

1.

$$(i) |-7| = 7 \quad (ii) |7| = 7 \quad (iii) |-7+1| = |-6| = 6$$

$$(iv) |-7-1| = |-8| = 8 \quad (v) |-7|+|1| = 7+1 = 8$$

$$(vi) |-7|+|-1| = 7+1 = 8 \quad (vii) |-3-2+1| = |-4| = 4$$

$$(viii) |-3|-|2|+|1| = 3-2+1 = 2$$

$$(ix) |-3|+|-2|+|1| = 3+2+1 = 6$$

$$(x) |-3|-|2|-|1| = 3-2-1 = 0$$

2.

$$(i) |a+b+c| = |(-5)+(3 \cdot 2)+(-4 \cdot 8)| \\ = |-6 \cdot 6| = 6 \cdot 6$$

$$(ii) |a|+|b|+|c| = |-5|+|3 \cdot 2|+|-4 \cdot 8| \\ = 5+3 \cdot 2+4 \cdot 8 = 13$$

$$(iii) |a|-|b|-|c| = |-5|-|3 \cdot 2|-|-4 \cdot 8| \\ = 5-3 \cdot 2-4 \cdot 8 = -3$$

$$(iv) |a-b|+|c| = |(-5)-(3 \cdot 2)|+|-4 \cdot 8| \\ = 8 \cdot 1+4 \cdot 8 = 13$$

3.

$$(i) |x+y| = |(-2 \cdot 4)+(1 \cdot 8)| = |-0 \cdot 6| = 0 \cdot 6 \\ |x|+|y| = |-2 \cdot 4|+|1 \cdot 8| = 2 \cdot 4+1 \cdot 8 = 4 \cdot 2 \\ \therefore |x+y| \neq |x|+|y|$$

$$(ii) |xy| = |(-2 \cdot 4)(1 \cdot 8)| = 4 \cdot 32 \\ |x||y| = |-2 \cdot 4||1 \cdot 8| = 2 \cdot 4 \times 1 \cdot 8 = 4 \cdot 32 \\ \therefore |xy| = |x||y|$$

$$(iii) |x-y| = |(-2 \cdot 4)-(1 \cdot 8)| = |-4 \cdot 2| = 4 \cdot 2 \\ |x|-|y| = |-2 \cdot 4|-|1 \cdot 8| = 2 \cdot 4-1 \cdot 8 = 0 \cdot 6 \\ \therefore |x-y| \neq |x|-|y|$$

$$\text{(iv)} \quad |y - x| = |(1 \cdot 8) - (-2 \cdot 4)| = |4 \cdot 2| = 4 \cdot 2$$

$$|y| - |x| = |1 \cdot 8| - |-2 \cdot 4| = 1 \cdot 8 - 2 \cdot 4 = -0 \cdot 6$$

$$\therefore |y - x| \neq |y| - |x|$$

$$\text{(v)} \quad \left| \frac{y}{x} \right| = \left| \frac{(1 \cdot 8)}{(-2 \cdot 4)} \right| = \frac{1 \cdot 8}{2 \cdot 4} = \frac{3}{4}$$

$$\frac{|y|}{|x|} = \frac{|1 \cdot 8|}{|-2 \cdot 4|} = \frac{1 \cdot 8}{2 \cdot 4} = \frac{3}{4}$$

$$\therefore \left| \frac{y}{x} \right| = \frac{|y|}{|x|}$$

4.

$$\text{(i)} \quad |x| + |y| = |5| + |-2| = 7$$

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

$$\therefore |x| + |y| \geq |x + y|$$

$$\text{(ii)} \quad |x| - |y| = |5| - |-2| = 3$$

$$|x - y| = |5 - (-2)| = 7$$

$$\therefore |x| - |y| \leq |x - y|$$

$$\text{(iii)} \quad |xy| = |(5)(-2)| = |-10| = 10$$

$$|x||y| = |5||-2| = 5 \times 2 = 10$$

$$\therefore |xy| = |x||y|$$

$$\text{(iv)} \quad \left| \frac{x}{y} \right| = \left| \frac{(5)}{(-2)} \right| = \frac{5}{2} = 2 \cdot 5$$

$$\frac{|x|}{|y|} = \frac{|5|}{|-2|} = \frac{5}{2} = 2 \cdot 5$$

$$\therefore \left| \frac{x}{y} \right| = \frac{|x|}{|y|}$$

5.

$$\text{(i)} \quad |k + 1| = |-5 + 1| = 4$$

$$|k| + 1 = |-5| + 1 = 6$$

$$\therefore |k| + 1 \geq |k + 1|$$

$$\text{(ii)} \quad |k - 1| = |-5 - 1| = 6$$

$$|k| - 1 = |-5| - 1 = 4$$

$$\therefore |k - 1| \geq |k| - 1$$

$$\text{(iii)} \quad |1-k| = |1-(-5)| = 6$$

$$1-|k| = 1-|-5| = 1-5 = -4$$

$$\therefore |1-k| \geq 1-|k|$$

$$\text{(iv)} \quad |-1-k| = |-1-(-5)| = |-1+5| = 4$$

$$|-1|-|k| = |-1|-|-5| = 1-5 = -4$$

$$\therefore |-1-k| \geq |-1|-|k|$$

6.

$$\text{(i)} \quad |x| = 10 \Rightarrow x = \pm 10$$

$$\text{(ii)} \quad |x+1| = 10$$

$$\Rightarrow x+1 = 10 \quad \text{or} \quad x+1 = -10$$

$$\Rightarrow x = 9 \quad \text{or} \quad x = -11$$

$$\text{(iii)} \quad |x-1| = 10$$

$$\Rightarrow x-1 = 10 \quad \text{or} \quad x-1 = -10$$

$$\Rightarrow x = 11 \quad \text{or} \quad x = -9$$

$$\text{(iv)} \quad |3x+1| = 10$$

$$\Rightarrow 3x+1 = 10 \quad \text{or} \quad 3x+1 = -10$$

$$\Rightarrow 3x = 9 \quad \text{or} \quad 3x = -11$$

$$\Rightarrow x = 3 \quad \text{or} \quad x = -\frac{11}{3}$$

7.

$$\text{(i)} \quad |2x+1| = 9$$

$$\Rightarrow 2x+1 = 9 \quad \text{or} \quad 2x+1 = -9$$

$$\Rightarrow 2x = 8 \quad \text{or} \quad 2x = -10$$

$$\Rightarrow x = 4 \quad \text{or} \quad x = -5$$

$$\text{(ii)} \quad |3x| = 9$$

$$\Rightarrow 3x = 9 \quad \text{or} \quad 3x = -9$$

$$\Rightarrow x = 3 \quad \text{or} \quad x = -3$$

$$\text{(iii)} \quad |1-x| = 9$$

$$\Rightarrow 1-x = 9 \quad \text{or} \quad 1-x = -9$$

$$\Rightarrow 1-9 = x \quad \text{or} \quad 1+9 = x$$

$$\Rightarrow -8 = x \quad \text{or} \quad 10 = x$$

(iv) $|1-4x|=9$

$$\Rightarrow 1-4x=9 \quad \text{or} \quad 1-4x=-9$$

$$\Rightarrow 1-9=4x \quad \text{or} \quad 1+9=4x$$

$$\Rightarrow -8=4x \quad \text{or} \quad 10=4x$$

$$\Rightarrow -2=x \quad \text{or} \quad 2.5=x$$

8.

(i) $|2x+1|=|x-1|$

$$\Rightarrow 2x+1=x-1 \quad \text{or} \quad 2x+1=-(x-1)$$

$$\Rightarrow 2x-x=-1-1 \quad \text{or} \quad 2x+1=-x+1$$

$$\Rightarrow x=-2 \quad \text{or} \quad 2x+x=1-1$$

$$3x=0 \Rightarrow x=0$$

(ii) $|3x-5|=|x+7|$

$$\Rightarrow 3x-5=x+7 \quad \text{or} \quad 3x-5=-(x+7)$$

$$\Rightarrow 3x-x=+7+5 \quad \text{or} \quad 3x-5=-x-7$$

$$\Rightarrow 2x=12 \quad \text{or} \quad 3x+x=-7+5$$

$$\Rightarrow x=6 \quad 4x=-2 \Rightarrow x=-\frac{1}{2}$$

(iii) $2|x-1|=|x+3| \Rightarrow |2x-2|=|x+3|$

$$\Rightarrow 2x-2=x+3 \quad \text{or} \quad 2x-2=-(x+3)$$

$$\Rightarrow 2x-x=3+2 \quad \text{or} \quad 2x-2=-x-3$$

$$\Rightarrow x=5 \quad \text{or} \quad 2x+x=-3+2$$

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

(iv)

$$\frac{1}{2}|x-3|=|2x+5| \Rightarrow |x-3|=|4x+10|$$

$$\Rightarrow x-3=4x+10 \quad \text{or} \quad x-3=-(4x+10)$$

$$\Rightarrow -3-10=4x-x \quad \text{or} \quad x-3=-4x-10$$

$$\Rightarrow -13=3x \quad \text{or} \quad x+4x=-10+3$$

$$\Rightarrow -\frac{13}{3}=x \quad \text{or} \quad 5x=-7 \Rightarrow x=-\frac{7}{5}$$

(v) $|2x|+x=6 \Rightarrow |2x|=6-x$

$$\Rightarrow 2x=6-x \quad \text{or} \quad 2x=-(6-x)$$

$$\Rightarrow 3x=6 \quad \text{or} \quad 2x=-6+x$$

$$\Rightarrow x=2 \quad \text{or} \quad x=-6$$

9.

$$\frac{1}{2}|x-7|=|x+5| \Rightarrow |x-7|=|2x+10|$$

$$\Rightarrow x-7=2x+10 \quad \text{or} \quad x-7=-(2x+10)$$

$$\Rightarrow -10-7=2x-x \quad \text{or} \quad x-7=-2x-10$$

$$\Rightarrow -17=x \quad \text{or} \quad 2x+x=-10+7$$

$$3x=-3 \Rightarrow x=-1$$

10.

$$3|5-x|=2|x+10| \Rightarrow |15-3x|=|2x+20|$$

$$\Rightarrow 15-3x=2x+20 \quad \text{or} \quad 15-3x=-(2x+20)$$

$$\Rightarrow 15-20=2x+3x \quad \text{or} \quad 15-3x=-2x-20$$

$$\Rightarrow -5=5x \quad \text{or} \quad 15+20=-2x+3x$$

$$\Rightarrow -1=x \quad \text{or} \quad 35=x$$

11. $|x| < 3 \Rightarrow -3 < x < 3$

12. $|x| < 5 \Rightarrow -5 < x < 5$

13. $|x| \leq 2 \Rightarrow -2 \leq x \leq 2$

14. $|x+1| < 4$

$$\Rightarrow -4 < x+1 < 4$$

$$\Rightarrow -4-1 < x < 4-1$$

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

15. $|x-3| < 5$

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

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

$$\Rightarrow -2 < x < 8$$

16. $|2-x| \leq 1 \Rightarrow |x-2| \leq 1$

$$\Rightarrow -1 \leq x-2 \leq 1$$

$$\Rightarrow -1+2 \leq x \leq 1+2$$

$$\Rightarrow 1 \leq x \leq 3$$

17. $|2x-1| < 7$

$$\Rightarrow -7 < 2x-1 < 7$$

$$\Rightarrow -7+1 < 2x < 7+1$$

$$\Rightarrow -6 < 2x < 8$$

$$\Rightarrow -3 < x < 4$$

- 18.** $|2x+1| \leq 9$
 $\Rightarrow -9 \leq 2x+1 \leq 9$
 $\Rightarrow -9-1 \leq 2x \leq 9-1$
 $\Rightarrow -10 \leq 2x \leq 8$
 $\Rightarrow -5 \leq x \leq 4$
- 19.** $|4x-1| < 7$
 $\Rightarrow -7 < 4x-1 < 7$
 $\Rightarrow -7+1 < 4x < 7+1$
 $\Rightarrow -6 < 4x < 8$
 $\Rightarrow -1.5 < x < 2$
- 20.** $\left| \frac{1-3n}{2} \right| \leq 5 \Rightarrow |1-3n| \leq 10 \Rightarrow |3n-1| \leq 10$
 $\Rightarrow -10 \leq 3n-1 \leq 10$
 $\Rightarrow -10+1 \leq 3n \leq 10+1$
 $\Rightarrow -9 \leq 3n \leq 11$
 $\Rightarrow -3 \leq n \leq 3\frac{2}{3}$
 $\Rightarrow n \in \{-3, -2, -1, 0, 1, 2, 3\}$
- 21.** $|x-11| > 2$
 $\Rightarrow -2 > x-11 > 2$
 $\Rightarrow -2+11 > x > 2+11$
 $\Rightarrow 9 > x > 13$
 Ans. $x < 9$ or $x > 13$
- 22.** $|2x+1| > 5$
 $\Rightarrow -5 > 2x+1 > 5$
 $\Rightarrow -5-1 > 2x > 5-1$
 $\Rightarrow -6 > 2x > 4$
 $\Rightarrow -3 > x > 2$
 Ans. $x < -3$ or $x > 2$