

Math Sci 9: Test		Total No. 40
Name: _____ Roll No. : _____		
Date: _____ - _____ -20	Teacher's Signature: _____	

Q.1: Tick (✓) the correct answer.

The value of x in equation $\sqrt{2x-3} - 7 = 0$:

26 (D) 52 (C)

Solution set of $|x-4| = -4$:

8 (D) { } (C)

Who introduced the symbols of inequality?

Thomas Harriot/تھامس ہیریٹ (D) Jhon Napier/جان نیپئر (C) Henry Briggs/ہنری برگز (B) Jobuist Burgil/جوبسٹ برگی (A)

Which is the solution of inequality $3 \leq 7 + 2x$:

-2 (D) 4 (C)

If x is no larger than 10, then:

$x > 10$ (D) $x < 10$ (C)

$x = 0$ is a solution of the inequality:

$x - 2 < 0$ (D) $x + 2 < 0$ (C)

In equ $x - 2 < 0$ has _____ solution set:

4 (D) 3 (C)

Which of the following is the solution of the inequality $3 - 4x \leq 11$:

None (D) $-14/4$ (C)

Which is the solution set of the inequality $9 - 7x > 19 - 2x$?

19 (D) -7 (C)

If the capacity ' c ' of an elevator is at most 1600 pounds, then:

$c > 1600$ (D) $c \leq 1600$ (C)

$10 \times 2 = 20$ Write short answers to any ten (10) questions.

Define a linear equation in one variable.

Solve the equation:

$$\sqrt{2x-3} - 7 = 0$$

Define extraneous roots.

Solve the equation:

$$\sqrt{3x+4} = 2$$

Define radical equation.

Solve the equ:

$$\sqrt{2t+6} - \sqrt{2t-5} = 0$$

Define absolute value of a real number.

Solve

$$|3x+10| = 5x+6$$

Solve:

$$|2x+5| = 11$$

Define inequality.

Solve $9 - 7x > 19 - 2x, (Where x \in R)$

Solve inequality:

$$3x+1 < 5x-4$$

$1 \times 10 = 10$ Write answer to any One (1) question.

Find the solution set of equation:

$$\frac{x}{3x-6} = 2 - \frac{2x}{x-2}, x \neq 1$$

Solve the inequality: $x - 2(5 - 2x) \geq 6x - 3\frac{1}{2}$

سوال نمبر 1- درست جواب پر (✓) کا نشان لگائیں۔

1- مساوات $\sqrt{2x-3} - 7 = 0$ سے x کی قیمت ہے:

7 (A) 49 (B)

2- $|x-4| = -4$ کا حل سیٹ ہے:

-8 (A) -16 (B)

3- غیر مساوات کی علامات کو کس نے متعارف کروایا:

جوبسٹ برگی (A) ہنری برگز (B) جان نیپئر (C) تھامس ہیریٹ (D)

4- کون سا عدد غیر مساوات $3 \leq 7 + 2x$ کا حل سیٹ ہے:

-8 (A) -4 (B)

5- اگر x کی قیمت 10 سے بڑی نہ ہو تو:

$x \geq 8$ (A) $x \leq 10$ (B)

6- $x = 0$ غیر مساوات _____ کے حل سیٹ کا رکن ہے:

$x > 0$ (A) $3x + 5 < 0$ (B)

7- $x - 2 < 0$ غیر مساوات کا حل سیٹ ہے:

1 (A) 2 (B)

8- درج ذیل میں سے کون سا عدد غیر مساوات $3 - 4x \leq 11$ کا حل ہوگا؟

-8 (A) -2 (B)

9- غیر مساوات $9 - 7x > 19 - 2x$ کے لیے کون سا حل سیٹ ہے؟

-2 (A) 2 (B)

10- ایک لفٹ کی بوجھ اٹھانے کی استعداد ' c ' زیادہ سے زیادہ 1600 پاؤنڈ ہے تو:

$c < 1600$ (A) $c \geq 1600$ (B)

سوال نمبر 2- کوئی سے 10 سوالات کے جوابات تحریر کیجیے۔

i- ایک متغیر میں یک درجی مساوات کی تعریف کریں۔

ii- مساوات کو حل کیجیے:

iii- اضافی اصل کی تعریف کریں۔

iv- مساوات حل کریں۔

v- جذری مساوات کی تعریف کیجیے۔

vi- مساوات کو حل کریں۔

vii- کسی حقیقی عدد کی مطلق قیمت کی تعریف کیجیے۔

viii- حل کریں۔

ix- حل کیجیے:

x- غیر مساوات کی تعریف کیجیے۔

xi- (جبکہ $x \in R$) $9 - 7x > 19 - 2x$ کا حل سیٹ معلوم کیجیے۔

xii- غیر مساوات کو حل کریں:

نوٹ: کوئی سے ایک سوال کا جواب لکھیے۔

سوال نمبر 3- مساوات کا حل سیٹ معلوم کیجیے:

سوال نمبر 4- غیر مساوات کو حل کریں:

Exercise 7.1

Q.1 Solve the following equations

(i) $\frac{2}{3}x - \frac{1}{2}x = x + \frac{1}{6}$

Solution: $\frac{2}{3}x - \frac{1}{2}x = x + \frac{1}{6}$

$$\frac{4x - 3x}{6} = \frac{6x + 1}{6}$$

$$x = 6 \frac{(6x + 1)}{6}$$

$$x = 6x + 1$$

$$-6x + x = 1$$

$$-5x = 1$$

$$x = \frac{1}{-5}$$

$$x = -\frac{1}{5}$$

To check

Substitution $x = -\frac{1}{5}$

$$\frac{2}{3} \times \frac{-1}{5} - \frac{1}{2} \times \frac{-1}{5} = -\frac{1}{5} + \frac{1}{6}$$

$$\frac{-2}{15} + \frac{1}{10} = \frac{-6 + 5}{30}$$

$$\frac{-2 \times 2 + 1 \times 3}{30} = \frac{-1}{30}$$

$$\frac{-4 + 3}{30} = \frac{-1}{30}$$

$$\frac{-1}{30} = \frac{-1}{30}$$

Solution Set = $\left\{ -\frac{1}{5} \right\}$

(ii) $\frac{x-3}{3} - \frac{x-2}{2} = -1$

Solution $\frac{x-3}{3} - \frac{x-2}{2} = -1$

By taking L.C.M

$$\frac{2(x-3) - 3(x-2)}{6} = -1$$

$$2x - 6 - 3x + 6 = -6$$

$$-x = -6$$

Multiplying both sets by -1

$$-1 \times -x = -1 \times -6$$

$$x = 6$$

To check

$$\frac{x-3}{3} - \frac{x-2}{2} = -1$$

When $x = 6$

$$\frac{6-3}{3} - \frac{6-2}{2} = -1$$

$$\frac{3}{3} - \frac{4}{2} = -1$$

$$\frac{6-12}{6} = -1$$

$$\frac{6}{6} = -1$$

$$1 = -1$$

Solution Set = $\{6\}$

(iii) $\frac{1}{2} \left(x - \frac{1}{6} \right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3} \left(\frac{1}{2} - 3x \right)$

Solution $\frac{1}{2} \left(x - \frac{1}{6} \right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3} \left(\frac{1}{2} - 3x \right)$

Taking L.C.M of brackets

$$\frac{1}{2} \left(\frac{6x-1}{6} \right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3} \left(\frac{1-6x}{2} \right)$$

$$\frac{6x-1}{12} + \frac{2}{3} = \frac{5}{6} + \frac{1-6x}{6}$$

$$\frac{6x-1+8}{12} = \frac{5+1-6x}{6}$$

$$\frac{6x+7}{12} = \frac{6-6x}{6}$$

$$\frac{6x+7}{2} = 6-6x$$

$$6x+7 = 2(6-6x)$$

$$6x+7 = 12-12x$$

$$6x+12x = 12-7$$

$$18x = 5$$

$$x = \frac{5}{18}$$

$$x = \frac{5}{18}$$

To check

$$\frac{1}{2}\left(x - \frac{1}{6}\right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left(\frac{1}{2} - 3x\right)$$

When $x = \frac{5}{18}$

$$\frac{1}{2}\left[\frac{15}{18} - \frac{1}{6}\right] + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left[\frac{1}{2} - 3\left(\frac{5}{18}\right)\right]$$

$$\frac{1}{2}\left[\frac{5-3}{18}\right] + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left[\frac{1}{2} - \frac{5}{6}\right]$$

$$\frac{1}{2}\left[\frac{\cancel{2}}{18}\right] + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left[\frac{3-5}{6}\right]$$

$$\frac{1}{\cancel{2}}\left[\frac{\cancel{2}}{18}\right] + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left[\frac{-2^1}{6^3}\right]$$

$$\frac{1}{18} + \frac{2}{3} = \frac{5}{6} + \frac{1}{3}\left[\frac{-1}{3}\right]$$

$$\frac{1+12}{18} = \frac{5}{6} - \frac{1}{9}$$

$$\frac{13}{18} = \frac{15-2}{18}$$

$$\frac{13}{18} = \frac{13}{18}$$

Solution Set = $\left\{\frac{5}{18}\right\}$

(iv) $x + \frac{1}{3} = 2\left[x - \frac{2}{3}\right] - 6x$

Solution $x + \frac{1}{3} = 2\left[x - \frac{2}{3}\right] - 6x$

$$\frac{3x+1}{3} = 2\left[\frac{3x-2}{3}\right] - 6x$$

$$\frac{3x+1}{3} = \frac{6x-4}{3} - 6x$$

Taking L.C.M of right side

$$\frac{3x+1}{3} = \frac{6x-4-18x}{3}$$

$$\frac{3x+1}{\cancel{3}} = \frac{(-12x-4)}{\cancel{3}}$$

$$3x+1 = -12x-4$$

$$3x+12x = -4-1$$

$$15x = -5$$

$$x = \frac{-5}{15}$$

$$x = \frac{-1}{3}$$

To check

$$x + \frac{1}{3} = 2\left[x - \frac{2}{3}\right] - 6x$$

When $x = \frac{-1}{3}$

$$\frac{\cancel{-1}}{\cancel{3}} + \frac{1}{\cancel{3}} = 2\left[\frac{-1}{\cancel{3}} - \frac{2}{\cancel{3}}\right] - 6\left(\frac{-1}{\cancel{3}}\right)$$

$$0 = 2\left[\frac{-1-2}{3}\right] + \frac{\cancel{6}^2}{\cancel{3}}$$

$$0 = 2\left[\frac{-\cancel{3}}{\cancel{3}}\right] + 2$$

$$0 = 2(-1) + 2$$

$$0 = -\cancel{2} + \cancel{2}$$

$$0 = 0$$

Solution Set = $\left\{\frac{-1}{3}\right\}$

(v) $\frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$

Solution $\frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$

$$\frac{5x-15-6x}{6} = \frac{9-x}{9}$$

$$\frac{-15-x}{6} = \frac{9-x}{9}$$

$$9(-15-x) = 6(9-x)$$

$$-135-9x = 54-6x$$

$$-135-54 = -6x+9x$$

$$-189 = 3x$$

$$\frac{-189}{3} = x$$

$$x = -63$$

To check

$$\frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$$

When $x = -63$

$$\frac{5(-63-3)}{6} - (-63) = 1 - \frac{(-63)}{\cancel{9}}$$

$$\frac{5(-\cancel{66}^{11})}{\cancel{6}} + 63 = 1 + 7$$

$$-55 + 63 = 8$$

$$8 = 8$$

$$\text{Solution Set} = \{-63\}$$

$$(vi) \quad \frac{x}{3x-6} = 2 - \frac{2x}{x-2}, x \neq 2$$

$$\text{Solution} \quad \frac{x}{3x-6} = 2 - \frac{2x}{x-2}, x \neq 2$$

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

$$\frac{x}{3(x-2)} = \frac{2x-4-2x}{x-2}$$

$$\frac{x}{3(x-2)} = \frac{-4}{x-2}$$

$$x(x-2) = -4 \times 3(x-2)$$

$$x(x-2) = -12(x-2)$$

$$x(x-2) + 12(x-2) = 0$$

$$(x-2)(x+12) = 0$$

$$x-2=0, \text{ or } x+12=0$$

$$x=2, \text{ or } x=-12$$

$$x=2 \text{ (Rejected because } x \neq 2)$$

$$\text{Hence } x = -12$$

To check

$$\frac{x}{3x-6} = 2 - \frac{2x}{x-2}$$

$$\text{When } x = -12$$

$$\frac{-12}{3(-12)-6} = 2 - \frac{2(-12)}{-12-2}$$

$$\frac{-12}{-36-6} = 2 + \frac{24}{-14}$$

$$\frac{-12}{-42} = 2 - \frac{24}{14}$$

$$\frac{12}{42} = 2 - \frac{12}{7}$$

$$\frac{2}{7} = \frac{14-12}{7}$$

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

$$\text{Solution Set} = \{-12\}$$

$$(vii) \quad \frac{2x}{2x+5} = \frac{2}{3} - \frac{5}{4x+10}$$

$$\text{Solution} \quad \frac{2x}{2x+5} = \frac{2}{3} - \frac{5}{4x+10}$$

$$\frac{2x}{2x+5} = \frac{2(4x+10) - 3 \times 5}{3(4x+10)}$$

$$\frac{2x \times 3(4x+10)}{2x+5} = 8x + 20 - 15$$

$$\frac{6x \times 2(\cancel{2x+5})}{(\cancel{2x+5})} = 8x + 5$$

$$12x = 8x + 5$$

$$12x - 8x = 5$$

$$4x = 5$$

$$x = \frac{5}{4}$$

To check

$$\frac{2x}{2x+5} = \frac{2}{3} - \frac{5}{4x+10}$$

$$\text{When } x = \frac{5}{4}$$

$$\frac{2\left(\frac{5}{4}\right)}{2\left(\frac{5}{4}\right)+5} = \frac{2}{3} - \frac{5}{4\left(\frac{5}{4}\right)+10}$$

$$\frac{\frac{5}{2}}{\frac{5}{2}+5} = \frac{2}{3} - \frac{5}{5+10}$$

$$\frac{\frac{5}{2}}{5+10} = \frac{2}{3} - \frac{5}{15}$$

$$\frac{\frac{5}{2}}{15} = \frac{2}{3} - \frac{1}{3}$$

$$\frac{\cancel{5}}{\cancel{2}} \times \frac{\cancel{2}}{\cancel{15}^3} = \frac{2-1}{3}$$

$$\frac{1}{3} = \frac{1}{3}$$

$$\text{Solution Set} = \left\{\frac{5}{4}\right\}$$

$$(viii) \quad \frac{2x}{x-1} + \frac{1}{3} = \frac{5}{6} + \frac{2}{x-1} \quad x \neq 1$$

$$\text{Solution} \quad \frac{2x}{x-1} + \frac{1}{3} = \frac{5}{6} + \frac{2}{x-1} \quad x \neq 1$$

$$\frac{3 \times 2x + 1(x-1)}{3(x-1)} = \frac{5(x-1) + 2 \times 6}{6(x-1)}$$

$$\frac{6x + x - 1}{3(x-1)} = \frac{5x - 5 + 12}{6(x-1)}$$

$$\frac{7x - 1}{3(x-1)} = \frac{5x - 5 + 12}{6(x-1)}$$

$$7x - 1 = \frac{5(x-1)(5x+7)}{(x-1)}$$

$$2(7x - 1) = 5x + 7$$

$$14x - 2 = 5x + 7$$

$$14x - 5x = 4 + 2$$

$$9x = 9$$

$$x = \frac{9}{9}$$

$$x = 1$$

No solution because $x \neq 1$.

$$(ix) \quad \frac{2}{x^2-1} - \frac{1}{x+1} = \frac{1}{x+1} \quad x \neq \pm 1$$

$$\text{Solution} \quad \frac{2}{x^2-1} - \frac{1}{x+1} = \frac{1}{x+1} \quad x \neq \pm 1$$

$$\frac{2}{(x-1)(x+1)} - \frac{1}{x+1} = \frac{1}{x+1}$$

$$\frac{2 - (x-1)}{(x-1)(x+1)} = \frac{1}{x+1}$$

$$\frac{2 - (x-1)}{(x-1)(x+1)} = \frac{1}{x+1}$$

$$2 - x + 1 = \frac{(x-1)(x+1)}{(x+1)}$$

$$3 - x = x - 1$$

$$1 + 3 = x + x$$

$$4 = 2x$$

$$\frac{4}{2} = x$$

$$x = 2$$

To check

$$\frac{2}{2^2-1} - \frac{1}{2+1} = \frac{1}{2+1}$$

$$\frac{2}{4-1} - \frac{1}{3} = \frac{1}{3}$$

$$\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$$

$$\frac{2-1}{3} = \frac{1}{3}$$

$$\frac{1}{3} = \frac{1}{3}$$

Solution Set = {2}

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

$$\text{Solution} \quad \frac{2}{3x+6} = \frac{1}{6} - \frac{1}{2x+4}$$

$$\frac{2}{3(x+2)} = \frac{1}{6} - \frac{1}{2(x+2)}$$

$$\frac{2}{3(x+2)} = \frac{x+2-3}{6(x+2)}$$

$$\frac{2 \times 6(x+2)}{3(x+2)} = x-1$$

$$4 = x-1$$

$$4+1 = x$$

$$x = 5$$

Check

$$\frac{2}{3(5)+6} = \frac{1}{6} - \frac{1}{2(5)+4}$$

$$\frac{2}{15+6} = \frac{1}{6} - \frac{1}{10+4}$$

$$\frac{2}{21} = \frac{1}{6} - \frac{1}{14}$$

$$\frac{2}{21} = \frac{7-3}{42}$$

$$\frac{2}{21} = \frac{4}{21}$$

$$\frac{2}{21} = \frac{2}{21}$$

Solution Set = {5}

Q.2 Check each equation and check for extraneous solution, if any

(i) $\sqrt{3x+4} = 2$

Solution: $\sqrt{3x+4} = 2$

Taking square on both side

$$(\sqrt{3x+4})^2 = (2)^2$$

$$3x+4 = 4$$

$$3x = 4 - 4$$

$$3x = 0$$

$$x = \frac{0}{3}$$

$$x = 0$$

To check

$$\sqrt{3x+4} = 2$$

When $x = 0$

$$\sqrt{3(0)+4} = 2$$

$$\sqrt{4} = 2$$

$$2 = 2$$

L.H.S = R.H.S

Solution Set = {0}

(ii) $\sqrt[3]{2x-4} - 2 = 0$

Solution: $\sqrt[3]{2x-4} - 2 = 0$

$$\sqrt[3]{2x-4} = 2$$

Taking cube on both sides

$$(\sqrt[3]{2x-4})^3 = (2)^3$$

$$2x-4 = 8$$

$$2x = 8 + 4$$

$$2x = 12$$

$$x = \frac{12}{2}$$

$$x = 6$$

To check

$$\sqrt[3]{2x-4} - 2 = 0$$

When $x = 6$

$$\sqrt[3]{2x-4} - 2 = 0$$

$$\sqrt[3]{2(6)-4} - 2 = 0$$

$$\sqrt[3]{12-4} - 2 = 0$$

$$\sqrt[3]{8} - 2 = 0$$

$$\sqrt[3]{2^3} - 2 = 0$$

$$2 - 2 = 0$$

$$0 = 0$$

L.H.S = R.H.S

Solution Set = {6}

(iii) $\sqrt{x-3} - 7 = 0$

Solution: $\sqrt{x-3} - 7 = 0$

$$\sqrt{x-3} = 7$$

Taking square on both side

$$(\sqrt{x-3})^2 = (7)^2$$

$$x-3 = 49$$

$$x = 49 + 3$$

$$x = 52$$

To check

$$\sqrt{x-3} - 7 = 0$$

When $x = 52$

$$\sqrt{52-3} - 7 = 0$$

$$\sqrt{49} - 7 = 0$$

$$7 - 7 = 0$$

$$0 = 0$$

L.H.S = R.H.S

Solution Set = {52}

(iv) $2\sqrt{t+4} = 5$

Solution: $2\sqrt{t+4} = 5$

Taking square on both side

$$(2\sqrt{t+4})^2 = (5)^2$$

$$4(t+4) = 25$$

$$t+4 = \frac{25}{4}$$

$$t = \frac{25}{4} - 4$$

$$t = \frac{25-16}{4}$$

$$t = \frac{9}{4}$$

To check

$$2\sqrt{t+4} = 5$$

$$\text{When } t = \frac{9}{4}$$

$$2\sqrt{\frac{9}{4}+4} = 5$$

$$2\sqrt{\frac{9+16}{4}} = 5$$

$$2\sqrt{\frac{25}{4}} = 5$$

$$2 \times \frac{5}{2} = 5$$

$$5 = 5$$

$$\text{L.H.S} = \text{R.H.S}$$

$$\text{Solution Set} = \left\{ \frac{9}{4} \right\}$$

$$(v) \quad \sqrt[3]{2x+3} = \sqrt[3]{x-2}$$

$$\text{Solution: } \sqrt[3]{2x+3} = \sqrt[3]{x-2}$$

Taking cube on both sides

$$\left(\sqrt[3]{2x+3} \right)^3 = \left(\sqrt[3]{x-2} \right)^3$$

$$2x+3 = x-2$$

$$2x-x = -2-3$$

$$x = -5$$

To check

$$\sqrt[3]{2x+3} = \sqrt[3]{x-2}$$

When $x = -5$

$$\sqrt[3]{2(-5)+3} = \sqrt[3]{-5-2}$$

$$\sqrt[3]{-10+3} = \sqrt[3]{-7}$$

$$\sqrt[3]{-7} = \sqrt[3]{-7}$$

L.H.S = R.H.S

$$\text{Solution Set} = \{-5\}$$

$$(vi) \quad \sqrt[3]{2-t} = \sqrt[3]{2t-28}$$

$$\text{Solution: } \sqrt[3]{2-t} = \sqrt[3]{2t-28}$$

Taking cube on both sides

$$\left(\sqrt[3]{2-t} \right)^3 = \left(\sqrt[3]{2t-28} \right)^3$$

$$2-t = 2t-28$$

$$2+28 = 2t+t$$

$$30 = 3t$$

$$\frac{30}{3} = t$$

$$t = 10$$

To check

$$\sqrt[3]{2-t} = \sqrt[3]{2t-28}$$

When $t = 10$

$$\sqrt[3]{2-10} = \sqrt[3]{2(10)-28}$$

$$\sqrt[3]{-8} = \sqrt[3]{20-28}$$

$$\sqrt[3]{-8} = \sqrt[3]{-8}$$

L.H.S = R.H.S

$$\text{Solution Set} = \{10\}$$

$$(vii) \quad \sqrt{2t+6} - \sqrt{2t-5} = 0$$

$$\text{Solution: } \sqrt{2t+6} - \sqrt{2t-5} = 0$$

$$\sqrt{2t+6} = \sqrt{2t-5}$$

Taking square on both side

$$\left(\sqrt{2t+6} \right)^2 = \left(\sqrt{2t-5} \right)^2$$

$$2t+6 = 2t-5$$

$$2t-2t = -5-6$$

$$0 = -11$$

Solution is not possible

$$\text{Solution Set} = \{ \} \text{ or } \phi$$

$$(viii) \quad \sqrt{\frac{x+1}{2x+5}} = 2 \quad x \neq \frac{-5}{2}$$

$$\text{Solution: } \sqrt{\frac{x+1}{2x+5}} = 2 \quad x \neq \frac{-5}{2}$$

Taking square on both side

$$\left(\sqrt{\frac{x+1}{2x+5}} \right)^2 = (2)^2$$

$$\frac{x+1}{2x+5} = 4$$

$$x+1 = 4(2x+5)$$

$$x+1 = 8x+20$$

$$1-20 = 8x-x$$

$$-19 = 7x$$

$$-\frac{19}{7} = x$$

$$\text{Or, } x = \frac{-19}{7}$$

To check

$$\sqrt{\frac{x+1}{2x+5}} = 2$$

$$\text{When } x = \frac{-19}{7}$$

$$\sqrt{\left(\frac{-19}{7} + 1 \right) \div \left[2 \times \frac{-19}{7} + 5 \right]} = 2$$

$$\sqrt{\frac{-19+7}{7} \div \left[\frac{-38}{7} + 5 \right]} = 2$$

$$\sqrt{\frac{-12}{7} \div \left[\frac{-38+35}{7} \right]} = 2$$

$$\sqrt{\frac{-12}{7} \div \frac{-3}{7}} = 2$$

$$\sqrt{\frac{-12^4}{7} \times \frac{7}{-7}} = 2$$

$$\sqrt{4} = 2$$

$$2 = 2$$

L.H.S = R.H.S

$$\text{Solution Set} = \left\{ \frac{-19}{7} \right\}$$



Exercise 7.2

Q1) Identify the following statements as true or

- | | | |
|--------------|---|-------|
| (i) | $ x = 0$ has only one solution | True |
| (ii) | All absolute value equations have two solutions | False |
| (iii) | The equation $ x = 2$ is equivalent to $x = 2$ or $x = -2$ | True |
| (iv) | The equation $ x-4 = -4$ has no solution | True |
| (v) | The equation $ 2x-3 = 5$ is equivalent to $2x-3 = 5$ or $2x+3 = 5$ | False |

Q2)

(i) $|3x-5|=4$

Solution $|3x-5|=4$

$$3x-5 = \pm 4$$

$$3x-5 = 4$$

$$3x = 4+5$$

$$3x = 9$$

$$x = \frac{9}{3}$$

$$x = 3$$

To check

$$x = 3$$

$$|3(3)-5|=4$$

$$|9-5|=4$$

$$4=4$$

$$\text{Solution Set} = \left\{ 3, \frac{1}{3} \right\}$$

(ii) $\frac{1}{2}|3x+2|-4=11$

Solution $\frac{1}{2}|3x+2|-4=11$

$$\frac{1}{2}|3x+2|-4=11$$

$$\frac{1}{2}|3x+2|=11+4$$

$$\frac{1}{2}|3x+2|=15$$

$$|3x+2|=2 \times 15$$

$$|3x+2|=30$$

$$3x+2 = \pm 30$$

$$3x+2 = 30$$

$$3x = 30-2$$

$$3x = 28$$

$$x = \frac{28}{3}$$

Check

$$\frac{1}{2}|3x+2|-4=11$$

$$\frac{1}{2}\left|3 \times \frac{28}{3} + 2\right| - 4 = 11$$

$$\frac{1}{2}|28+2|-4=11$$

$$\frac{1}{2} \times 30 - 4 = 11$$

$$15 - 4 = 11$$

$$11 = 11$$

$$\text{Solution Set} = \left\{ \frac{28}{3}, \frac{-32}{3} \right\}$$

$$3x+2 = -30$$

$$3x = -30-2$$

$$3x = -32$$

$$x = \frac{-32}{3}$$

$$\frac{1}{2}\left|3 \times \frac{-32}{3} + 2\right| - 4 = 11$$

$$\frac{1}{2}|-32+2|-4=11$$

$$\frac{1}{2}|-30|-4=11$$

$$\frac{1}{2}(30)-4=11$$

$$15-4=11$$

$$11=11$$

(iii) $|2x+5|=11$

Solution $|2x+5|=11$

$$2x+5 = \pm 11$$

$$2x+5 = 11$$

$$2x = 11-5$$

$$2x = 6$$

$$x = \frac{6}{2}$$

$$x = 3$$

$$2x+5 = -11$$

$$2x = -11-5$$

$$2x = -16$$

$$x = \frac{-16}{2}$$

$$x = -8$$

To check

$$|2x + 5| = 11 \quad |2(-8) - 8 + 5| = 11$$

$$|2 \times 3 + 5| = 11 \quad |-16 + 5| = 11$$

$$6 + 5 = 11 \quad |-11| = 11$$

$$11 = 11 \quad 11 = 11$$

Solution Set = $\{-8, 3\}$

(iv) $|3 + 2x| = |6x - 7|$

Solution $|3 + 2x| = |6x - 7|$

$$3 + 2x = \pm(6x - 7)$$

$$3 + 2x = 6x - 7 \quad 3 + 2x = -(6x - 7)$$

$$3 + 7 = 6x - 7 \quad 3 + 2x = -6x + 7$$

$$10 = 4x \quad 2x + 6x = 7 - 3$$

$$\frac{10}{4} = x \quad \frac{4}{8} = x$$

$$x = \frac{5}{2} \quad x = \frac{1}{2}$$

To check

$$|3 + 2x| = |6x - 7| \quad |3 + 2x| = |6x - 7|$$

$$\left| 3 + 2\left(\frac{5}{2}\right) \right| = \left| 6\left(\frac{5}{2}\right) - 7 \right|$$

$$\left| 3 + 2 \times \frac{1}{2} \right| = \left| 6 \times \frac{1}{2} - 7 \right|$$

$$|3 + 5| = |5 - 7| \quad |3 + 1| = |3 - 7|$$

$$|8| = |8| \quad |4| = |4|$$

$$8 = 8 \quad 4 = 4$$

Solution Set = $\left\{ \frac{5}{2}, \frac{1}{2} \right\}$

(v) $|x + 2| - 3 = 5 - |x + 2|$

Solution $|x + 2| - 3 = 5 - |x + 2|$

$$|x + 2| + |x + 2| = 5 + 3$$

$$2|x + 2| = 8$$

$$|x + 2| = \frac{8}{2}$$

$$|x + 2| = 4$$

$$x + 2 = \pm 4$$

$$x + 2 = 4 \quad x + 2 = -4$$

$$x = 4 - 2 \quad x = -4 - 2$$

$$x = 2 \quad x = -6$$

To check

$$|x + 2| - 3 = 5 - |x + 2| \quad |x + 2| - 3 = 5 - |x + 2|$$

$$|2 + 2| - 3 = 5 - |2 + 2| \quad |-6 + 2| - 3 = 5 - |-6 + 2|$$

$$14 - 3 = 5 - |4| \quad |-4| - 3 = 5 - |-4|$$

$$4 - 3 = 5 - 4 \quad 4 - 3 = 5 - 4$$

$$1 = 1 \quad 1 = 1$$

Solution Set = $\{-6, 2\}$

(vi) $\frac{1}{2}|x + 3| + 21 = 9$

Solution $\frac{1}{2}|x + 3| + 21 = 9$

$$\frac{1}{2}|x + 3| = 9 - 21$$

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

$$|x + 3| = -12 \times 2$$

$$|x + 3| = -24$$

Value of absolute is never negative so solution is not possible

Solution Set = $\{ \}$

(vii) $\left| \frac{3 - 5x}{4} \right| - \frac{1}{3} = \frac{2}{3}$

Solution $\left| \frac{3 - 5x}{4} \right| - \frac{1}{3} = \frac{2}{3}$

$$\left| \frac{3 - 5x}{4} \right| = \frac{2}{3} + \frac{1}{3}$$

$$\left| \frac{3 - 5x}{4} \right| = \frac{2 + 1}{3}$$

$$\left| \frac{3 - 5x}{4} \right| = \frac{3}{3}$$

$$\left| \frac{3 - 5x}{4} \right| = 1$$

$$\frac{3 - 5x}{4} = \pm 1$$

$$\frac{3 - 5x}{4} = 1 \quad \text{and} \quad \frac{3 - 5x}{4} = -1$$

$$3 - 5x = 4 \quad 3 - 5x = -4$$

$$-5x = 4 - 3 \quad -5x = -4 - 3$$

$$-5x = 1 \quad -5x = -7$$

$$x = \frac{1}{-5}$$

$$x = \frac{-7}{-5}$$

$$x = -\frac{1}{5}$$

$$x = \frac{7}{5}$$

$$\left| \frac{3 - 5 \times \left(-\frac{1}{5}\right)}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$\left| \frac{3 - 5 \times \left(\frac{7}{5}\right)}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$\left| \frac{3+1}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$\left| \frac{3-7}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$\left| \frac{4}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$\left| \frac{-4}{4} \right| - \frac{1}{3} = \frac{2}{3}$$

$$|-1| - \frac{1}{3} = \frac{2}{3}$$

$$1 - \frac{1}{3} = \frac{2}{3}$$

$$1 - \frac{1}{3} = \frac{2}{3}$$

$$\frac{3-1}{3} = \frac{2}{3}$$

$$\frac{3-1}{3} = \frac{2}{3}$$

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

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

$$\text{Solution Set} = \left\{ \frac{-1}{5}, \frac{7}{5} \right\}$$

(viii) $\left| \frac{x+5}{2-x} \right| = 6$

Solution $\left| \frac{x+5}{2-x} \right| = 6$

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

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

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

$$x+5 = 12-6x$$

$$x+6x = 12-5$$

$$7x = 7$$

$$x = \frac{7}{7}$$

$$x = 1$$

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

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

$$x+5 = -12+6x$$

$$5+12 = 6x-x$$

$$17 = 5x$$

$$\frac{17}{5} = x$$

$$x = \frac{17}{5}$$

To check

$$\left| \frac{x+5}{2-x} \right| = 6$$

$$\left| \frac{1+5}{2-1} \right| = 6$$

$$\left| \frac{6}{1} \right| = 6$$

$$6 = 6$$

$$\left| \frac{\left(\frac{17}{5}+5\right)}{\left(2-\frac{17}{5}\right)} \right| = 6$$

$$\left| \frac{17+25}{5} \div \frac{10-17}{5} \right| = 6$$

$$\left| \frac{42}{5} \div \frac{-7}{5} \right| = 6$$

$$|-6| = 6$$

$$6 = 6$$

$$\text{Solution Set} = \left\{ 1, \frac{17}{5} \right\}$$

Exercise 7.3

Q1) Solve the following inequalities.

(i) $3x + 1 < 5x - 4$

Solution: $3x + 1 < 5x - 4$

$$3x < 5x - 4 - 1$$

$$3x - 5x < -5$$

$$-2x < -5$$

Case-I When negative is eliminated from both sides of inequality the symbol will be change.

Case-II When negative is transferred from variable to constant side, symbol will also change.

$$x > \frac{-5}{-2}$$

$$x > \frac{5}{2}$$

$$\text{Solution Set} = \left\{ x \mid x > \frac{5}{2} \right\}$$

(ii) $4x - 10.3 \leq 21x - 1.8$

Solution: $4x - 10.3 \leq 21x - 1.8$

$$4x - 21x \leq -8.5 + 10.3$$

$$-17x \leq 8.5$$

When negative value is shifted to other side its symbol changes.

$$x \geq \frac{8.5}{-17}$$

$$x \geq -\frac{8.5}{17}$$

$$x \geq -0.5$$

$$\text{Solution Set} = \{x \mid x \geq -0.5\}$$

(iii) $4 - \frac{1}{2}x \geq -7 + \frac{1}{4}x$

Solution: $4 - \frac{1}{2}x \geq -7 + \frac{1}{4}x$

$$-\frac{1}{2}x - \frac{1}{4} \geq -7 - 4$$

$$\frac{-2x - x}{4} \geq -11$$

$$-3x \geq -44$$

When negative value is shifted the symbol changes

$$x \leq \frac{-44}{-3}$$

$$x \leq \frac{44}{3}$$

$$\text{Solution Set} = \left\{ x \mid x \leq \frac{44}{3} \right\}$$

(iv) $x - 2(5 - 2x) \geq 6x - 3\frac{1}{2}$

Solution: $x - 2(5 - 2x) \geq 6x - 3\frac{1}{2}$

$$x - 10 + 4x \geq 6x - \frac{7}{2}$$

$$5x - 6x \geq -\frac{7}{2} + 10$$

$$-1x \geq \frac{-7 + 20}{2}$$

$$-x \geq -\frac{13}{2}$$

When negative is shifted other side symbol changes

$$x \leq \frac{13}{-1 \times 2}$$

$$x \leq -\frac{13}{2}$$

$$x \leq -6.5$$

$$\text{Solution Set} = \{x \mid x \leq -6.5\}$$

(v) $\frac{3x+2}{9} - \frac{2x+1}{3} > -1$

Solution: $\frac{3x+2}{9} - \frac{2x+1}{3} > -1$

$$\frac{3x+2-3(2x+1)}{9} > -1$$

$$3x+2-6x-3 > -9$$

$$-3x > -9+1$$

$$x > -8$$

Negative value is shifted to other side its symbols changes

$$x < \frac{-8}{-3}$$

$$x < \frac{8}{3}$$

$$\text{Solution Set} = \left\{ x \mid x < \frac{8}{3} \right\}$$

(vi) $3(2x+1) - 2(2x+5) < 5(3x-2)$

Solution: $3(2x+1) - 2(2x+5) < 5(3x-2)$

$$6x + 3 - 4x - 10 < 15x - 10$$

$$2x - 7 - 15x < -10$$

$$-13x < -10 + 7$$

$$-13x < -3$$

The value is negative when shifted to other side it changes its symbols

$$x > \frac{-3}{-13}$$

$$x > \frac{3}{13}$$

$$\text{Solution Set} = \left\{ x \mid x > \frac{3}{13} \right\}$$

(vii) $3(x-1) - (x-2) > -2(x+4)$

Solution: $3(x-1) - (x-2) > -2(x+4)$

$$3x - 3 - x + 2 > -2x - 8$$

$$2x - 1 > -2x - 8$$

$$2x + 2x > -8 + 1$$

$$4x > -7$$

$$x > \frac{-7}{4}$$

$$\text{Solution Set} = \left\{ x \mid x > \frac{-7}{4} \right\}$$

(viii) $2\frac{2}{3}x + \frac{2}{3}(5x-4) > -\frac{1}{3}(8x+7)$

Solution: $2\frac{2}{3}x + \frac{2}{3}(5x-4) > -\frac{1}{3}(8x+7)$

$$\frac{8}{3}x + \frac{10x-8}{3} > -\frac{(8x+7)}{3}$$

$$\frac{8x+10x-8}{3} > -\frac{8x+7}{3}$$

Multiplying both side by 3

$$\cancel{3} \times \frac{18x-8}{\cancel{3}} > -\cancel{3} \times \frac{8x+7}{\cancel{3}}$$

$$18x - 8 > -(8x + 7)$$

$$18x - 8 > -8x - 7$$

$$18x + 8x > -7 + 8$$

$$26x > 1$$

$$x > \frac{1}{26}$$

$$\text{Solution Set} = \left\{ x \mid x > \frac{1}{26} \right\}$$

Q2) Solve the following inequalities

(i) $-4 < 3x + 5 < 8$

Solution: $-4 < 3x + 5 < 8$

$$-4 < 3x + 5 \quad \text{and} \quad 3x + 5 < 8$$

$$-4 - 5 < 3x \quad 3x < 8 - 5$$

$$-9 < 3x \quad 3x < 3$$

$$\frac{-9}{3} < x \quad x < \frac{3}{3}$$

$$-3 < x \quad x < 1$$

$$-3 < x < 1$$

$$\text{Solution Set} = \{x \mid -3 < x < 1\}$$

(ii) $-5 \leq \frac{4-3x}{2} < 1$

Solution: $-5 \leq \frac{4-3x}{2} < 1$

$$-5 \leq \frac{4-3x}{2} \quad \text{and} \quad \frac{4-3x}{2} < 1$$

$$-10 \leq 4 - 3x \quad 4 - 3x < 2$$

$$3x - 10 \leq 4 \quad -3x < 2 - 4$$

$$3x \leq 4 + 10 \quad -3x < -2$$

$$3x \leq 14 \quad x > \frac{-2}{-3}$$

$$x \leq \frac{14}{3} \quad x > \frac{2}{3}$$

$$\frac{2}{3} < x$$

$$\frac{2}{3} < x \leq \frac{14}{3}$$

$$\text{Solution Set} = \left\{x \mid \frac{2}{3} < x \leq \frac{14}{3}\right\}$$

$$\text{(iii)} \quad -6 < \frac{x-2}{4} < 6$$

$$\text{Solution: } -6 < \frac{x-2}{4} < 6$$

$$-6 < \frac{x-2}{4}$$

$$-24 < x-2$$

$$-24+2 < x$$

$$-22 < x$$

and

$$\frac{x-2}{4} < 6$$

$$x-2 < 24$$

$$x < 24+2$$

$$x < 26$$

$$-22 < x < 26$$

$$\text{Solution Set} = \{x \mid -22 < x < 26\}$$

$$\text{(iv)} \quad 3 \geq \frac{7-x}{2} \geq 1$$

$$\text{Solution: } 3 \geq \frac{7-x}{2} \geq 1$$

$$3 \geq \frac{7-x}{2}$$

$$6 \geq 7-x$$

$$6-7 \geq -x$$

$$-1 \geq -x$$

Negative sign change the symbols

$$1 \leq x$$

and

$$\frac{7-x}{2} \geq 1$$

$$7-x \geq 2$$

$$-x \geq 2-7$$

$$-x \geq -5$$

$$x \leq 5$$

$$1 \leq x \leq 5$$

$$\text{Solution Set} = \{x \mid 1 \leq x \leq 5\}$$

$$\text{(v)} \quad 3x-10 \leq 5 < x+3 \quad \text{www.pakcity.org}$$

$$\text{Solution } 3x-10 \leq 5 < x+3$$

$$3x-10 \leq 5 \quad \text{and} \quad 5 < x+3$$

$$3x \leq 5+10 \quad 5-3 < x$$

$$3x \leq 15 \quad 2 < x$$

$$\frac{3x}{3} \leq \frac{15}{3}$$

$$x \leq 5$$

$$2 < x \leq 5$$

$$\text{Solution Set} = \{x \mid 2 < x \leq 5\}$$

$$\text{(vi)} \quad -3 \leq \frac{x-4}{-5} < 4$$

$$\text{Solution } -3 \leq \frac{x-4}{-5} < 4$$

$$-3 \leq \frac{x-4}{-5} \quad \text{and} \quad \frac{x-4}{-5} < 4$$

$$-3 \times -5 \geq x-4$$

$$x-4 > 4(-5)$$

$$15 \geq x-4$$

$$x > -20+4$$

$$15+4 \geq x$$

$$x > -16$$

$$19 \geq x$$

$$-16 < x$$

$$x \leq 19$$

$$-16 < x \leq 19$$

$$\text{Solution Set} = \{x \mid -16 < x \leq 19\}$$

$$\text{(vii)} \quad 1-2x < 5-x \leq 25-6x$$

$$\text{Solution: } 1-2x < 5-x \leq 25-6x$$

$$1-2x < 5-x \quad \text{and}$$

$$5-x \leq 25-6x$$

$$-x+6x \leq 25-5$$

$$6x-x \leq 20$$

$$1-2x+x < 5$$

$$5x \leq 20$$

$$-x < 5-1$$

$$x \leq \frac{20}{5}$$

$$-x < 4$$

$$x \leq 4$$

Due negative sign

Symbol change

$$-4 < x$$

$$-4 < x \leq 4$$

$$\text{Solution Set} = \{x \mid -4 < x \leq 4\}$$

$$\text{(viii)} \quad 3x-2 < 2x+1 < 4x+17$$

$$\text{Solution: } 3x-2 < 2x+1 < 4x+17$$

$$3x-2 < 2x+1$$

$$2x+1 < 4x+17$$

$$3x-2x-2 < +1$$

$$2x-4x < 17-1$$

$$x < 1+2$$

$$-2x < 16$$

$$x < 3$$

$$x > \frac{16}{-2}$$
$$x > -8$$
$$-8 < x$$

$$-8 < x < 3$$

$$\text{Solution Set} = \{x \mid -8 < x < 3\}$$



Review Exercise 7

Q.1 Choose the correct answer

- (i) Which of the following is the solution of the inequality $3 - 4x \leq 11$?
- (a) -8 (b) -2
 (c) $-\frac{14}{4}$ (d) None of these
- (ii) A statement involving any of the symbols $<$, $>$, \leq or \geq , is called-----
- (a) Equation (b) Identity
 (c) Inequality (d) Linear equation
- (iii) $x = \text{-----}$ is a solution of the inequality $-z < x > \frac{3}{2}$
- (a) -5 (b) 3
 (c) 0 (d) $\frac{3}{2}$
- (iv) If x is no larger than 10, then -----
- (a) $x \leq 8$ (b) $x \geq 10$
 (c) $x < 10$ (d) $x > 10$
- (v) If the capacity c of an elevator is at most 1600 pounds then -----
- (a) $c < 1600$ (b) $c \geq 1600$
 (c) $c \leq 1600$ (d) $c > 1600$
- (vi) $x = 0$ is a solution of the inequality -----
- (a) $x > 0$ (b) $3x + 5 < 0$
 (c) $x + \frac{z}{2} < 0$ (d) $x - 2 < 0$

ANSWER KEY

i	ii	iii	iv	v	vi
b	c	c	b	c	d

Q.2 Identify the following statement as true or false

- (i) The equation $3x - 5 = 7 - x$ is a linear equation. (True)
- (ii) The equation $x - 0.3x = 0.7x$ is an identity (True)
- (iii) The equation $-2x + 3 = 8$ is equivalent to $-2x = 11$ (False)
- (iv) To eliminate fractions we multiply each side of an equation by the L.C.M of denominators (True)
- (v) $4(x + 3) = x + 3$ is a conditional equations (True)
- (vi) The equation $2(3x + 5) = 6x + 12$ is an in consistent equation (True)
- (vii) To solve $\frac{2}{3}x = 12$, we should multiply each side by $\frac{2}{3}$ (False)
- (viii) Equations having exactly the same solution are called equivalent equations. (True)
- (ix) A solution that does not satisfy the original equation is called extra solution (True)

Q.3 Answer the following short question.

(i) Define a linear inequality in one variable

Ans A linear inequality in one variable x is an inequality in which the variable x occurs only to the first power and has the standard form $ax + b < 0, a \neq 0$

(ii) State the trichotomy and transitive properties of in equalities

Ans Trichotomy Property

For any $a, b \in R$ one and only one of the following statements in true. $a < b$ or $a = b$, or $a > b$

Transitive Property

Let $a, b, c \in R$.

(a) If $a > b$ and $b > c$, then $a > c$

(b) If $a < b$ and $b < c$, then $a < c$

(iii) The formula relating degree Fahrenheit to degree Celsius is $F = \frac{9}{5}c + 32$ for what value of c is $F < 0$ was

Ans $F = \frac{9}{5}c + 32$

$$\frac{9}{5}c + 32 = F$$

Since $F < 0$

So $\frac{9}{5}c + 32 < 0$

$$\frac{9c + 160}{5} < 0$$

Or $9c + 160 < 0 \times 5$

Or $9c + 160 < 0$

Or $9c < -160$

Or $c < -\frac{160}{9}$

(iv) Seven times the sum of an integer and 12 is at least 50 and at most 60. Write and solve the inequality that expresses this relation ship

Solution: Let the integer = y

Sum of integer and 12 = $y + 12$

Seven times sum of integer and 12 = $7(y + 12)$

According to condition

$$50 \leq 7(y + 12) \leq 60$$

$$\frac{50}{7} \leq 7 \frac{(y + 12)}{7} \leq \frac{60}{7}$$

$$\frac{50}{7} \leq y + 12 \leq \frac{60}{7}$$

$$\frac{50}{7} - 12 \leq y + \cancel{12} - \cancel{12} \leq \frac{60}{7} - 12$$



$$\frac{50-84}{7} \leq y \leq \frac{60-84}{7}$$

$$\frac{-34}{7} \leq y \leq \frac{-24}{7}$$

$$\text{Solution Set} = \left\{ y \mid \frac{-34}{7} \leq y \leq \frac{-24}{7} \right\}$$

Q.4 Solve each of the following and check for extraneous solution if any

(i) $\sqrt{2t+4} = \sqrt{t-1}$

Solution: $\sqrt{2t+4} = \sqrt{t-1}$

Taking square on both side

$$\left(\sqrt{2t+4}\right)^2 = \left(\sqrt{t-1}\right)^2$$

$$2t+4 = t-1$$

$$2t-t = -1-4$$

$$t = -5$$

To check

$$\sqrt{2t+4} = \sqrt{t-1}$$

When $t = -5$

$$\sqrt{2(-5)+4} = \sqrt{-5-1}$$

$$\sqrt{-10+4} = \sqrt{-6}$$

$$\sqrt{-6} = \sqrt{-6}$$

L.H.S = R.H.S

$$\text{Solution Set} = \{-5\}$$

(ii) $\sqrt{3x-1} - 2\sqrt{8-2x} = 0$

Solution: $\sqrt{3x-1} - 2\sqrt{8-2x} = 0$

$$\sqrt{3x-1} = 2\sqrt{8-2x}$$

Taking square on both side

$$\left(\sqrt{3x-1}\right)^2 = \left(2\sqrt{8-2x}\right)^2$$

$$3x-1 = 4(8-2x)$$

$$3x-1 = 32-8x$$

$$3x+8x = 32+1$$

$$11x = 33$$

$$x = \frac{33}{11}$$

$$x = 3$$

To check

$$\sqrt{3x-1} - 2\sqrt{8-2x} = 0$$



When $x = 3$

$$\sqrt{3(3)-1}-2\sqrt{8-2(3)}=0$$

$$\sqrt{9-1}-2\sqrt{8-6}=0$$

$$\sqrt{8}-2\sqrt{2}=0$$

$$2\sqrt{2}-2\sqrt{2}=0$$

$$0=0$$

L.H.S = R.H.S

Solution Set = {3}**Q.5 Solve for x**

(i) $|3x+14|-2=5x$

Solution: $|3x+14|-2=5x$

$|3x+14|=5x+2$

$3x+14=\pm(5x+2)$

$3x+14=5x+2$

$14-2=5x-3x$

$12=2x$

$\frac{12}{2}=x$

$x=6$

To check

$|3x+14|-2=5x$

When $x=6$

$|3(6)+14|-2=5(6)$

$|18+14|-2=30$

$32-2=30$

$30=30$

Solution Set = {6}

$3x+14=-(5x+2)$

$3x+14=-5x-2$

$3x+5x=-2-14$

$8x=\frac{-16}{8}$

$x=-2$

$|3x+14|-2=5x$

when $x=-2$

$|3(-2)+14|-2=5(-2)$

$|-6+14|-2=-10$

$8-2=-10$

$6=-10$

(ii) $\frac{1}{3}|x-3|=\frac{1}{2}|x+2|$

Solution $\frac{1}{3}|x-3|=\frac{1}{2}|x+2|$

$\frac{2}{3}|x-3|=|x+2|$

$\frac{2}{3}=\frac{|x+2|}{|x-3|}$

$\frac{x+2}{x-3}=\pm\frac{2}{3}$

$$\frac{x+2}{x-3} = \frac{2}{3} \quad \text{and}$$

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

$$3(x+2) = 2(x-3)$$

$$3(x+2) = -2(x-3)$$

$$3x+6 = 2x-6$$

$$3x+6 = -2x+6$$

$$3x-2x = -6-6$$

$$3x+2x = +6-6$$

$$x = -12$$

$$5x = 0$$

To check

$$x = \frac{0}{5} \Rightarrow x = 0$$

$$\frac{1}{3}|x-3| = \frac{1}{2}|x+2|$$

$$\frac{1}{3}|x-3| = \frac{1}{2}|x+2|$$

When $x = -12$

when $x = 0$

$$\frac{1}{3}|-12-3| = \frac{1}{2}|-12+2|$$

$$\frac{1}{3}|0-3| = \frac{1}{2}|0+2|$$

$$\frac{1}{3}|-15| = \frac{1}{2}|-10|$$

$$\frac{1}{3}|-3| = \frac{1}{2}|2|$$

$$\frac{1}{3}(15) = \frac{1}{2}(10)$$

$$\frac{1}{3}(3) = \frac{1}{2}(2)$$

$$5 = 5$$

$$\frac{1}{3}(3) = 1$$

$$1 = 1$$

Solution Set = $\{-12, 0\}$

Q.6 Solve the following inequality

(i) $-\frac{1}{3}x + 5 \leq 1$

Solution $-\frac{1}{3}x + 5 \leq 1$

$$-\frac{1}{3}x \leq 1 - 5$$

$$-\frac{1}{3}x \leq -4$$

$$x \geq -4 \times (-3)$$

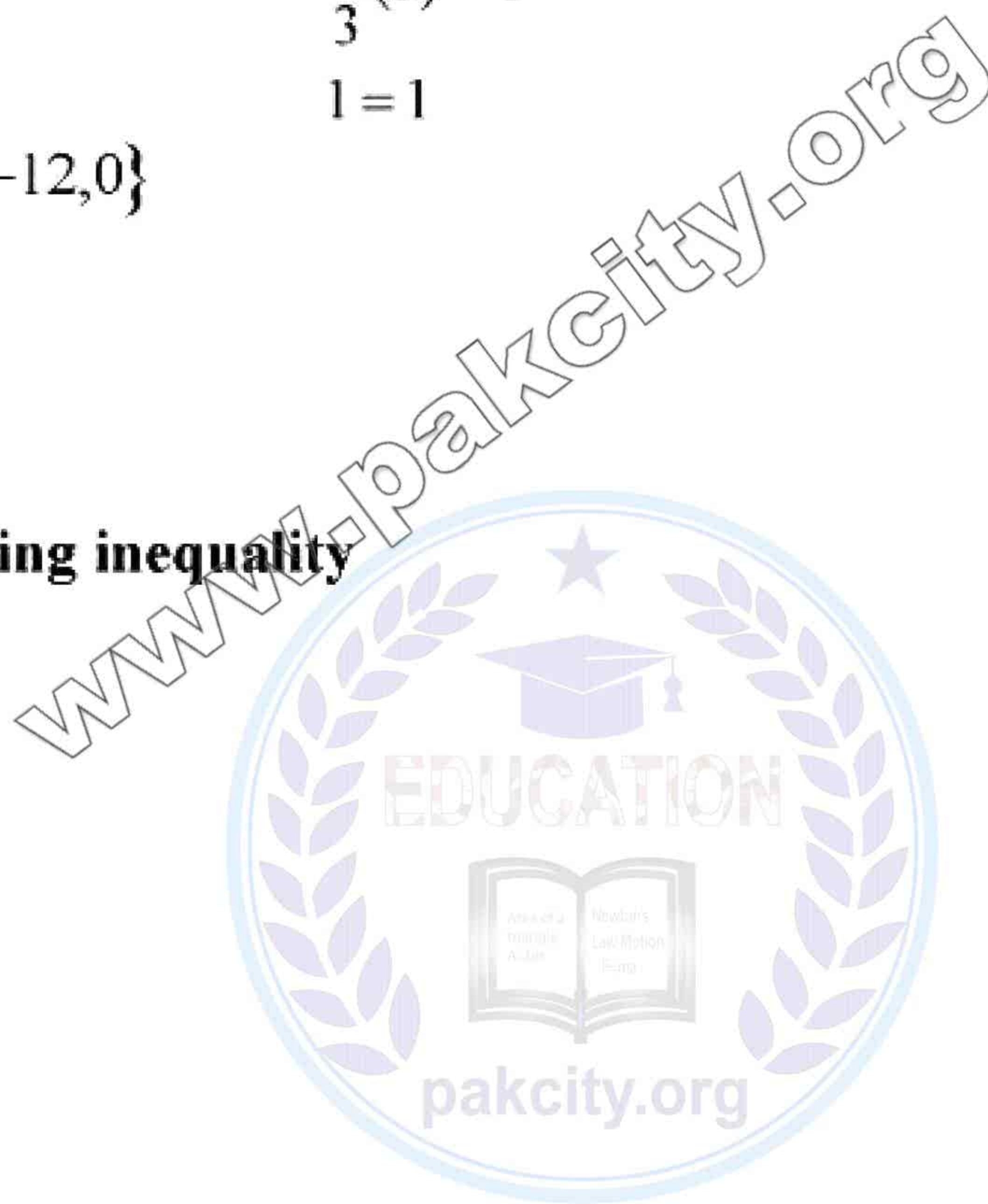
$$x \geq 12$$

Solution Set = $\{x \mid x \geq 12\}$

(ii) $-3 < \frac{1-2x}{5} < 1$

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

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



$$\begin{array}{ll} -15 < 1 - 2x & 1 - 2x < 5 \\ -15 - 1 < -2x & -2x < 5 - 1 \\ -16 < -2x & -2x < 4 \\ \frac{-16}{-2} > x & x > \frac{4}{-2} \\ 8 > x & x > -2 \\ x < 8 & -2 < x \end{array}$$

$$-2 < x < 8$$

$$\text{Solution Set} = \{x \mid -2 < x < 8\}$$



Unit 7: Linear Equations and Inequalities

Overview

Linear Equation:

A linear equation in one unknown variable x is an equation of the form $ax + b = 0$, where $a, b \in \mathbb{R}$ and $a \neq 0$.

Example:

(i) $5x - 3 = 0$

(ii) $\frac{1}{2}x + 18 = 0$

Radical equations:

When the variable in an equation occurs under a radical the equation is called a radical equation.

Example:

(i) $\sqrt{2x-3} - 7 = 0$

Absolute value:

The absolute value of a real number 'a' denoted by $|a|$, is defined as

$$|a| = \begin{cases} a, & \text{if } a \geq 0 \\ -a, & \text{if } a < 0 \end{cases}$$

$$|6| = 6,$$

e.g., $|0| = 0$

$$|-6| = -(-6) = 6$$

Extraneous Roots:

If the solutions (roots) obtained from the equation does not satisfy the original equations are called extraneous roots.

Linear inequality:

A linear inequality in one variable x is an inequality in which the variable x occurs only to the first power and has the standard form. $ax + b < 0$, $a \neq 0$, $a, b \in \mathbb{R}$ we may replace the symbol $<$ by $>$, \leq or \geq also.

Inconsistent equation:

An inconsistent equation is that whose solution set is ϕ .

