

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

33

Chap 1 ALGEBRAIC SENTENCES

INTRODUCTION CHAPTER

ALGEBRAIC EXPRESSION

An expression, containing or using only algebraic symbols and operations such as $5x + 6$, $4x^2 + 8x + 4$ etc.

SIMPLE LINEAR EQUATIONS IN VARIABLES

If a symbol of equality "=" is involved in an open sentence then such sentence is called an equation. The unknown variable for which given equation. For example

$$(i) \frac{x-1}{4} - \frac{2x-1}{6} = 3 \quad (ii) \quad 2x + 8 = \frac{x}{2} + 32$$

ALGEBRAIC SENTENCES

$5 < 7$, $2 + 3 = 5$ and $2x = 7$ are algebraic sentences.

There are three kinds of algebraic sentences.

1. True sentences

The true sentence is the sentence which is true according to the Given condition. For example, $9 + 8 = 17$, $10 > 8$, etc. are true Sentences.

2. False sentences

The false sentence is a sentence which is false according to the given condition. For example, $3 + 9 = 5$, $18 < 11$, etc. are the false sentences.

3. Open Sentence

An open sentence is a sentence which is true or false for the given Condition. For example, $3x = 5$, $4x + 2 < 7$, etc. are open sentences.

EQUATIONS

An equation is an open sentence with the sign of equality

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

34

"="". For example, $3y + 7 = 11$, $z^2 + z = 3$, $z^3 = 1$, etc are equations.

The value (or values) of variable for which open sentence becomes true is (are) called root (or roots).

For example, 5 is a root of the equation $6x = 30$.

The set of all roots of an equation is called the solution set.

For example, the solution set of the equation $x^2 = 4$ is $\{-2, 2\}$.

Equation Involving Radical

An equation containing radicals of a variable is called a radical equation.

For example, $\sqrt{2x-2} + 5 = 12$ and $\sqrt{x+3} = 7$ are radical equations.

Equation Involving Absolute Value

An equation involving absolute value or modulus of a variable, e.g. $|x|$, is called the equation involving absolute value.

For example, $|2x - 3| = 7$ and $|5x - 12| + 8 = 17$ are equations involving absolute value.

INEQUATIONS:

The inequation is an open sentence with the sign of inequality " $<$ " or " $>$ ".

For example, $5x + 3 < 7$, $3y - 1 < 0$, $\frac{8z}{3} > 2$, etc. are inequations.

QUADRATIC EQUATION

If $a, b, c \in R$ and $a \neq 0$, then the quadratic equation in one variable is:
 $ax^2 + bx + c = 0$,

Which is called the standard form of the quadratic equation. The solution of $ax^2 + bx + c = 0$ is:

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

Which is called quadratic formula.

There are three ways to solve a quadratic equation. They are:

1. Factorization method
2. Completing the square method
3. Quadratic formula method

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

35

MULTIPLE CHOICE (MCQ's)

- (i) Which is one solution set of $|x| + 5 = 2$
 (a) $\{ \}$ (b) $\{6, -6\}$ (c) $\{8, -8\}$ (d) $\{-6, 8\}$
- (ii) Which is one solution set of $|x + 2| = 3$
 (a) $\{-1, 6\}$ (b) $\{1, 6\}$ (c) $\{-1, -5\}$ (d) $\{1, -5\}$
- (iii) Which is one solution set of $\sqrt{x} = -3$
 (a) $\{-5\}$ (b) $\{ \}$ (c) $\{8\}$ (d) $\{6\}$
- (iv) Which is one solution set of $\sqrt{x} - 5 = -2$
 (a) $\{5\}$ (b) $\{-9\}$ (c) $\{9\}$ (d) $\{-8\}$
- (v) Which is a compound sentence?
 (a) $x = 6$ (b) $x < 6$ (c) $x > 6$ (d) $x \leq 6$
- (vi) Which is an open sentence?
 (a) $5 > 4$ (b) $x + 2 = 3$ (c) $-4x < -9$ (d) $5y < 8y$
- (vii) What is the meaning of compound sentence $x \geq 5$?
 (a) $x > 5$ (b) $x = 5$ (c) $x = 5$ or $x > 5$ (d) $x < 5$
- (viii) Which one is the linear equation?
 (a) $x - 4 < 2$ (b) $5 - z > 2z$ (c) $lx + m$ (d) $x + 5 \geq 2x + 7$
- (ix) Which one ordered pair satisfies $x - y = 3$
 (a) $\{0, 3\}$ (b) $\{3, 0\}$ (c) $\{5, 1\}$ (d) $\{1, -5\}$
- (x) A quadratic equation in one variable has,
 (a) one root (b) infinite number of roots
 © two roots (d) no root
- (xi) If two lines does not intersect, then they have,
 (a) finite solution (b) infinite solution
 © no solution (d) none of above
- (xii) Which one is a radical equation?
 (a) $\sqrt{2x+6} = 5$ (b) $t - 10 = \sqrt{12}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

36

- © $x = \sqrt{3}$ (d) none of above
- (xiii) Values of x and y are positive in.
 (a) first quadrant (b) second quadrant
 © third quadrant (d) none of above
- (xiv) Point $P(-6, -7)$ lies insitive in.
 (a) first quadrant (b) second quadrant
 © third quadrant (d) none of above
- (xv) In $2x + 5y = -3$, if $x = -4$, then $y = ?$
 (a) 0 (b) -1 © 1 (d) -2
- (xvi) $6x + 8y - 9z$ is an algebraic _____.
 (a) sentence (b) expression
 © fraction (d) addition
- (xvii) $7x + 9 = 21$ is an algebraic _____.
 (a) sentence (b) expression
 © fraction (d) addition
- (xviii) Algebraic sentences are of _____ types.
 (a) 1 (b) 2 © 3 (d) 4
- (xix) Open sentences are of _____ types.
 (a) 1 (b) 2 © 3 (d) 4
- (xx) Sentences which consist of two open sentences are called _____.
 (a) compound sentence (b) compound expression
 © compound fraction (d) compound addition
- (xxi) $ax^2 + bx + c = 0$ is the _____ of quadratic equations.
 (a) $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (b) $\frac{-4b \pm \sqrt{b^2 - 4ac}}{5a}$
 © $\frac{-b \pm \sqrt{b^2 - ac}}{10a}$ (d) $\frac{-b \pm \sqrt{4b^2 - ac}}{2a}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

37

EXERCISE 1.1

Q.1 Solve the following equations:

(i) $\frac{6}{2x-5} - \frac{4}{x-3} = 0$

(ii) $\frac{2x-3}{5} = \frac{x-2}{2}$

(iii) $\frac{7x}{8} + 3 = \frac{9x}{10}$

(iv) $\frac{7x-4}{15} + \frac{x-1}{3} = \frac{3x-1}{5} - \frac{7+x}{10}$

SOLUTION:

(i) $\frac{6}{2x-5} - \frac{4}{x-3} = 0$

$$\Rightarrow \frac{6(x-3) - 4(2x-5)}{(2x-5)(x-3)} = 0 \Rightarrow 6x - 18 - 8x + 20 = 0$$

$$\Rightarrow -2x + 2 = 0$$

$$\Rightarrow x = \frac{-2}{-2} = 1 \quad \therefore \text{Solution set} = \{1\}$$

(ii) $\frac{2x-3}{5} = \frac{x-2}{2}$

$$\Rightarrow 4x - 6 = 5x - 10 \Rightarrow 4x - 5x = -10 + 6$$

$$\Rightarrow -x = -4$$

$$\Rightarrow x = 4$$

$$\therefore \text{Solution Set} = \{4\}$$

(iii) $\frac{7x}{8} + 3 = \frac{9x}{10}$

$$\Rightarrow \frac{7x+24}{8} = \frac{9x}{10} \Rightarrow 70x + 240 = 72x$$

$$\Rightarrow 70x - 72x = -240 \Rightarrow x = \frac{-240}{-2} = 120$$

$$\therefore \text{Solution Set} = \{120\}$$

(iv) $\frac{7x-4}{15} + \frac{x-1}{3} = \frac{3x-1}{5} - \frac{7+x}{10}$

$$\Rightarrow \frac{(7x-4)+5(x-1)}{15}$$

$$\Rightarrow \frac{2(3x-1)-(7+x)}{10}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

38

$$\Rightarrow \frac{7x-4+5x-5}{15}$$

$$\Rightarrow \frac{12x-9}{15} = \frac{5x-9}{10}$$

$$\Rightarrow 120x - 75x = -135 + 90$$

$$\Rightarrow x = -1$$

$\therefore$ Solution Set = $\{-1\}$

$$\Rightarrow \frac{6x-2-7-x}{10}$$

$$\Rightarrow 120x - 90 = 75x - 135$$

$$\Rightarrow 45x = -45$$

Q.2 When 25 is added to a number and the result is halved, the answer is 3 times the original number. What is the number?

SOLUTION:

Let x be the required number.

According to the given condition, we get

$$\frac{x+25}{2} = 3x$$

$$\Rightarrow x + 25 = 6$$

$$\Rightarrow -5x = -25$$

$$\Rightarrow x = \frac{-25}{-5} = 5, \text{ Therefore, 5 is the required number.}$$

1. When 18 is added to $\frac{1}{4}$ of a number, the result is $2\frac{1}{2}$ times the original number. What is the number?

SOLUTION:

Let x be the required number.

According to the given condition, we get

$$18 + \frac{1}{4}x = 2\frac{1}{2}x$$

$$\Rightarrow 18 + \frac{x}{4} = \frac{5}{2}x$$

$$\Rightarrow \frac{x-10x}{4} = -18$$

$$\Rightarrow x = \frac{-18 \times 4}{-9} = 2 \times 4 = 8$$

Therefore, 8 is the required number.

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

39

Q.4 5 is subtracted from 4 times a number and the result doubled. If the answer is 6, what is the original number?

SOLUTION:

Let x be the original number.

According to the given condition, we get

$$\begin{aligned} 2(4x - 5) &= 6 \\ \Rightarrow 8x - 10 &= 6 & \Rightarrow 8x &= 16 \\ \Rightarrow x &= \frac{16}{8} = 2 \end{aligned}$$

Thus, 2 is the original number.

Q.5 When a number is added to 4, the result is equal to subtracting 10 from three times of it. What is the number?

SOLUTION :

Let x be the required number.

According to the given condition, we get

$$\begin{aligned} x + 4 &= 3x - 10 \\ \Rightarrow x - 3x &= -10 - 4 & \Rightarrow -2x &= -14 \\ \Rightarrow x &= \frac{-14}{-2} = 7 \end{aligned}$$

Thus, the required number is 7.

Q.6 A mother is 21 years older than her new born baby. How old will the baby be when her age is $\frac{1}{4}$ that of mother?

SOLUTION :

Let x years be the age of the baby.

According to the given condition, we get

$$\begin{aligned} \frac{x + 21}{4} &= x \\ \Rightarrow x + 21 &= 4x & \Rightarrow x - 4x &= -21 \\ \Rightarrow -3x &= -21 & \Rightarrow x &= \frac{-21}{-3} = 7 \end{aligned}$$

Thus, the baby is 7 years old.

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

40

Q.7 The sum of three consecutive natural numbers is 192. Find the numbers. {Hint: consecutive natural numbers be $x-1$, x , $x+1$ }

SOLUTION:

Let three consecutive natural numbers are: $x-1$, x and $x+1$

According to the given condition, we get

$$(x-1) + x + (x+1) = 192$$

$$\Rightarrow x-1 + x + x + 1 = 192$$

$$\Rightarrow 3x = 192 \quad \Rightarrow \quad x = \frac{192}{3} = 64$$

Thus, 63, 64 and 65 are the required numbers.

Q.8 The sum of three consecutive odd numbers is 909. Find the numbers. {Hints: $x-2$, x , $x+2$ be three consecutive odd numbers}

SOLUTION:

Let three consecutive odd numbers be:

$$x-2, x, x+2$$

According to the given condition, we get

$$(x-2) + x + (x+2) = 909$$

$$\Rightarrow x-2 + x + x + 2 = 909$$

$$\Rightarrow 3x = 909 \quad \Rightarrow \quad x = \frac{909}{3} = 303$$

Thus, 301, 303 and 305 are the required numbers.

Q.9 Juman Khan bought some apples, then he bought a Dozen more and found that the total was three less than $1\frac{1}{2}$ times the numbers of apples purchased. How many apples he purchased first?

SOLUTION:

Let x apples be purchased.

According to the given condition, we get

$$x + 12 = 1\frac{1}{2}x - 3 \quad \Rightarrow \quad x + 12 = \frac{3}{2}x - 3$$

$$\Rightarrow x - \frac{3}{2}x = -3 - 12 \quad \Rightarrow \quad \frac{2x - 3x}{2} = -15$$

$$\Rightarrow -x = -30 \quad \Rightarrow \quad x = 30$$

Thus, 30 apples were purchased.

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

41

Q.10 The length of the rectangle is 4cm more than its Breadth.
If the perimeter of the rectangle is 192 cm, find the length and breadth of the rectangle.

SOLUTION :

Let x cm is the breadth of a rectangle.

Then its length is $[x + 4]$ cm and

Perimeter = $(x + x + 4 + x + x + 4)$ cm.

$$= (4x + 8)$$
cm

According to the given condition, we get

$$\text{Perimeter} = 192$$

$$\text{i.e., } 4x + 8 = 192$$

$$\Rightarrow 4x = 192 - 8 \quad \Rightarrow x = \frac{84}{4} = 46$$

Thus, breadth = 46 cm and length = $46 + 4 = 50$ cm

EXERCISE 1.2

Solve graphically the following simultaneous linear equations.

Q.1. $3x - 11 = y$

$$x - 3y = 9$$

SOLUTION :

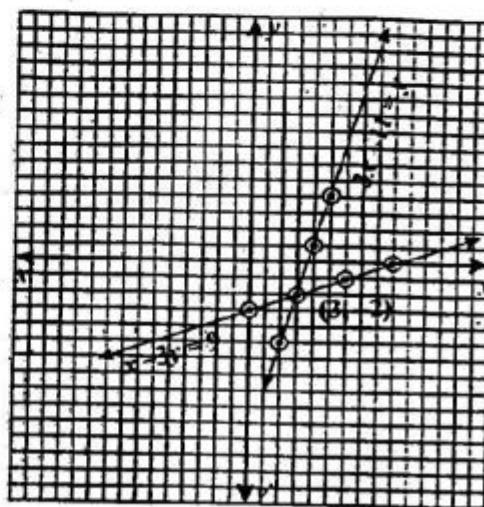
For $y = 3x - 11$:

X	1	2	3	4	5
y	-8	-5	-2	1	4

$$\text{For } y = \frac{x-9}{3}$$

X	0	3	6	9	12
y	-3	-2	-1	0	1

Hence, solution set = $\{ (3, -2) \}$



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

42

Q.2. $x + y = 4$
 $2x - 1 = 5y$

SOLUTION :
 For $y = 4 - x$:

X	1	2	3	4	5
y	3	2	1	0	-1

For $y = \frac{2x-1}{5}$

X	-7	-2	3	8	13
y	-3	-1	1	3	5

Hence, solution set $\{(3, 1)\}$

Q.3. $2x = y + 5$
 $x = 2y + 1$

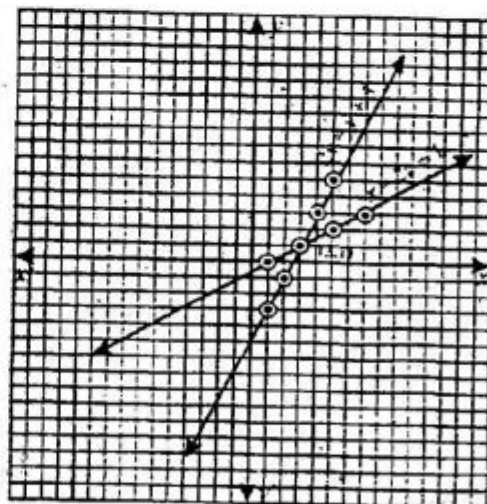
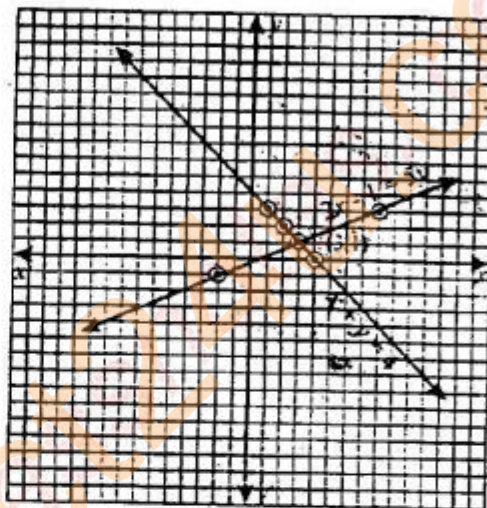
SOLUTION :
 For $y = 2x - 5$:

X	1	2	3	4	5	6
Y	-3	-1	1	3	5	7

For $y = \frac{x-1}{2}$

X	1	3	5	7	9
y	0	1	2	3	4

Hence, solution set $= \{(3, 1)\}$



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

43

Q.4. $y = 3x - 5$
 $x + y = 11$

SOLUTION:

For $y = 3x - 5$:

X	1	2	3	4
Y	-2	1	4	7

For $y = 11 - x$:

X	4	5	6	7	8	9
Y	7	6	5	4	3	2

Hence, Solution Set = $\{ (4, 7) \}$

Q.5. $\frac{x+2}{5} + y = 6$
 $2x - y = 12$

SOLUTION:

For $y = 6 - \frac{x+2}{5}$

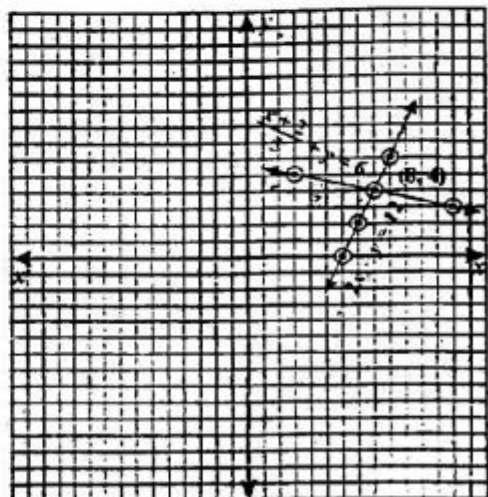
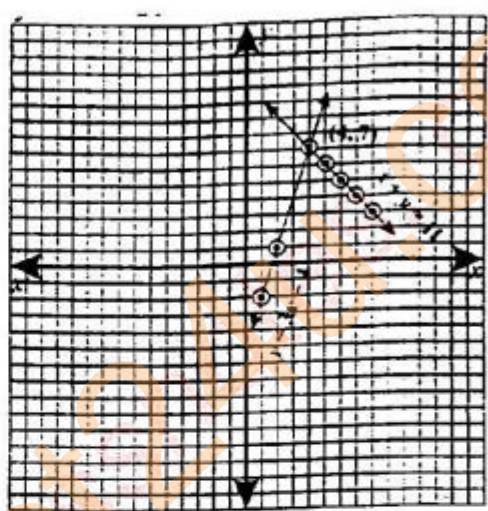
$$= \frac{30 - x - 2}{5} = \frac{28 - x}{5}$$

x	3	8	13	18
y	5	4	3	2

For $y = 2x - 12$:

X	6	7	8	9
y	0	2	4	6

Hence, Solution Set = $\{ (8, 4) \}$



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

44

Q.6. $\frac{x+y}{3} = 2$
 $x - 5y = 0$

SOLUTION:

For $y = x - 6$:

X	7	$\frac{15}{2} = 7.5$	8	9	10
y	1	$\frac{3}{2} = 1.5$	2	3	4

For $y = \frac{x}{5}$

x	5	$\frac{15}{2} = 7.5$	10	15	20	25
y	1	$\frac{3}{2} = 1.5$	2	3	4	5

Hence, solution set = $\left\{ \left(\frac{15}{2}, \frac{3}{2} \right) \right\}$

Q.7. $2y - 3x = 12$
 $x + 6 = y$

SOLUTION:

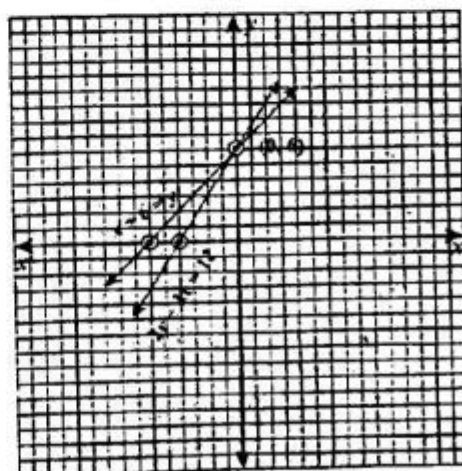
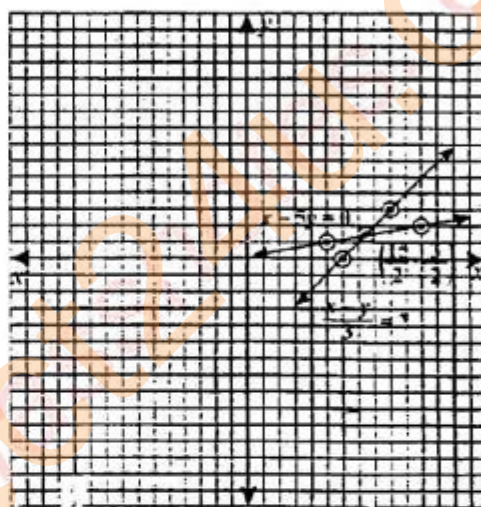
For $y = \frac{12+3x}{2}$

x	-2	-4	0	2
y	3	0	6	9

For $y = x + 6$

X	-2	-6	0	2
y	4	0	6	8

Hence, solution set = $\{ (0, 6) \}$



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

45

Q.8. $5x + 7y = 13$

$7x + 6y = 3$

SOLUTION:

For $y = \frac{13-5x}{7}$:

X		-3	-4	
y		4	-1	

For $y = \frac{3-7x}{6}$

X		-3	3	
y		4	-3	

Hence, solution set = $\{ (3, 4) \}$

Q.9. $4x - y - 10 = 0$

$3x + 5y - 19 = 0$

SOLUTION:

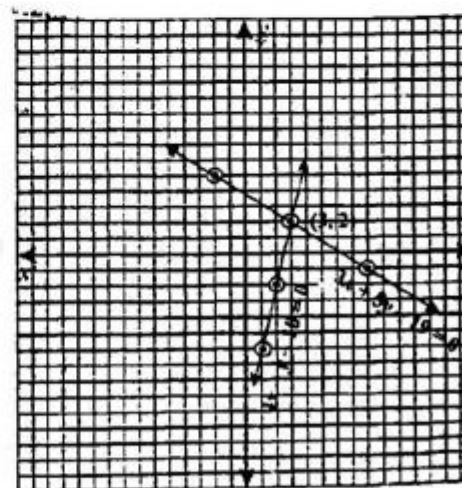
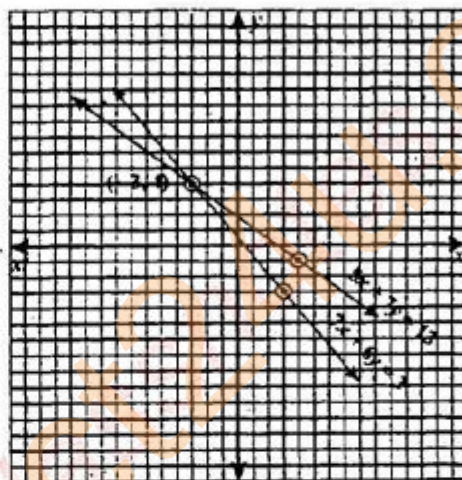
For $y = 4x - 10$:

x	1	2	3
y	-6	-2	2

For $y = \frac{19-3x}{5}$

x	-2	3	8
y	5	2	-1

Hence, solution set = $\{ (3, 2) \}$



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

46

Q.10. $3x - 2y - 7 = 0$
 $2x + 5y = 11$

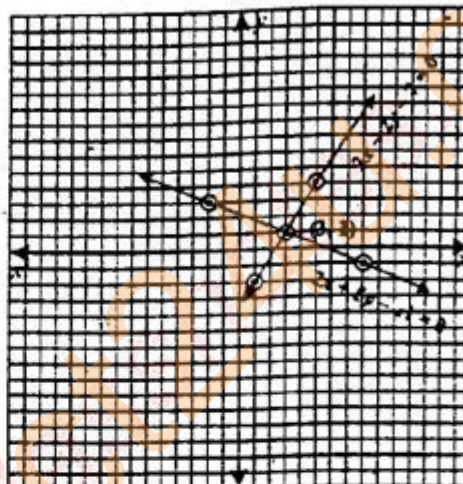
SOLUTION: :

For $y = \frac{3x-7}{2}$:

x	1	3	5	7
y	-2	1	4	7

For $y = \frac{11-2x}{5}$

x	-2	3	8	13
y	3	1	-1	-3



Hence, the solution set = $\{ (3, 1) \}$

EXERCISE 1.3

Find the solution set of the following equations. Also verify The answers.

Q.1. $\sqrt{4x-5} = \sqrt{3x+7}$

SOLUTION:

$$\sqrt{4x-5} = \sqrt{3x+7}$$

squaring the both side

$$\Rightarrow (\sqrt{4x-5})^2 = (\sqrt{3x+7})^2$$

$$\Rightarrow 4x-5 = 3x+7$$

$$\Rightarrow x = 12$$

$$\Rightarrow 4x-3x = 7+5$$

Verification:

Putting $x = 12$ in the given equation, we get.

$$\sqrt{4(12)-5} = \sqrt{3(12)+7}$$

$$\Rightarrow \sqrt{48-5} = \sqrt{36+7}$$

$$\Rightarrow \sqrt{43} = \sqrt{43}$$

Thus, the solution set = $\{ 12 \}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

47

Q.2. $3\sqrt{y} = 2$

SOLUTION :

$$3\sqrt{y} = 2$$

squaring the both side

$$\Rightarrow (3\sqrt{y})^2 = (2)^2$$

$$\Rightarrow 9y = 4 \quad \Rightarrow y = \frac{4}{9}$$

Verification:

Putting $y = \frac{4}{9}$ in the given equation, we get

$$3\sqrt{\frac{4}{9}} = 2$$

$$\Rightarrow 3 \times \frac{2}{3} = 2$$

$$\Rightarrow 2 = 2$$

Thus, the solution set = $\left\{\frac{4}{9}\right\}$

Q.3. $\sqrt{z-8} = 1$

SOLUTION :

$$\sqrt{z-8} = 1$$

squaring the both side

$$\Rightarrow (\sqrt{z-8})^2 = (1)^2 \quad \Rightarrow z-8 = 1$$

$$\Rightarrow z = 1+8 \quad \Rightarrow z = 9$$

Verification:

Putting $z = 9$ in the given equation, we get.

$$\Rightarrow \sqrt{9-8} = 1$$

$$\Rightarrow \sqrt{1} = 1$$

$$\Rightarrow 1 = 1$$

Thus, the solution set = $\{9\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

48

Q.4. $\frac{\sqrt{y}}{3} - 2 = 3$

SOLUTION :

$$\begin{aligned} \frac{\sqrt{y}}{3} - 2 &= 3 & \Rightarrow & \frac{\sqrt{y}}{3} - 2 = 3 \\ \Rightarrow \frac{\sqrt{y}}{3} &= 3 + 2 & \Rightarrow & \sqrt{y} = (5)(3) \\ \Rightarrow \sqrt{y} &= 15 \\ \text{squaring the both side} \\ \Rightarrow (\sqrt{y})^2 &= 5^2 & \Rightarrow & y = 225 \end{aligned}$$

Verification:

Putting $y = 225$ in the given equation, we get.

$$\begin{aligned} \frac{\sqrt{225}}{3} - 2 &= 3 \\ \Rightarrow \frac{15}{3} - 2 &= 3 \\ \Rightarrow 5 - 2 &= 3 \\ \Rightarrow 3 &= 3 \end{aligned}$$

Thus, the solution set = { 225 }

Q.5. $\frac{\sqrt{4y+2}}{6} + 13 = 2$

SOLUTION :

$$\begin{aligned} \frac{\sqrt{4y+2}}{6} + 13 &= 2 & \Rightarrow & \sqrt{4y+2} = 12 - 13 \\ \text{squaring the both side} \\ \Rightarrow (\sqrt{4y+2})^2 &= (-1)^2 \\ \Rightarrow 4y + 2 &= 1 & \Rightarrow & y = \frac{1-2}{4} = -\frac{1}{4} \\ \rightarrow y &= -\frac{1}{4} \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

49

Verification:

Putting $y = -\frac{1}{4}$ in the given equation, we get.

$$\frac{\sqrt{4\left(-\frac{1}{4}\right)+2+13}}{6} = 2$$

$$\Rightarrow \frac{\sqrt{-1+2+13}}{6} = 2$$

$$\Rightarrow \frac{\sqrt{1+13}}{6} = 2$$

$$\Rightarrow \frac{14}{6} = 2$$

Thus, the solution set = { 2 }

Q.6. $\sqrt{25y-6} = 4\sqrt{y+3}$

SOLUTION :

$$\sqrt{25y-6} = 4\sqrt{y+3}$$

squaring the both side

$$\Rightarrow (\sqrt{25y-6})^2 = (4\sqrt{y+3})^2$$

$$\Rightarrow 25y-6 = 16(y+3)$$

$$\Rightarrow 25y-16y = 48+6$$

$$\Rightarrow y = 6$$

$$\Rightarrow 25y-6 = 16y+48$$

$$\Rightarrow 9y = 54$$

Verification:

Putting $y = 6$ in the given equation, we get.

$$\sqrt{25(6)-6} = 4\sqrt{6+3}$$

$$\Rightarrow \sqrt{150-6} = 4\sqrt{9}$$

$$\Rightarrow \sqrt{144} = 4 \times 3$$

$$\Rightarrow 12 = 12$$

Thus, the solution set = {6}

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

50

Q.7. $\sqrt{12x-4} = \sqrt{4x+8}$

SOLUTION:

$$\sqrt{12x-4} = \sqrt{4x+8}$$

squaring the both side

$$\Rightarrow (\sqrt{12x-4})^2 = (\sqrt{4x+8})^2$$

$$\Rightarrow 12x-4 = 4x+8$$

$$\Rightarrow 12x-4x = 8+4$$

$$\Rightarrow 8x = 12$$

$$\Rightarrow x = \frac{12}{8}$$

$$\therefore x = \frac{3}{2}$$

Verification:

Putting $x = \frac{3}{2}$ in the given equation, we get.

$$\sqrt{12\left(\frac{3}{2}\right)-4} = \sqrt{4 \times \left(\frac{3}{2}\right)+8}$$

$$\Rightarrow \sqrt{18-4} = \sqrt{6+8}$$

$$\Rightarrow 14 = 14 \quad \text{Thus, the solution set} = \left\{\frac{3}{2}\right\}$$

Q.8. $\sqrt{y} - 7 = -4$

SOLUTION:

$$\sqrt{y} - 7 = -4 \quad \Rightarrow \quad \sqrt{y} = -4 + 7$$

$$\Rightarrow \sqrt{y} = 3 \quad \text{squaring the both side}$$

$$\Rightarrow (\sqrt{y})^2 = (3)^2$$

$$\Rightarrow y = 9$$

Verification:

Putting $y = 9$ in the given equation, we get.

$$\sqrt{9} - 7 = -4$$

$$\Rightarrow 3 - 7 = -4$$

$$\Rightarrow -4 = -4$$

Thus, the solution set = { 9 }

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

51

Q.9. $\sqrt{x} - 1 = 8$

SOLUTION:

$$\sqrt{x} - 1 = 8 \quad \Rightarrow \quad \sqrt{x} = 9$$

squaring the both side

$$\Rightarrow (\sqrt{x})^2 = (9)^2$$

$$\Rightarrow \underline{x = 81}$$

Verification:

Putting $x = 81$ in the given equation, we get

$$\sqrt{81} - 1 = 8$$

$$\Rightarrow 9 - 1 = 8$$

$$\Rightarrow 8 = 8$$

Thus, the solution set = { 81 }

10. $3\sqrt{x} + 7 = 10$

SOLUTION:

$$3\sqrt{x} + 7 = 10$$

$$\Rightarrow 3\sqrt{x} = 10 - 7 \quad \Rightarrow \quad 3\sqrt{x} = 3$$

$$\Rightarrow \sqrt{x} = 1$$

squaring the both side

$$\Rightarrow (\sqrt{x})^2 = (1)^2$$

$$\Rightarrow x = 1$$

Verification:

Putting $x = 1$ in the given equation, we get

$$3\sqrt{1} + 7 = 10$$

$$\Rightarrow 3(1) + 7 = 10$$

$$\Rightarrow 3 + 7 = 10$$

$$\Rightarrow 10 = 10$$

Thus, the solution set = { 1 }

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

52

EXERCISE 1.4

Find the solution set of the following equations.

Q.1. $|2a - 3| = 7$

SOLUTION: :

$$|2a - 3| = 7$$

By definition of absolute value,

$$\begin{aligned} 2a - 3 &= 7 & \Rightarrow & 2a = 10 & \Rightarrow & a = 5 \\ \Rightarrow 2a - 3 &= -7 & \Rightarrow & 2a = -4 & \Rightarrow & a = -2 \end{aligned}$$

Verification:

Putting $a = -2, 5$ in the given equation.

$$\begin{aligned} \Rightarrow 2(5) - 3 &= 7 & \Rightarrow |2(-2) - 3| &= 7 \\ \Rightarrow |10 - 3| &= 7 & \Rightarrow |-4 - 3| &= 7 \\ \Rightarrow |7| &= 7 & \Rightarrow |-7| &= 7 \\ & & \Rightarrow 7 &= 7 \end{aligned}$$

Thus, the solution set is $\{-2, 5\}$

Q.2. $|5b - 12| = 9$

SOLUTION: :

$$|5b - 12| = 9$$

By definition of absolute value,

$$\begin{aligned} 5b - 12 &= 9 & \Rightarrow & 5b = 9 + 12 = 21 \\ \Rightarrow b &= \frac{21}{5} & \Rightarrow & 5b - 12 = -9 \\ \Rightarrow 5b &= 3 & \Rightarrow & b = \frac{3}{5} \end{aligned}$$

Verification:

Putting $b = \frac{21}{5}, \frac{3}{5}$ in the given equation.

$$\begin{aligned} \Rightarrow 5\left(\frac{21}{5}\right) - 12 &= 9 & \Rightarrow 5\left(\frac{3}{5}\right) - 12 &= 9 \\ \Rightarrow |21 - 12| &= 9 & \Rightarrow |3 - 12| &= 9 \\ \Rightarrow |9| &= 9 & \Rightarrow |-9| &= 9 \\ \Rightarrow 9 &= 9 & \Rightarrow 9 &= 9 \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

53

Thus, the solution set = $\left\{\frac{3}{5}, \frac{21}{5}\right\}$

Q.3. $|3x| = 6$

SOLUTION ::

$$|3x| = 6$$

By definition of absolute value

$$\begin{aligned} 3x &= 6 & \Rightarrow & x = 2 \\ \Rightarrow 3x &= -6 & \Rightarrow & x = -2 \end{aligned}$$

Verification:

Putting $x = +2, -2$ in the given equation.

$$\begin{aligned} \Rightarrow |3(2)| &= 6 & \Rightarrow |3(-2)| &= 6 \\ \Rightarrow |6| &= 6 & \Rightarrow |-6| &= 6 \\ \Rightarrow 6 &= 6 & \Rightarrow 6 &= 6 \end{aligned}$$

Thus, the solution set = $\{-2, 2\}$

Q.4. $\left|\frac{y}{3}\right| = 12$

SOLUTION ::

$$\left|\frac{y}{3}\right| = 12$$

By definition of absolute value,

$$\begin{aligned} \frac{y}{3} &= 12 & \Rightarrow & y = 36 \\ \Rightarrow \frac{y}{3} &= -12 & \Rightarrow & y = -36 \end{aligned}$$

Verification:

Putting $y = 36, -36$ in the given equation.

$$\begin{aligned} \Rightarrow \left|\frac{y}{3}\right| &= 12 & \Rightarrow \left|\frac{y}{3}\right| &= 12 \\ \Rightarrow \left|\frac{36}{3}\right| &= 12 & \Rightarrow \left|\frac{-36}{3}\right| &= 12 \\ \Rightarrow |12| &= 12 & \Rightarrow |-12| &= 12 \\ 12 &= 12 & 12 &= 12 \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

54

Thus, the solution set = $\{-36, 36\}$

Q.5. $|y-3|=4$

SOLUTION:

$$\begin{array}{ll} |y-3|=4 & Y-3=-4 \\ \text{By definition of absolute value,} & \\ Y-3=4 & \Rightarrow Y=-4+3 \\ \Rightarrow Y=7 & \Rightarrow Y=-1 \end{array}$$

Verification:

Putting $y = 7, -1$ in the given equation.

$$\begin{array}{ll} |7-3|=4 & \Rightarrow |-1-3|=4 \\ \Rightarrow |4|=4 & \Rightarrow |-4|=4 \\ \Rightarrow 4=4 & \end{array}$$

Thus, the solution set = $\{-1, 7\}$

Q.6. $\left|\frac{x+1}{3}\right|=1$

SOLUTION:

By definition of absolute value,

$$\begin{array}{llll} \frac{x+1}{3}=1 & \Rightarrow & x+1=3 & \Rightarrow & x=2 \\ \Rightarrow \frac{x+1}{3}=-1 & \Rightarrow & x+1=-3 & \Rightarrow & x=-4 \end{array}$$

Verification:

Putting $y = 2, -4$ in the given equation.

$$\begin{array}{ll} \left|\frac{2+1}{3}\right|=1 & \Rightarrow \left|\frac{-4+1}{3}\right|=1 \\ \Rightarrow |1|=1 & \Rightarrow |1|=1 \\ \Rightarrow 1=1 & \Rightarrow 1=1 \end{array}$$

Thus, the solution set = $\{-4, 2\}$

Q.7. $-6+|5x-3|=3$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

55

SOLUTION ::

$$\begin{aligned} -6 + |5x - 3| &= 3 & \Rightarrow & |5x - 3| = 3 + 6 \\ \Rightarrow |5x - 3| &= 9 \end{aligned}$$

By definition of absolute value.

$$5x - 3 = 9$$

$$5x - 3 = -9$$

$$\Rightarrow 5x = 12$$

$$\Rightarrow x = \frac{12}{5}$$

$$\Rightarrow 5x = -6$$

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

$$\text{Thus, the solution set} = \left\{ -\frac{6}{5}, \frac{12}{5} \right\}$$

Verification:

Putting $x = \left\{ -\frac{6}{5}, \frac{12}{5} \right\}$ in the given equation.

$$\begin{aligned} -6 + \left| 5\left(\frac{12}{5}\right) - 3 \right| &= 3 & -6 + \left| 5\left(-\frac{6}{5}\right) - 3 \right| &= 3 \\ \Rightarrow -6 + |9 - 3| &= 3 & \Rightarrow -6 + |-9 - 3| &= 3 \\ \Rightarrow -6 + 9 &= 3 & \Rightarrow -6 + 9 &= 3 \\ \Rightarrow 3 &= 3 & \Rightarrow 3 &= 3 \end{aligned}$$

Q.8. $|3x - 4| = 22$

SOLUTION :

$$|3x - 4| = 22$$

By definition of absolute value,

$$3x - 4 = 22$$

$$\Rightarrow 3x = 26$$

$$\Rightarrow x = \frac{26}{3}$$

$$3x - 4 = -22$$

$$\Rightarrow 3x = -18$$

$$\Rightarrow x = -6$$

Verification:

Putting $x = \frac{26}{3}, -6$ in the given equation

$$\begin{aligned} -6 + \left| 3\left(\frac{26}{3}\right) - 4 \right| &= 22 & |3(-6) - 4| &= 22 \\ \Rightarrow |18 - 4| &= 22 & \Rightarrow |-18 - 4| &= 22 \\ \Rightarrow |14| &= 22 & \Rightarrow |-22| &= 22 \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

56

$$\begin{aligned} \Rightarrow |26 - 4| &= 22 & \Rightarrow 22 &= 22 \\ \Rightarrow |22| &= 22 \\ \Rightarrow 22 &= 22 \end{aligned}$$

Thus, the solution set = $\left\{-6, \frac{26}{3}\right\}$

Q.9. $|3x - 4| + 8 = \frac{3}{4}$

SOLUTION :

$$\begin{aligned} |3x - 4| + 8 &= \frac{3}{4} - 8 & \Rightarrow |3x - 4| &= \frac{3}{4} - 8 \\ \Rightarrow |3x - 4| &= \frac{3 - 32}{4} & \Rightarrow |3x - 4| &= -\frac{29}{4} \end{aligned}$$

Which is not possible due to the definition of absolute value.
Thus, solution set = $\{ \}$.

Q.10. $\left|\frac{2x + 1}{7}\right| = 1$

SOLUTION :

$$\left|\frac{2x + 1}{7}\right| = 1$$

By definition of absolute value.

$$\begin{aligned} \frac{2x + 1}{7} &= 1 & ; & \frac{2x + 1}{7} = -1 \\ \Rightarrow 2x + 1 &= 7 & \Rightarrow 2x + 1 &= -7 \\ \Rightarrow 2x &= 6 & \Rightarrow 2x &= -8 \\ \Rightarrow x &= 3 & \Rightarrow x &= -4 \end{aligned}$$

Verification:

Putting $x = 3, -4$ in the given equation

$$\begin{aligned} \Rightarrow \left|\frac{2(3) + 1}{7}\right| &= 1 & \Rightarrow \left|\frac{2(-4) + 1}{7}\right| &= 1 \\ \Rightarrow \left|\frac{7}{7}\right| &= 1 & \Rightarrow \left|\frac{-7}{7}\right| &= 1 \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

57

$$\begin{aligned} \Rightarrow |1| &= 1 \\ \Rightarrow 1 &= 1 \end{aligned}$$

Thus, solution set = $\{-4, 3\}$

$$\begin{aligned} \Rightarrow |1| &= 1 \\ \Rightarrow 1 &= 1 \end{aligned}$$

EXERCISE 1.5

Find the solution set the following inequations (or inequalities)

Q.1. $2a - 6 > 3 + a, \forall a \in \mathbb{N}$

SOLUTION :

$$\begin{aligned} 2a - 6 &> 3 + a \\ \Rightarrow 2a - a &> 3 + 6 \\ \Rightarrow a &> 9 \end{aligned}$$

Thus, the solution set = $\{a \in \mathbb{N} \mid a > 9\}$

Q.2. $6b - 5 < b + 10, \forall b \in \mathbb{R}$

SOLUTION :

$$\begin{aligned} 6b - 5 &< b + 10 \\ \Rightarrow 5b &< 15 \end{aligned}$$

$$\Rightarrow 6b - b < 10 + 5$$

Thus, the solution set = $\{b \in \mathbb{R} \mid b < 3\}$

Q.3. $\frac{x+5}{10} < \frac{25-4x}{5}, \forall x \in \mathbb{N}$

SOLUTION :

$$\frac{x+5}{10} < \frac{25-4x}{5}$$

$$\Rightarrow 5(x+5) < 10(25-4x)$$

$$\Rightarrow 5x + 25 < 250 - 40x$$

$$\Rightarrow 5x + 40x < 250 - 25$$

$$\Rightarrow 45x < 225$$

$$\Rightarrow x < 5$$

$$\begin{aligned} \Rightarrow \text{Thus, the solution set} &= \{x \in \mathbb{N} \mid x < 5\} \\ &= \{1, 2, 3, 4\} \end{aligned}$$

Q.4. $\frac{7+5x}{3} < \frac{1-x}{2}, \forall x \in \mathbb{R}$

SOLUTION :

$$\frac{7+5x}{3} < \frac{1-x}{2}$$

$$\Rightarrow 2(7+5x) > 3(1-x)$$

$$\Rightarrow 14 + 10x > 3 - 3x$$

$$\Rightarrow 10x + 3x > 3 - 14$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

58

$$\Rightarrow 13x > -11 \quad \text{Thus, the solution set} = \left\{ x \in \mathbb{R} \mid x > -\frac{11}{13} \right\}$$

Q.5. $\frac{7y}{8} + \frac{y+4}{6} + \frac{3}{8} > \frac{3y-4}{4}, \forall y \in \mathbb{Z}$

SOLUTION :

$$\begin{aligned} & \frac{7y}{8} + \frac{y+4}{6} > \frac{3y-4}{4} \\ \Rightarrow & \frac{21y+4y+16+9}{24} > \frac{3y-4}{4} \\ \Rightarrow & \frac{25y+25}{6} > 3y-4 & \Rightarrow 25y+25 > 18y-24 \\ \Rightarrow & 7y > -49 & \Rightarrow y > -7 \\ & \text{Thus, the solution set} = \{y \in \mathbb{Z} \mid y > -7\} \\ & = \{-6, -5, -4, -3, \dots\} \end{aligned}$$

Q. 6. $7 - 2x > 6, \quad \forall x \in \mathbb{Z}$

SOLUTION :

$$\begin{aligned} & 7 - 2x > 6 \quad \Rightarrow \quad -2x > 6 - 7 \\ \Rightarrow & -2x > -1 \quad \Rightarrow \quad 1 > 2x \\ \Rightarrow & \frac{1}{2} > x \quad \Rightarrow \quad x < \frac{1}{2} \end{aligned}$$

Thus, the solution set is $\left\{ x \in \mathbb{R} \mid x < \frac{1}{2} \right\}$

Q.7. $\frac{4-x}{2} + \frac{3x+4}{8} - \frac{5x}{8} > \frac{11}{12}, \forall x \in \mathbb{R}$

SOLUTION :

$$\begin{aligned} & \frac{4-x}{2} + \frac{3x+4}{8} - \frac{5x}{8} > \frac{11}{12} \\ \Rightarrow & \frac{16-4x+3x+4-5x}{8} > \frac{11}{12} \\ \Rightarrow & \frac{-6x+20}{8} > \frac{11}{12} \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

59

$$\Rightarrow -72x + 240 > 88$$

$$\Rightarrow 152 > 72x$$

$$\Rightarrow 72x < 152$$

$$\Rightarrow x < \frac{19}{9}$$

$$\text{Thus, the solution set} = \left\{ x \in \mathbb{R} \mid x > -\frac{19}{9} \right\},$$

Q.8. $|3x - 2| < x + 5, \forall x \in \mathbb{R}$

Solution:

$$|3x - 2| < x + 5$$

$$3x - 2 < x + 5$$

$$\Rightarrow 3x - 2 < x + 5$$

$$\Rightarrow 3x - x < 5 + 2$$

$$\Rightarrow 2x < 7$$

$$\Rightarrow x < \frac{7}{2}$$

$$; \quad 3x - 2 > -(x + 5)$$

$$\Rightarrow 3x - 2 > -x - 5$$

$$\Rightarrow 3x + x > -5 + 2$$

$$\Rightarrow 4x > -3$$

$$\Rightarrow x > -\frac{3}{4}$$

$$\therefore \text{Thus, the solution set is } -\frac{3}{4} < x < \frac{7}{2}$$

Q.9. $|5 + 3y| < 12, \forall y \in \mathbb{R}$ $\left\{ x \in \mathbb{R} \mid -\frac{3}{4} < x < \frac{7}{2} \right\}$.

SOLUTION:

$$|5 + 3y| < 12$$

$$5 + 3y < 12$$

$$5 + 3y < 12$$

$$\Rightarrow 3y < 7$$

$$\Rightarrow y < \frac{7}{3}$$

$$; \quad 5 + 3y < -12$$

$$\Rightarrow 3y < -12 - 5$$

$$\Rightarrow y < -\frac{17}{3}$$

$$\therefore -\frac{7}{13} < y < \frac{7}{3}$$

$$\text{Thus, the solution set} = \left\{ y \in \mathbb{R} \mid -\frac{7}{13} < y < \frac{7}{3} \right\}.$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

60

Q.10. $5(3y - 2) > 3(y - 5), \forall y \in \mathbb{R}$

SOLUTION:

$$\begin{aligned} & 5(3y - 2) > 3(y - 5) \\ \Rightarrow & 15y - 10 > 3y - 15 & \Rightarrow & 15y - 3y > -15 + 10 \\ \Rightarrow & 12y > -5 & \Rightarrow & y > -\frac{5}{12} \end{aligned}$$

Thus, the solution set = $\left\{ y \in \mathbb{R} \mid y > -\frac{5}{12} \right\}$.

Solve the following Inequations (or inequations), illustrate each solution by a number line.

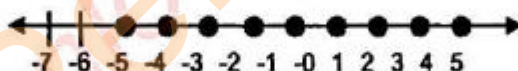
Q11. $7 - 5a \leq 32, \forall a \in \mathbb{Z}$

SOLUTION:

$$\begin{aligned} 7 - 5a & \leq 32 & \Rightarrow & 7 - 32 \leq 5a \\ \Rightarrow & -25 \leq 5a & \Rightarrow & a \geq -5 \end{aligned}$$

Thus, the solution set = $\{-5, -4, -3, -2, \dots, 4\} = \{a \in \mathbb{Z} \mid a \geq -5\}$

The solution is illustrated by the following number line.



Q.12. $7 < 2y + 3 < 15, \forall y \in \mathbb{N}$

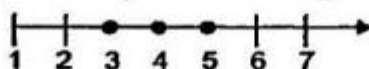
Solution:

$$7 < 2y + 3 < 15$$

$\Rightarrow 7 < 2y + 3$	$; 2y + 3 < 15$
$\Rightarrow 7 - 3 < 2y$	$\Rightarrow 2y < 12$
$\Rightarrow 2 < y$	$\Rightarrow y < 6$

Thus, the solution set = $\{y \in \mathbb{N} \mid 2 < y < 6\}$
 = $\{3, 4, 5\}$

Thus solution is illustrated by the following number line.



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

61

Q.13. $-8 < 3y + 3 < 14, \forall y \in \mathbb{N}$

SOLUTION:

$$-8 < 3y + 3 < 14$$

$$-11 < 3y < 11 \quad ; \quad 2y + 3 < 15$$

$$\Rightarrow 7 - 3 < 2y$$

$$\Rightarrow 2y < 12$$

$$\Rightarrow 2 < y$$

$$\Rightarrow y < 6$$

Thus, the solution set $= \{y \in \mathbb{N} \mid 2 < y < 6\}$

$$= \{3, 4, 5\}$$

Thus solution is illustrated by the following number line.



Q.14. $2(3x + 5) > 4x, \forall x \in \mathbb{R}$

SOLUTION:

$$2(3x + 5) > 4x$$

$\Rightarrow$

$$6x + 10 > 4x$$

$$\Rightarrow 6x - 4x > -10$$

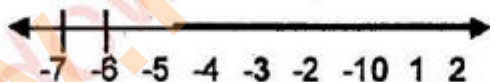
$\Rightarrow$

$$2x > -10$$

$$\Rightarrow x > -5$$

Thus, the solution set $= \{x \in \mathbb{R} \mid x > -5\}$

Thus solution is illustrated by the following number line.



Q.14. $3(x + 5) > 2(x + 2) + 8, \forall x \in \mathbb{R}$

SOLUTION:

$$3(x + 5) > 2(x + 2) + 8$$

$\Rightarrow$

$$3x + 15 > 2x + 4 + 8$$

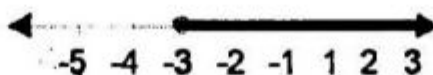
$$\Rightarrow 3x - 2x > 12 - 15$$

$\Rightarrow$

$$x > -3$$

Thus, the solution set $= \{x \in \mathbb{R} \mid x > -3\}$

Thus solution is illustrated by the following number line.



MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

62

EXERCISE 1.6

Write the following quadratic equations in the standard form

Q.1. $(x - 3)(x - 4) = 0$

SOLUTION:

$$\begin{aligned} (x - 3)(x - 4) &= 0 & \Rightarrow & x(x - 4) - 3(x - 4) = 0 \\ \Rightarrow x^2 - 4x - 3x + 12 &= 0 & \Rightarrow & x^2 - 7x + 12 = 0, \end{aligned}$$

Which is the required standard form.

Q.2. $5x^2 + 10x = 4(3x - 1)$

SOLUTION:

$$\begin{aligned} 5x^2 + 10x &= 4(3x - 1) & \Rightarrow & 5x^2 + 10x = 12x - 4 \\ \Rightarrow 5x^2 + 10x - 12x + 4 &= 0 & \Rightarrow & 5x^2 - 2x + 4 = 0, \end{aligned}$$

Which is the required standard form.

Q.3. $z^2 = 3(4z - 1)$

Solution:

$$\begin{aligned} z^2 &= 3(4z - 1) & \Rightarrow & z^2 = 12z - 3 \\ \Rightarrow z^2 - 12z + 3 &= 0, \end{aligned}$$

Which is the required standard form.

Q.4. $x^2 + 7 = -2x$

SOLUTION:

$$x^2 + 7 = -2 \quad \Rightarrow \quad x^2 + 2x + 7 = 0$$

Which is the required standard form.

Q.5. $2p^2 - 5p - 2$

SOLUTION:

$$2p^2 = 5p - 2 \quad \Rightarrow \quad 2p^2 - 5p + 2 = 0$$

Which is the required standard form.

Q.6. $15 + 2s - s^2 = 0$

SOLUTION:

$$15 + 2s - s^2 = 0 \quad \Rightarrow \quad s^2 - 2s - 15 = 0$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

63

Which is the required standard form.

Q.7. $2m^2 - 3 = -5m$

SOLUTION:

$$2m^2 - 3 = -5m \Rightarrow 2m^2 + 5m - 3 = 0, \\ \text{Which is the required standard form.}$$

Q.8. $q^2 + 7q = 60$

SOLUTION:

$$q^2 + 7q = 60 \Rightarrow q^2 + 7q - 60 = 0, \\ \text{Which is the required standard form.}$$

Q.9. $x^2 - 5x + 6 = 0$

SOLUTION:

$$\begin{aligned} x^2 - 5x + 6 &= 0 \Rightarrow x^2 - 2x - 3x + 6 = 0 \\ \Rightarrow x(x-2) - 3(x-2) &= 0 \Rightarrow (x-2)(x-3) = 0 \end{aligned}$$

Either for

$\Rightarrow x - 2 = 0$	$x - 3 = 0$
$\therefore x = 2$	$x = 3$

Verification.

Putting $x = 2, 3$ in the given equation, we get

$(2)^2 - 5(2) + 6 = 0$	$(3)^2 - 5(3) + 6 = 0$
$\Rightarrow 4 - 10 + 6 = 0$	$\Rightarrow 9 - 15 + 6 = 0$
$\Rightarrow 10 - 10 = 0$	$\Rightarrow 15 - 15 = 0$
$\Rightarrow 0 = 0$	$\Rightarrow 0 = 0$

Thus, the solution set = $\{2, 3\}$

Q.10. $x^2 + x = 6$

SOLUTION:

$$\begin{aligned} x^2 + x &= 6 \Rightarrow x^2 + x - 6 = 0 \\ \Rightarrow (x+3)(x-2) &= 0 \Rightarrow x+3=0; x-2=0 \end{aligned}$$

Either for: $x = -3; x = 2$

Thus, the solution set = $\{-3, 2\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

64

Q.11. $2x^2 + 21 = 13x$

SOLUTION:

$$\begin{aligned} 2x^2 + 21 &= 13x & \Rightarrow & 2x^2 - 13x + 21 = 0 \\ \Rightarrow 2x^2 - 6x - 7x + 21 &= 0 & \Rightarrow & (x-3)(2x-7) = 0 \\ \Rightarrow x-3 = 0; 2x-7 &= 0 \end{aligned}$$

Either for $x = 3; x = \frac{7}{2}$

Thus, the solution set = $\left\{3, \frac{7}{2}\right\}$

Q.12. $3(x-5)(x-7) = 4(x+3)$

SOLUTION:

$$\begin{aligned} 3(x-5)(x-7) &= 4(x+3) & \Rightarrow & 3(x^2 - 12x + 35) = 4x + 12 \\ \Rightarrow 3x^2 - 36x + 105 &= 4x + 12 & \Rightarrow & 3x^2 - 40x + 93 = 0 \\ \Rightarrow 3x^2 - 9x + 31x + 93 &= 0 & \Rightarrow & (x-3)(3x-31) = 0 \\ \Rightarrow x-3 = 0; 3x-31 &= 0 \end{aligned}$$

Either for $x = 3; x = \frac{31}{3}$

Thus, the solution set = $\left\{3, \frac{31}{3}\right\}$

Q.13. $(2x+1)(x+3)+3=0$

SOLUTION:

$$\begin{aligned} (2x+1)(x+3)+3 &= 0 & \Rightarrow & 2x^2 + 7x + 3 + 3 = 0 \\ \Rightarrow 2x^2 + 7x + 6 &= 0 & \Rightarrow & 2x^2 + 4x + 3x + 6 = 0 \\ \Rightarrow (x+2)(2x+3) &= 0 & \Rightarrow & x+2 = 0; 2x+3 = 0 \end{aligned}$$

Either for: $x = -2; x = -\frac{3}{2}$

Thus, the solution set = $\left\{-2, -\frac{3}{2}\right\}$

Q.14. $2x(4x-1) = 15$

SOLUTION:

$$\begin{aligned} 2x(4x-1) &= 15 & \Rightarrow & 8x^2 - 2x = 15 \\ \Rightarrow 8x^2 - 2x - 15 &= 0 & \Rightarrow & 8x^2 - 10x + 12x + 15 = 0 \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

65

$$\Rightarrow (2x-3)(4x+5) = 0 \quad \Rightarrow \quad 2x-3=0; \quad 4x+5=0$$

$$\Rightarrow \quad 2x-3=0; \quad 4x+5=0$$

$$\text{Either for} \quad x = \frac{3}{2}; \quad x = -\frac{5}{4}$$

$$\text{Thus, the solution set} = \left\{ -\frac{5}{4}, \frac{3}{2} \right\}$$

Q.15. $x(x+1) + x(x+2) + x(x+3) + 3 = 0$

SOLUTION:

$$x(x+1) + x(x+2) + x(x+3) + 3 = 0$$

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

$$\Rightarrow \quad 3x^2 + 6x + 3 = 0 \quad \Rightarrow \quad 3x^2 + 3x + 3x + 3 = 0$$

$$\Rightarrow \quad (x+1)(3x+3) = 0 \quad \Rightarrow \quad x+1=0; \quad 3x+3=0$$

$$\text{Either for} \quad x = -1; \quad x = -1 \quad \text{Thus, the solution set} = \{-1\}$$

Q.16. $x + \frac{6}{x} = 5, (x \neq 0)$

SOLUTION:

$$x + \frac{6}{x} = 5 \quad \Rightarrow \quad \frac{x^2 + 6}{x} = 5$$

$$\Rightarrow \quad x^2 + 6 = 5x \quad \Rightarrow \quad x^2 - 5x + 6 = 0$$

$$\Rightarrow \quad x^2 - 2x - 3x + 6 = 0 \quad \Rightarrow \quad (x-2)(x-3) = 0$$

$$\Rightarrow \quad x-2=0; \quad x-3=0$$

$$\text{Either for:} \quad x = 2; \quad x = 3$$

Verification

Putting $x = 2, 3$ in the given equation, we get

$2 + \frac{6}{2} = 5$	$3 + \frac{6}{3} = 5$
$\Rightarrow \quad 2 + 3 = 5$	$\Rightarrow \quad 3 + 2 = 5$
$\Rightarrow \quad 5 = 5$	$\Rightarrow \quad 5 = 5$

Thus, the solution set = $\{2, 3\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

66

EXERCISE 1.7

Q.1. $x^2 - 2x = 1$

SOLUTION:

$$\begin{aligned} x^2 - 2x &= 1 & \Rightarrow & x^2 - 2x + 1 = 1 + 1 \\ \Rightarrow (x - 1)^2 &= 2 & \Rightarrow & x - 1 = \pm \sqrt{2} \\ \Rightarrow x &= 1 \pm \sqrt{2} \end{aligned}$$

Thus, the solution set = $\{1 - \sqrt{2}, 1 + \sqrt{2}\}$

Q.2. $x^2 - 2x = 2$

SOLUTION:

$$\begin{aligned} x^2 - 2x &= 2 & \Rightarrow & x^2 - 2x + 1 = 2 + 1 \\ \Rightarrow (x - 1)^2 &= 3 & \Rightarrow & x - 1 = \pm \sqrt{3} \\ \Rightarrow x &= 1 \pm \sqrt{3} \end{aligned}$$

Thus, the solution set = $\{1 - \sqrt{3}, 1 + \sqrt{3}\}$

Q.3. $x^2 - 3x = 2$

SOLUTION:

$$\begin{aligned} x^2 - 3x &= 2 & \Rightarrow & x^2 - 3x + \frac{9}{4} = 2 + \frac{9}{4} \\ \Rightarrow \left(x - \frac{3}{2}\right)^2 &= \frac{17}{4} & \Rightarrow & x - \frac{3}{2} = \pm \frac{\sqrt{17}}{2} \end{aligned}$$

$$\Rightarrow x = \left\{ \frac{3 \pm \sqrt{17}}{2} \right\} \quad \text{Thus, the solution set} = \left\{ \frac{3 + \sqrt{17}}{2}, \frac{3 - \sqrt{17}}{2} \right\}$$

Q.4. $x^2 - x = 5$

SOLUTION:

$$\begin{aligned} 2x^2 - x &= 5 & \Rightarrow & x^2 + \frac{1}{2}x = \frac{5}{2} \\ \Rightarrow x^2 + \frac{1}{2}x + \frac{1}{16} &= \frac{5}{2} + \frac{1}{16} & \Rightarrow & \left(x + \frac{1}{4}\right)^2 = \frac{41}{16} \end{aligned}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

67

$$\Rightarrow X + \frac{1}{4} = \pm \sqrt{\frac{41}{4}} \quad \Rightarrow \quad X = \frac{-1 \pm \sqrt{41}}{4}$$

Thus, solution set is: $\left\{ \frac{-1 - \sqrt{41}}{2}, \frac{-1 + \sqrt{41}}{2} \right\}$

Q.5. $3x^2 - 5x - 3 = 0$

SOLUTION:

$$3x^2 - 5x - 3 = 0 \quad \Rightarrow \quad x^2 - \frac{5}{3}x - 1 = 0$$

$$\Rightarrow x^2 - \frac{5}{3}x = 1 \quad \Rightarrow \quad x^2 - \frac{5}{3}x + \frac{25}{36} = 1 + \frac{25}{36}$$

$$\Rightarrow \left(x - \frac{5}{6}\right)^2 = \frac{61}{36} \quad \Rightarrow \quad x - \frac{5}{6} = \pm \frac{\sqrt{61}}{6}$$

$$\Rightarrow x = \frac{5 \pm \sqrt{61}}{6} \quad \text{Thus, solution set is: } \left\{ \frac{5 - \sqrt{61}}{6}, \frac{5 + \sqrt{61}}{6} \right\}$$

Q.6. $12 = 4x + 5x^2$

SOLUTION:

$$\Rightarrow 12 = 4x + 5x^2 \quad \Rightarrow \quad 5x^2 + 4x = 12$$

$$\Rightarrow x^2 + \frac{4}{5}x = \frac{12}{5} \quad \Rightarrow \quad x^2 + \frac{4}{5}x + \frac{4}{25} = \frac{12}{5} + \frac{4}{25}$$

$$\Rightarrow x^2 + \frac{4}{5}x + \frac{4}{25} = \frac{12}{5} + \frac{4}{25} \quad \Rightarrow \quad \left(x + \frac{2}{5}\right)^2 = \frac{64}{25}$$

$$\Rightarrow x + \frac{2}{5} = \pm \frac{8}{5} \quad \Rightarrow \quad x = -\frac{2}{5} \pm \frac{8}{5}$$

$$\Rightarrow x = \frac{-2+8}{5}, \frac{-2-8}{5} \quad \Rightarrow \quad x = \frac{6}{5}, \frac{-10}{5}$$

$$= \frac{6}{5}, -2$$

Thus, solution set = $\left\{ -2, \frac{6}{5} \right\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

68

Q.7. $12x - 3 = x^2$

SOLUTION:

$$\begin{aligned} 12x - 3 &= x^2 & \Rightarrow & -3 = x^2 - 12x \\ \Rightarrow x^2 - 12x + 36 &= 3 + 36 & \Rightarrow & (x - 6)^2 = 33 \\ \Rightarrow x - 6 &= \pm \sqrt{33} & \Rightarrow & x = 6 \pm \sqrt{33} \end{aligned}$$

Thus, the solution set is: $\{6 - \sqrt{33}, 6 + \sqrt{33}\}$

Q.8. $3x^2 - 5x + 2 = 0$

SOLUTION:

$$\begin{aligned} \Rightarrow x^2 - \frac{5}{3}x + \frac{2}{3} &= 0 & \Rightarrow & x^2 - \frac{5}{3}x = -\frac{2}{3} \\ \Rightarrow x^2 - \frac{5}{3}x + \frac{25}{36} &= -\frac{2}{3} + \frac{25}{36} & \Rightarrow & \left(x - \frac{5}{6}\right)^2 = \frac{1}{36} \\ \Rightarrow x - \frac{5}{6} &= \pm \frac{1}{6} & \Rightarrow & x = \frac{5}{6} \pm \frac{1}{6} \\ \Rightarrow x = \frac{5+1}{6}, \frac{5-1}{6} & & \Rightarrow & x = \frac{6}{6}, \frac{4}{6} \\ \Rightarrow x = 1, \frac{2}{3} & & \text{Thus, solution set} &= \left\{\frac{2}{3}, 1\right\} \end{aligned}$$

Q.9. $(x + 2)(x - 3) = (x - 3)$

SOLUTION:

$$\begin{aligned} (x + 2)(x - 3) &= (x - 3) & \Rightarrow & x^2 - x - 6 = x - 3 \\ \Rightarrow x^2 - 2x - 3 &= 0 & \Rightarrow & x^2 - 2x = 1 \\ \Rightarrow x^2 - 2x + 1 &= 3 + 1 & \Rightarrow & (x - 1)^2 = 4 \\ \Rightarrow x - 1 &= \pm 2 & \Rightarrow & x = 1 \pm 2 \\ \Rightarrow &= 3, -1 & & \end{aligned}$$

Thus solution set = $\{-1, 3\}$

Q.10. $x^2 + 60x - 61 = 0$

SOLUTION:

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

69

$$\begin{aligned}
 x^2 + 60x - 61 &= 0 & \Rightarrow & x^2 + 60x = 61 \\
 \Rightarrow x^2 + 60x + 900 &= 61 + 900 & \Rightarrow & (x + 30)^2 = 961 \\
 \Rightarrow x + 30 &= \pm 31 & \Rightarrow & = -30 + 31; -30 - 31 \\
 \Rightarrow &= 1; -61
 \end{aligned}$$

Thus, solution set = $\{-61, 1\}$

Q11. $2x^2 + 10x - 48 = 0$

SOLUTION:

$$\begin{aligned}
 2x^2 + 10x - 48 &= 0 & \Rightarrow & x^2 + 5x - 24 = 0 \\
 \Rightarrow x^2 + 5x &= 24 & \Rightarrow & x^2 + 5x + \frac{25}{4} = 24 + \frac{25}{4} \\
 \Rightarrow \left(x + \frac{5}{2}\right)^2 &= \frac{121}{4} & \Rightarrow & x + \frac{5}{2} = \pm \frac{11}{2} \\
 \Rightarrow x = -\frac{5}{2} \pm \frac{11}{2} & & \Rightarrow & = -\frac{5+11}{2} - \frac{5-11}{2} \\
 \Rightarrow &= 3, -8
 \end{aligned}$$

Thus, solution set = $\{-8, 3\}$

Q.12. $15x^2 - 34x + 15 = 0$

SOLUTION:

$$\begin{aligned}
 15x^2 - 34x + 15 &= 0 & \Rightarrow & x^2 - \frac{34}{15}x + 1 = 0 \\
 \Rightarrow x^2 - \frac{34}{15}x &= -1 & \Rightarrow & x^2 - \frac{34}{15}x + \frac{289}{225} = -1 + \frac{289}{225} \\
 \Rightarrow \left(x - \frac{17}{15}\right)^2 &= \frac{64}{225} & \Rightarrow & x - \frac{17}{15} = \pm \frac{8}{15} \\
 \Rightarrow x = \frac{17}{15} \pm \frac{8}{15} & & \Rightarrow & = \frac{5}{3}, \frac{5}{3}
 \end{aligned}$$

Thus, the solution set = $\left\{\frac{5}{3}, \frac{5}{3}\right\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

70

EXERCISE 1.8

Solve the following equation by using the quadratic formula:

Q1. $3a^2 - 12a - 15 = 0$

SOLUTION:

$$3a^2 - 12a - 15 = 0$$

Here $a = 3, b = -12, c = -15$

so, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$a = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(-15)}}{2(3)} = \frac{12 \pm \sqrt{144 + 180}}{6}$$

$$= \frac{12 \pm \sqrt{324}}{6} = \frac{12 \pm 18}{6}$$

$$= \frac{12 + 18}{6}, \frac{12 - 18}{6}$$

$$= \frac{30}{6}, \frac{-6}{6} = 5, -1$$

Thus, the solution set = $\{-1, 5\}$

Q.2. $k^2 - 2k - 63 = 0$

SOLUTION:

$$k^2 - 2k - 63 = 0$$

Here $a = 1, b = -2, c = -63$

so, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$k = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-63)}}{2(1)} = \frac{2 \pm \sqrt{4 + 252}}{2}$$

$$= \frac{2 \pm \sqrt{256}}{2} = \frac{2 \pm 16}{2}$$

$$k = \frac{18}{2}, \frac{-14}{2} = 9, -7$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

71

Thus, the solution set = $\{-7, 9\}$

Q.3. $y^2 - y - 56 = 0$

SOLUTION:

$$y^2 - y - 56 = 0$$

$$\Rightarrow y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-56)}}{2(1)}$$

$$= \frac{1 \pm \sqrt{1 + 224}}{2} = \frac{1 \pm \sqrt{225}}{2}$$

$$= \frac{1 \pm 15}{2}$$

$$y = \frac{16}{2}, \frac{-14}{2} = 8, -7$$

Thus, the solution set = $\{-7, 8\}$

Q.4. $3(y^2 - 1) - 4(y + 1) = 0$

SOLUTION:

$$3(y^2 - 1) - 4(y + 1) = 0$$

$$\Rightarrow 3y^2 - 4y - 7 = 0$$

$$\Rightarrow y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-7)}}{2(3)}$$

$$= \frac{4 \pm \sqrt{16 + 84}}{6} = \frac{4 \pm 10}{6}$$

$$= \frac{4 + 10}{6}, \frac{4 - 10}{6} = \left\{ \frac{7}{3}, -1 \right\}$$

Thus, solution set = $\left\{ -1, \frac{7}{3} \right\}$

Q.5. $2b^2 - 7b + 5 = 0$

SOLUTION:

$$\Rightarrow b = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(5)}}{2(2)}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

72

$$= \frac{7 \pm \sqrt{49 - 40}}{4} = \frac{7 \pm \sqrt{9}}{4}$$

$$= \frac{7 \pm 3}{4} = \frac{5}{2}, 1$$

Thus, solution set = $\left\{1, \frac{5}{2}\right\}$

Q.6. $5x^2 - 9 = 0$

SOLUTION:

$$5x^2 - 9 = 0$$

$$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(0) \pm \sqrt{(0)^2 - 4(5)(9)}}{2(5)}$$

$$= \pm \frac{\sqrt{180}}{10} = \pm \frac{6\sqrt{5}}{10}$$

$$= \pm \frac{3\sqrt{5}}{5}$$

Thus, the solution set = $\left\{-\frac{3\sqrt{5}}{5}, \frac{3\sqrt{5}}{5}\right\}$

Q.7. $2m^2 - 3 = -5m$

SOLUTION: $2m^2 - 3 = -5m$

$$\Rightarrow 2m^2 + 5m - 3 = 0$$

$$m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-5 \pm \sqrt{(5)^2 - 4(2)(-3)}}{2(2)}$$

$$= \frac{-5 \pm \sqrt{25 + 24}}{4} = \frac{-5 \pm \sqrt{49}}{4}$$

$$= \frac{-5 \pm \sqrt{49}}{4} = \frac{-5 \pm 7}{4}$$

$$= \frac{-5 \pm 7}{4} = \frac{1}{2}, -3$$

Thus, the solution set = $\left\{\frac{1}{2}, -3\right\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

73

Q.8. $5x^2 + 11x = 4(3x + 1)$

SOLUTION: $5x^2 + 11x = 4(3x + 1)$

$\Rightarrow 5x^2 - x - 4 = 0$

$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-4)}}{2(5)}$

$x = \frac{1 \pm \sqrt{81}}{10} = \frac{1 \pm 9}{10} = 1, -\frac{4}{5}$

Thus, the solution set = $\left\{-\frac{4}{5}, 1\right\}$

Q.9. $3x - x^2 = -\frac{7}{4}$

SOLUTION: $3x - x^2 = -\frac{7}{4}$

$\Rightarrow x^2 - 3x - \frac{7}{4} = 0$

$\Rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)\left(-\frac{7}{4}\right)}}{2(1)}$

$= \frac{3 \pm \sqrt{16}}{2} = \frac{3 \pm 4}{2} = \frac{7}{2}, -\frac{1}{2}$

Thus, the solution set = $\left\{-\frac{1}{2}, \frac{7}{2}\right\}$

10. $\frac{1}{y+4} - \frac{1}{y-4} = 4, (y \neq \pm 4)$

SOLUTION:

$\frac{1}{y+4} - \frac{1}{y-4} = 4$

$\Rightarrow \frac{y-4-y-4}{y^2-16} = 4$

$4y^2 - 56 = 0$

$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-0 \pm \sqrt{0^2 - 4(4)(-56)}}{2(4)}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

74

$$= \pm \frac{8\sqrt{14}}{8} = \pm \sqrt{14}$$

Thus, the solution set = $\{\pm\sqrt{14}\}$

MISCELLANEOUS EXERCISE 1

Solve the following equations.

Q.1. $y - 4 = \frac{y-6}{y}, (y \neq 0)$

SOLUTION: $y^2 - 4 = \frac{y-6}{y}$

$$\Rightarrow y^2 - 4y = y - 6$$

$$\Rightarrow y^2 - 5y + 6 = 0$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(6)}}{2(1)}$$

$$= \frac{5 \pm \sqrt{25 - 24}}{2}$$

$$= \frac{5 \pm \sqrt{1}}{2} = \frac{5+1}{2}, \frac{5-1}{2}$$

$$= 3, 2$$

thus, solution set = $\{2, 3\}$

Q.2. $z + \frac{1}{z} = 2, (z \neq 0)$

SOLUTION: $z + \frac{1}{z} = 2$

$$\Rightarrow z^2 + 1 - 2z = 0$$

$$\Rightarrow z^2 - 2z + 1 = 0$$

$$\Rightarrow (z - 1)^2 = 0$$

$$\Rightarrow z - 1 = 0$$

$$\Rightarrow z = 1$$

thus, solution set = $\{1\}$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

75

Q.3. $\frac{z+1}{z} + \frac{z}{z+1} = \frac{13}{6}, (z \neq 0, -1)$

SOLUTION:

$$\begin{aligned} \Rightarrow \frac{z+1}{z} + \frac{z}{z+1} &= \frac{13}{6} \\ \Rightarrow \frac{(z+1)^2 + z^2}{z(z+1)} &= \frac{13}{6} \end{aligned}$$

$$\Rightarrow \frac{z^2 + 2z + 1 + z^2}{z^2 + z} = \frac{13}{6}$$

$$\Rightarrow 12z^2 + 12z + 6 = 13z^2 + 13z$$

$$\Rightarrow z^2 + z - 6 = 0$$

$$\Rightarrow (z-2)(z+3) = 0$$

$$\Rightarrow z = 2, -3$$

Thus, solution set = $\{2, -3\}$

Q.4. $\frac{3}{y+8} + \frac{4}{y+2} = \frac{5}{y}, (y \neq 0, -2, -8)$

SOLUTION:

$$\frac{3}{y+8} + \frac{4}{y+2} = \frac{5}{y} \quad \Rightarrow \quad \frac{3(y+2) + 4(y+8)}{(y+8)(y+2)} = \frac{5}{y}$$

$$\Rightarrow \frac{3y+6+4y+32}{y^2+10y+16} = \frac{5}{y}$$

$$\Rightarrow y(3y+6+4y+32) = (5y^2+10y+16)$$

$$\Rightarrow 7y^2 + 38y = 5y^2 + 50y + 80$$

$$\Rightarrow 2y^2 - 12y - 80 = 0$$

$$\Rightarrow y = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(2)(-80)}}{2(2)}$$

$$= \frac{12 \pm \sqrt{144 + 640}}{4}$$

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

76

$$= \frac{12 \pm \sqrt{784}}{4} = \frac{12 \pm 28}{4}$$

$$= \frac{40}{4}, \frac{16}{4} = 10, -4$$

Thus, solution set = $\{-4, 10\}$

Q.5. If $z = 3$, is a solution of the equation $z^2 + kz + 15 = 0$,

Find the value of k . Hence, find the other solution.

SOLUTION:

$$z^2 + kz + 15 = 0$$

Putting the value of $z = 3$

$$\Rightarrow (3)^2 + k(3) + 15 = 0 \quad \Rightarrow \quad 9 + 3k + 15 = 0$$

$$\Rightarrow k = -\frac{24}{3} = -8$$

$$z^2 + kz + 15 = 0$$

Putting the value of $k = -8$

$$\Rightarrow z^2 - 2z + 15 = 0 \quad \Rightarrow \quad (z - 5)(z - 3) = 0$$

$$\Rightarrow z - 5 = 0, \quad z - 3 = 0 \quad \Rightarrow \quad z = 5, 3$$

Thus, the solution set = $\{5, 3\}$

Q.6. The perimeter of a rectangle is 20cm and its area is 24 cm². Find the length and breadth of the rectangle.

SOLUTION: Let x cm be the length of the rectangle.

$$\text{then} \quad \text{Breath} = \frac{\text{perimeter} - 2 \text{ length}}{2} = \frac{20 - 2x}{2} = 10 - x$$

Now $\text{Area} = \text{Length} \times \text{Breadth}$

$$\Rightarrow 24 = (x)(10 - x)$$

$$\Rightarrow 24 = 10x - x^2$$

$$\Rightarrow 24 - 10x + x^2 = 0$$

$$\Rightarrow x^2 - 10x + 24 = 0$$

$$\Rightarrow (x - 6)(x - 4) = 0$$

$$\Rightarrow x = 6, 4$$

Thus, length = 6cm, breadth = 4cm or length = 4cm, breadth = 6cm.

Thus, the other solution is 5.

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

77

Q.7. Find the whole number such that twice of its square added to itself makes 10.

SOLUTION : let x be the required number.

according to the given condition.

$$2x^2 + x = 10$$

$$\Rightarrow 2x^2 + x - 10 = 0$$

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

$$= \frac{-1 \pm \sqrt{1 + 80}}{4} = \frac{-1 \pm \sqrt{81}}{4}$$

$$= \frac{-1 \pm 9}{4} = \frac{-1 + 9}{4}, \frac{-1 - 9}{4} = 2, -\frac{5}{2}$$

We discard $-\frac{5}{2}$ because it is not a whole number.

So, 2 is the required number.

Q.8. The base and height of a triangle are $(x + 3)$ cm and $(2x - 5)$ cm respectively. If the area of the triangle is 20cm^2 find x .

SOLUTION : Area = $\frac{1}{2}$ (base) (height)

$$\Rightarrow 20 = \frac{1}{2} (x + 3) (2x - 5)$$

$$\Rightarrow 40 = 2x^2 + x - 15$$

$$\Rightarrow 2x^2 + x - 55 = 0$$

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

$$x = \frac{-1 \pm \sqrt{1 + 440}}{2(2)} = \frac{-1 \pm \sqrt{441}}{4} = \frac{-1 \pm 21}{4} = 5, -\frac{11}{2}$$

We discard $-\frac{11}{2}$ because length is not negative. so, $x = 5$.

MATHEMATICS NOTES FOR CLASS 10TH (FOR SINDH)

=====

78

Q.9. The length of rectangle is 5cm longer than its width and its area is 66 cm². Find the perimeter of a rectangle.

SOLUTION: Let x cm be the width of a rectangle.

then length = $(x + 5)$ (x)

$$\Rightarrow x^2 + 5x - 66 = 0$$

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

$$= \frac{-5 \pm \sqrt{25 + 264}}{2} = \frac{-5 \pm \sqrt{289}}{2}$$

$$= \frac{-5 \pm 17}{2} = 6, -11$$

we discard -11 because width is not negative.

so, perimeter = 2 length + 2 width.

$$= 2(6 + 5) + 2(6)$$

$$= 22 + 12 = 34 \text{ cm. Ans.}$$

More Notes, Books Visit Now: www.Perfect24u.com

www.Perfect24u.com