quadratic equation

→ द्विघात समीकरण

$ax^2+bx+c=0 \Rightarrow a\neq 0$

$\Downarrow$

$x < \alpha, \beta$ | मूल / शून्य
roots / zeroes

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

$$\alpha=\frac{-b+\sqrt{b^2-4ac}}{2a}$$

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

(i) $\alpha+\beta=\frac{-b}{a}$

(ii) $\alpha\cdot\beta=\frac{c}{a}$

(iii) समी० $\Rightarrow x^2-(\alpha+\beta)x+\alpha\cdot\beta=0$

$3x^2 - 7x + 9 = 0$

(i) $\alpha + \beta = \frac{-b}{a} = \frac{+7}{3} = \frac{7}{3}$

(ii) $\alpha \cdot \beta = \frac{c}{a} = \frac{9}{3} = 3$

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

$\alpha + \beta = \frac{6}{2} = 3$

$\alpha \cdot \beta = \frac{2}{2} = 1$

(i) $\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\cdot\beta$

$= 3^2 - 2\times1 = 9 - 2 = 7$

(ii) $\alpha^3 + \beta^3 = (\alpha+\beta)^3 - 3\alpha\cdot\beta(\alpha+\beta)$

$3^3 - 3\times1\times3$

$27 - 9 = 18$

$5x^2 - 20x + 25 = 0$

$\alpha + \beta = \frac{-b}{a} = \frac{20}{5} = 4$

$\alpha \cdot \beta = \frac{c}{a} = \frac{25}{5} = 5$

$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\cdot\beta$

$= 4^2 - 2 \times 5$

$= 16 - 10 = 6$

$\alpha^3 + \beta^3 = (\alpha+\beta)^3 - 3\alpha\cdot\beta(\alpha+\beta)$

$= 4^3 - 3 \times 5 \times 4$

$= 64 - 60 = 4$

(i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\cdot\beta} = \frac{6}{5}$ Ans.

(ii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\cdot\beta} = \frac{4}{5}$ Ans.

$ax^2+bx+c=0$

विवेचक / विविक्तर ($\mathcal{D}$)

$\mathcal{D}=b^2-4ac$

(i) यदि $\mathcal{D}=0$ हो तो दोनो मूल समान तथा वास्तविक होंगे।

(ii) यदि $\mathcal{D}>0$ हो तो मूल वास्तविक तथा असमान होंगे।

(iii) यदि $\mathcal{D}<0$ हो तो मूल काम्पनिक होंगे।

$3x^2 - 5x - 11 = 0$

$ax^2 + bx + c = 0$

$a = 3$
$b = -5$
$c = -11$

$D = b^2 - 4ac$

$D = (-5)^2 - 4 \times 3 \times -11$

$D = 25 + 132$

$D = 157$

$D > 0 \rightarrow$ मूल वास्तविक तथा असमान होंगे।
Roots Real and unequal

$4x^2 - 6x + 2 = 0$

$ax^2 + bx + c = 0$

$a = 4$
$b = -6$
$c = 2$

$D = b^2 - 4ac$

$D = 36 - 4 \times 4 \times 2$

$D = 36 - 32$

$D = 4$

$D > 0$

ax^2+bx+c

(i) $max^m \longrightarrow x^2 \rightarrow -ve$

(ii) $min^m \longrightarrow x^2 \rightarrow +ve$

$max^m / min^m = \frac{4ac-b^2}{4a}$

$x_e = \frac{-b}{2a}$

Maxm and minm value

	maxm	minm
विषम घात Odd power		
$x \to$	∞	$-\infty$
सम घात Even power		
$x^2 \to$	∞	0

18. Find the minimum value of $4x^2 + 2x + 1$.

$4x^2 + 2x + 1$ का न्यूनतम मान ज्ञात करें।

$a=4$, $b=2$, $c=1$

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $-\frac{3}{4}$ (D) $-\frac{4}{3}$

$\text{min}^m/\text{max}^m = \frac{4ac-b^2}{4a}$

$= \frac{4\times4\times1-2^2}{4\times4} = \frac{16-4}{4\times4} = \frac{12}{16} = \frac{3}{4}$

(ii) x के किस मान के लिए न्यूनतम होगा?

$x = \frac{-b}{2a} = \frac{-2^1}{2\times4} = \left(\frac{-1}{4}\right)$

II-method

$4x^2+2x+1$

$4\times\left(\frac{-1}{4}\right)^2+2\times\left(\frac{-1}{4}\right)+1$

$4\times\frac{1}{16_4}-\frac{2\times1}{4}+1$

$\frac{1}{4}-\frac{1}{2}+1 = \frac{1-2+4}{4} = \frac{3}{4}$ ✓

19. For real number 'x', find the maximum value of $4 - 6x - x^2$.
'x' के वास्तविक मान के लिये, $4 - 6x - x^2$ का अधिकतम मान निकालें।
(A) 10 (B) 13 (C) 11 (D) 9

$-x^2 - 6x + 4$
$ax^2 + bx + c$

$a = -1$
$b = -6$
$c = 4$

$$\text{max}^m/\text{min}^m = \frac{4ac - b^2}{4a} = \frac{4 \times -1 \times 4 - (-6)^2}{4 \times -1}$$

$$= \frac{-16 - 36}{-4}$$

$$= \frac{52}{4} = 13$$

20. If one root $x^2 - 6kx + 5 = 0$ is 5, find the value of 'K'.

यदि $x^2 - 6kx + 5 = 0$ का एक मूल 5 हो, तो 'K' का मान निकालें।

Most Imp.

(A) $-\frac{1}{2}$ (B) -1 (C) 1 (D) 2

$x = 5$

$x = \alpha = \beta$

$x^2 - 6Kx + 5 = 0$

$25 - 30k + 5 = 0$

$30 - 30k = 0$

$30 = 30k$

$k = 1$

1 ✓
2 ✗

N ✓
A ✓

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21. If one of the roots of quadratic equation $7x^2 - 50x + K = 0$, is 7, then what is the value of K ?
यदि द्विघात समीकरण $7x^2 - 50x + K = 0$ का एक मूल 7 हो, तो K का मान क्या होगा ?

(A) $\frac{50}{7}$ (B) $\frac{7}{50}$ (C) 7 (D) 1

$x = 7$

$7 \times 7^2 - 50 \times 7 + k = 0$

$343 - 350 + k = 0$

$-7 + k = 0$

$k = 7$

22. Find sum and product of the roots of quadratic equation $3x^2 - 6x + 5 = 0$?

द्विघात समीकरण $3x^2 - 6x + 5 = 0$ के मूलों का जोड़ तथा गुणनफल ज्ञात करें।

(A) $-2, \frac{5}{3}$ (B) $2, \frac{5}{3}$ (C) $\frac{5}{3}, -2$ (D) $\frac{5}{3}, 2$

$\alpha + \beta = \frac{-b}{a} = \frac{6}{3} = 2$

$\alpha \cdot \beta = \frac{c}{a} = \frac{5}{3}$

3-4 Q

Mensuration → 2D

Sat → 9am to 12pm

Sun → 9am to 12pm

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