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

SECTION -A

Q No 1:

(1) D	(2) B	(3) C	(4) B	(5) D	(6) C	(7) A
(8) C	(9) A	(10) B	(11) C	(12 A	(13) ± 8	(14) B
(15) B						

SECTION -B

SOLUTIONS: **MARKS**

Q-no 2 (i): **04**

$3x^2 + 4x - 5 = 5x^2 + 2x + 1$

$\Longrightarrow$ $x^2 - x + 3 = 0$ (1)

$\Longrightarrow$ Here, a = 1, b = -1, c = 3, (1)

$\Longrightarrow$ We have $x = \frac{-b \pm\sqrt{b^2 - 4ac}}{2a}$ (1)

$\Longrightarrow$ $x = \frac{1 \pm\sqrt{1+12}}{2}$ (0.5)

$\Longrightarrow$ $x = \frac{1\pm\sqrt{13}}{2}$ (0.5)

(ii):

Given that the smaller number of two consecutive number is x,

(a) The larger number = x+1 (1)

(b) Given that the product of these two number is 132,

$\Longrightarrow x(x+1) = 132$

$\Longrightarrow x^2 + x - 132 = 0$__________I (1)

(c) By using factorization method,

I $\Longrightarrow x^2 + 12x - 11x - 132 = 0$ (0.5)

$\Longrightarrow (x+12)(x-11) = 0$ (0.5)

$\Longrightarrow$ Either $x = -12$ Or $x = 11$,

Hence the numbers are, Either $\{-12, -11\}$ Or $\{11, 12\}$ (1)

(iii):

Given that $\propto Q$,

(a) $P = K Q$____________I (1)

(b) Given that P = 12 and Q=4

$\Longrightarrow K = \frac{P}{Q} = \frac{12}{3} = 4,$ (1)

Now for the value Q=8,

I $\Longrightarrow$ P = 3(8) = 24 (1)

(c) For P = 21,

I $\Longrightarrow Q = \frac{P}{K} = \frac{21}{3} = 7.$ (1)

(iv):

$4x^2 + 3y^2 = 37$-----------I

$3x^2 - y^2 = 5$--------------II

Multiplying equation II with 3, and adding in I,

$\Longrightarrow 13x^2 = 52 \quad \Longrightarrow x^2 = 4 \Longrightarrow x = \pm 2$ (2)

Putting the value of x^2 in equation number I,

$\Longrightarrow 16 + 3y^2 = 37 \quad \Longrightarrow y^2 = 7 \quad \Longrightarrow y = \pm\sqrt{7}$ (2)

(v):

U = {1, 2, 3,………10}

A= {2, 4, 6}

B= {1, 3, 5}

(a) A' = U − A = {1, 3, 5, 7,8,9,10} (1)
(b) B' =U − B= {2, 4, 6, 7, 8, 9, 10} (1)
(c) $(A \cap B)'$ = U − $A \cap B$= U – { } = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (1)
(d) $A' \cup B'$ = {1,2, 3, 4, 5, 6, 7, 8, 9, 10}. Hence verified the requirement (1)

(vi):

A = {1, 2, 3} B = {2, 4, 6}

(i) A x B = { (1, 2), (1, 4), (1, 6), (2, 2), (2, 4), (2, 6), (3, 2), (3, 4), (3, 6)} (2)
(ii) R = {(x ,y)\ y=2x} = { (1,2), (2, 4), (3, 6)} (1)
(iii) Domain of R = {1, 2, 3} and Range of R = {2, 4, 6} (1)

(vii):

4	1	2	1	0	0	3	2	3	3

(a) Mean $= \frac{\sum X}{n} = \frac{19}{10} = 1.9$ (1)

(b) Median =?

0	0	1	1	2	2	3	3	3	4

Here n=10 $\Longrightarrow \frac{n}{2} = 5$ and $\frac{n+2}{2} = 6$

Median $= \frac{1}{2} = (\,5th\ term + 6th\ term)$

Here 5^{th} term = 2 and 6^{th} term = 2

So, Median $= \frac{2+2}{2} = 2$ (2)

(c) Mode = 3 (1)

(viii):

Given that $tan\,\theta = \frac{4}{3}$, and $Sin\,\theta < 0$, $\Longrightarrow$ Perpendicular = 4 and Base = 3,

(a) Let, Perpendicular = a, Base = b and Hypotenuse = c, using Pythagoras theorem, we Hypotenuse.

$$c^2 = a^2 + b^2 \Longrightarrow c = \sqrt{16 + 9}, \Longrightarrow c = 5$$

$\Longrightarrow Cos\theta = \frac{3}{5}$,

Since $Cos\,\theta$ *and* $tan\,\theta > 0$ *while* $Sin\,\theta < 0$, So θ lies in IV- Quadrant.

(2)

(b) $Sec\,\theta = \frac{c}{b} = \frac{5}{3}$ and $Cosec\,\theta = \frac{c}{a} = \frac{5}{4}$ (1)

(c) $1 + Cot^2\theta = Cosec^2\theta$

$1 + \left(\frac{3}{4}\right)^2 = \left(\frac{5}{4}\right)^2$

$\Longrightarrow 1 + \frac{9}{16} = \frac{25}{16} \quad \Longrightarrow \quad \frac{25}{16} = \frac{25}{16}$ Hence proved (1)

(ix):

L.H.S $= \frac{Sin\,\theta}{1 + Cos\,\theta} + \frac{Cos\,\theta}{Sin\,\theta}$

$= \frac{Sin^2\theta + Cos\,\theta\,(1 + Cos\,\theta)}{(1 + Cos\,\theta)\,(Sin\theta)}$ (1)

$= \frac{Sin^2\theta + Cos^2\theta + Cos\,\theta}{(1 + Cos\,\theta)\,(Sin\theta)}$ (1)

$= \frac{1 + Cos\,\theta}{(1 + Cos\,\theta)\,(Sin\theta)}$ (1)

$= \frac{1}{Sin\theta}$

$= Cosec\,\theta$ = R.H.S , Hence proved (1)

(x):

(a)

(b) $Cos\,45° = \frac{\overline{RS}}{2\sqrt{2}} \Longrightarrow \frac{1}{\sqrt{2}} = \frac{\overline{RS}}{2\sqrt{2}} \Longrightarrow \overline{RS} = 2$ (1)

(c) $\left(\overline{PQ}\right)^2 = \left(\overline{QR}\right)^2 + \left(\overline{PR}\right)^2 + 2.\overline{QR}.\overline{RS}$

$= (6)^2 + (2\sqrt{2}) + 2 \times (6) \times (2)$

$= 36 + 8 + 24$

$= 68$

$\overline{PQ} = 2\sqrt{17}$ (2)

(xi):

(i) From given figure, $\overline{OC}$ bisects $\overline{AB}$ at M

$\Longrightarrow \overline{AM} = 5\,cm.$ (1)

(ii) From given figure in right angled triangle OPC, we have

$\overline{OC} = \overline{OA} = 7\,cm$ (Radius)

$\overline{PC} = 4$ cm (as in (i))

So, by Pythagoras theorem,

$(\overline{OP})^2 = (\overline{OC})^2 - (\overline{PC})^2$

$= 49 - 16 = 33$

$\overline{OP} = \sqrt{33}$ (2)

(iii) From given figure in right angled triangle OMA, by Pythagoras theorem,

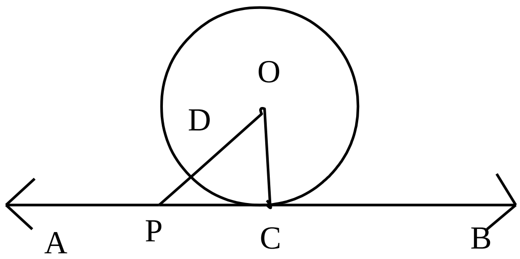
$\overline{OM}^2 = \overline{OA}^2 - \overline{AM}^2$

$= 49 - 25$

$\overline{OM} = 2\sqrt{6}$ (2)

(xii):

Figure:



(1)

Given: A circle with center O and $\overline{OC}$ is the radial segment. $\overleftrightarrow{AB}$ is perpendicular to $\overline{OC}$

At its outer end C. (0.5)

To prove: $\overleftrightarrow{AB}$ is a tangent to the circle at C. (0.5)

Construction: Take a point P other than C on $\overleftrightarrow{AB}$. Join O with P. (0.5)

Proof:

Statement	Reason
In $\Delta\, OCP$,	
$m\angle OCP = 90°$	$\overleftrightarrow{AB} \perp \overleftrightarrow{OC}$ (given)
and $m\angle OPC < 90°$	Acute angle of right angled triangle.
$m\angle OP > m\angle OC$	Greater angle has greater side opposite to it
P is a point outside the circle.	$\overline{OC}$ is the radial segment.
Similarly, every point on $\overleftrightarrow{AB}$ except C lies outside the circle.	
Hence $\overleftrightarrow{AB}$ intersects the circle at one point C only.	
i.e. $\overleftrightarrow{AB}$ is a tangent to the circle at one point only.	

(1.5)

(xiii):

From given figure, we have,

(a) PC bisects $\angle APB$, $\therefore \angle x = 30$.

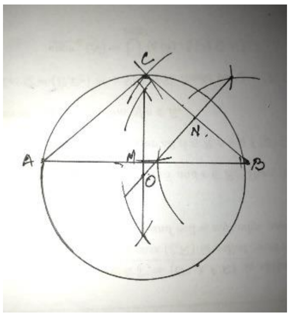
(b) $\overline{OP} = \overline{OA}$ (Radius) (1)

$\therefore \angle y = 30°$ (Opposite angles of equal sides of isosceles triangle) (1)

(c) $\angle AOB = 2\angle APB \implies \angle AOB = 2 \, x \, 60 = 120$ (2)

(xiv):

Figure:



(3)

m $\overline{AB}$ = 6cm, m $\overline{BC}$ = 4cm m $\overline{AC}$ = 4cm

Here radius = 3 cm.(Answer) (1)

<u>SECTION – C</u>

Q-No-3:

Let the width of the rectangle = x cm

And the length of the rectangle is = y cm

Area of original rectangle = 48 cm^2 (given)

Area = length x width

48 = xy---------------I (1)

By given condition after increase in length and width by 4 cm

Width = x + 4 and length = y + 4 (1)

The area of new rectangle is

(x+4) (y+4) = 48 +72 (given, area increased by 72cm)

$\implies$ xy + 4x + 4y +16 = 48 +72

$\implies$ $4(x + y) = 56$

$\implies$ $x + y = 14$----------------II (2)

From equation I we have $y = \frac{48}{x}$----------III

Putting this value in equation II ,

$\implies$ $x + \frac{48}{x} = 14$

$\implies$ $\frac{x^2 + 48}{x} = 14$

$\Rightarrow \quad x^2 + 48 - 14x = 0$

$\Rightarrow \quad x^2 - 6x - 8x + 48 = 0$

$\Rightarrow \quad (x - 6)(x - 8) = 0$

$\Rightarrow$ Either $x=6$ Or $x=8$ (3)

Putting the values in equation III,

$\Rightarrow$ for $x = 6$, $y = 8$ and for $x = 8$, $y = 6$ (0.5)

$\Rightarrow$ Either width = 6cm and length = 8cm

OR width = 8cm and length = 6cm (0.5)

Q- No 4:

Figure:

(2)

Given: *ABCD* and *A'B' C' D'* are two congruent circles, with centers *O* and *O'* respectively.

So that $m\,\widehat{ADC} = m\,\widehat{A'D'C'}$. (1)

To prove: $m\,\overline{AC} = m\,\overline{A'C'}$ (1)

Construction: Join *O* with *A*, *O* with *C*, *O* with *A'* and *O* with *C'*

So that we can form $\Delta s\ OAC\ and\ O'A'C'$. (1)

Proof:

Statement	Reason
In two equal circles *ABCD* and *A'B'C'D'* With centers *O* and *O'* respectively,	Given
$m\,\widehat{ADC} = m\,\widehat{A'D'C'}$	Given
$m\angle ADC = m\angle A'D'C'$	Central angles subtended by equal arcs of the equal circle.
Now in $\Delta AOC \leftrightarrow \Delta A'O'C'$	
$m\,\overline{OA} = m\,\overline{O'A'}$	Radii of equal circles
$m\angle ADC = m\angle A'D'C'$	Proved
$m\,\overline{OC} = m\,\overline{O'C'}$	Radii of equal circles
$\Rightarrow \Delta AOC \cong \Delta A'O'C'$	S.A.S ≅ S.A.S
In particular $m\,\overline{AC} = m\,\overline{A'C'}$	

(3)

Q-No 5:

Given that, $x = \frac{12ab}{a-b}$ or $x = \frac{(6a)(6b)}{a-b}$ or $\frac{x}{6a} = \frac{6b}{a-b}$-----------I (1)

By Componendo and Dividendo theorem,

$$\frac{x-6a}{x+6a} = \frac{6b+(a-b)}{6b-(a-b)}$$

$$= \frac{5b+a}{7b-a}\text{------------------II} \quad (2)$$

Again consider equation I, $\Longrightarrow \frac{x}{6b} = \frac{6a}{a-b}$ (1)

By Componendo and Dividendo theorem,

$$\frac{x+6b}{x-6b} = \frac{6a-(a-b)}{6a+(a-b)}$$

$$= \frac{5a+b}{7a-b}\text{-------------III} \quad (2)$$

Adding equation II and III,

$$\Longrightarrow \frac{x-6a}{x+6a} + \frac{x+6b}{x-6b} = \frac{5b+a}{7b-a} + \frac{5a+b}{7a-b}$$

$$= \frac{(5b+a)+(5a+b)}{(7b-a)(7a-b)} = \frac{26ab+5b^2+5a^2}{48ab+7b^2-7a^2} \quad (2)$$

Q-No 6:

$$\frac{x^2}{(1-x)(1+x^2)^2} = \frac{A}{1-x} + \frac{Bx+C}{1+x^2} + \frac{Dx+E}{(1+x^2)^2}\text{----------------------I}$$

$\Longrightarrow x^2 = A(1+x^2)^2 + (Bx+C)(1-x)(1+x^2) + (Dx+E)(1-x)$---------------II (1)

$\Longrightarrow x^2 = A(1+2x^2+x^4) + (Bx+C)(1-x+x^2-x^3) + (Dx+E)(1-x)$-------------III

Putting x = 1 in equation number II,

$\Longrightarrow 1 = 4A \Longrightarrow A = \frac{1}{4}$---------IV (1)

Comparing coefficient of x^4,

$\Longrightarrow 0 = A - B$ --------------- V

Comparing the coefficient of x^3,

$0 = B - C$ ----------------- VI

Comparing the coefficient of x^2,

$1 = 2A - B + C - D$-----------VII

Comparing the coefficient of x,

$0 = B - C + D - E$----------------------------VIII

Comparing the constant,

0 = A +C +E ---------------------------------- IX

From V $\Longrightarrow$ A – B = 0 $\Longrightarrow$ B = A $\Longrightarrow$ B $= \frac{1}{4}$ (1)

From VI $\Longrightarrow$ B – C = 0 $\Longrightarrow$ C $= \frac{1}{4}$ (1)

From VII $\Longrightarrow$ 2A – B + C – D =1 $\Longrightarrow \frac{1}{2} + \frac{1}{4} - \frac{1}{4} - 1 = D$ $\Longrightarrow$ D $= -\frac{1}{2}$, (1)

From IX $\Longrightarrow$ A +C + E = 0 $\Longrightarrow$ E $= -\frac{1}{2}$, (1)

Putting all values in Equation I,

$$\Longrightarrow \quad \frac{x^2}{(1-x)\,(1+x^2)^2} = \frac{1}{4(1-x)} + \frac{\frac{1}{4}x + \frac{1}{4}}{1+x^2} + \frac{-\frac{1}{2}x - \frac{1}{2}}{(1+x^2)^2}$$

$$\Longrightarrow \quad \frac{1}{4(1-x)} + \frac{x+1}{4(1+x^2)} - \frac{(x+1}{2(1+x^2)^2}$$ (2)

Q-No 7:

1245, 1255, 1654, 1547, 1245, 1255, 1547, 1737, 1989, 2011.

Let the data be represented by X. We make the following table

(3)

X	X^2
1245	1550025
1245	1550025
1255	1575025
1255	1575025
1547	2393209
1547	2393209
1654	2735716
1737	3017169
1989	3956121
2011	4044121
$\sum$ X= 15485	$\sum X^2$ = 24789645

Range = 2011−1245 = 766 (1)

Variance (X) = $S^2 = \frac{\sum X^2}{n} - (\frac{\sum X}{n})^2$

$= \frac{24789645}{10} - (\frac{15485}{10})^2$

= 81112.25 (3)

Standard deviation = S = $\sqrt{81112,25}$

= 284.80 (1)