Version No.			

ROLL NUMBER						

Answer Sheet No.____________

Sign. of Candidate___________

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MATHEMATICS SSC–II

(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 types represents $(x-3)(x+3)=0$?

A. Quadratic equation ◯ B. Linear equation ◯
C. Cubic equation ◯ D. Pure quadratic equation ◯

(2) If b^2-4ac of an equation is the discriminant than the equation would be of the form:

A. $ax^2-bx+c=0$ ◯ B. $ax^2+bx+c=0$ ◯
C. $ax^2+bx+c=0$ ◯ D. $ax^2-bx-c=0$ ◯

(3) Which one of the following cannot be factorized without using synthetic division method?

A. $3x^2+5x+2$ ◯ B. $5x+10$ ◯
C. $3x^4+3x^3-2x+6$ ◯ D. $x^2-\frac{1}{x^2}$ ◯

(4) If α,β are the roots of $2x^2-6x-4=0$, then what is value of $\alpha^2\beta^3+\alpha^3\beta^2$?

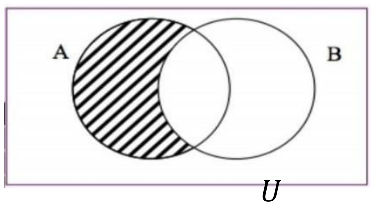
A. -12 ◯ B. 12 ◯
C. 6 ◯ D. -6 ◯

(5) Which one of the following are the partial fractions of $\frac{x^3}{x^3+1}$?

A. $\frac{Ax^3}{x+1}+\frac{Bx+C}{x^2-x+1}$ ◯ B. $1+\frac{A}{x-1}+\frac{Bx+C}{x^2+x+1}$ ◯
C. $1+\frac{A}{x+1}+\frac{Bx+C}{x^2-x-1}$ ◯ D. $1+\frac{A}{x+1}+\frac{Bx+C}{x^2-x+1}$ ◯

(6) Which one of the following expressions shows the shaded region?

A. $A\cap B'$ ◯
B. $A'\cap B$ ◯
C. $A\cup B'$ ◯
D. $A'\cup B$ ◯



(7) If $\overline{x} = 7$, $\sum f = 30$ and $\sum fx = 120 + 3k$ then value of k is

A. 30 B. -30
C. -11 D. 11

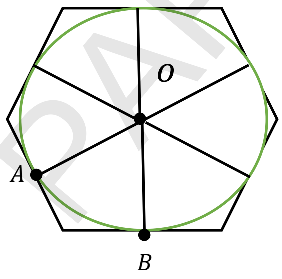
(8) Which one of the following is **NOT** equal to $\tan\theta$ for a unit circle?

A. $\frac{\cos\theta}{\sin\theta}$ B. $\frac{1}{\cot\theta}$
C. $\frac{\sec\theta}{\cos\theta}$ D. $\frac{\sin\theta}{\cos\theta}$

(9) Which one of following is the radius of a circle, if an arc of 10cm subtends an angle of 60° ?

A. $\frac{30}{\pi}$cm B. $\frac{\pi}{30}$cm
C. $\frac{10800}{\pi}$cm D. $\frac{1}{6}$cm

(10) What is the value of $m\angle AOB$ in the adjoining figure of a hexagon?

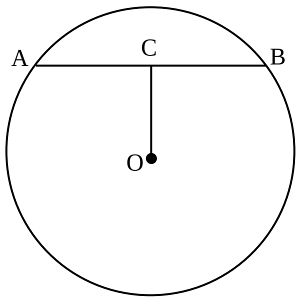


A. $360° \div 45°$
B. $360° \div 60°$
C. $360° \div 30°$
D. $360° \div 120°$

(11) What is the elevation of Sun if a pole of 6m high casts a shadow of $2\sqrt{3}m$?

A. 30° B. 45°
C. 60° D. 90°

(12) If $\overline{AB} = 6cm$ is a chord of a circle with centre O and $\overline{OC} \perp \overline{AB}$, then length of $\overline{AC}$ will be:

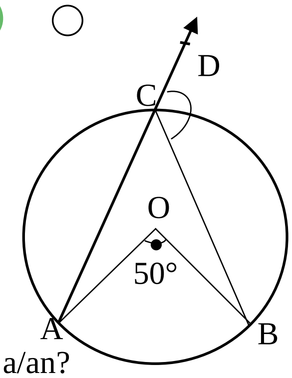


A. 3
B. 2
C. 12
D. 14

(13) What is the value of x if 64, x and 1 are in continued proportion?

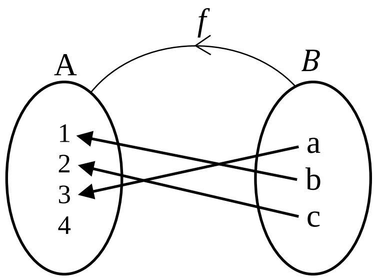
A. 3 B. $\pm\sqrt{3}$
C. $\sqrt{3}$ D. ± 8

(14) In the drawn figure, what is the value of $m\angle BCD$?



A. 165° B. 155°
C. 80° D. 130°

(15) If $f: B \to A$, then which one of the following represents a/an?



A. Onto function
B. Bijective function
C. Injective function
D. Into function

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)

$\Longrightarrow$ $x = \frac{1\pm\sqrt{-12}}{2}$ (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,

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

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

$\Rightarrow$ $16 + 3y^2 = 37$ $\Rightarrow y^2 = 7$ $\Rightarrow y = \pm\sqrt{7}$ (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 $\Rightarrow \frac{n}{2} = 5$ 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) $\left(\overline{PQ}\right)^2 = \left(\overline{QR}\right)^2 + \left(\overline{PR}\right)^2 + 2.\overline{QR}.\overline{RS}$

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

$= 36 + 8 + 24$

$= 68$

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

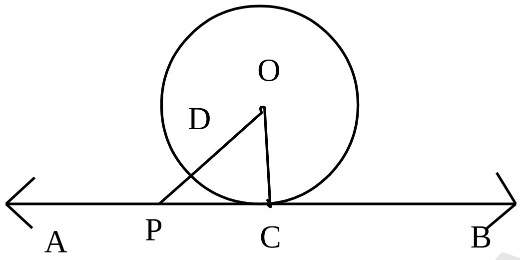
$\overline{OM}^2 = \overline{OA}^2 - \overline{AM}^2$

$= 49 - 25$

$\overline{OM} = 2\sqrt{6}$ (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 $\Delta\ OCP$, $m\angle OCP = 90°$ and $m\angle OPC < 90°$ $m\angle OP > m\angle OC$ P is a point outside the circle. 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.	 $\overleftrightarrow{AB} \perp \overleftrightarrow{OC}$ (given) Acute angle of right angled triangle. Greater angle has greater side opposite to it $\overline{OC}$ is the radial segment.

(1.5)

(xiii):

From given figure, we have,

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

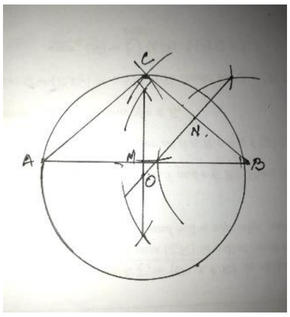
(b) $\overline{OP} = \overline{OA}$ (Radius) (1)

$\therefore \angle y = 30°$ (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)

SECTION – C

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 Δs 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 $\cong$ 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, $\Rightarrow \frac{x}{6b} = \frac{6a}{a-b}$ (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,

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

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

Q-No 6:

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

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

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

Putting x = 1 in equation number II,

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

Comparing coefficient of x^4,

$\Rightarrow 0 = A - B$ --------------- 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)