MATHEMATICS

Evaluation Indications

I. Problem solving

Types of problems : (a) Verbal problems

(b) Pictorial problems

(c) Data handling problems /graph

Indicators

(a) Verbal problems

(i) Identifying data (1Mark)

- Identifying the data in the given problem by reading comprehensively.
- Drawing figure wherever of it is needed.

(ii) Selecting the procedure (1Mark)

- Selection of formula
- If there is no formula selecting process

(iii) Substituting the values (1Mark)

- Substituting appropriate values at appropriate places with appropriate signs.

(iv) Computations and arriving solutions

- Doing with right computations
- Solution

(b) Pictorial problems

(i) Identifying data (1Mark)

- Observing the picture and sentences/statements in the problem
- Electing data

(ii) Selecting procedure (1Mark)

- Selecting appropriate procedure.
- Making constructions in the picture wherever it is needed.

(iii) Giving Reasons (1Mark)

- Giving Reasons with appropriate rules theorems, formulas etc.

(iv) Making Calculations arriving solution (1Mark)

- Doing right calculations
- Solutions

(c) Data handling - Graph problems

(i) Electing the required data from ungrouped data, table or graph (1 Mark)

(ii) Selecting procedure / formula (1 Mark)

(iii) Substitution values appropriately (1 Mark)

(iv) Computation and arriving solution (1Mark)

II. Reasoning - Proof

Types of Questions : (a) Direct proof

(b) Indirect proof

(c) Counter example

(d) Giving examples to support arguments

(a) Direct proof

(i) Identifying data from statement (1Mark)

- Writing data
- Drawing pictures if needed.
- Making constructions in the diagram.

(ii) Beginning the proof by appropriate procedure (1Mark)

(iii) Extending the procedure by appropriate reasons (1Mark)

(iv) Giving conclusions (1Mark)

(b) Indirect proof

(i) Define contradictory statements to the given statement and supposing accordingly (1Mark)

(ii) Selecting procedure to prove and extending (1Mark)

(iii) Making logical arguments to disprove that supposition (1Mark)

(iv) Giving conclusion (1Mark)

(c) Counter example

(i) Giving appropriate example (1Mark)

(ii) Giving logical conclusion (1Mark)

III. Communication

Types of questions and giving marks

(a) Making mathematical statements by using mathematical symbols or signs or terms. With appropriate logic with right syntax for given information.

for all (Indicator : If it is in right ways and giving full information only 1 mark will be given, otherwise 0 mark)

(b) Expressing the mathematical sentences / statements in own words.

(c) Explaining each term or variable in a formula or expressing them with appropriate units.

(d) Explaining the information given in the form of a picture or table.

(e) Creating new problems (these problems may be come in 2 marks section)

- Taking data for suitable variables (1 Mark)
- Expressing in right form of statements (1 Mark)

IV. Connections

(1 Problems with more mathematical concepts or involving multiple subjects or multiple contexts in daily life)

(i) Identifying data (1Mark)

- Identifying the concepts involved in the problem.
- Writing the data of all concepts wherever it is required.
- Electing indirect data if it is needed.

(ii) Making Connections (2 Marks)

- Handling all the connections in the problem solving.

(iii) Computation and arriving solution (1 Mark)

- Substituting appropriate values at appropriate places with appropriate signs.

V. Representation - Visualisation

Types of questions

(a) Constructions

(b) Graph

(c) Tabling the unorganised data

(d) Drawing pictures for the given information

(e) Drawing Venn diagrams

(f) Showing a number on number line.

(a) Constructions

- Drawing rough diagram proportionately (1Mark)
- Making constructions in the right way (2 Marks)
- Steps for constructions (1Mark)

(b) Graphs

- Calculations for identifying points (2 Marks)
- Plotting the points and preparing required graph with appropriate scale (2 Marks)

Note : These indications have been given for 4 marks questions (except communication) only. Please consider appropriate proportion of marks to award for 2 marks question answers.

MATHEMATICS - SA - II - Solutions

Paper - I

Class : X

Section - I

I. (1) Prime numbers = 2, 3, 5, 7 ...

Square roots = $\sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{7}, ...$

these are all irrational numbers

$\therefore$ This set of irrational numbers is the subset of the set of real numbers.

(2) $\pi = \frac{\pi}{1}$ (in the form $\frac{p}{q}, p, q$ are integers, $q \neq 0$)

π is irrational number

$\therefore$ I agree with Geetha's coment.

(3) $6x + py = 5$

$3x + 4y = 2$

There is no solution for these. So there are incosistent lines

$$\therefore \frac{a_1}{a_2} = \frac{b_1}{b_2}$$

$$\therefore \frac{6}{3} = \frac{p}{4}$$

$3P = 6 \times 4$

$3P = 24$

$P = \frac{24}{3} = 8$

$P = 8$

(4) Let the number is x

Square of $x = x^2$

3 times of $x = 3x$

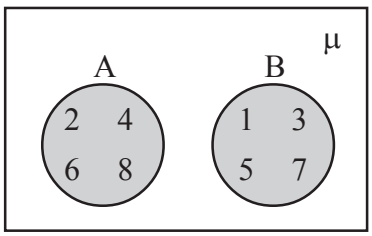
Sum of square of x and 3 times of x is equals to 18

$\Rightarrow x^2 + 3x = 18$

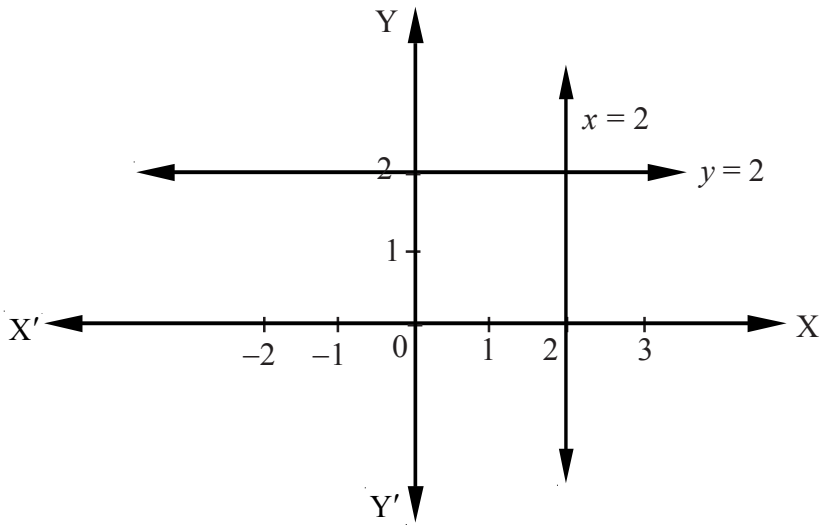
(5) A = {2, 4, 6, 8, ...}

B = {1, 3, 5, 7, ...}

A $\cup$ B = {1, 2, 3, 4, 5, 6, 7, 8, ...}



(6)



(7) $f(x) = x^2 - 7x + 10$

$f(x) = x^2 - 7x + 10 = 0$

$x^2 - 2x - 5x + 10 = 0$

$x(x - 2) - 5(x - 2) = 0$

$x - 2 = 0$ or $x - 5 = 0$

$x = 2$ or $x = 5$

$\therefore$ If 5 units is the length of the rectangle then 2 units is the breadth of the rectangle or if 2 units is the length of the rectangle then 5 units is the breadth of the rectangles.

Section - II

II. (8) First 10 natural numbers

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Product of these 10 natural numbers $= 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10$

$= 2 \times 3 \times 2 \times 2 \times 5 \times 2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 3 \times 3 \times 2 \times 5$

$= 2^8 \times 3^4 \times 5^2 \times 7^1$

Compare with then $\Rightarrow 2^a \times 3^b \times 5^c \times 7^d$

$a = 8, b = 4, c = 2, d = 1$

then $a + b + c + d = 8 + 4 + 2 + 1 = 15$

(9) A, B are disjoint sets

$\therefore$ A – B = A and B – A = B

A – B = {1, 2, 3}; B – A = {6, 7, 8, 9}

$\therefore$ A = {1, 2, 3}, B = {6, 7, 8, 9}

(10) $\sqrt{3}x^2 - \sqrt{6}x + 3$

$a = \sqrt{3}$, $b = -\sqrt{6}$, c = 3

Sum of zero's of above polynomial

$$-\frac{b}{a} = \frac{-(-\sqrt{6})}{\sqrt{3}} = \frac{\sqrt{2} \times \cancel{\sqrt{3}}}{\cancel{\sqrt{3}}} = \sqrt{2}$$

Product of zero's of above polynomial

$$\frac{c}{a} = \frac{3}{\sqrt{3}} = \frac{\sqrt{3} \times \sqrt{3}}{\sqrt{3}} = \sqrt{3}$$

(11) $x^2 - x + p = 0$ ... (1)

$x^2 + x + q = 0$ ... (2)

$x - 3$ is common factor for these

$\Rightarrow x = 3$, then

$x^2 - x + p = 0 \quad \Rightarrow 3^2 - 3 + p = 0$

$\Rightarrow 9 - 3 + p = 0$

$6 + p = 0$

$p = -6$

and $x^2 + x + p = 0$

$\Rightarrow \quad 3^2 + 3 + q = 0$

$\Rightarrow \quad x^2 - x + p = 0$

$\Rightarrow \quad 9 + 3 + q = 0$

$\Rightarrow \quad 12 + q = 0$

$\Rightarrow \quad q = -12$

(12) Let one angle is x^o

then another angle is 4 times of $x^o = 4x^o$

x^o, $4x^o$ these two angles are complementary angles

$\therefore \quad x^o = 4x^o = 90^o$

$5x^o = 90^o$

$$x^o = \frac{90^o}{5}$$

$x^o = 18^o$

One of the complementary angles is 18^o and another angles is $4x^o = 4 \times 18 = 72^o$.

(13) $9x^2 = -1$

$\Rightarrow \quad 9x^2 + 1 = 0$

$a = 9, \quad b = 0, \quad c = 1$

$b^2 - 4ac = 0^2 - 4(9)(1) = 0 - 36 = -36 < 0$

roots are imaginary or complex numbers.

Section - III

(14) (a) (i) $\log_{\sqrt{8}} x = 6$

$x = \left(\sqrt{8}\right)^6$

$x = \left(2^{3/2}\right)^6$

$x = 2^{3/2 \times 6^{3}} = 2^{3/3}$

$2^x = 2^9 \Rightarrow x = 9$

Note : or follow anyappropriate method or procedure.

(ii) A = {factors of 32} = {1, 2, 4, 8, 16, 32}

B = {factors of 54} = {1, 2, 3, 6, 9, 18, 27, 54}

A – B = {1, 2, 4, 8, 16, 32} – {1, 2, 3, 6, 9, 18, 27, 54} = {4, 8, 16, 32}

B – A = {1, 2, 3, 6, 9, 18, 27, 54} – {1, 2, 4, 8, 16, 32} = {3, 6, 9, 18, 27, 54}

(A – B) $\cup$ (B – A) = {4, 8, 16, 32} $\cup$ {3, 6, 9, 18, 27, 54}

= {3, 4, 6, 8, 9, 16, 18, 27, 32, 54}

(b) $x - 2y = 8$ .... (1)

$5x + 3y = 1$ .... (2)

$5x$ (1) $5(x - 2y = 8)$

$5x - 10y = 40$ .... (3)

$5x + 3y = 1$ .... (2)

– – –

$-13y = 39$

$\Rightarrow y = \dfrac{39}{-13} = -3$

Substituting the value $y = -3$ in (1)

$x - 2y = 8$

$x - 2(-3) = 8$

$x + 6 = 8$

$x = 8 - 6 = 2$

$\therefore x = 2$

$y = -3$

(15) (a) Graph

(b) Graph

(16) (a) $(x+2)(x+3) = x^2 + 5x + 6$

$x^2 + 5x + 6 \;\big|\; x^4 - 0x^3 + 13x^2 + 0x + 36 \;\big|\; x^2 - 5x + 6$

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

$-5x^3 - 19x^2 - 0x$

$5x^3 - 25x^2 - 30x$

$- \quad + \quad +$

$6x^2 + 30x + 36$

$+6x^2 + 30x + 36$

$- \quad - \quad -$

0

$\therefore\ x^4 - 13x^2 + 36\ (x+2)(x+3)(x^2 - 5x + 6)$

Next, then have to find factors of $x^2 - 5x + 6$

$x^2 - 5x + 6$

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

$x(x-2) - 3(x-2)$

$(x-2)(x-3)$

$\therefore\ x^4 - 13x^2 + 36 = (x+2)(x+3)(x-2)(x-3)$

So $(x+2)(x+3)$ are given factors remaining factors $(x-2)(x-3)$

(b) $\dfrac{1}{x-3} - \dfrac{1}{x-6} = \dfrac{9}{20}$

$\dfrac{x-6-(x-3)}{(x-3)(x-6)} = \dfrac{9}{20}$

$\dfrac{x-6-x+3}{x^2-9x+18} = \dfrac{9}{20} \Rightarrow \dfrac{-3^{1}}{x^2-9x+18} = \dfrac{9^{3}}{20}$

$\dfrac{-1}{x^2-9x+18} = \dfrac{3}{20}$

$-(20) = (x^2 - 9x + 18) \times 3$

$3x^2 - 27x + 54 + 20 = 0$

$\Rightarrow\ 3x^2 - 27x + 74 = 0$

$a = 3, \qquad b = -27, \qquad c = 74$

$b^2 - 4ac = (-27)^2 - 4 \times 3 \times 74$

$= 529 - 888 < 0$

$b^2 - 4ac = 529 - 296 \times 3 = 888$

if $b^2 - 4ac < 0$ then the solutions are imaginary numbers

(17) (a) $px^2 + (p+q)x + q = 0$

roots are equal (given condition)

then $b^2 - 4ac = 0$

$(p+q)^2 - 4(p)(q) = 0$

$p^2 + q^2 + 2pq - 4pq = 0$

$p^2 + q^2 - 2pq = 0$

$(p - q)^2 = 0$

$p - q = 0$

$p = q$ prooved

(b) Let $5\sqrt{7} + 3\sqrt{2}$ is a rational number

$\Rightarrow 5\sqrt{7} + 3\sqrt{2} = \frac{a}{b}$ (a, b are integers, $b \neq 0$)

$3\sqrt{2} = \frac{a}{b} - 5\sqrt{7}$

Squaring both sides

$18 = \frac{a^2}{b^2} - 175 - 10\sqrt{7}\frac{a}{b}$

$10\sqrt{7}\frac{a}{b} = \frac{a^2}{b^2} + 175 - 18$

$\sqrt{7} = \left(\frac{a^2 + 157b^2}{b^2}\right) \times \frac{b}{10 \times a} = \frac{a^2 + 157b^2}{10ab}$

$\Rightarrow \sqrt{7} = \frac{a^2 + 157b^2}{10ab}$ here $\frac{a^2 + 157b^2}{10ab}$ is a rational because a, b are integers and $b \neq 0$.

but $\sqrt{7}$ is not a rational number

$\therefore$ So this is not possible.

$\therefore 5\sqrt{7} + 3\sqrt{2}$ is irrational number

Section - IV

(18) C

(19) D ($\because$ P = 2)

(20) B

(21) C

(22) -

(23) A

(24) D

(25) A

(26) B

(27) D