UDAAN

2026

POLYNOMIALS

MATHS LECTURE-6

BY-RITIK SIR

Topics *to be covered*

A. Important Question (Part - 02)


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#Q. If α and β are the zeros of the quadratic polynomial $f(x) = 2x^2 - 5x + 7$, find a polynomial whose zeros are $2\alpha + 3\beta$ and $3\alpha + 2\beta$.

$\boxed{?}$ $\to 2\alpha+3\beta$, $\to 3\alpha+2\beta$

$2x^2 - 5x + 7 \to \alpha, \beta$

$a = 2, b = -5, c = 7$

$Sum = 2\alpha+3\beta+3\alpha+2\beta$

$= 5\alpha+5\beta$

$= 5(\alpha+\beta)$

$= 5 \cdot \frac{5}{2}$

$= \boxed{\frac{25}{2}}$

$product = (2\alpha+3\beta)(3\alpha+2\beta)$

$= 6\alpha^2+4\alpha\beta+9\alpha\beta+6\beta^2$

$= 6(\alpha^2+\beta^2)+13\alpha\beta$

$= \cancel{6}^{3}\left(-\frac{3}{\cancel{4}_2}\right)+13\left(\frac{7}{2}\right)$

$= \frac{-9}{2}+\frac{91}{2} = \frac{82}{2} = \boxed{41}$

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

$\alpha+\beta = -\frac{-5}{2}$

$\boxed{\alpha+\beta = 5/2}$

$P = c/a$

$\boxed{\alpha\beta = 7/2}$

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

$$= \left(\frac{5}{2}\right)^2 - \cancel{2}\left(\frac{7}{\cancel{2}}\right)$$

$$= \frac{25}{4} - 7$$

$$= \frac{25-28}{4}$$

$$= \boxed{\frac{-3}{4}}$$

$$S = \frac{25}{2}, \quad P = 41$$

$$= k\left[x^2 - Sx + P\right]$$

$$= k\left[x^2 - \frac{25}{2}x + 41\right]$$

$$k = 2$$

$$= 2x^2 - 25x + 82$$ Ans.

$$\boxed{a^3+b^3=(a+b)(a^2+b^2-ab)}$$

#Q. If α and β are the zeros of the quadratic polynomial $f(x) = 3x^2 - 4x + 1$, find a quadratic polynomial whose zeros are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

$$\boxed{?} \to \alpha^2/\beta, \quad \beta^2/\alpha$$

$$\text{Sum} = \frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$$

$$= \frac{\alpha^3+\beta^3}{\alpha\beta}$$

$$= \frac{(\alpha+\beta)(\alpha^2+\beta^2-\alpha\beta)}{\alpha\beta}$$

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

$$= \left(\frac{4}{3}\right)^2 - 2\left(\frac{1}{3}\right)$$

$$= \frac{16}{9} - \frac{2}{3}$$

$$= \frac{16-6}{9}$$

$$= \boxed{10/9}$$

$3x^2-4x+1$

$a=3,\ b=-4,\ c=1$

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

$\alpha+\beta = -\frac{-4}{3}$

$\boxed{\alpha+\beta = 4/3}$

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

$\boxed{\alpha\beta = \frac{1}{3}}$

$$S = \frac{(\alpha+\beta)(\alpha^2+\beta^2-\alpha\beta)}{\alpha\beta}$$

$$S = \frac{\left(\frac{4}{3}\right)\cdot\left(\frac{10}{9}-\frac{1}{3}\right)}{\frac{1}{3}}$$

$$S = \frac{\frac{4}{3}\left[\frac{10-3}{9}\right]}{\frac{1}{3}}$$

$$S = \frac{\frac{4}{3}\cdot\frac{7}{9}}{\frac{1}{3}}$$

$$S = \frac{\frac{28}{27}}{\frac{1}{3}}$$

$$\text{Sum} = \frac{\cancel{3}\times 28}{1\times \cancel{27}\,9}$$

$$S = \frac{28}{9}$$

$$\text{Product} = \frac{\alpha^{\cancel{2}}}{\cancel{\beta}}\times\frac{\beta^{\cancel{2}}}{\cancel{\alpha}}$$

$$= \alpha\beta$$

$$= \frac{1}{3}$$

$$= k\left[x^2 - Sx + P\right]$$

$$= k\left[x^2 - \frac{28}{9}x + \frac{1}{3}\right]$$

$$k = 9$$

$$= 9x^2 - 28x + 3$$ Ans.

#Q. If α and β are the zeros of the polynomial $x^2 + 4x + 3$, form the polynomial whose zeroes are $1 + \frac{\beta}{\alpha}$ and $1 + \frac{\alpha}{\beta}$.

$1+\frac{\beta}{\alpha}$

$1+\frac{\alpha}{\beta}$

HGPK

x^2+4x+3

$\alpha+\beta=-4, \alpha\beta=3$

$$\text{Sum} = 1+\frac{\beta}{\alpha} + 1+\frac{\alpha}{\beta}$$

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

$$= \boxed{2+\frac{\beta^2+\alpha^2}{\alpha\beta}}$$

#Q. α and β are zeroes of a quadratic polynomial $px^2 + qx + 1$. Form a quadratic polynomial whose zeroes are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$.

CBSE 2025

$$px^2+qx+1 \quad \alpha, \beta$$

$$a=p,\ b=q,\ c=1$$

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

$$\boxed{\alpha+\beta=-\frac{q}{p}} \qquad \boxed{\alpha\beta=\frac{1}{p}}$$

$$\boxed{?} \quad 2/\alpha,\ 2/\beta$$

$$\text{Sum}=\frac{2}{\alpha}+\frac{2}{\beta}$$

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

$$=\frac{2(\beta+\alpha)}{\alpha\beta}$$

$$=\frac{2(-q/p)}{1/p}$$

$$=\frac{\frac{-2q}{p}}{\frac{1}{p}}$$

$$=\frac{-2q\times \cancel{p}}{1\times \cancel{p}}$$

$$\boxed{\text{Sum}=-2q}$$

$$\text{Product}=\frac{2}{\alpha}\cdot\frac{2}{\beta}$$

$$=\frac{4}{\alpha\beta}=\frac{4}{\frac{1}{p}}=\boxed{4p}$$

$= k[x^2 - 5x + p]$

$= k[x^2 - -2qx + 4p]$

$k = 1$

$x^2 + 2qx + 4p$ Ans//

#QT

#Q. Find a quadratic polynomial whose zeros are reciprocals of the zeros of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

CBSE 2020

$\boxed{\begin{matrix}\alpha \\ \beta\end{matrix}}$ → $1/\alpha$, $1/\beta$

ax^2+bx+c → α, β

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

$$\text{Sum} = \frac{1}{\alpha}+\frac{1}{\beta}$$

$$= \frac{\beta+\alpha}{\alpha\beta}$$

$$= \frac{-b/\cancel{a}}{c/\cancel{a}}$$

$$\boxed{\text{Sum} = -b/c}$$

$$\text{Product} = \frac{1}{\alpha}\times\frac{1}{\beta}$$

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

$$= \frac{1}{c/a}$$

$$= \boxed{a/c}$$

$$= k[x^2 - Sx + P]$$

$$= k\left[x^2 - -\frac{b}{c}x + \frac{a}{c}\right]$$

$k = c$

$$= cx^2 + bx + a$$ Ans.

#Q. Find a quadratic polynomial whose zeros are negative of the zeros of the polynomial $px^2 + qx + r$.

$$\boxed{g} \to -\alpha,\ -\beta$$

$$px^2+qx+r \to \alpha,\ \beta$$

$$\boxed{\alpha+\beta = \frac{-q}{p},\ \alpha\beta = \frac{r}{p}}$$

Sum $= -\alpha + -\beta$

$= -\alpha - \beta$

$= -(\alpha+\beta)$

$= -\left(-\frac{q}{p}\right)$

$\boxed{\text{Sum} = q/p}$

Product $= -\alpha \cdot -\beta$

$= \alpha\beta$

$\boxed{P = \frac{r}{p}}$

$= k\left[x^2 - Sx + P\right]$

$k\left[x^2 - q/p\, x + r/p\right]$

$k = p$

Ans// $px^2 - qx + r$

#Q. If the zeroes of the polynomial $x^2 + px + q$ are double than the zeroes of $2x^2 - 5x - 3$, find the value of p and q.

$x^2+px+q \to 2\alpha, \; 2\beta$

$2x^2-5x-3 \to \alpha, \; \beta$

$a=2, b=-5, c=-3$

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

Sum $= -\frac{b}{a}$ | Product $= \frac{c}{a}$

$\alpha+\beta = -\frac{-5}{2}$ | $\boxed{\alpha\beta = \frac{-3}{2}}$

$\boxed{\alpha+\beta = \frac{5}{2}}$

$2\alpha + 2\beta = -\frac{p}{1}$

$2(\alpha+\beta) = -p$

$\cancel{2}\cdot\left(\frac{5}{\cancel{2}}\right) = -p$

$-5 = p$

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

$4\alpha\beta = q$

$\cancel{4}^{2} \cdot -\frac{3}{\cancel{2}} = q$

$-6 = q$

#Q. Find the value for P which one zero of the quadratic $px^2 - 14x + 8$ is 6 times the other.

CBSE 2017

A 0, 3

B 3

C 0

D NOTA

α

6α

$px^2 - 14x + 8$

$a = p,\ b = -14,\ c = 8$

$\text{Sum} = \frac{-b}{a}$

$\alpha + 6\alpha = -\frac{-14}{p}$

$7\alpha = \frac{14}{p}$

$\alpha = \frac{2}{p}$

$P = \frac{c}{a}$

$\alpha \cdot 6\alpha = \frac{8}{p}$

$6\alpha^2 = \frac{8}{p}$

$6\alpha^2 = \frac{8}{p}$

$6 \cdot \left(\frac{2}{p}\right)^2 = \frac{8}{p}$

$6 \cdot \frac{4}{p^2} = \frac{8}{p}$

$\frac{24}{p^2} = \frac{8}{p}$

$24p = 8p^2$

$\boxed{0 = 8p^2 - 24p}$

$0 = 8p(p-3)$

$8p = 0$

$p = 0$

$p - 3 = 0$

$p = 3$

Ans.

#Q. If the zeroes of the polynomial $ax^2 + bx + \frac{2a}{b}$ are reciprocal of each other, then the value of b is:

CBSE 2025

A 2

B $\frac{1}{2}$

C -2

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

α $1/\alpha$

$a = a$
$b = b$
$c = \frac{2a}{b}$

$P = \frac{c}{a}$

$\cancel{\alpha} \cdot \frac{1}{\cancel{\alpha}} = \frac{2a/b}{a/1}$

$1 = \frac{2\cancel{a}}{\cancel{a}b}$

$1 = \frac{2}{b}$

$b = 2$

#GPU

#Q. If α and β are the zeros of the polynomial $f(x) = x^2 - 5x + k$ such that $\alpha - \beta = 1$, find the value of k.

#GPU

#Q. If α and β are the zeros of the quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$, find a quadratic polynomial having α and β as its zeros.

#Q. If α, β are the zeros of the polynomial $f(x) = x^2 - p(x+1) - c$.
Such that $(\alpha+1)(\beta+1) = 0$ then $c =$

(A) 1
(B) 0
(C) −1
(D) 2

$$(\alpha+1)(\beta+1) = 0$$
$$\alpha\beta + \alpha + \beta + 1 = 0$$
$$-p - c + p + 1 = 0$$
$$-c + 1 = 0$$
$$-c = -1$$
$$\boxed{c = 1}$$
// Ans //

$$x^2 - p(x+1) - c$$
$$x^2 - px - p - c$$
$$\boxed{a = 1,\ b = -p,\ c = -p - c.}$$

$$\alpha + \beta = -\frac{b}{a} \qquad \alpha\beta = \frac{c}{a}$$
$$\alpha + \beta = -\frac{-p}{1} \qquad \alpha\beta = \frac{-p-c}{1}$$
$$\boxed{\alpha + \beta = p} \qquad \boxed{\alpha\beta = -p-c}$$

#Q. Figure shows the path of a diver, when she takes a jump from the diving board. Clearly, it is a parabola. Annie was standing on a diving board, 48 feet above the water level. She took a dive into the pool. Her height (in feet) above the water level at any time 't' in seconds is given by the polynomial h(t) such that h(t) = - $16t^2 + 8t + k$.

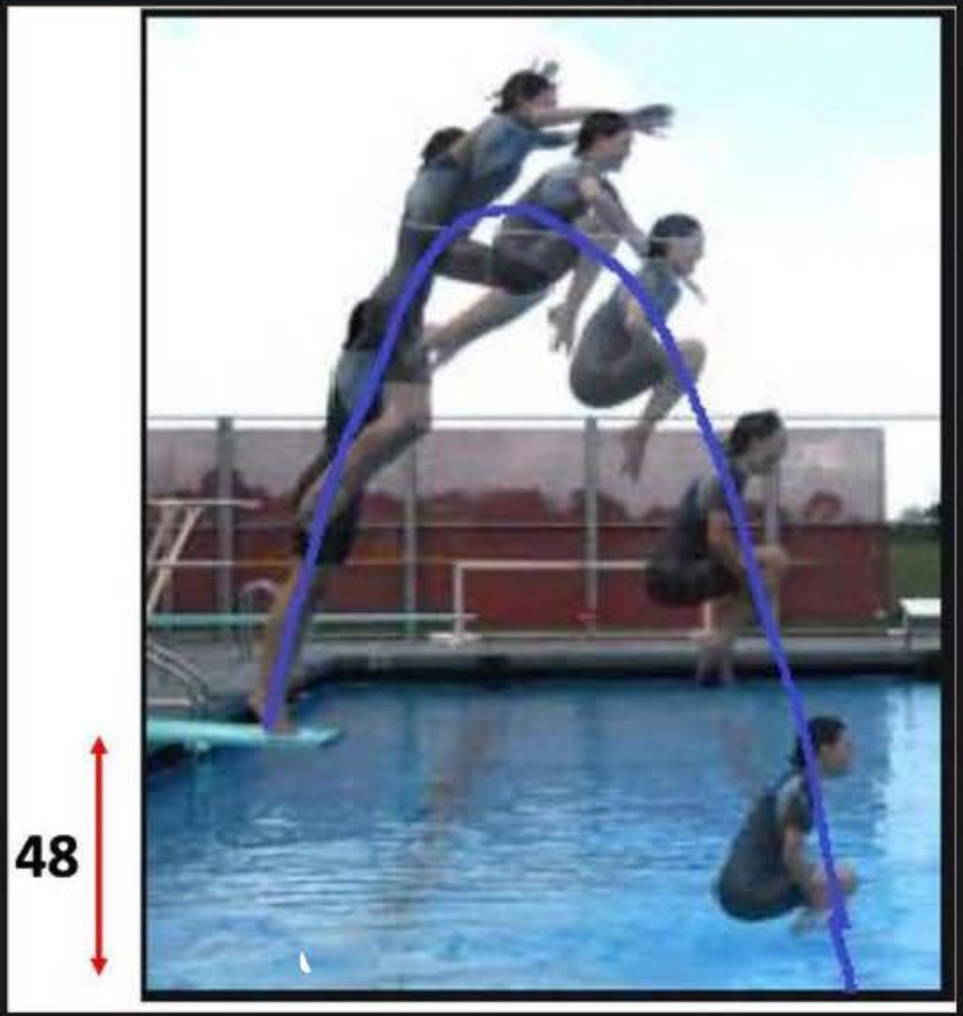
$\boxed{h(t) = -16t^2 + 8t + k}$

At $t = 0$, $h = 48$ feet

$h(0) = -16(0)^2 + 8(0) + k$

$h(0) = k$

$h(0) = 48$



Continue...

Based on the above, answer the following questions.

(i) What is the value of k?

(a) 0 (b) -48 (c) 48 (d) 48/- 16

$k(x^2 - Sx + P)$

$k(x^2 - x - 2)$

$S = 1$
$P = -2$

(ii) At what time will she touch the water in the pool?

(a) 30 seconds (b) 2 seconds (c) 1.5 seconds (d) 0.5 seconds

(iii) Rita's height (in feet) above water level is given by another polynomial p(t) with zeroes -1 and 2. Then, p(t) is given by

(a) $t^2 + t - 2$ (b) $t^2 + 2t - 1$ (c) $24t^2 - 24t + 48$ (d) $-24t^2 + 24t + 48$

$-24(t^2 - t - 2)$

$h(t) = -16t^2 + 8t + 48$

$0 = -16t^2 + 8t + 48$

$0 = -8[2t^2 - t - 6]$

$\boxed{0 = 2t^2 - t - 6}$

$2t^2 - t - 6 = 0$

$S = -1, P = -12$

$-4, 3$

$2t^2 - 4t + 3t - 6 = 0$

$2t(t-2) + 3(t-2) = 0$

$(2t+3)(t-2) = 0$

$2t + 3 = 0, \quad t - 2 = 0$

$t = -3/2, \quad t = 2$

#Q. In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after t seconds is given by $h = 20t - 16t^2$.

CBSE 2023

speed = 20cm per second

$\boxed{20cm = 1 second}$

$h = 20t - 16t^2$

Continue...

Based on the above, answer the following questions.

(i) Find zeroes of polynomial p(t) = 20t - 16t²

$20t - 16t^2 = 0$

$4t[5 - 4t] = 0$

$4t = 0$, $5 - 4t = 0$

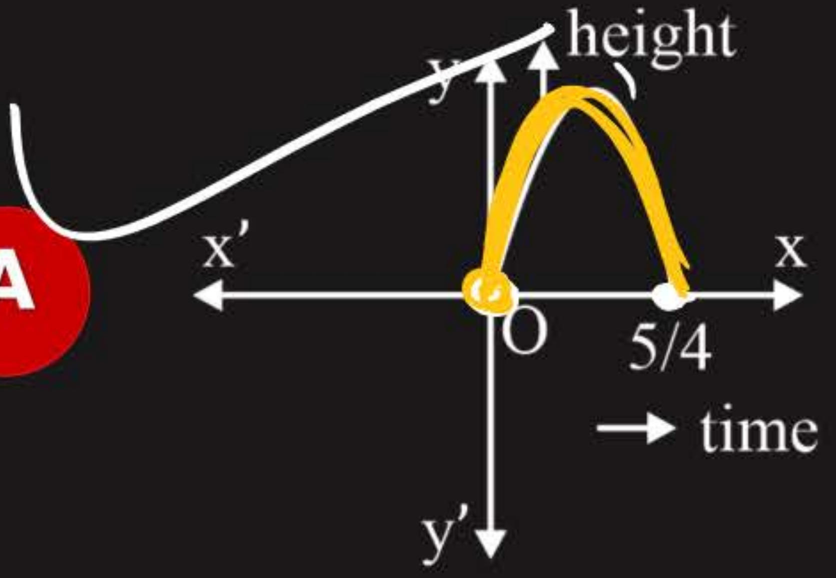
$\boxed{t = 0}$

$5 = 4t$

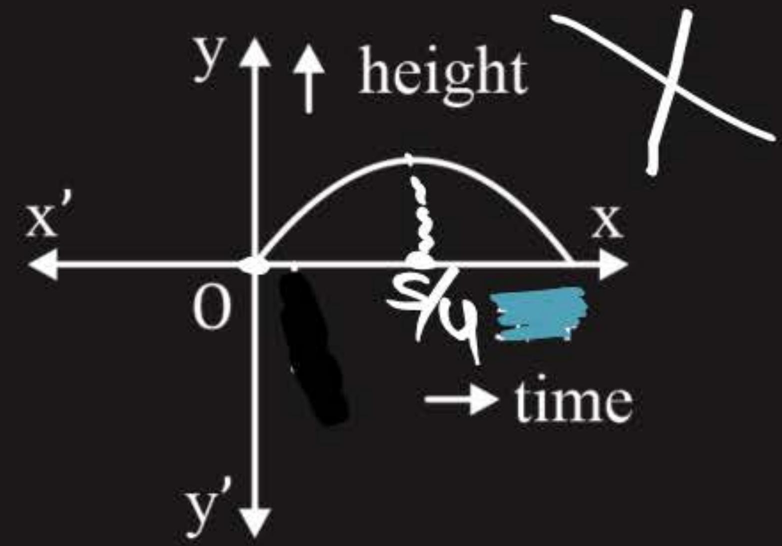
$\boxed{\frac{5}{4} = t}$

(ii) Which of the following type of graph represents p(t) ?

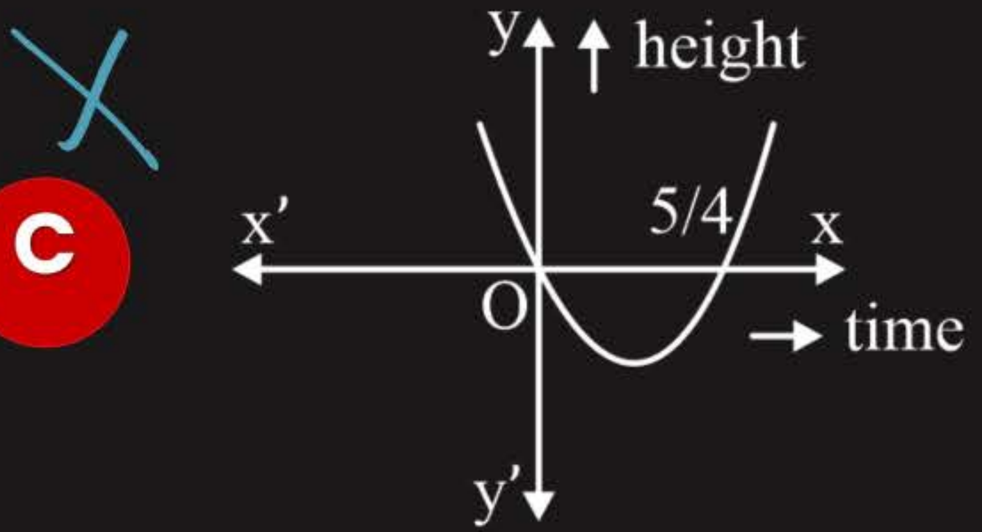
A



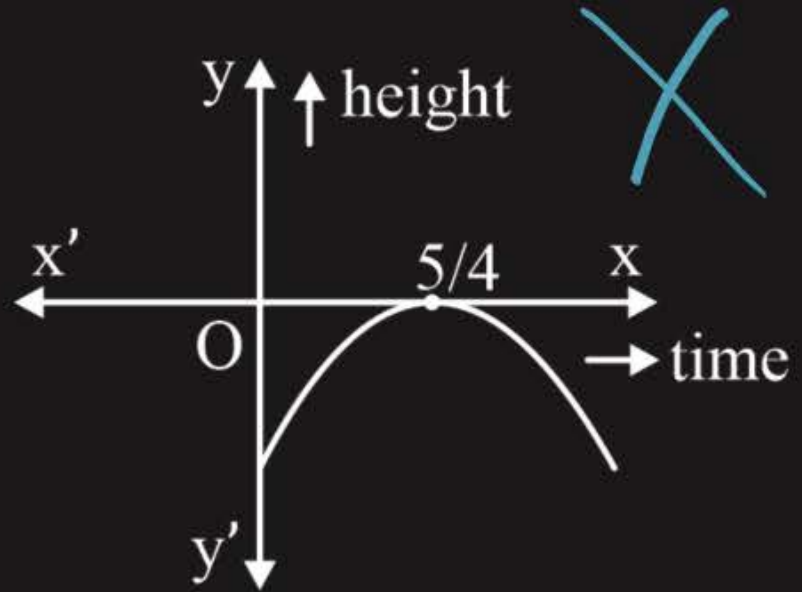
B



C



D



Continue...

Based on the above, answer the following questions.

(iii) What would be the value of h at $t = \frac{3}{2}$? Interpret the result.

(iv) How much distance has the dolphin covered before hitting the water level again?

(iii) $h = 20t - 16t^2$

$t = 3/2$

$h = \cancel{20}^{10}\left(\frac{3}{\cancel{2}}\right) - 16\left(\frac{3}{2}\right)^2$

$= 30 - \cancel{16}^{4}\frac{9}{\cancel{4}}$

$h = 30 - 36$

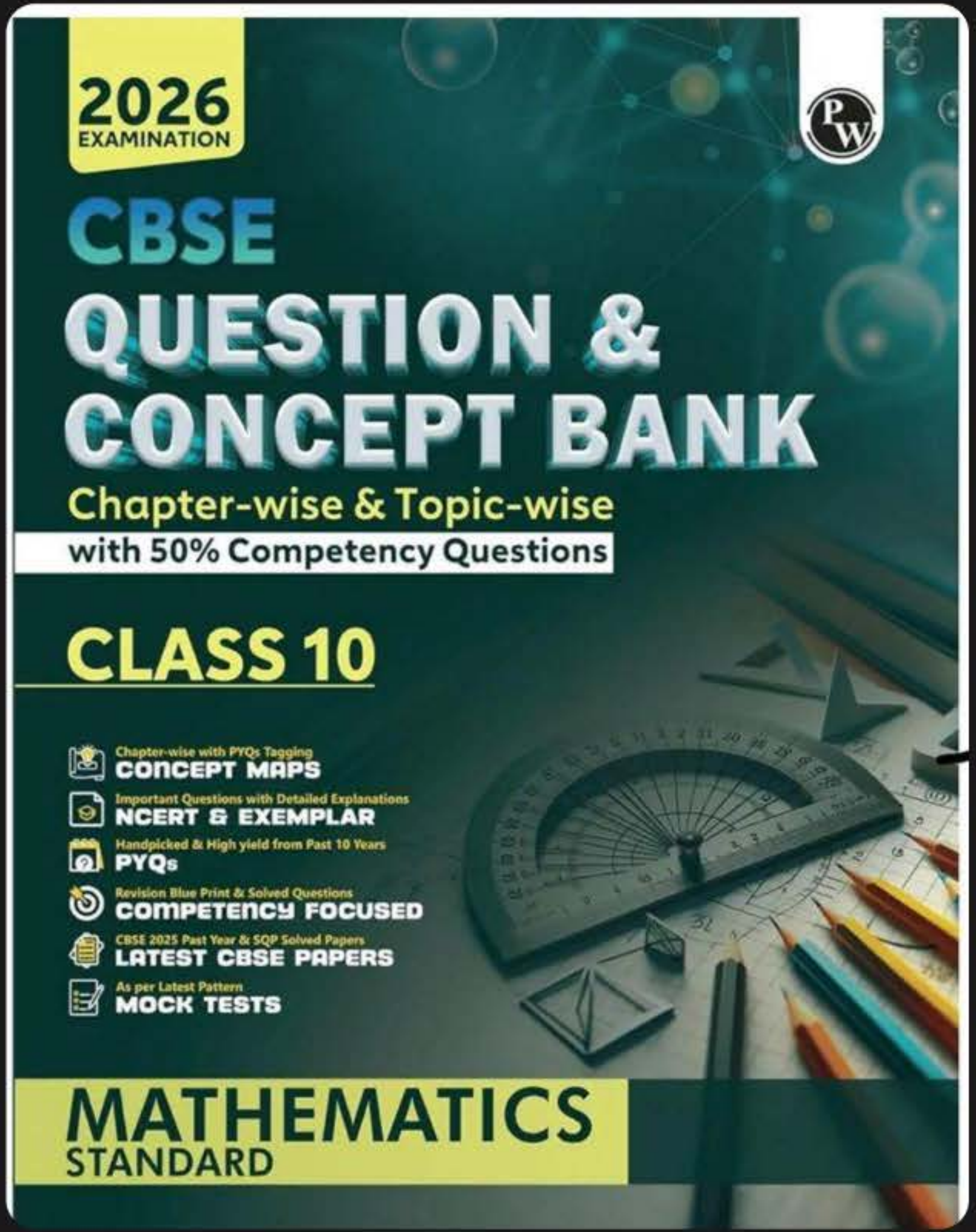
$h = -6\text{cm}$

– sign tells that dolphin is under the water.

(iv) 1 second = 20cm

$\frac{5}{4}\,s = \frac{5}{\cancel{4}} \times \cancel{20}^{5}\text{ cm}$

$\boxed{\frac{5}{4}\,s = 25\text{cm}}$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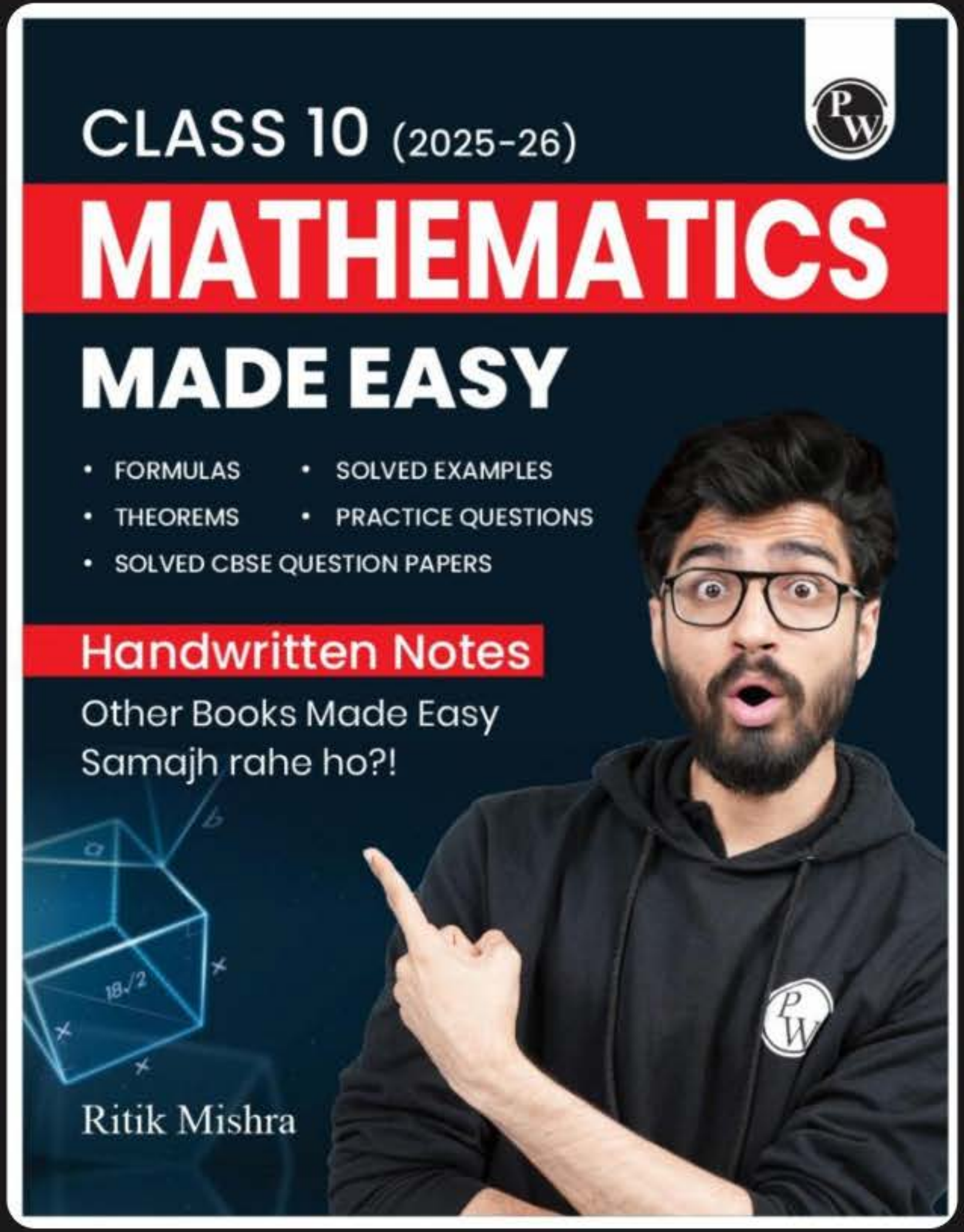
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Thank You