NTS GAT General Past Papers Questions

Quantitative – Exam No. 13

Inequalities

Prepared by: GAT Online Tutor

Formulas:

1. If we interchange the left-hand side and right-hand side of an inequality, then inequality sign will be reversed. For example:

$$4 < 7 \quad \rightarrow \quad 7 > 4$$

2. If we multiply the inequality with a negative sign, then inequality sign will be reversed. For example:

$$-2 < 5 \quad \rightarrow \quad 2 > -5$$

3. If we interchange the left-hand side and right-hand side of an inequality as well as we multiply the inequality with a negative sign, then inequality sign will remain same. For example:

$$3 > -8 \quad \rightarrow \quad 8 > -3$$

4. To find the all possible values of $x + y$:

$$(x_{min} + y_{min}) < (x + y) < (x_{max} + y_{max})$$

5. To find the all possible values of $x - y$:

$$(x_{min} - y_{max}) < (x - y) < (x_{max} - y_{min})$$

6. To find the all possible values of xy:

$$(x_{min} \times y_{min}) < (xy) < (x_{max} \times y_{max})$$

7. To find the all possible values of $\frac{x}{y}$:

$$\left(\frac{x_{min}}{y_{max}}\right) < \left(\frac{x}{y}\right) < \left(\frac{x_{max}}{y_{min}}\right)$$

Exercise:

1. What is the value of y?

$$4y - 3 > 2 + 3y$$

Solution:

$$4y - 3 > 2 + 3y$$
$$4y - 3y > 2 + 3$$
$$y > 5$$

2. Find the value of x?

$$\frac{x}{2} - 2 > \frac{x}{3}$$

Solution:

$$\frac{x}{2} - 2 > \frac{x}{3}$$
$$\frac{x-4}{2} > \frac{x}{3}$$
$$(x-4)(3) > (x)(2)$$
$$3x - 12 > 2x$$
$$3x - 2x > 12$$
$$x > 12$$

3. If $4 - a > 5$, then what is the value of a?

Solution:

$$4 - a > 5$$
$$4 - 5 > a$$
$$-1 > a$$
$$a < -1$$

4. Find the value of x: (PP)

$$9 - 3x > 0$$

Solution:

$$9 - 3x > 0$$

$$-3x > -9$$

$$3x > 9$$

$$x > 3$$

5. For what values of x, the following inequality exists?

$$|2x - 3| - 4 < 7$$

Solution:

$$|2x - 3| - 4 < 7$$

By removing the mode symbol, it can be written in the following two forms:

$$-(2x - 3) - 4 < 7$$

$$-2x + 3 - 4 < 7$$

$$-2x < 7 - 3 + 4$$

$$-2x < 8$$

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

$$-x < 4$$

$$-4 < x$$

$$+(2x - 3) - 4 < 7$$

$$2x - 3 - 4 < 7$$

$$2x < 7 + 3 + 4$$

$$2x < 14$$

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

$$x < 7$$

We can write it as follows:

$$-4 < x < 7$$

6. If $1 < x < 4$ and $10 < y < 19$, what are all possible values of $x + y$?

Solution:

We can see that:

$$Minimum\ value\ of\ x = x_{min} = 1$$

$$Maximum\ value\ of\ x = x_{max} = 4$$

$$Minimum\ value\ of\ y = y_{min} = 10$$

$$Maximum\ value\ of\ y = y_{max} = 19$$

To find the all possible values of $x + y$, we have the following formula:

$$(x_{min} + y_{min}) < (x + y) < (x_{max} + y_{max})$$

$$(1 + 10) < (x + y) < (4 + 19)$$

$$11 < (x + y) < 23$$

$$Minimum\ value\ of\ x + y = 11$$

$$Maximum\ value\ of\ x + y = 23$$

7. If $2 < x < 5$ and $3 < y < 5$, what are all possible values of $x - y$? (PP)

Solution:

We can see that:

$$Minimum\ value\ of\ x = x_{min} = 2$$

$$Maximum\ value\ of\ x = x_{max} = 5$$

$$Minimum\ value\ of\ y = y_{min} = 3$$

$$Maximum\ value\ of\ y = y_{max} = 5$$

To find the all possible values of $x - y$, we have the following formula:

$$(x_{min} - y_{max}) < (x - y) < (x_{max} - y_{min})$$

$$(2 - 5) < (x - y) < (5 - 3)$$

$$-3 < (x - y) < 2$$

$$Minimum\ value\ of\ x - y = -3$$

$$Maximum\ value\ of\ x - y = 2$$

8. If $-7 < x < 7$ and $0 < y < 12$, what are all possible values of $y - x$? (PP)

Solution:

We can see that:

$$Minimum\ value\ of\ x = x_{min} = -7$$

$$Maximum\ value\ of\ x = x_{max} = 7$$

$$Minimum\ value\ of\ y = y_{min} = 0$$

$$Maximum\ value\ of\ y = y_{max} = 12$$

To find the all possible values of $y - x$, we have the following formula:

$$(y_{min} - x_{max}) < (y - x) < (y_{max} - x_{min})$$

$$(0 - 7) < (y - x) < (12 - (-7))$$

$$-7 < (y - x) < (12 + 7)$$

$$-7 < (y - x) < 19$$

$$Minimum\ value\ of\ y - x = -7$$

$$Maximum\ value\ of\ y - x = 19$$

9. If $3 < x < 7$ and $6 < y < 12$, what are all possible values of xy?

Solution:

We can see that:

$$Minimum\ value\ of\ x = x_{min} = 3$$

$$Maximum\ value\ of\ x = x_{max} = 7$$

$$Minimum\ value\ of\ y = y_{min} = 6$$

$$Maximum\ value\ of\ y = y_{max} = 12$$

To find the all possible values of xy, we have the following formula:

$$(x_{min} \times y_{min}) < (xy) < (x_{max} \times y_{max})$$

$$(3 \times 6) < (xy) < (7 \times 12)$$

$$18 < (xy) < 84$$

$$Minimum\ value\ of\ xy = 18$$

$$Maximum\ value\ of\ xy = 84$$

10. If $4 < x < 9$ and $13 < y < 23$, what are all possible values of $\frac{x}{y}$?

Solution:

We can see that:

$$Minimum\ value\ of\ x = x_{min} = 4$$

$$Maximum\ value\ of\ x = x_{max} = 9$$

$$Minimum\ value\ of\ y = y_{min} = 13$$

$$Maximum\ value\ of\ y = y_{max} = 23$$

To find the all possible values of $\frac{x}{y}$, we have the following formula:

$$\left(\frac{x_{min}}{y_{max}}\right) < \left(\frac{x}{y}\right) < \left(\frac{x_{max}}{y_{min}}\right)$$

$$\left(\frac{4}{23}\right) < \left(\frac{x}{y}\right) < \left(\frac{9}{13}\right)$$

$$Minimum\ value\ of\ xy = \frac{4}{23}$$

$$Maximum\ value\ of\ xy = \frac{9}{13}$$

11. If 'a' and 'b' are negative, and 'c' is positive, which of the following statements are true?

I. $a - b < a - c$

II. If $a < b$, then $\frac{a}{c} < \frac{b}{c}$

III. $\frac{1}{b} < \frac{1}{c}$

(A) I only

(B) II only

(C) III only

(D) II and III only

(E) I, II and III

Solution:

We assume the following values of a, b and c:

$$a = -8, \qquad b = -4, \qquad c = 2$$

Any other values of a, b and c can be assumed according to given conditions. (For example, $a = -9, b = -3, c = 7$, or $a = -15, b = -11, c = 24$). Now we will check all three statements one by one.

Statement I	Statement II	Statement III
$a - b < a - c$ $-8 - (-4) < -8 - 2$ $-8 + 4 < -10$ $-4 < -10$ $False$	If $a < b$, then $\frac{a}{c} < \frac{b}{c}$ $\frac{a}{c} < \frac{b}{c}$ $\frac{-8}{2} < \frac{-4}{2}$ $-4 < -2$ $True$	$\frac{1}{b} < \frac{1}{c}$ $\frac{1}{-4} < \frac{1}{2}$ $-0.25 < 0.5$ $True$

Only statement II and III are correct hence option D is correct.