

Quadratic Equation Part-1

Quadratic Eqⁿ ✓

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Quadratic Equations

Direction (1-5): In each of these questions, two equations are given. You have to solve these equations and find out the values of x and y and give answer

$$x > y$$

$$x < y$$

$$x \geq y$$

$$x \leq y$$

x = y or no relation can be established between x & y.

Q1.

$$X^2 - 10X + 21 = 0$$

$$Y^2 - 16Y + 63 = 0$$

Quadratic

$$ax^2 + bx + c = 0$$

$$ax^3 + bx^2 + cx + d = 0$$

Cubic

$$x^2 = 4$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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Q1.

$$X^2 - 10X + 21 = 0$$

$$Y^2 - 16Y + 63 = 0$$

Comp: $\begin{matrix} x & y \\ 3, 7 & 7, 9 \end{matrix}$

$$3 < 7$$

$$7 < 9$$

$$7 < 9$$

$$ax^2 + bx + c = 0$$

$$x \leq y$$

$$x^2 - 3x - 7x + 21 = 0$$

$$x(x-3) - 7(x-3) = 0$$

$$x^2 - 10x + 21 = 0$$

$$x = 3, 7$$

$$\begin{array}{r} 7 \overline{) 63} \\ \underline{7 \times 3} \\ 63 \\ \underline{7 \times 3} \\ 0 \end{array}$$

$$\begin{array}{r} 3 \overline{) 21} \\ \underline{3 \times 7} \\ 21 \\ \underline{3 \times 7} \\ 0 \end{array}$$

Roots: $\frac{-3 \pm \sqrt{9 - 4 \times 1 \times 21}}{2 \times 1}$, $\frac{-7 \pm \sqrt{49 - 4 \times 1 \times 21}}{2 \times 1}$

$$+3, +7$$

$$y^2 - 16y + 63 = 0$$

$$\begin{array}{r} 7 \overline{) 63} \\ \underline{7 \times 9} \\ 63 \\ \underline{7 \times 9} \\ 0 \end{array}$$

$$-7, -9$$

$$+7, +9$$

$$+7, +9$$

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Q2.

(i) $6x^2 - 11x + 4 = 0$

(ii) $3y^2 - 5y + 2 = 0$

Handwritten notes for Q2:
 $\frac{x}{8, 3}$
 $\frac{y}{6, 4}$
 A circle containing:
 $8 > 6$
 $8 > 4$
 $3 < 6$
 $3 < 4$
 Another circle containing:
 $x \geq y$

Handwritten solution for (i):
 $6x^2 - 11x + 4 = 0$
 $-8, -3$
 AC method:
 $2 \times 6 = 12$
 $3 \times 4 = 12$
 Roots: $\frac{-8}{6}, \frac{-3}{4}$

Handwritten solution for (ii):
 $3y^2 - 5y + 2 = 0$
 $-3, -2$
 AC method:
 $3 \times 2 = 6$
 $-3, -2$
 Roots: $\frac{-3}{3}, \frac{-2}{2}$
 $\frac{6}{6}, \frac{4}{6}$

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Q3.

$x^2 - 16^2 = 23^2 - 56$

$y^{1/3} - 55 + 376 = 18^2$

Handwritten solution for Q3 (i):
 $x^2 - 16^2 = 23^2 - 56$
 $x^2 - 256 = 529 - 56$
 $x^2 = 256 + 529 - 56$
 $x^2 = 729$
 $x = 27$

Handwritten solution for Q3 (ii):
 $y^{1/3} - 55 + 376 = 18^2$
 $y^{1/3} + 321 = 324$
 $y^{1/3} = 324 - 321 = 3$
 $y = 3^3 = 27$

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Q4.

$25/\sqrt{x} + 9/\sqrt{x} = 17\sqrt{x}$

$\sqrt{y}/3 + 5\sqrt{y}/6 = 3/\sqrt{y}$

Handwritten note: $y > x$

Handwritten solution for Q4 (i):
 $\frac{25}{\sqrt{x}} + \frac{9}{\sqrt{x}} = 17\sqrt{x}$
 $\frac{25+9}{\sqrt{x}} = 17\sqrt{x}$
 $\frac{34}{\sqrt{x}} = 17\sqrt{x}$
 $34 = 17x$
 $x = 2$

Handwritten solution for Q4 (ii):
 $\sqrt{y} \times \sqrt{y} = (y)^{1/2} \times y^{1/2} = (y)^{1/2+1/2} = y^1 = y$
 $\frac{2 \times \sqrt{y}}{3} + \frac{5\sqrt{y}}{6} = \frac{3}{\sqrt{y}}$
 $\frac{7\sqrt{y}}{6} \times \frac{3}{\sqrt{y}} = \frac{3}{\sqrt{y}}$
 $\frac{7}{2} = \frac{3}{\sqrt{y}}$
 $7\sqrt{y} = 6$
 $\sqrt{y} = \frac{6}{7}$
 $y = \left(\frac{6}{7}\right)^2$

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Q5

$x^3 = (54872) \rightarrow \text{Cubic}$

$y^2 - 22y + 105 = 0 \rightarrow \text{Square}$

↑

x > y

$\Rightarrow x^3 = 54872$

$x = 38$

$y^2 - 22y + 105 = 0$

$-15, -7$

$+105$

AC

105

5×7

$\text{Roots} = \frac{15 \pm 7}{1}$

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Q6.

$6x^2 - 49x + 99 = 0$

$5y^2 + 17y + 14 = 0$

x > y

$6x^2 - 49x + 99 = 0$

9×11

$\left[\begin{array}{c} 3 \\ 3 \end{array} \middle| \begin{array}{c} AC \\ 99 \times 6 \\ 11 \times 2 \times 3 \end{array} \right] \quad (-27, -22)$

$\text{Roots} = 27/6, 22/6$

yes

$5y^2 + 17y + 14 = 0$

$\left[\begin{array}{c} 2 \\ 2 \end{array} \middle| \begin{array}{c} 14 \times 5 \\ 7 \times 5 \end{array} \right]$

$+10, +7 \quad \text{Roots: } -\frac{10}{5}, -\frac{7}{5}$

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Q7

$12x^2 + 29x + 15 = 0$

$24y^2 + 38y + 15 = 0$

$\frac{x}{-40, -18}$

$\frac{y}{-20, -18}$

$x < y$

$-40 < -20$

$-40 < -18$

$-18 > -20$

$-18 > -18$

$\checkmark 12x^2 + 29x + 15 = 0$

$\left[\begin{array}{c} 3 \\ 3 \end{array} \middle| \begin{array}{c} AC \\ 12 \times 15 \\ 2 \times 3 \times 5 \end{array} \right] \quad +20, +9$

$\left[\begin{array}{c} \text{Roots: } 2x-20, -9 \times 2 \\ 2 \times 12, 12 \times 2 \end{array} \right]$

$24y^2 + 38y + 15 = 0$

$\left[\begin{array}{c} 3 \\ 3 \end{array} \middle| \begin{array}{c} 15 \times 24 \\ 2 \times 2 \times 2 \times 3 \end{array} \right] \quad +20, +18$

$\text{Roots: } -\frac{20}{24}, -\frac{18}{24}$

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Q8.

$$x^2 = 36$$

$$y = \sqrt{36}$$

Handwritten solution for Q8:

$x^2 = 36$
 $x = \pm 6$
 $x = +6, -6$

$y = \sqrt{36}$
 $y = 6$

Comparison: $6 = 6$, $-6 < 6$

Conclusion: $x \leq y$

General notes:
Quadratic equation: $ax^2 + bx + c$ has 2 roots.
Linear equation: $ax + b = 0$ has 1 root.
Cubic equation: $ax^3 + bx^2 + cx + d$ has 3 roots.