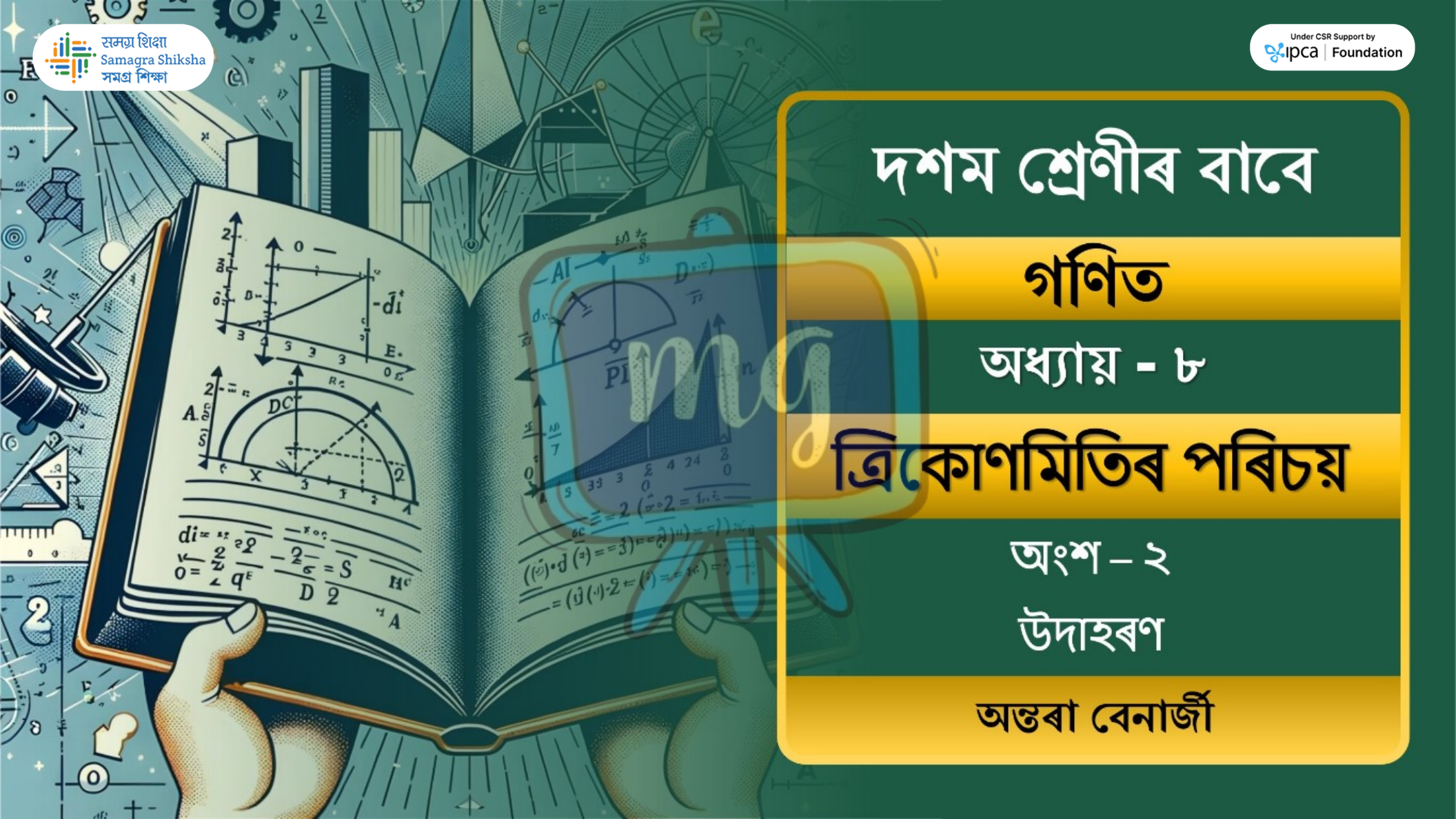

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দশম শ্রেণীৰ বাবে

গণিত

অধ্যায় - ৮

ত্রিকোণমিতিৰ পৰিচয়

অংশ – ২

উদাহৰণ

অন্তৰা বেনার্জী

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উদাহৰণ - 1

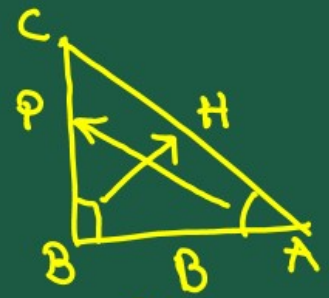
যদি $\tan A = \frac{4}{3}$ তেন্তে A কোণৰ আন ত্ৰিকোণমিতিক অনুপাতবোৰ উলিওৱা।

দিয়া আছে $\tan A = \frac{4}{3}$

$\Rightarrow \frac{BC}{AB} = \frac{4}{3}$

ধৰা হ'ল $\frac{BC}{AB} = \frac{4}{3} = k$, k এটা ধনাত্মক সংখ্যা

$\Rightarrow BC = 4k$, $AB = 3k$



$\tan\theta = \frac{P}{B}$

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পাইথাগোরাস উপপাদ্য প্রয়োগ করি পাই -

$$H^2 = B^2 + P^2$$

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow AC = \sqrt{AB^2 + BC^2}$$

$$= \sqrt{(3k)^2 + (4k)^2}$$

$$= \sqrt{9k^2 + 16k^2}$$

$$= \sqrt{25k^2} = 5k$$

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$$\sin A = \left(\frac{P}{H}\right) = \frac{BC}{AC} = \frac{4k}{5k} = \frac{4}{5}$$

$$\cos A = \left(\frac{B}{H}\right) = \frac{AB}{AC} = \frac{3k}{5k} = \frac{3}{5}$$

$$\operatorname{cosec} A = \frac{1}{\sin A} = \frac{5}{4}$$

$$\sec A = \frac{1}{\cos A} = \frac{5}{3}$$

$$\cot A = \frac{1}{\tan A} = \frac{3}{4}$$

$H = 5k$

$P = 4k$

$B = 3k$

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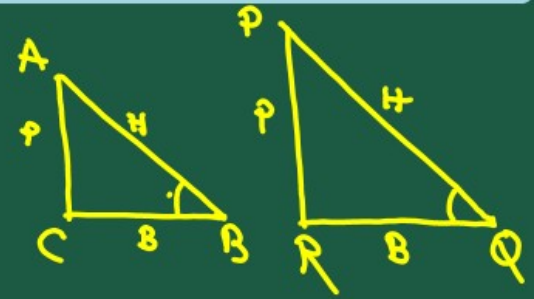
উদাহৰণ - 2

যদি $\angle B$ আৰু $\angle Q$ সূক্ষ্ম কোণ দুটা এনে ধৰণৰ যে $\sin B = \sin Q$, তেন্তে প্ৰমাণ কৰা যে $\angle B = \angle Q$.

$\sin B = \frac{AC}{AB}$, $\sin Q = \frac{PR}{PQ}$



দিয়া আছে, $\sin B = \sin Q$

$\Rightarrow \frac{AC}{AB} = \frac{PR}{PQ}$

ধৰা হ'ল $\frac{AC}{AB} = \frac{PR}{PQ} = k$, k এটা ধনাত্মক সংখ্যা,

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$$\frac{BC}{QR} = \frac{\sqrt{AB^2 - AC^2}}{\sqrt{PQ^2 - PR^2}}$$

$$= \frac{\sqrt{(kPQ)^2 - (kPR)^2}}{\sqrt{PQ^2 - PR^2}}$$

$$= \frac{\sqrt{k^2(PQ^2 - PR^2)}}{\sqrt{(PQ^2 - PR^2)}}$$

$$= k \quad \text{— (ii)}$$

(i) আর (ii) র পাই,

$$\frac{AC}{AB} = \frac{PR}{PQ} = \frac{BC}{QR}$$

$$\Rightarrow \frac{AC}{PR} = \frac{AB}{PQ} = \frac{BC}{QR}$$

অতিভুজ^2 = ভূমি^{2} + লম্ব^2

$\Rightarrow$ অতিভুজ^2 − লম্ব^2 = ভূমি^{2}

$\Rightarrow \sqrt{\text{অতিভুজ}^2 - \text{লম্ব}^2}$ = ভূমি

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$\triangle ABC \sim \triangle PQR$

$\Rightarrow \angle B = \angle Q$



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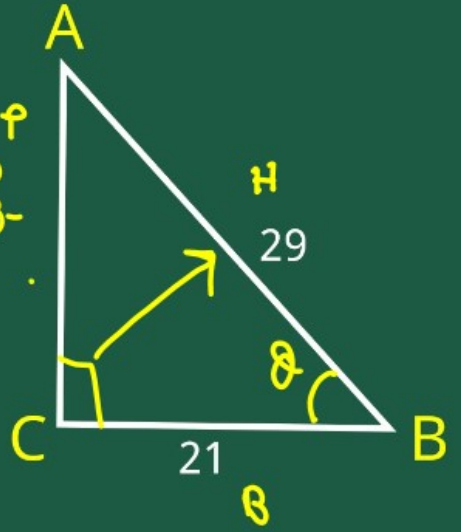
উদাহৰণ - 3

ধৰাহ'ল ΔACB ৰ C কোণ সমকোণ আৰু AB = 29 একক, BC = 21 একক আৰু $\angle ABC = \theta$ (চিত্ৰ 8.10 চোৱা)।

(i) $\cos^2\theta + \sin^2\theta$



পাইথাগোৰাছ উপপাদ্য ব্যৱহাৰ কৰি পাওঁ-

$AB^2 = BC^2 + AC^2$

$\Rightarrow AC^2 = AB^2 - BC^2$

$\Rightarrow AC = \sqrt{AB^2 - BC^2}$

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$$AC = \sqrt{29^2 - 21^2}$$

$$= \sqrt{841 - 441}$$

$$= \sqrt{400}$$

$$= 20$$

$29 \times 29 = 841$

$21 \times 21 = 441$

(i) $\cos^2\theta + \sin^2\theta$

$$= \left(\frac{21}{29}\right)^2 + \left(\frac{20}{29}\right)^2$$

$$= \frac{441}{841} + \frac{400}{841} = \frac{441+400}{841} = \frac{841}{841} = 1$$

$\cos\theta = \frac{B}{H}$

$\sin\theta = \frac{P}{H}$

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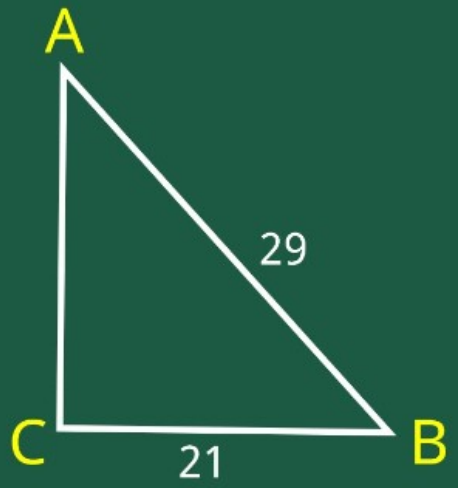
(ii) $\cos^2\theta - \sin^2\theta$

$$= \left(\frac{21}{29}\right)^2 - \left(\frac{20}{29}\right)^2$$

$$= \frac{441}{841} - \frac{400}{841}$$

$$= \frac{441 - 400}{841}$$

$$= \frac{41}{841}$$



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উদাহৰণ - 4

ABC ত্ৰিভুজৰ যদি B কোণ সমকোণ আৰু tanA = 1, তেন্তে দেখুওৱা যে 2sinA cosA = 1.

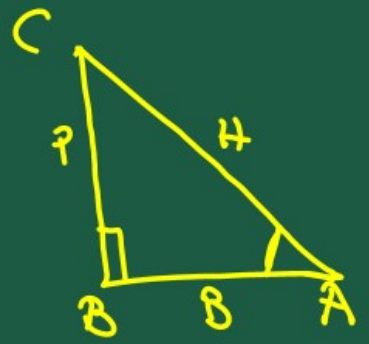
$\tan A = 1$.

$\Rightarrow \frac{BC}{AB} = 1 = k$ (ধৰা হ'ল).

$\Rightarrow BC = AB = k$

$AC = \sqrt{AB^2 + BC^2} = \sqrt{k^2 + k^2} = \sqrt{2k^2}$

$= k\sqrt{2}$



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$$2 \sin A \cdot \cos A$$

$$= 2 \frac{BC}{AC} \cdot \frac{AB}{AC}$$

$$= 2 \cdot \frac{K}{K\sqrt{2}} \cdot \frac{K}{K\sqrt{2}}$$

$$= \frac{2}{2}$$

$$= 1.$$

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উদাহৰণ - 5

ΔOPQ ৰ P সমকোণ আৰু $OP = 7cm$ আৰু $OQ - PQ = 1cm$ (চিত্ৰ চোৱা)। $\sin Q$ আৰু $\cos Q$ ৰ মান নিৰ্ণয় কৰা।

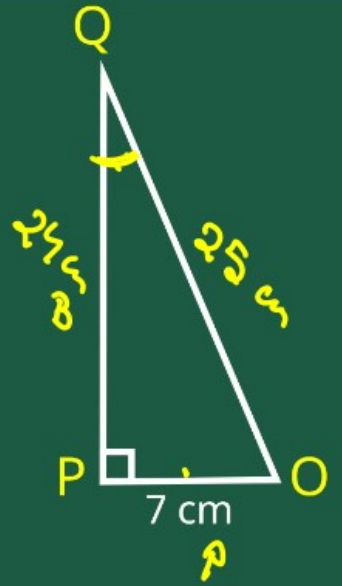
দিয়া আছে, $OP = 7$ cm

$OQ - PQ = 1$ cm

$\Rightarrow OQ = (1 + PQ)$ cm

পাইথাগোৰাছ উপপাদ্য প্ৰয়োগ কৰিলে

$OQ^2 = OP^2 + PQ^2$



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$$(1+PQ)^2 = 7^2 + PQ^2$$

$$\Rightarrow 1 + 2PQ + PQ^2 = 7^2 + PQ^2$$

$$\Rightarrow 1 + 2PQ = 49$$

$$\Rightarrow 2PQ = 49 - 1$$

$$\Rightarrow 2PQ = 48$$

$$\Rightarrow PQ = \frac{48}{2} = 24 \text{ cm}$$

$$\therefore OQ = 1 + PQ = 25 \text{ cm}$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

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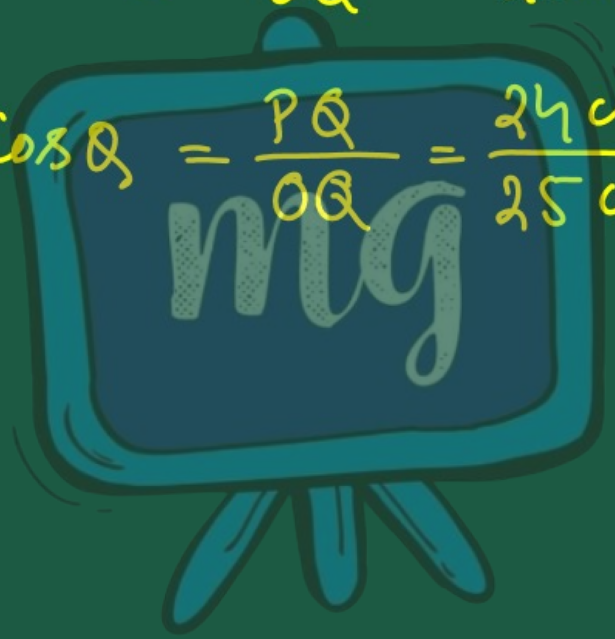
$$\sin Q = \frac{OP}{OQ} = \frac{7\,cm}{25\,cm} = \frac{7}{25}$$

$$\cos Q = \frac{PQ}{OQ} = \frac{24\,cm}{25\,cm} = \frac{24}{25}$$



মূল্যায়ন



1 যদি **sin**A = x আৰু **sec**A =y তেন্তে tanA = ?

A xy

B $\frac{x}{y}$

C $\frac{1}{xy}$

D $\frac{y}{x}$

$\tan A = \frac{\sin A}{\cos A}$

$= \frac{\sin A}{\frac{1}{\sec A}}$

$= \sin A \cdot \sec A$

$= x \cdot y$

$= xy$

মূল্যায়ন

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2 যদি $\cot x = \frac{2}{3}$, তবে $\frac{\sin x - \cos x}{\sin x + \cos x} = ?$

A 5

B $\frac{1}{5}$

C $\frac{1}{\sqrt{5}}$

D $\sqrt{5}$

$$\frac{\sin x - \cos x}{\sin x + \cos x}$$

$$= \frac{\frac{\sin x}{\sin x} - \frac{\cos x}{\sin x}}{\frac{\sin x}{\sin x} + \frac{\cos x}{\sin x}}$$

$$= \frac{1 - \cot x}{1 + \cot x}$$

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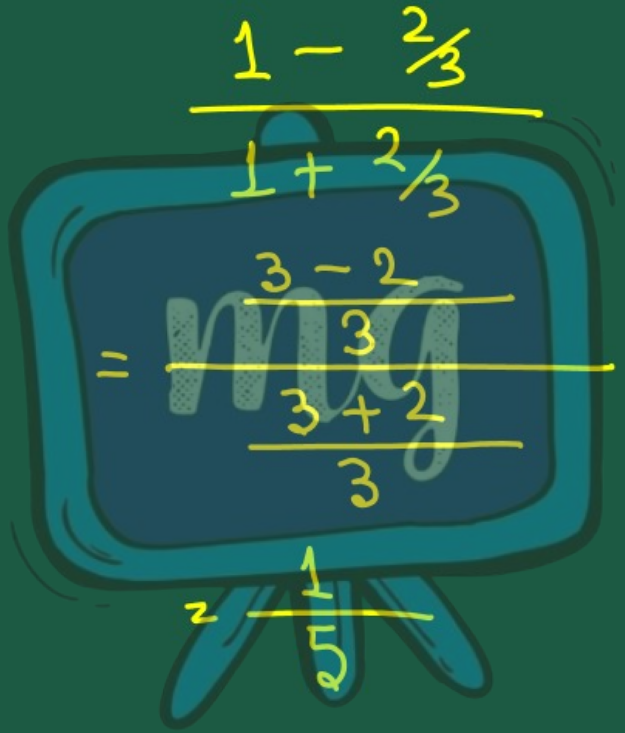

মূল্যায়ন



3 যদি $\cos A = \frac{3}{5}$, তবে $\tan A = ?$

A $\frac{3}{4}$

B $\frac{2}{\sqrt{3}}$

C $\frac{4}{3}$

D $\frac{\sqrt{2}}{\sqrt{3}}$

$\cos A = \frac{3}{5}$

$\Rightarrow \frac{B}{H} = \frac{3}{5}$

$\tan A = \frac{P}{B}$ $\quad P = \sqrt{H^2 - B^2}$

$= \frac{4k}{3k}$ $\quad = \sqrt{25k^2 - 9k^2}$

$= \sqrt{16k^2} = 4k$

$B = 3k,\ H = 5k$