Version No.			
⓪	⓪	⓪	⓪
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

ROLL NUMBER						
⓪	⓪	⓪	⓪	⓪	⓪	⓪
①	①	①	①	①	①	①
②	②	②	②	②	②	②
③	③	③	③	③	③	③
④	④	④	④	④	④	④
⑤	⑤	⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨

Answer Sheet No._____________

Sign. of Candidate___________

Sign. of Invigilator___________

MATHEMATICS SSC–I

(Science Group) (Curriculum 2006)

SECTION – A (Marks 15)

Time allowed: 20 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

(1) Which one of the following represents an identity matrix?

A. $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ ○ B. $\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ ○

C. $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ ○ D. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ○

(2) Which one of the following options is the real part of $5i(3-2i)$?

A. –10 ○ B. 10 ○

C. 15 ○ D. –5 ○

(3) The scientific notation of 537.1 is:

A. 5.371×10^2 ○ B. 5.371×10^3 ○

C. 5.371×10^{-2} ○ D. 5.371×10^{-3} ○

(4) Which one of the following is a polynomial?

A. x^3+3x^2-5 ○ B. $x^3+3x^{-2}-5$ ○

C. $x^{3/2}+3x^2-5$ ○ D. $x^2+3x^{-1/2}-5$ ○

(5) The expansion of $(x-1)^3$ is:

A. x^3+3x^2-3x+1 ○ B. x^3-3x^2+3x-1 ○

C. x^3-3x^2-3x+1 ○ D. x^3-3x^2-3x-1 ○

(6) The multiplicative factors of $(2x^2-18)$ are:

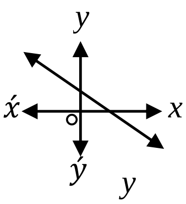
A. $2(x-3)(x-3)$ ○ B. $2(x-3)(x+3)$ ○

C. $(\sqrt{2}x-9)(\sqrt{2}x-9)$ ○ D. $(\sqrt{2}x-9)(\sqrt{2}x+9)$ ○

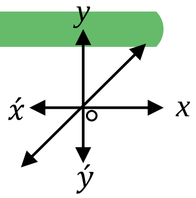
(7) Let a, b be real numbers, then a is greater than b if the difference $a - b$ is positive and we denote this order relation by the inequality:

[✓ A. $a > b$] ○ B. $a < b$ ○
C. $b \geq a$ ○ D. $b \leq a$ ○

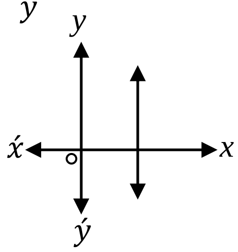
(8) Which one of the following is a graph of $y = mx$?

A.


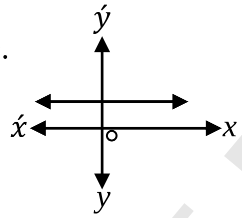
○

[✓ B.]


○

C.


○

D.


○

(9) The distance between the points A (5,3) and B (−5,7) is:

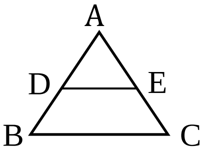
A. $10\sqrt{29}$ ○ B. $4\sqrt{29}$ ○
C. $8\sqrt{29}$ ○ [✓ D. $2\sqrt{29}$] ○

(10) Which one of the following points lies on the line $x - 2y + 1 = 0$?

A. $(0, -1)$ ○ [✓ B. $(-1,0)$] ○
C. $(1,0)$ ○ D. $(0,1)$ ○

(11) In a given figure, If D and E are the mid points of the sides and $m\overline{DE} = 5cm$ then $m\overline{BC} = ?$

A. $5\ cm$ ○ [✓ B. $10\ cm$] ○
C. $15\ cm$ ○ D. $2.5\ cm$ ○



(12) What is the value of $|-a|$, where $a > 0$?

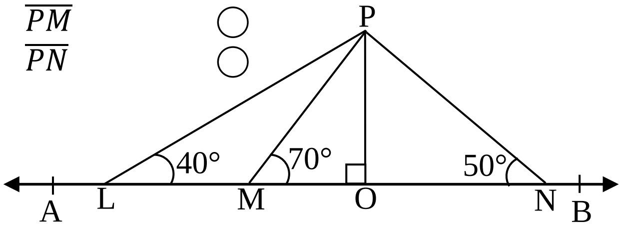
A. $-a$ ○ [✓ B. $+a$] ○
C. $-|a|$ ○ D. $\sqrt{a}$ ○

(13) Which one of the following side measures represents a right angled triangle?

A. 1, 2, 3 ○ B. 2, 3, 5 ○
C. 2, 4, 7 ○ [✓ D. 3, 4, 5] ○

(14) In the figure given below, P is any point and AB is a line. Which one of the following is the shortest distance between the point P and the line AB?

[✓ A. $\overline{PO}$] ○ B. $\overline{PM}$ ○
C. $\overline{PL}$ ○ D. $\overline{PN}$ ○



(15) If P, Q and R are the collinear points then, which one of the following options is correct?

[✓ A. $|\overline{PQ}| + |\overline{QR}| = |\overline{PR}|$] ○ B. $|\overline{PQ}|^2 + |\overline{QR}|^2 = |\overline{PR}|^2$ ○
C. $|\overline{PQ}|^2 + |\overline{QR}|^2 \neq |\overline{PR}|^2$ ○ D. $|\overline{PQ}| + |\overline{QR}| \neq |\overline{PR}|$ ○

Federal Board SSC-I Examination
Mathematics Model Question Paper
(Science Group) (Curriculum 2006)

Section A(Marks 15)

Q1.

Part No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Correct Option	D	B	A	A	B	B	A	B	D	B	B	B	D	A	A

Section B(Marks 4x9=36)

Q. 2 Attempt any nine parts from the following. All parts carry equal marks ((9*4=36)

i. if A = $\begin{bmatrix} \frac{1}{4} & \frac{7}{2} \\ 2 & 2 \end{bmatrix}$

a. find $|A|$

b. is matrix A nonsingular?

c. Find A^{-1} (multiplicative inverse)

Sol.

a) $|A| = \begin{vmatrix} \frac{1}{4} & \frac{7}{2} \\ 2 & 2 \end{vmatrix}$

$= \frac{1}{4} \times 2 - \frac{7}{2} \times 2$

$= \frac{1}{2} - 7$

$= \frac{1-14}{2}$

$= -\frac{13}{2}$ 1 mark

b) $|A| = \frac{13}{2} \neq 0$ so matrix A is nonsingular. 1 mark

c) $A^{-1} = ?$

$A^{-1} = \frac{1}{|A|}\text{Adj}[A]$ -----------I 0.5 mark

$\text{Adj}[A] = \text{Adj}\begin{bmatrix} \frac{1}{4} & \frac{7}{2} \\ 2 & 2 \end{bmatrix}$

$= \begin{bmatrix} 2 & -\frac{7}{2} \\ -2 & \frac{1}{4} \end{bmatrix}$ 1 mark

put values in eq. i

$A^{-1} = \frac{1}{-\frac{13}{2}}\begin{bmatrix} 2 & -\frac{7}{2} \\ -2 & \frac{1}{4} \end{bmatrix}$

$= -\frac{2}{13}\begin{bmatrix} 2 & -\frac{7}{2} \\ -2 & \frac{1}{4} \end{bmatrix}$ 0.5 mark

$= \begin{bmatrix} -\frac{2}{13} \text{x } 2 & -\frac{2}{13} \text{x } -\frac{7}{2} \\ -\frac{2}{13} \text{x } -2 & -\frac{2}{13} \text{x} \frac{1}{4} \end{bmatrix}$

$= \begin{bmatrix} -\frac{4}{13} & \frac{7}{13} \\ \frac{4}{13} & -\frac{1}{26} \end{bmatrix}$ 1 mark

ii. Simplify using laws of exponents $\frac{(x^{m+n})^2 \times (x^{n+p})^2 \times (x^{p+m})^2}{(x^{m+n+p})^3}$

Sol.

$= \frac{(x)^{2(m+n)} \times (x^{2(n+p)} \times (x^{2(p+m)}}{x^{3(m+n+p)}}$ $\because (a^m)^n = a^{mn}$

$= \frac{(x)^{2m+2n} \times (x)^{2n+2p} \times (x)^{2p+2m}}{(x)^{3m+3n+3p}}$ 1 mark

$= \frac{(x)^{2m+2n+2n+2p+2p+2m}}{(x)^{3m+3n+3p}}$

$= \frac{x^{4m+4n+4p}}{x^{3m+3n+3p}}$ 1 mark

$= x^{4m+4n+4p}$ x $x^{-(3m+3n+3p)}$

$= x^{4m+4n+4p}$ x $x^{-3m-3n-3p}$ 1 mark

$= x^{4m+4n+4p-3m-3n-3p}$ $\because a^m$x $a^n = a^{m+n}$

$= x^{m+n+p}$ 1 mark

iii. Simplify $\frac{2+6i}{3-i} - \frac{4-i}{3-i}$

Sol.

$$\frac{2+6i}{3-i} - \frac{4-i}{3-i}$$

$=\frac{(2+6i)-(4-i)}{3-i}$ taking lcm

$=\frac{2+6i-4+i}{3-i}$

$=\frac{-2+7i}{3-i}$ 1 mark

$=\frac{-2+7i}{3-i}$ x $\frac{3+i}{3+i}$ by rationalizing

$=\frac{-6-2i+21i+7(\,i^2)}{3^2-\,i^2}$ ∵ (a+b)(a-b)= a^2-b^2

$=\frac{-6+19i+7(-1)}{9-(-1)}$ $\because\ i^2=-1$ 1 mark

$=\frac{-6+19i-7}{10}$

$=\frac{-13+19i}{10}$ 1 mark

$=\frac{-13}{10}+\ \frac{19}{10}i$where a $=\frac{-13}{10}$ and b $=\frac{19}{10}$ 1 mark

iv. If $x=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ find

a) $\frac{1}{x}$
b) $x+\frac{1}{x}$
c) $x^3+\frac{1}{x^3}$

Sol.

$x=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ x $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ rationalizing

$x=\frac{(\sqrt{5}+\sqrt{3})^2}{\sqrt{5}^2-\sqrt{3}^2}$ ∵ (a+b)(a-b)= a^2-b^2 (a+b)(a+b) = $(a+b)^2$

$x=\frac{(\sqrt{5})^2+(\sqrt{3})^2+2\,(\sqrt{5})(\sqrt{3}\ )}{\sqrt{5}^2-\sqrt{3}^2}$ $(a+b)^2$ = a^2+b^2 2ab

$$x=\frac{5+3+2\sqrt{15}}{5-3}$$
$$x=\frac{8+2\sqrt{15}}{2}$$
$$x=\frac{2(4+\sqrt{15})}{2}$$
$$x=4+\sqrt{15}$$ 1 mark
$$\frac{1}{x}=\frac{1}{4+\sqrt{15}}$$
$$=\frac{1}{4+\sqrt{15}}\text{x}\frac{4-\sqrt{15}}{4-\sqrt{15}}$$

$= \frac{1}{4+\sqrt{15}} \text{x} \frac{4-\sqrt{15}}{4-\sqrt{15}}$

$= \frac{4-\sqrt{15}}{4^2-\sqrt{15}^2}$

$= \frac{4-\sqrt{15}}{16-15}$

$= \frac{4-\sqrt{15}}{1}$

$= 4-\sqrt{15}$ 1 mark

$x+\frac{1}{x} = \left(4+\sqrt{15}\right)+(4-\sqrt{15})$

$= 4+\sqrt{15}+\ 4-\sqrt{15}$

$= 8$ 1 mark

$(x+\frac{1}{x})^3 = \ x^3+(\frac{1}{x})^3+3(x)(\frac{1}{x})(x+\frac{1}{x})$

$(8)^3 \quad = \ x^3+\frac{1}{x^3}+3(8)$

$512 \quad = \ x^3+\frac{1}{x^3}+24$

$512-24 \quad = \ x^3+\frac{1}{x^3}$

$x^3+\frac{1}{x^3} = 488$ 1 mark

v. Factorize (x+1)(x+3)(x+6)(x+8)-119

Sol.

(x+1)(x+3)(x+6)(x+8)-119

=(x+1)(x+8)(x+3)(x+6)-119 0.5 mark

=(x^2+8x+x+8)(x^2+6x+3x+18)-119

=(x^2+9x+8)(x^2+9x+18)-119 0.5 mark

Let x^2+9x= y 0.5 mark

=(y+8)(y+18)-119

= y^2+8y+18y+144-199

=y^2+26y+25 1 mark

=y^2+y+25y+25

=y(y+1)+25(y+1)

=(y+1) (y+25) 1 mark

=(x^2+9x+1)(x^2+9x+25) 0.5 marks

vi. f(x)= x^4 +5x^3- 8x^2 -45x-9

a) Find Remainder when f(x) is divided by (x-3)
b) Use factor theorem to show that (x+3) is a factor of f(x)

Sol.

a) $f(x)= x^4 +5x^3- 8x^2 -45x-9$

According to remainder theorem if a polynomial p(x) is divided by (x-a) then p(a) is called remainder. 1 mark

So put x=3 in f(x)

$f(3)=3^4 +5(3^3)- 8(3^2)-45(3)-9$

$=81+5(27)-8(9)-135-9$

$= 81+135-72-135-9$

$=0$ 1 mark

Hence remainder is zero

a) $f(x)= x^4 +5x^3- 8x^2 -45x-9$

According to Factor theorem if a polynomial p(x) is divided by (x-a) and p(a) = 0 then (x-a) is called factor of p(x) 1 mark

So put x=-3 in f(x)

$f(-3)=(-3)^4 +5(-3)^3- 8(-3)^2-45(-3)-9$

$=81+5(-27)-8(9)+135-9$

$= 81-135-72+135-9$

$=0$

Since remainder is zero so (x+3) is factor off(x) 1 mark

vii. Find HCF of given polynomials by division method $3x^3+ 5x^2 -6x-2$; $3x^3- 5x^2 +6x-4$

1

$3x^3- 5x^2 +6x-4 \;\big|\; 3x^3+ 5x^2 -6x-2$

$3x^3- 5x^2 +6x-4$

$- \quad + \quad - \quad +$

$10x^2-12x+2$

$2(5x^2-6x+1)$ $3x-7$ 1 mark

$5x^2-6x+1 \;\big|\; 3x^3- 5x^2 +6x-4$

x5

$15x^3-25x^2 +30x-20$

$15x^3-18x^2+ 3x$

$- \quad + \quad -$

$-7x^2+27x-20$ 1 mark

x 5

$-35x^2+135x-100$

$-35x^2+ 42x- 7$

$+ \quad - \quad +$

$93x-93$

$93(x-1)$ 1 mark

$5x-1$

$x-1 \;\big|\; 5x^2-6x+1$

$5x^2-5x$

$- \quad +$

$-x + 1$

$-x + 1$ HCF =x-1 1 mark

$+ \quad -$

x

viii. Find values of l and m for which the following expression become a perfect square

$64x^4 + 153x^2 + 48x^3 + lx + m$

Sol.

$64x^4 + 48x^3 + 153x^2 + lx + m$ rearranging 0.5 mark

$8x^2 + 3x + 9$

$8x^2 \,\big|\, 64x^4 + 48x^3 + 153x^2 + lx + m$

$64x^4$

$-$

$16x^2 + 3x \,\big|\, 48x^3 + 153x^2 + lx + m$ 0.5 mark

$48x^3 + 9x^2$

$- \quad -$

$16x^2 + 6x + 9 \,\big|\, 144x^2 + lx + m$ 0.5 mark

$144x^2 + 54x + 81$

$- \quad - \quad -$

$lx - 54x + m - 81$ 1 mark

The given expression will be perfect square if remainder is zero 0.5 mark

$lx - 54x + m - 81 = 0$

$(l-54)x + (m-81) = 0$

$l-54=0$ and $m-81 = 0$ 1 mark

ix. Prove that, any point on right bisector of a line segment is equidistant from its end points.

Given

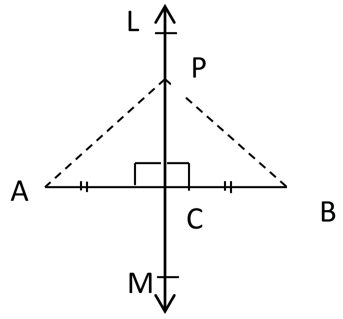
A line $\overleftrightarrow{LM}$ intersects the line segment AB atthe point C. Such that $\overleftrightarrow{LM} \perp \overline{AB}$ and $\overline{AC} \cong \overline{BC}$ P is a point on $\overleftrightarrow{LM}$.

To Prove

$\overline{PA} \cong \overline{PB}$

Construction

Join P to the points A and B. 1 mark



Proof

1 mark

Statements	**Reasons**
In ΔACP ←→ ΔBCP	
$\overline{AC} \cong \overline{BC}$	given
∠ACP ≅∠BCP	given $\overleftrightarrow{LM} \perp \overline{AB}$so that each ∠at C = 90°
$\overline{PC} \cong \overline{PC}$	Common
ΔACP ≅ ΔBCP	S.A.S. postulate
Hence$\overline{PA} \cong \overline{PB}$	corresponding sides of congruent triangles

2 mark

x. Solve for x$\frac{3|\,x-5\,|}{2} - 8 = 12 - |\,x-5\,|$

Sol.

$$\frac{3|\,x-5\,|}{2} + |\,x-5\,| = 12 + 8$$

$$|\,x-5\,|(\tfrac{3}{2} + 1) = 20$$ 1 mark

$$|\,x-5\,|(\frac{3+2}{2}) = 20$$

$|x-5|(\frac{5}{2}) = 20$

$|x-5| = 20(\frac{2}{5})$

$|x-5| = 8$ 1 mark

$\pm(x-5) = 8$

$(x-5) = 8$ or $-(x-5) = 8$

$x = 8+5$ or $-x+5 = 8$

$x = 13$ or $-x = 8-5 = 3 \Rightarrow x = -3$ 1 mark

Sol. Set ={13, −3} 1 mark

xi. Simplify $\frac{a+b}{a^2+b^2} \cdot \frac{a}{a-b} \div \frac{(a+b)^2}{a^4-b^4}$

Sol.

$= \frac{a+b}{a^2+b^2} \cdot \frac{a}{a-b} \text{x} \frac{a^4-b^4}{(a+b)^2}$ 1 mark

$= \frac{a+b}{a^2+b^2} \cdot \frac{a}{a-b} \text{x} \frac{(a^2-b^2)(a^2+b^2)}{(a+b)(a+b)}$ 1 mark

$= \frac{a}{a-b} \text{x} \frac{(a+b)(a-b)}{(a+b)}$ 1 mark

$= a$ 1 mark

xii. Evaluate log 81 to the base $\sqrt[3]{3}$

Sol.

Let $\log_{\sqrt[3]{3}} 81 = x$

$\because \log_a y = x \Rightarrow a^x = y$ 1 mark

So $\log_{\sqrt[3]{3}} 81 = x$

$\Rightarrow (\sqrt[3]{3})^x = 81$ 1 mark

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

$\Rightarrow (3)^{\frac{x}{3}} = (3)^4$ 1 mark

Bases are same exponents can be equated

$\Rightarrow \frac{x}{3} = 4$

$\Rightarrow x = 3 \text{ x } 4$

$\Rightarrow x = 12$

Hence $\log_{\sqrt[3]{3}} 81 = 12$ 1 mark

xiii. Find the values of x and y for the given congruent triangles

Sol.

ΔRSU ≅ ΔRUT Given

$m < T = m < S$

(5x + 5)° = 50° 1 mark

5x=50-5

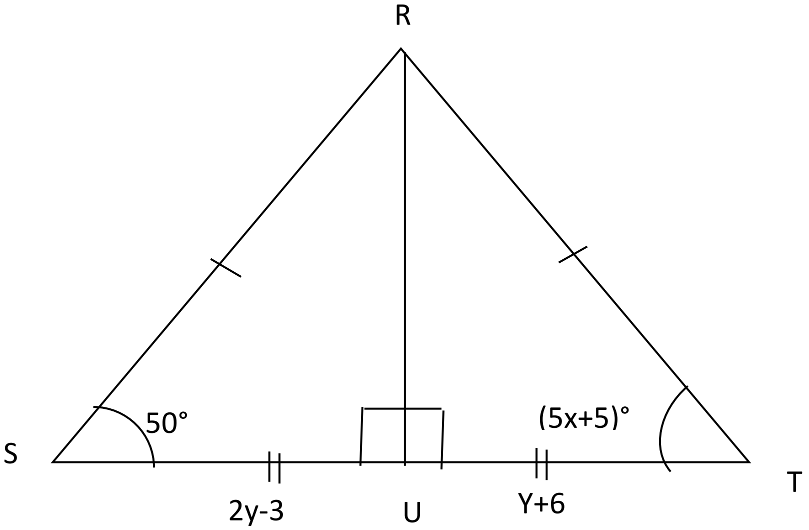
5x= 45

x = 45/5

x = 9° 1 mark

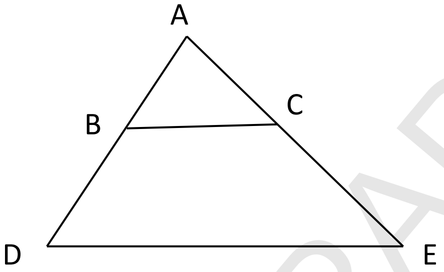
also

SU = UT



2y-3 = y + 6 1 mark
2y-y = 6+3
Y = 9 1 mark

Xiv. Given



$m\overline{AB} = 5\ cm,$
$m\overline{BD} = 10\ cm$
$m\overline{AE} = 18\ cm,$
$\overline{BC}| \quad |\overline{DE}$

To find
$m\overline{AC} = ?$

Sol.

$\overline{BC}| \quad |\overline{DE}$

$\frac{m\overline{AB}}{m\overline{AD}} = \frac{m\overline{AC}}{m\overline{AE}}$ --------i) 1 mark

$m\overline{AD} = m\overline{AB} + m\overline{DB}$
$m\overline{AD} = 5 + 10$
$m\overline{AD} = 15$ 1 mark

Put values in eq. i)

$\frac{5}{15} = \frac{m\overline{AC}}{18}$ 1 mark

$15\ m\overline{AC} = 5 \text{ x } 18$
$m\overline{AC} = \frac{90}{15}$
$m\overline{AC} = 6\ cm$ 1 mark

Section C (8x3=24)

Q no 3:

Part a) L.H.S= $(AB)^t$

$$AB = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} 5 & 7 \\ 6 & 8 \end{bmatrix}$$

$$= \begin{bmatrix} (1)(5) + (3)(6) & (1)(7) + (3)(8) \\ (2)(5) + (4)(6) & (2)(7) + (4)(8) \end{bmatrix}$$

$$= \begin{bmatrix} 23 & 31 \\ 34 & 46 \end{bmatrix}$$

L.H.S= $(AB)^t$

$= \begin{bmatrix} 23 & 31 \\ 34 & 46 \end{bmatrix}^t$

$= \begin{bmatrix} 23 & 34 \\ 31 & 46 \end{bmatrix}$---eq(1)

Now R.H.S= B^tA^t

$B^t = \begin{bmatrix} 5 & 7 \\ 6 & 8 \end{bmatrix}^t$

$= \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

$A^t = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}^t$

$= \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

R.H.S= B^tA^t

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

$= \begin{bmatrix} (5)(1) + (6)(3) & (5)(2) + (6)(4) \\ (7)(1) + (8)(3) & (7)(2) + (8)(4) \end{bmatrix}$

$= \begin{bmatrix} 23 & 34 \\ 31 & 46 \end{bmatrix}$---eq(2)

From eq(1) and eq(2) L.H.S=R.H.S

Q No 3:

Part b:

$A^{-1} = \frac{adj\ A}{|A|}$

$|A| = \begin{vmatrix} 1 & 3 \\ 2 & 4 \end{vmatrix}$

$= (1)(4) - (3)(2)$

$= -2$

$adj\ A = \begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}$

$A^{-1} = \frac{\begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}}{-2}$

$$= \begin{bmatrix} \frac{4}{-2} & \frac{-3}{-2} \\ \frac{-2}{-2} & \frac{1}{-2} \end{bmatrix}$$

$$= \begin{bmatrix} -2 & \frac{3}{2} \\ 1 & \frac{-1}{2} \end{bmatrix}$$

$L.H.S = A.A^{-1}$

$$= \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} -2 & \frac{3}{2} \\ 1 & \frac{-1}{2} \end{bmatrix}$$

$$= \begin{bmatrix} -2+3 & \frac{3}{2}-\frac{3}{2} \\ -4+4 & 3-2 \end{bmatrix}$$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$---------------------------------eq(3)

$R.H.S = A^{-1}.A$

$$= \begin{bmatrix} -2 & \frac{3}{2} \\ 1 & \frac{-1}{2} \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} -2+3 & -6+6 \\ 1-1 & 3-2 \end{bmatrix}$$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$------------------------------------eq(4)

From eq(3) and eq(4)

$L.H.S = R.H.S$

Q No 4:

Given: ΔABC is a right angled triangle in which $m < C = 90°$and $\overline{BC} = a$,

$m\overline{AC} = b$and $m\overline{AB} = c$.

To Prove:

$$c^2 = a^2 + b^2$$

Construction:

Draw $\overline{CD}$ perpendicular from Con $\overline{AB}$.

; Let $m\overline{CD} = h, m\overline{AD} = x$ and $m\overline{BD} = y$. Line segment CD splits ΔABC into two

$\Delta s\ ADC\ and\ BDC$which are separately shown in the figures (ii)-a and (ii)-b

Respectively.

Proof (Using similar Δs)

Statements	**Reasons**
In $\Delta ADC \longleftrightarrow \Delta ACB$	Refer to figures (ii)-a and (i)
$< A \cong < A$	Common-self congruent
$< ADC \cong < ACB$	Construction – given, each angle=90˚
$< C \cong < B$	$< C$ and $< B$, complements of $< A$
$\therefore \Delta ADC \sim \Delta ACB$	Congruency of three angles
$\therefore \frac{x}{b} = \frac{b}{c}$	Measures of corresponding sides of similar triangles are propotional
Or $x = \frac{b^2}{c}$ ……………………(I)	
Again in $\Delta BDC \longleftrightarrow \Delta BCA$	Refer to fig(ii)-b and (i)
$< B \cong < B$	Common-self congruent
$< BDC \cong < BCA$	Construction-given, each angle=90˚
$< C \cong < A$	$< C$ and $< A$, complements of $< B$
$\therefore \Delta BDC \sim \Delta BCA$	Congruency of three angles
$\therefore \frac{y}{a} = \frac{a}{c}$	
Or $y = \frac{a^2}{c}$ ……………………(II)	Supposition
But $y + x = c$	By (I) and (II)
$\therefore \frac{a^2}{c} + \frac{b^2}{c} = c$	
Or $a^2 + b^2 = c^2$	

Q 6.

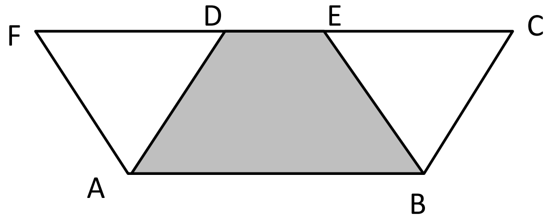
Prove that parallelograms on the same base between the same parallel lines(or of same altitude) are equal in area.

Given:

Two parallelograms ABCD and ABEF having the same base $\overline{AB}$ and between the same parallel lines $\overline{AB}$and $\overline{DE}$.

To prove:

Area of parallelogram ABCD =Area of parallelogram ABEF



Proof:

Statements	**Reasons**
Area of parallelogram ABCD= area of quad ABED + area of ΔCBE ----------i	Area addition axiom
Area of parallelogram ABEF= area of quad ABED + area of ΔDAF ------------ii	Area addition axiom
In ΔCBE $\leftrightarrow$ ΔDAF	
$m\overline{CB} = m\overline{DA}$	Opposite sides of parallelogram
$m\overline{BE} = m\overline{AF}$	Opposite sides of parallelogram
$m < CBE = m < DAF$	$\overline{BC}$ || $\overline{AD}$ and $\overline{BE}$ || $\overline{AF}$
ΔCBE $\cong$ ΔDAF	S.A.S congruent axiom
area ofΔCBE = area of ΔDAF …………….iii	Congruent area axiom
Hence Area of parallelogram ABCD =Area of parallelogram ABEF	From eq. I, eq. ii and eq. iii

Q.7.

Find b such that the points A(2, b) , B(5, 5) and C(-6, 0) are the vertices of right angle triangle ABC with $m < BAC = 90°$

Sol.

Given

A(2, b) , B(5, 5) and C(-6, 0)

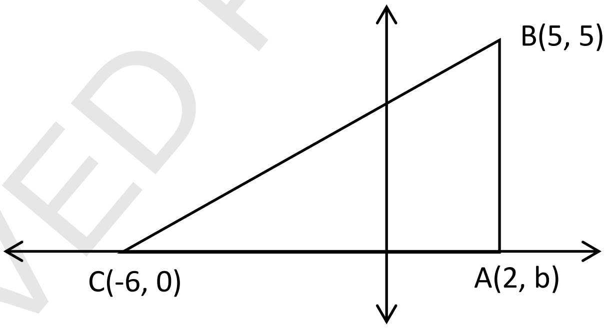
ΔABCis right angle triangle

$m < BAC = 90°$

To find

B=?

Distance Formula:



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

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

$|AB|^2$ = $(5-2)^2$+ $(5-b)^2$

= $(3)^2$+ $(5-b)^2$

$|AB|^2$ = 9 + $(5-b)^2$----------------------1 1 mark

$|BC|^2$ = $(-6-5)^2$+ $(5-0)^2$

= $(-11)^2$+ $(5)^2$

= 121 + 25

$|BC|^2$ = 146 -----------------------------2 1 mark

$|AC|^2$ = $(-6-2)^2$+ $(b-0)^2$

= $(-8)^2$+ $(b)^2$

$|AC|^2$ = 64 + b^2 -------------------------3 1 mark

According to Pythagoras Theorem

$|BC|^2$=$|AB|^2$+ $|AC|^2$

146 = $(3)^2$+ $(5-b)^2$+ 64 + b^2 from eq. 1, eq. 2 and eq. 3 1 mark

146 = 9+ 5^2 +b^2 - 10b + 64 + b^2 $(a-b)^2 = a^2+b^2 -2ab$

146 = 9+25+64+b^2+b^2-6b

146=98+2b^2 -10b

2b^2- 10b+98-146=0

2b^2-10b - 48=0

2(b^2- 5b- 24)=0

b^2- 5b- 24=0 1 mark

b^2- 5b- 24=0

b^2- 8b+3b - 24=0

b(b-8)+3(b-8)=0

(b-8)(b+3)=0

b-8=0 or b+3=0

b=8 or b=-3 1 mark

Q. 7

If $\overline{\mathrm{mZX}} = 5\ \mathrm{cm},\ \mathrm{m} < X = 75° \, and \, m < Y = 45°$

a. Construct triangle XYZ

b. Draw perpendicular bisectors of the three sides of Δ XYZ

c. Are the perpendicular bisectors are concurrent.

Given

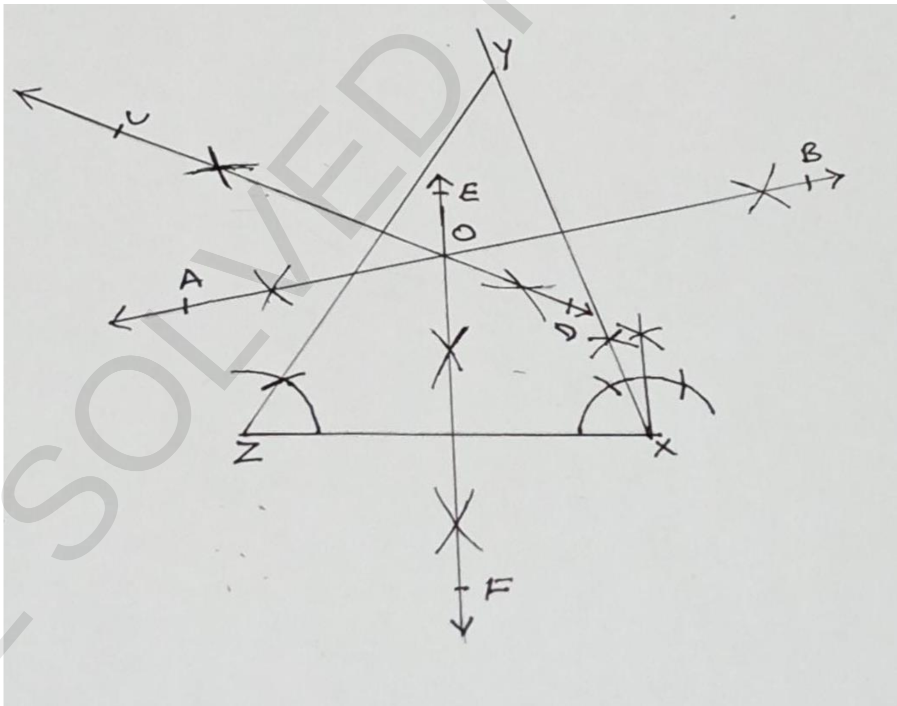
$\overline{\mathrm{mZX}} = 5\ \mathrm{cm}, \qquad \mathrm{m} < X = 75° \, and \, m < Y = 45°$

Required:

a. Construct triangle XYZ

b. Draw perpendicular bisectors of the three sides of Δ XYZ

c. Are the perpendicular bisectors are concurrent.



3 msrks

Steps of construction:

Part a.

1. Draw the line segment $\overline{\mathrm{mZX}} = 5\ \mathrm{cm}$
2. At the end point X of ZX make $\mathrm{m} < X = 75°$
3. $\mathrm{m} < X + m < Y + m < Z = 180°$

$75° + 45° + \mathrm{m} < Z = 180°$
$\mathrm{m} < Z = 180° - 75° - 45°$
$\mathrm{m} < Z = 60°$
At Z make$\mathrm{m} < Z = 60°$

4. Arms of $< X$ and $< Z$ intersect at pint Y. Δ XYZ is required triangle. 3 marks

Part b.

Draw perpendicular bisectors $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, $\overleftrightarrow{EF}$, of the sides $\overline{\mathrm{XY}}$, $\overline{\mathrm{YZ}}$and$\overline{\mathrm{ZX}}$respectively. 1 mark

Part c.

Yes the perpendicular bisectors are concurrent at O. 1 mark