSA of conc + CSA of hemisphere

$= \pi r (l + 2r)$

$= \frac{22}{7}$ x 7 (25 + 2 x 7)

= 22 x 39 = 858 cm^2

Q.9.

a. MP = ` 40,000 /-

For shopkeeper

Purchased price = 40,000 - $\frac{1}{100}$ x 40,000
= 40,000 – 4000
= 36,000

Tax paid = $\frac{5}{100}$ x 36000
= ` 1800

Selling price = 40,000 - $\frac{5}{100}$ x 40,000
= 40,000 – 2000
= 38,000

Tax changed = $\frac{5}{100}$ x 38,000
= 1900

VAT = Tax changed – Tax paid
= 1900 – 1800
= ` 100

Amt paid by customer = 38000 + 1900
= 39,900/-

Q.9.

b. Construction

Q.9.

c. let two natural numbers be x and 8-x

$$\frac{1}{x} - \frac{1}{8-x} = \frac{2}{15}$$

$$\frac{9-x-x}{x(8-x)} = \frac{2}{15}$$

$$\frac{8-2x}{8x-x^2} = \frac{2}{15}$$

120 - 30x = 16x - 2x^2

2x^2 – 16x – 30x + 120 = 0

2x^2 – 46 + 120 = 0

2x^2 – 23x + 60 = 0

$x^2 - 20x + 3x + 60 = 0$
$x(x - 20) - 3(x - 20) = 0$
$(x - 20)(x - 3) = 0$
$x - 20 = 0$ or $x - 3 = 0$
$x = 0$ or $x = 3$

But $x = 20$ is not possible
$\therefore x = 3$
$\therefore 8 - x = 8 - 3 = 5$
Thus the two numbers are 3 and 5.

Q.10.
a. Distance Formula for (3, 3) an d(9, 0)

$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(3 - 9)^2 + (3 - 0)^2}$

$= \sqrt{36 + 9}$

$= \sqrt{45}$

Distance Formula for (3, 3) and (12, 21)
$= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(3 - 12)^2 + (3 - 21)^2}$

$= \sqrt{81 + 324}$

$= \sqrt{405}$

Distance Formula for (3, 3) and (12, 21)
$= \sqrt{(12 - 9)^2 + (21 - 0)^2}$

$= \sqrt{9 + 441}$

$= \sqrt{450}$

$\therefore (\sqrt{405})^2 + (\sqrt{45})^2 = (\sqrt{450})^2$

$405 + 45 = 450$
$450 = 450$

$\therefore$ By phythogoras Theorem
(9, 0), (3, 3) and (12, 21) are the vertices of a right angled triangle.

b.

c. let the number of shares be x

Case I :

∴ Investment = $90 \times x$

= ` $90x$

∴ No of shares = $\frac{Investment}{market\ value}$

= $\frac{90x}{33} = \frac{30x}{11}$

∴ Income = No. of shares × Rate x NV

= $\frac{30x}{11}$ x $\frac{15}{11}$ x 50

= $\frac{225x}{11}$

Case II

Investment = $110 \times x$

= ` $110x$

∴ No of shares = $\frac{110x}{33} = \frac{10x}{3}$

∴ Income = No. of shares × NV × Rate

= $\frac{10x}{3} \times 50 \times \frac{15}{100}$

= $\frac{75x}{3}$

= $25x$

According to condition

$25x - \frac{225x}{11} = 450$

$\frac{275x - 225x}{11} = 450$

$50x = 450 \times 11$

$x = \frac{450 \times 11}{50}$

$x =$ ` 99 shares

Q.11.

a. $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

$\sin\theta = \sqrt{2}\cos\theta - \cos\theta$

$= \cos\theta\,(\sqrt{2} - 1)$

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

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

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

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

b. Graph