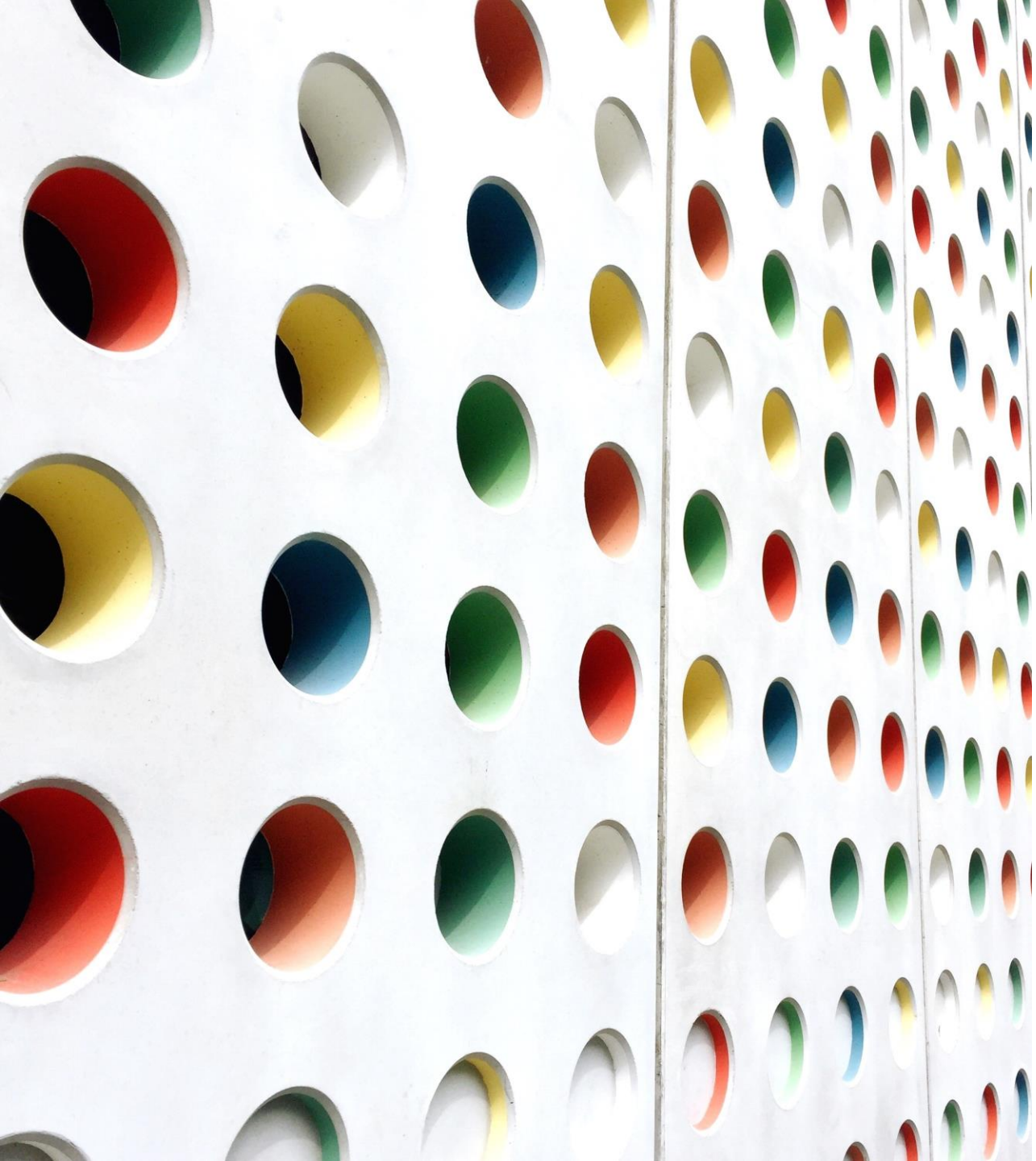


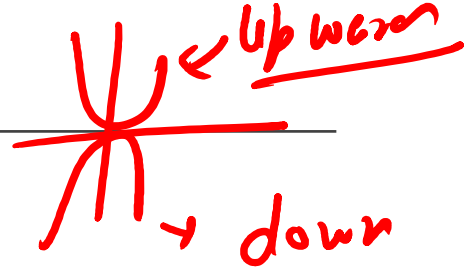
Polynomial (Relationship between Zeroes and Coefficients of a Polynomial)(exercise:2.2) class: 10th

NITISH KUMAR

(α, β) (a, b, c)

Relationship between Zeroes and Coefficients of a Polynomial

$ax^2 + bx + c = 0$ — quadratic



Sum of Zeros :- $-\frac{(\text{Coeff. of } x)}{\text{Coeff. of } x^2}$

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

Product of Zeros : $\frac{\text{Constant}}{\text{Coeff of } x^2}$

$$\alpha\beta = \frac{c}{a}$$

$ax^3 + bx^2 + cx + d$ — cubic

$\hookrightarrow \alpha + \beta + \gamma = -\frac{b}{a}\left(\frac{x^2}{x^3}\right)$

$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$

$\alpha\beta\gamma = \frac{d}{a}$

Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.

$x^2 + 7x + 10 = 0$

$[10]$

$[2 \times 5 = 10]$

$a = 1, \quad b = 7, \quad c = 10$

$x^2 + 5x + 2x + 10 = 0$

$x(x+5) + 2(x+5) = 0$

$(x+5)(x+2) = 0$

$x+5 = 0$	$x+2 = 0$
$x = -5$	$x = -2$
$\alpha = -5$	$\beta = -2$

Sum of zeros $= \frac{-b}{a}$

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

$-5 - 2 = \frac{-(7)}{1} \Rightarrow -7 = -7$

$\alpha\beta = \frac{c}{a}$

$-5 \times -2 = \frac{10}{1}$

$\rightarrow 10 = 10$

Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients:

$t^2 - 15$

$ax^2 + bx + c = 0$

$t^2 - 15 = 0$

$t^2 = 15$

$t = \pm\sqrt{15}$

$t = \sqrt{15}, t = -\sqrt{15}$

$\alpha = \sqrt{15}, \beta = -\sqrt{15}$

$a = 1, b = 0, c = -15$

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

$\sqrt{15} + (-\sqrt{15}) = \frac{0}{1}$

$\sqrt{15} - \sqrt{15} = 0$

$0 = 0$

$\alpha\beta = \frac{c}{a}$

$\sqrt{15}(-\sqrt{15}) = \frac{-15}{1}$

$-(\sqrt{15})^2 = -15$

$-15 = -15$

$6x^2 - 3 - 7x$

$6x^2 - 7x - 3 = 0$

$6x^2 - 9x + 2x - 3 = 0$

$3x(2x-3) + 1(2x-3) = 0$

$(2x-3)(3x+1) = 0$

$2x - 3 = 0$ | $3x + 1 = 0$

$2x = 3$ | $3x = -1$

$x = \frac{3}{2}$ | $x = -\frac{1}{3}$

$6 \times -3 = -18$

$1 \times 18 = 18$

$2 \times (-9) = -18$

$3 \times 6 = 18$

$ax^2 + bx + c = 0$

$a = 6,\ b = -7,\ c = -3$

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

$\frac{3}{2} + \left(-\frac{1}{3}\right) = -\left(\frac{-7}{6}\right)$

$\frac{3}{2} - \frac{1}{3}$

$\frac{9-2}{6} = -\left(\frac{-7}{6}\right) \Rightarrow \boxed{\frac{7}{6} = \frac{7}{6}}$

$\alpha\beta = \frac{c}{a} \Rightarrow \frac{3}{2} \times \left(-\frac{1}{3}\right) = \frac{-3}{6}$

$\rightarrow \boxed{-\frac{1}{2} = -\frac{1}{2}}$

$4u^2 + 8u$

$4u^2+8u+0=0$

$4u^2+8u$

$4u(u+2)=0$

$u=0, \quad u=-2$

$\alpha=0, \quad \beta=-2$

$ax^2+bx+c=0$

$a=4, b=8, c=0$

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

$0+(-2) = \frac{-(8)}{4}$

$-2=-2$

$\alpha\beta = \frac{c}{a} \Rightarrow (0\times-2) = \frac{0}{4}$

$0=0$

Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively.

$$\frac{1}{4}, -1$$

$S = \frac{1}{4}$, $P = -1$

$S = \frac{-b}{a}$, $P = \frac{c}{a}$

$\frac{-b}{a} = \frac{1}{4}$, $\frac{c}{a} = \frac{-1 \times 4}{1 \times 4} = \frac{-4}{4}$

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

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

$ax^2 + bx + c = 0$

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

$x^2 - Sx + P = 0$

$x^2 - \frac{1}{4}x + -1 = 0$

$\frac{4x^2 - x - 4}{4} = 0$

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

$S = \sqrt{2}, \quad P = \frac{1}{3}$

$\sqrt{2}, \frac{1}{3}$

$ax^2 + bx + c = 0$

$3x^2 - 3\sqrt{2}x + 1 = 0$

$S = -\frac{b}{a}, \quad P = \frac{c}{a} = \frac{1}{3}$

$-\frac{b}{a} = \frac{\sqrt{2} \times 3}{1 \times 3}, \quad \frac{c}{a} = \frac{1}{3}$

$-\frac{b}{a} = \frac{3\sqrt{2}}{3}, \quad \frac{c}{a} = \frac{1}{3}$

$a = 3, \quad b = -3\sqrt{2}, \quad c = 1$

$x^2 - Sx + P = 0$

$x^2 - \sqrt{2}x + \frac{1}{3} = 0$

$3x^2 - 3\sqrt{2}x + 1 = 0$

3

$3x^2 - 3\sqrt{2} + 3 = 0$

$S = -\frac{1}{4}$, $P = \frac{1}{4}$ $\quad -\frac{1}{4}, \frac{1}{4}$ $\quad ax^2 + bx + c = 0$

$4x^2 + x + 1 = 0$

$S = \frac{-b}{a}$, $P = \frac{c}{a}$ $\quad x^2 - Sx + P = 0$

$\frac{-b}{a} = -\frac{1}{4}$, $\frac{c}{a} = \frac{1}{4}$ $\quad x^2 - \left(-\frac{1}{4}\right)x + \frac{1}{4} = 0$

$a = 4, \; -b = -1, \; c = 1$ $\quad x^2 + \frac{1}{4}x + \frac{1}{4} = 0$

$b = 1$ $\quad \frac{4x^2 + x + 1}{4} = 0$

$4x^2 + x + 1 = 0$

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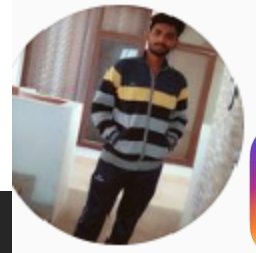

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