**CHAPTER THREE**

**INEQUALITIES IN ONE VARIABLE**

**Symbols used:**

-There are four symbols used and these are

1. **<** 2.  **≤** 3. **>** 4. **≥**

**The meaning of the symbols <**

Less than < greater than, greater than > less than.

For these two symbols, the sharp or pointed edge always points to the less or small value, while the other side points towards the great or big value.

Q1. Give the meaning of the following inequalities:

(a) x < 4

Solution

X is less than 4 or 4 is greater than x.

(b) 2 < 4

Solution

2 is less than 4 or 4 is grater than 2.

(c) y > x

Solution

y is greater than x or x is less than y.

(d) 5 > 2

Solution

5 is greater than 2 or 2 is less than 5.

(e) 9x >10

Solution

9x is greater than 10 or 10 is less than 9x.

**The meaning of the symbol**

1. greater than or equal to ≥ less than or equal to

2) less than or equal to ≤ greater than or equal to

- With respect to these two symbols, the sharp edge points towards the less than or equal to value,

while the other side points towards the greater than

or equal to value.

Q2. Given the meaning of the following inequalities:

(a) b ≤ 5

Solution

b is less than or equal to 5, or 5 is greater than or

equal to b.

(b) x ≤ 2

Solution

x is less than or equal to 2, or 2 is greater than or

equal to x.

(c) 5 ≤ y

Solution

5 is less than or equal to y or y is greater than or

equal to 5.

(d) 4 ≥ y

Solution

Y is less than or equal to 4 or 4 is greater than or

equal to y.

(e) 2x ≥ 6

Solution

6 is less than or equal to 2x or 2x is greater than or

equal to 6.

Q3. List the members of the following sets:

(a) Z = {x: x > 2}

Solution

x : x > 2 => x is greater than 2. The members are all the numbers greater than 2

=> Z = {3, 4, 5, 6 …………………}

(b) Y = {x : x ≥ 2 }

Solution

x ≥ 2 => x is greater than or equal to 2,

=> Y = {2, 3, 4, 5 …………………..}

(c) A = { n: n > 5}

Solution

n > 5 => n is greater than 5

=> A = {6, 7, 8, 9 ……………………)

(d) N = {n: n ≥ 5}

Solution

N ≥ 5 => n is greater than or equal to 5,

=>N = {5, 6, 7, 8 ………………..)

NB:

5 4 3 2 1 0 1 2 3 4 5

Less than greater than

-The numbers on the left hand side of the number

line, are always less than those on the right hand

side.

For examples

1. -5 is less than -4

2. -5 is less than -2

3. -4 is less than -2

4. -4 is less than -3

5. - 1 is greater than - 3

6. - 2 is greater than – 5

Q4. List the members of the following sets:

(a) X = { x : x ≤ 2}

Solution

x ≤ 2 => x is less than or equal to 2.

=> X = {2, 1, 0, -1, -2, -3 …………..}.

(b) Y = { x : x < 2}

Solution

x < 2 = > x is less than 2,

=> Y = {1, 0, -1, -2, -3 ………….….}.

(c) Y = {n : n ≤ - 2}

Solution

n ≤ - 2 => n is less than or equal to -2.

=> Y = {-2, - 3, - 4, - 5 ……….…....}.

(d) M = { n : n < - 2}

Solution

n < - 2 => n is less than – 2.

=> M = { - 3, - 4, - 5, - 6 …………..}.

(e) Z = { x : x > - 4}

Solution

x > - 4 => x is greater than – 4,

=> Z = {- 3, - 2, - 1, 0, 1, 2 ………...}

(f) Z = { x: x ≥ - 4}

Solution

x ≥ - 4 => x is greater than or equal to – 4

=> Z = {- 4, - 3, - 2, - 1, 0, 1, 2, 3……}.

(g) Y = {x: x ≤ - 4}

Solution

x ≤ - 4 => x is less than or equal to – 4

=> Y = {- 4, - 5, - 6, - 7 …………..}.

(h) Y = {x : x < - 4}

Solution

x < - 4 => x is less than – 4

=> Y = { -5, -6, - 7 ……………….}.

Q5.Determine the members of each of the following given inequalities:

(a) Y = {x: 2 < x < 5}

Solution

2 < x < 5 => x is greater than 2 but less than 5

=> Y = {3, 4}.

(b) Y = {x: 2 ≤ x ≤ 5 }

Solution

2 ≤ x ≤ 5 => x is greater than or equal to 2, and x is

less than or equal to 5.

=> Y = {2, 3, 4, 5}.

(c) X = {x: 2 ≤ x < 5}

Solution

2 ≤ x < 5 => x is greater than or equal to 2 and x is

less than 5.

=> X = {2, 3, 4}.

(d) M = {x: 2 < x ≤ 5}

Solution

2 < x ≤ 5 => x is greater than 2 and x is less than or

equal to 5.

=> M = { 3, 4, 5 }.

(e) Y = {x: - 2 ≤ x ≤ 4}

Solution

- 2 ≤ x ≤ 4 => x is greater than or equal to – 2, and x

is less than or equal to 4.

=> Y = {- 2, - 1, 0, 1, 2, 3, 4}.

(f) Y = {x: -2 ≤ x < 4}

Solution

-2 ≤ x < 4 => x is greater than or equal to -2 and x

is less than 4.

=> Y= {-2, -1, 0, 1, 2, 3}.

(g) Y = {x: -2 < x ≤ 4}

Solution

2 < z ≤ 4 => x is greater than 2 and less than or

equal to 4.

=> Y = { -1, 0, 1, 2, 3, 4}.

(h) Z = {n: - 6 ≤ n ≤ - 2}

Solution

- 6 ≤ n < -2 => n is greater than or equal to - 6 and n

is less than or equal to -2.

=>Z = {- 6, -5, - 4, -3, -2}

(i) Z = {n: - 6 ≤ n < -2}

Solution

- 6 ≤ n < -2 => n is greater than or equal to - 6 and n

is less than or equal to -2.

=>Z = {- 6, -5, - 4, -3}.

(j) Z = (n: - 6 < n ≤ -2}

Solution

- 6 < n ≤ -2 => n is greater than -6 and less than or

equal to -2.

=> Z = {-5, -4, -3, -2}.

**Graphs of inequalities:**

NB:

5 4 3 2 1 0 1 2 3 4 5

Less than more than

- In the graphical representation of inequalities, if the sign is greater than, then movement is in the right hand side direction.

- If we are dealing with the less than sign, then we move in the left hand side direction as indicated above.

Q1.Represent these inequalities graphically or by means of graphs:

a. x > 2

Solution

x > 2 => x is greater than 2. i.e {3, 4, 5, 6 ………..}

2 1 0 1 2 3 4 5

or

2 1 0 1 2 3 4 5

NB: If the circle is not shaded, then number below it

or within it is not a member of the set.

b. x > 4

Solution

x > 4 => x is greater than 4 i.e. {5, 6, 7, 8 ………}

0 1 2 3 4 5 6

or

0 1 2 3 4 5 6

c. Y = {x: x > - 2}

Solution

x > - 2 => x is greater than -2

4 3 2 1 0 1 2 3

d. X = {n: n > - 4 }

Solution

n> - 4 => n is greater than -4

6 5 4 3 2 1 0 1 2 3

e. Y = {x: x < 2}

Solution

x < 2 => x is less than 2

3 2 1 0 1 2 3 4

f. x = {n : n < 4}

Solution

n < 4 => n is less than 4

0 1 2 3 4 5

g. x = {n : n < - 2}

Solution

n < - 2 => n is less than -2

3 2 1 0 1 2 3 4

h. x = {x : x < - 4}

6 5 4 3 2 1 0 1 2 3

NB: If the circle is shaded, then the number below it

is part of the given set.

Q2.Represent each of the following inequalities, by means of a graph

a. x ≥ 2

Solution

X ≥ 2 => x is greater than or equal to 2.



0 1 2 3 4 5

or



0 1 2 3 4 5

b. x ≥ 4

Solution

x ≥ 4 => x is greater than or equal to 4



0 1 2 3 4 5 6

c. Y = {x: x ≥ - 2}

Solution

x ≥ -2 => x is greater than or equal to – 2



4 3 2 1 0 1 2 3

d. M = {n: n ≥ - 4}

Solution

n ≥ - 4 => n is greater than or equal to -4



6 5 4 3 2 1 0 1 2 3

e. Y = { x: x ≤ 2}

Solution

x ≤ 2 => x is less than or equal to 2



3 2 1 0 1 2 3 4

f. Y = {x: x ≤ 4 }

Solution

x ≤ 4 => x is less than or equal to 4

s 

2 1 0 1 2 3 4 5 6 7

g. x ≤ -2

Solution

x ≤ -2 => x is less than or equal to - 2



4 3 2 1 0 1 2 3

h. x ≤ - 4

Solution

x ≤ - 4 => x is less than or equal to - 4



5 4 3 2 1 0 1 2 3 4

Q3. Represent the following inequalities on graphs and indicate their members:

a. T = {x: 2 < x < 5}

Solution

2 < x < 5 => x is greater than 2 and less than 5.

The members = {3, 4}

0 1 2 3 4 5 6

or

0 1 2 3 4 5 6

b. W = {x: 2 ≤ x ≤ 5}

Solution

2 ≤ x ≤ 5 => x is greater than or equal to 2 and less

than or equal to 5.

The members = {2, 3, 4, 5}

 

0 1 2 3 4 5 6

or

 s

0 1 2 3 4 5 6

c. W = {x: 2 < x ≤ 5}

Solution

2 < x ≤ 5 => x is greater than 2 and less than or equal to 5.

The members = {3, 4, 5}



3 2 1 0 1 2 3 4 5 6

NB: The circle above 2 was not shaded, because 2 is

not a member of the set. Since 5 is a member, the

circle is shaded.

d. A = {x: 2 ≤ x < 5}

Solution

2 ≤ x < 5 => x is greater than or equal to 2 and x is

less than 5. The member = {2, 3, 4}



0 1 2 3 4 5 6

e. W = {x: 3 < x< 8}

Solution

The members = {4, 5, 6, 7}

0 1 2 3 4 5 6 7 8 9

f. W = {x: 2 ≤ x ≤ 8}

Solution

Members = {2,3, 4, 5, 6, 7, 8}

. . .  

0 1 2 3 4 5 6 7 8 9

h. W = {n: 3 < n ≤ 8}

Solution

Members = {4, 5, 6, 7, 8}



0 1 2 3 4 5 6 7 8

i. T = {x: -2 ≤ x ≤ 4}

Solution

-2 ≤ x ≤ 4 => is greater than or equal to -2 and less

than or equal to 4. Members = {-2, -1, 0, 1, 2, 3 4}

 

2 1 0 1 2 3 4 5

j. D = {x: -7 < x < -2}

Solution

-7 < x < - 2 => x is greater than -7 and less than -2 members = {- 6, -5, -4, -3}

8 7 6 5 4 3 2 1 0 1 2 3

k. Y = {x: -7 ≤ x ≤ -2}

Solution

-7 ≤ x ≤ -2 => x is greater than or equal to -7 and less

than or equal to -2.

Members = {-7, - 6, - 5, - 4, - 3, - 2}

l. X = {x: -7 < x ≤ -2}

Solution

Members = {- 6, - 5, - 4, - 3, - 2}



8 7 6 5 4 3 2 1 0 1 2

m. A = {x: - 4 ≤ x < 3}

Solution

Members = {- 4, - 3, - 2, - 1, 0, 1, 2}



5 4 3 2 1 0 1 2 3 4

Q4. Solve the following inequalities and represent your answer graphically.

a. x + 1 > 3

Solution

x + 1 > 3 => x > 3 – 1 => x > 2

2 1 0 1 2 3 4

b. x – 2 ≥ 4

Solution

x – 2 ≥ 4 => x ≥ 4 + 2, => x ≥ 6



0 1 2 3 4 5 6 7

c. 3x + 2 ≤ 2 x + 4

Solution

3x + 2 ≤ 2x + 4 => 3x ≤ 2x + 4 – 2,

=> 3x ≤ 2x + 2, => 3x – 2x ≤ 2, => x ≤ 2



2 1 0 1 2 3 4 5

d. 4x – 3 ≤ 2x – 5

Solution

4x – 3 ≤ 2x – 5 => 4x ≤ 2x – 5 + 3, => 4x ≤ 2x – 2,

=> 4x – 2x ≤ - 2, => 2x ≤ -2.

Divide through using 2

=> 2x ≤ -2,

2 2

=> x ≤ -1



2 1 0 1 2 3

e. -2x – 3 > - 3x – 6

Solution

-2x – 3 > - 3x – 6 => -2x > - 3x – 6 + 3,

=> -2x + 3x > -3,

=> x > -3

4 3 2 1 0 1 2 3

NB: When an inequality is multiplied through by a

negative number, or divided through by a negative

number, the inequality symbol is reversed.

f. 3x + 4 ≤ 4x + 6

Solution

3x + 4 ≤ 4x + 6 => 3x ≤ 4x + 6 – 4,

=> 3x ≤ 4x + 2, => 3x – 4x ≤ 2,

=> - x ≤ 2.

Multiply through using -1

=> x ≥ - 2



3 2 1 0 1 2 3 4

Q5. Find the truth set of the following inequalities:

a. x + 2 ≤ - 6

2

Solution

Multiply through using 2

=>2 x x + 2 x 2 < 2 x – 6,

2

=> x + 4 < – 12, => x < -12 – 4, => x < -16.

Truth set = {x: x < -16}.

b. x – 3 > 1

4

Solution

Multiply through using 4

=> 4 x x – 4 x 3 > 4 x 1,

4

=> x – 12 > 4, => x > 4 + 12, => x > 16.

Truth set = {x: x > 16}.

c. x – 1 < x + 5

3 2

Solution

Multiply through using 6, in order to remove the 3 and the 2

=> 6 x x – 6 x 1 < 6 x x + 6 x 5,

3 2

=> 2x – 3 < 6x + 30,

=> 2x < 6x + 30 + 3,

=> 2x < 6x + 33,

=> 2x – 6x < 33,

=> - 4x < 33.

Divide through using - 4

=> - 4x > 33,

- 4 - 4

=> x > - 8.3.

Truth set = { x: x > - 8.3}.

d. 2x + 2 < 4x – 3

3 5

Solution

Multiply through using 15

=> 15 x 2x + 15 x 2< 15 x 4x – 15 x 3,

3 5

=> 10x + 6 < 60x – 45,

=> 10x < 60x – 45 – 6,

=> 10x < 60x – 51,

=> 10x – 60x <-51,

=> -50x < -51.

Divide through using -50

=> -50x > -51

-50 -50

=> x > 1.02.

Truth set = {x: x > 1.02}.

e. 1x + 1 < 2x – 6

2 3

Solution

Multiply through using 6

=> 6 x 1x + 6 x 1 < 6 x 2x – 6 x 6,

2 3

=> 3x + 6 < 4x – 36,

=> 3x < 4x – 36 – 6,

=> 3x < 4x – 42,

=> 3x – 4x < -,42,

=> - x < - 42.

Multiply through using -1

=> x > 42.

Truth set = {x: x > 42}.

Q6.Determine the members of the following inequalities and represent your answers graphically:

a. Y = {x: - 4x < - 8}

Solution

- 4x < - 8 => - 4x > - 8,

- 4 - 4

=> x > 2.

Members = {3,4,5………………..}

2 1 0 1 2 3 4

b. A = {n: 2n - 1 ≤ 5}

Solution

2n - 1 ≤ 5 => 2n ≤ 5 + 1,

=>2n ≤ 6, => 2n ≤ 6,

2 2

=> n ≤ 3.

Members = {3, 2, 1, 0, -1, -2, ………….}



2 1 0 1 2 3 4

c. Y = {x: 3x > 6 + x}

Solution

3x > 6 + x => 3x – x > 6,

=> 2x > 6 => 2x > 6,

2 2

=> x > 3

Members = {4, 5, 6, ………………}

0 1 2 3 4

d. Y = { n : 3n + 4 ≤ 4n + 6}

Solution

3n + 4 ≤ 4n + 6 => 3n ≤ 4n + 6 – 4,

=> 3n ≤ 4n + 2 => 3n – 4n ≤ 2, => - n ≤ 2.

Multiply through using -1

=> n ≥ - 2

Members = {-2, -1, 0, 1, 2, ……….}



4 3 2 1 0 1 2 3

Q7. Find the solution set of the following inequalities:

a. 2(3 + x) ≤ 3x

Solution

2(3 + x) ≤ 3x

=> 6 + 2x ≤ 3x, => 6 ≤ 3x – 2x,

=> 6 ≤ x => x ≥ 6.

Solution set = {x:x ≥ 6}.

b. 3(x – 1) ≤ 4x + 2

Solution

3(x – 1) ≤ 4x + 2

=> 3x – 3 ≤ 4x + 2,

=>3x ≤ 4x + 2 + 3,

=> 3x ≤ 4x + 5,

=> 3x – 4x ≤ 5,

=> - x ≤ 5, => x ≥ -5.

Solution set = {x: x ≥ - 5}.

c. - (x – 2) + 2x ≤ -2(3+ x)

Solution

- (x – 2) + 2x ≤ -2(3+ x)

=> - x + 2 + 2x ≤ - 6 -2x

=> -x + 2x ≤ - 6 – 2x – 2

=> x ≤ - 6 – 2 – 2x,

=> x ≤ - 8 – 2x,

=> x + 2x ≤ - 8,

=> 3x ≤ - 8 => x ≤ - 8,

3

=> x ≤ - 2.66.

Solution set = {x: x ≤ - 2.66}.

d. 3(x – 2) + 2 (x + 3) ≥ 2(x – 6)

Solution

3(x – 2) + 2 (x + 3) ≥ 2(x – 6)

=>3x – 6 + 2x + 6 ≥ 2x – 12,

=> 3x + 2x – 6 + 6 ≥ 2x – 12,

=> 5x ≥ 2x – 12 (since – 6 + 6 = 0),

=> 5x – 2x ≥ -12,

=> 3x ≥ -12 => x > -12, => x ≥ - 4.

3

e. - 4(x + 2) + (x – 1) < -2 (x – 1)

Solution

- 4(x + 2) + (x – 1) < -2 (x – 1)

=> - 4x – 8 + x – 1 < -2x + 2,

=> - 4x + x – 8 – 1 < - 2x + 2,

=> -3x – 9 < -2 x + 2,

=> -3x < -2x + 2 + 9,

=> -3x < -2x + 11,

=> -3x + 2x < 11,

=> - x < 11.

Multiply through using – 1 => x > -11

Solution set = {x: x > -11}

f. x + 2 – 2(x – 1) ≤ 9 – 2x

Solution

x + 2 – 2(x – 1) ≤ 9 – 2x

=> x + 2 – 2x + 2 ≤ 9 – 2x,

=> x – 2x + 2 + 2 ≤ 9 – 2x,

=> - x + 4 ≤ 9 – 2x,

=> - x + 4 + 2x ≤ 9,

=> - x + 2x ≤ 9 – 4 => x ≤ 5.

Solution set = {x : x ≤ 5}.

g. - 3 ≤ x + N/B: First multiply through using 4.

Solution

=> -3x x 4 – 3 x 4 ≤ x x 4 + 1 x 4,

4 2

=> -3x – 12 ≤ 4x + 2,

=> -3x ≤ 4x + 2 + 12

=> -3x ≤ 4x + 14,

=> -3x – 4x ≤ 14

=> -7x ≤ 14.

Divide through using -7

=> - 7x ≥ 14 => x ≥ -2.

- 7 - 7

Solution set = {x: x ≥ -2}.

Q8.Determine the truth sets of the following inequalities and list their members:

a. 1 (2x + 1) < x + 1

3

N/B: Multiply through using 3.

Solution

=> 3 x 1 (2x + 1) < 3 x x + 3 x 1

3

=> 1 (2x + 1) < 3x + 3,

=> 2x + 1 < 3x + 3,

=> 2x – 3x < 3 -1,

=> -x < 2 and multiply through using -1 => x > -2.

Truth set = {x: x > -2}.

Members = {-1, 0, 1, 2, 3 …………………..}.

b. 2 (2x + 2 ) ≤ 1 (x + 1 )

3 4

Solution

Multiply through using 12

=> 12 x 2 (2x + 2) ≤ 12 x 1 (x + 1)

3 4

=> 8 ( 2x + 2) ≤ 3 (x + 1),

=> 16x + 16 ≤ 3x + 3,

=> 16x – 3x ≤ 3 – 16,

=> 13x ≤ -13 => 13x ≤ -13,

13 13

=> x ≤ - 1. Truth set = {x : x ≤ - 1}.

Members = { -1, -2, -3……………}.

c. 2x – 2 ≤ x + 1

4

N/B:

Solution

From 2x – 2 ≤ x + 1

4

1 (2x – 2) ≤ x + 1

4

Multiply through using 4

=> 4 x 1 (2x – 2) ≤ 4 x x + 4 x 1

4

=> 1 (2x – 2) ≤ 4x + 4,

=> 2x – 2 ≤ 4x + 4

=>2x ≤ 4x + 4 + 2,

=> 2x – 4x ≤ 6

=> -2x ≤ 6.

Divide through using -2 => - 2x ≥ 6 => x ≥ -3.

- 2 -2

Truth set {x: x ≥ -3}.

Members = {-3, -2, -1, 0, ………..).

d. 2x – 1 > x + 1

3 2

Solution

2x – 1 > x + 1 can also be written as

3 2

1 (2x – 1) > 1 (x + 1).

3 2

Multiply through using 6

=> 6 x 1 (2x – 1) > 6 x 1 (x + 1)

3 2

=>2(2x – 1) > 3(x + 1),

=> 4x – 2 > 3x + 3 => 4x > 3x + 3 + 2,

=> 4x > 3x + 5 => 4x – 3x > 5,

=> x > 5. Truth set = (x: x > 5).

Members = {6, 7, 8, 9 …………)

e.- 4(x – 2) >(x + 19) + (2x – 1).

Solution

Multiply through using 6

=> 6 x 4(x – 2) > 6 x 1 (x + 19) + 6 x 2 (2x – 1)

6 3

=> -24(x – 2) > 1 (x + 19) + 4 (2x – 1),

=> -24x + 48 > x + 19 + 8x – 4,

=> -24x + 48 – x – 8x > 19 – 4,

=> -24x – x – 8x > 19 – 4 – 48,

=> -33x > -33.

Divide through using -33, => x < 1

Truth set = {x: x < 1}

Members (- 0, -1, -2 ………)

Q9.Simplify the following inequality

3x + 1 -1 ≥ 2x + 3 - 2

2 4

Solution

The given inequality can be written as

1 (3x + 1) -1 ≥ 1 (2x +3) - 2

2 4

Multiply through using 4

=> 4 x 1 (3x + 1) – 4 x 1 ≥ 4 x 1 (2x +3) – 4 x 2

2 4

=>2 (3x + 1) – 4 ≥ 1 (2x + 3) – 8,

=> 6x + 2 – 4 ≥ 2x + 3 – 8,

=> 6x – 2x ≥ 3 – 8 – 2 + 4,

=> 4x ≥ -3 => x ≥ - 3

4

=> x ≥ - 0.75.

Q10. Given that -2x + 4 - 5(x + 1) ≤ 2,

3 2

find the value of x.

Solution

-2x + 4 - 5(x + 1) ≤ 2,

3 2

=> 1 (-2x + 4) – 5 (x + 1) ≤ 2.

3 2

Multiply through using 6

=> 6 x 1 (-2x + 4) - 6 x 5 (x + 1) ≤ 6 x 2,

3 2

=>2 (-2x + 4) – 15(x + 1) ≤ 12,

=> - 4x + 8 – 15x – 15 ≤ 12,

=> - 4x – 15x ≤ 12 – 8 + 15,

=> -19x ≤ 4 + 15,

=> -19x ≤ 19.

Divide through using -19

=> -19x ≥ 19 => x ≥ -1.

-19 -19

Q11. If 2(x – 1) - 4 (2x + 12) ≤ - 14,

3 5

determine the value of x which satisfies the given equation.

Solution

2(x – 1) - 4 (2x + 12) ≤ -14

3 5

Can also be written as

2 (x – 1) - 4 (2x + 12) ≤ -14

3 5

Multiply through using 15

15 x 2 (x – 1) -15 x 4 (2x + 12) ≤ 15 x 14

3 5

=>10(x – 1) – 12(2x + 12) ≤ -210,

=> 10x – 10 – 24x – 144 ≤ -210,

=> 10x – 24x – 10 – 144 ≤ -210,

=> -14x ≤ -210 + 154,

=> -14x – 154 ≤ - 210,

=> -14x ≤ - 210 +154,

=> -14x ≤ -56,

=> -14x ≥ -56

-14 -14

=> x ≥ 4.

Q12. Solve the inequality

4x + 1 < 5, where x ≠ 1

2x – 1 2 2

and illustrate your answer on a number line

Solution

4x + 1 < 5,

2x – 1 2

Cross multiply => 2(4x + 1) < 5(2x – 1),

=> 8x + 2 < 10x – 5

=> 8x – 10x < -5 -2,

=> -2x < -7

=> -2x > -7,

-2 -2

=> x > 3.5

0 1 2 3 4 5

Q13. Find the truth set of the inequality x – 1 ≥ 1

3(x + 1) - 4

Solution

x – 1 ≥ 1 Cross multiply

3(x + 1) - 4

=> - 4 (x – 1) ≥ 1 x 3(x + 1),

=> - 4(x – 1) ≥ 3(x +1),

=> - 4x + 4 ≥ 3x + 3,

=> - 4x -3x ≥ 3 – 4,

=> -7x ≥ -1

=> -7x ≤ - 1,

-7 -7

=> x ≤ 1 => x ≤ 0.14.

7

Q14. Given that 2 (2x +5) ≤ 82/3,

3

find the value of x and represent your answer

graphically.

Solution

2(2x +5) ≤ 82/3,

3

=> 2(2x + 5) ≤ 26

3 3

Multiply through using 3

=>3 x 2 (2x + 5) ≤ 3 x 26

3 3

=> 2(2x + 5) ≤ 26,

=> 4x + 10 ≤ 26,

=> 4x ≤ 26 – 10

=> 4x ≤ 16,

=> 4x ≤ 16 => x ≤ 4

4 4

**QUESTIONS**

Q1. List the members of the following inequalities

a. x > 5 Ans. {6, 7, 8………………..}

b. x ≥ 8 Ans. {8, 9, 10 ………………}

c. x ≥ -5 Ans. {-5, -4, -3, -2, -1, 0, 1, 2, 3…}

d. x < 3 Ans. {2, 1, 0, -1, -2 ………….}

e. x < -2 Ans. {-3, -4, -5, ……………..}

f. x ≤ -5 Ans. {-5, -6, -7 ……………..}

Q2. Write down the members of each of these given sets:

a. X = {x: 2 ≤ x ≤ 7}

Ans. {2, 3, 4, 5, 6, 7}

b. Y = {x: 3 ≤ x < 9}

Ans. {3, 4, 5, 6, 7, 8}

c. M = {x: -3 ≤ x < 2}

Ans. {-3, -2, -1, 0, 1}

d. N = {Y: -7 <Y ≤ -1}

Ans. {- 6, -5, - 4, -3, -2, -1}

e. M = {N: - 8 ≤ N < -2}

Ans. {- 8, -7, -6, -5, - 4, -3}

Q3. Represent the following inequalities graphically:

a. Y = {x: x > 5}

Ans.

3 2 1 0 1 2 3 4 5 6 7

b. Y = {x: x ≥ 3}

Ans.



0 1 2 3 4 5

c. M = {N: N < 2}

Ans.

2 1 0 1 2 3

d. M = {Y: Y < - 4}

Ans.

5 4 3 2 1 0 1 2

e. M = {Y: Y ≤ - 1}

Ans.



3 2 1 0 1 2

f. X = {Y: 2 ≤ Y ≤ 6}

 Ans.

2 1 0 1 2 3 4 5 6 7

g. X = {Y:2 ≤ Y < 6}

Ans.

3 2 1 0 1 2 3 4 5 6 7

h. X {Y: - 6 < Y < -1}

Ans.

6 5 4 3 2 1 0

Q4.Determine the truth set of each of the following inequalities and list its members:

a.3x – 4 ≥ x + 2

Ans. x ≥ 3. Members = {3, 4, 5 …….}

b. 5x + 2 < 8x – 10

Ans. Truth set = { x: x > 4}

Members = {5, 6, 7………….)

c. 2x + 2 + 4x ≤ x – 8 => x ≤ - 2

Ans. Truth set = (x: x ≤ -2}

Members = {-2, -3, - 4 …………….}

d. 1x – 1 ≤ 2

3

Ans. Truth set{x: x ≤ 9}

Members = {9, 8, 7, 6 ………..}

e. x – 2 ≥ 4

2

Ans. Truth set = {x : x ≥ 12}

Members = {12, 13, 14 ………..}

f. 1 x + 1 ≥ 4x -6

2 6

Ans. Truth set = {x: x ≤ 42}

Members = {42, 41, 40 …………)

g. 4(3 + x) ≤ 6x

Ans. Truth set = {x: x ≥ 6)

Members = {6, 7, 8 …………}

Q5. Find the truth set of each of the following inequalities:

a. -2(x – 2) + 4x ≤ - 4 (3 + x)

Ans. {x; x ≤ -2.66}

b. 6(x – 2) + 4(x + 3) ≥ 4(x – 6)

Ans. {x: x ≥ - 4}

c. - 8(x + 2) + 2(x – 1) < -4(x -1)

Ans. {x: x > -11}

d. 2x + 4 – 4(x – 1) ≤ 18 – 4x

Ans. {x: x ≤ 5}

e. 2 ( 2x + 1) < 2x + 2

3

Ans. {x: x > -2}

f. 4x – 4 ≤ 2x + 2

4

Ans. {x: x ≥ -3}

g. 2x –14 < x + 1

6

Ans. {x: x > 5}

.

Q6. Given that - 4x + 8 – 10(x + 1) ≤ 2

3 2

Find the value of x

Ans. x ≥ - 13

19

Q7. If 2(x – 1) – 4(2x + 12) ≤ -14,

6 10

Find the value of x which satisfies the given equation. . Ans. x ≥ 19.

Q8. Solve the inequality 4x + 1 < 5

4x – 2 4

Ans. x > 3.5 or x > 31/2

Q9. Given that 2 – 1 (2x – 2) ≥ 2x

3 3

Find the value of x. Ans. x ≤ 2