

C.E.M.TUITION

Name : _____

Review of Rules & Formulae

Inequations, Absolute Values, Internal & External Divisions

Year 12 - Extension 1

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INEQUATIONS :

The **inequality sign reverses** when :

- ♦ multiplying by a negative
- ♦ dividing by a negative
- ♦ taking the reciprocal of both sides

Examples :

(1) Solve $\frac{1}{x} < 3$

$$x < 0, x > \frac{1}{3}$$

(2) Solve $\frac{3}{x+5} \geq 2$

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

(3) Solve $\frac{x}{x+1} < 2$

$$x < -2, x > -1$$

(4) Solve $\frac{8x+7}{2x-9} > 5$

$$\frac{9}{2} < x < 26$$

(5) Solve $\frac{7}{(3-x)(x+3)} > -1$

$x < -4$ or $-3 < x < 3$ or $x > 4$

(6) Solve $\frac{2x-4}{x+3} > \frac{x+2}{2(x+3)}$

$$x < -3, x > \frac{10}{3}$$

ABSOLUTE VALUES & INEQUATIONS :**Examples :**

Solve the following inequations.

(1) $|2x - 3| \leq 9$

$$-3 \leq x \leq 6$$

(2) $7 \leq |2x - 1|$

$$x \geq 4, x \leq -3$$

(3) $|4x + 3| > 1$

$$x > -\frac{1}{2}, x < -1$$

QUADRATIC INEQUALITIES :**Examples :**

Solve

(1) $1 - x^2 < 0$

$$x < -1, x > 1$$

(2) $x^2 + 2x - 15 \leq 0$

$$-5 \leq x \leq 3$$

(3) $1 - 2x - 3x^2 \geq 0$

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

INTERNAL AND EXTERNAL DIVISION OF AN INTERVAL :

The point $P(x, y)$ which divides the interval $A(x_1, y_1)$ and $B(x_2, y_2)$

(i) in the ratio $k : l$ (i.e. internally)

(ii) in the ratio $k : -l$ or $-k : l$ (i.e. externally)

is given by : $x = \frac{kx_2 + lx_1}{k+l}$, $y = \frac{ky_2 + ly_1}{k+l}$

Examples :

(1) Find the coordinates of the points of trisection of the interval joining $(-1, -3)$ and $(8, 3)$.

$(5, 1), (2, -1)$

(2) $P(5, 6)$, $Q(-3, 1)$ and $R(7, -1)$ are points on a number plane.

(a) Find the coordinates of M , the mid-point of QR .

(b) G divides PM internally in the ratio $2 : 1$. F divides PM externally in the ratio $4 : 1$.
Find the coordinates of G and F and prove that $GQFR$ is a parallelogram.

(a) $M(2, 0)$ (b) $G(3, 2), F(1, -2)$

- (3) (a) Sketch the parabola $y = x^2$ and show that the point $T(t, t^2)$ lies on it.
- (b) A is the point $(-2, 0)$ and $P(x, y)$ divides the interval AT in the ratio $3 : 1$. Find x and y .
- (c) If P lies on the line $x + y = 4$, find the possible values of t and the corresponding positions of P . Illustrate these results on your sketch.
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Answer :

$$(b) x = \frac{-2+3t}{4}, y = \frac{3t^2}{4} \quad (c) t = 2, (1, 3) \text{ and } t = -3, \left(-2\frac{3}{4}, 6\frac{3}{4}\right)$$

