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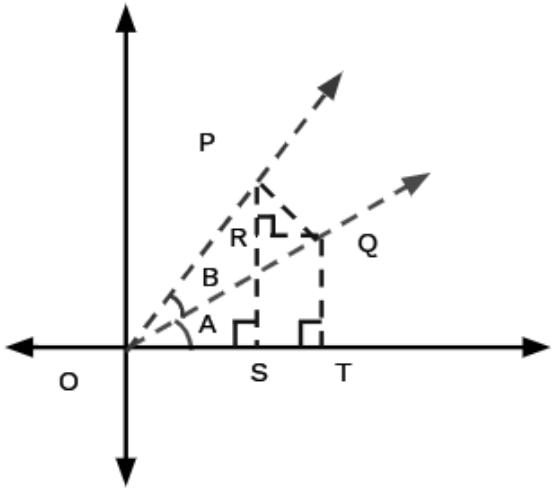
Compound Angles

Trigonometry 5



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Sameer Chincholikar

B.Tech, M.Tech - IIT-Roorkee

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- Taught **1 Million+** Students
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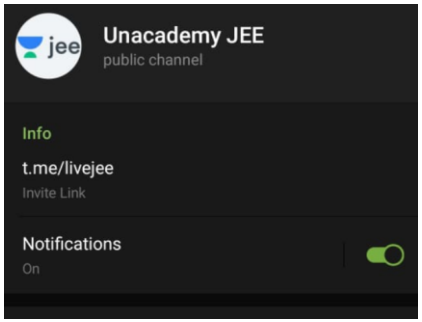

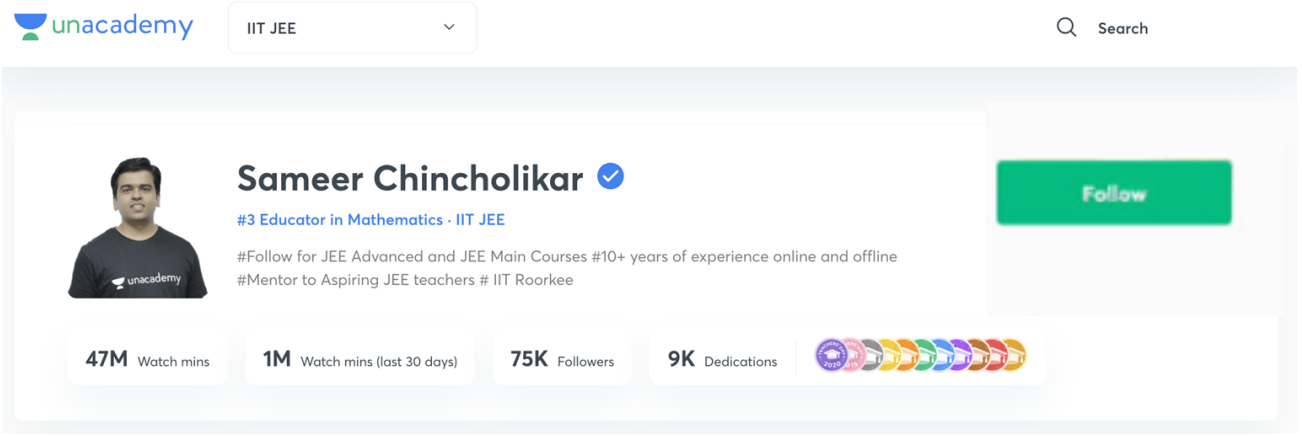

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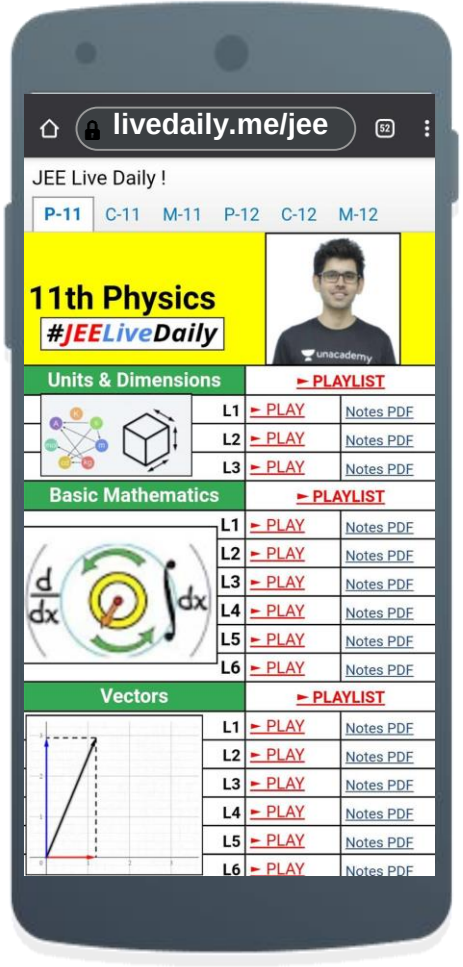

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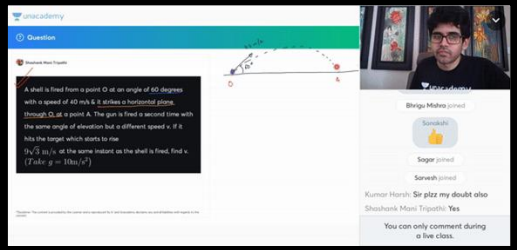

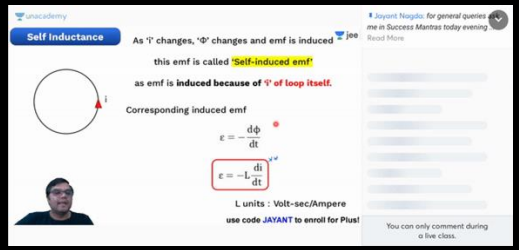

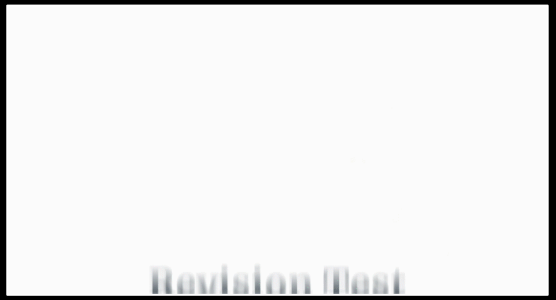

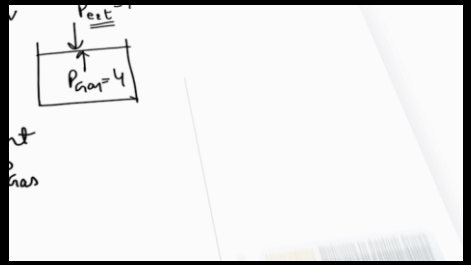

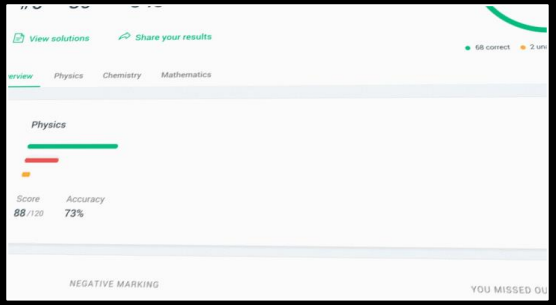

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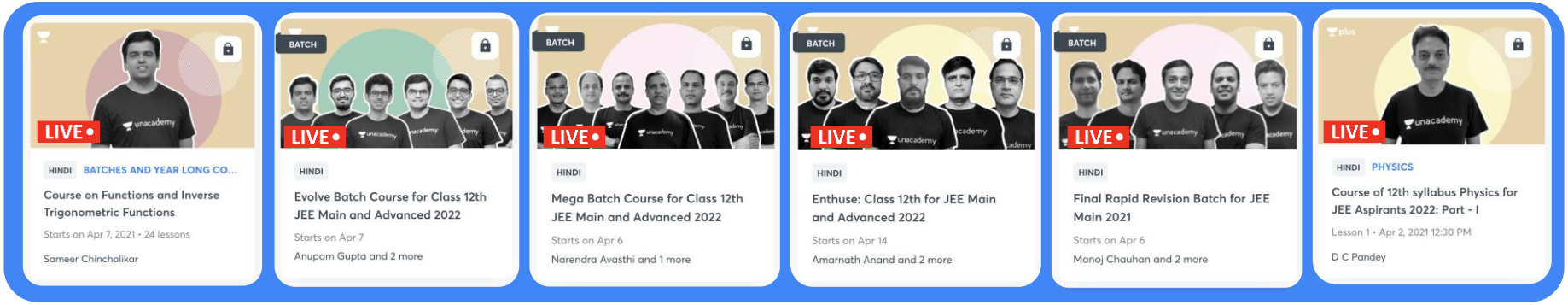

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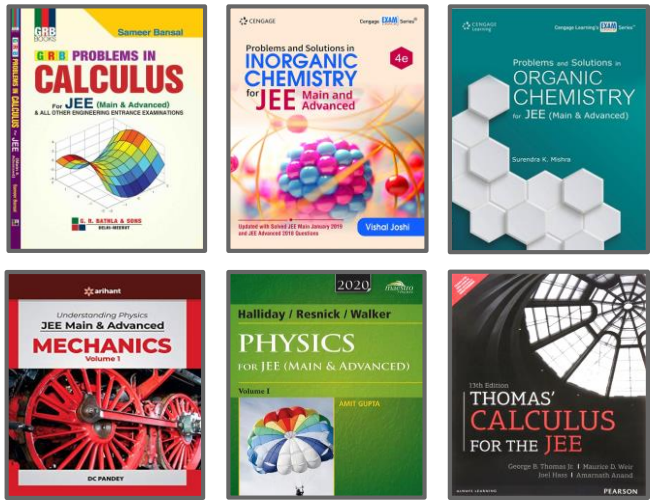

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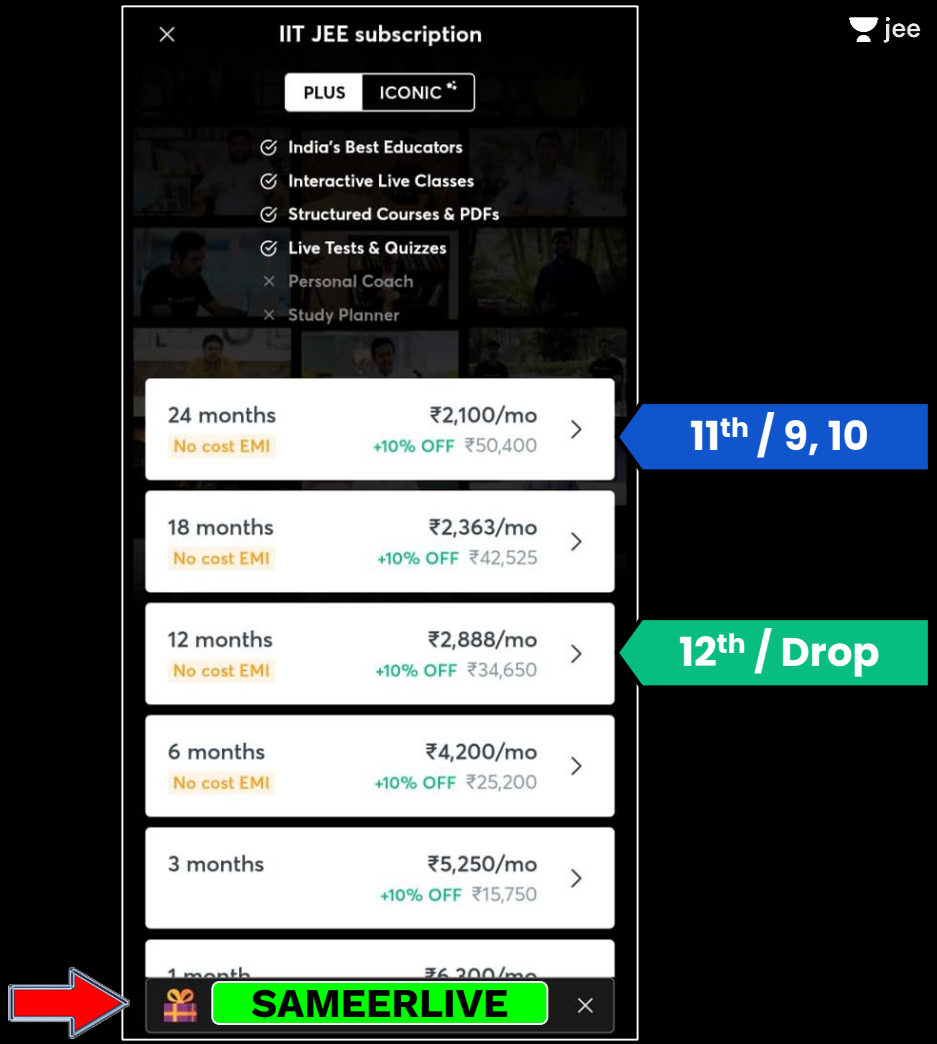
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6 months
No cost EMI
₹4,200/mo
+10% OFF ₹25,200
3 months
₹5,250/mo
+10% OFF ₹15,750
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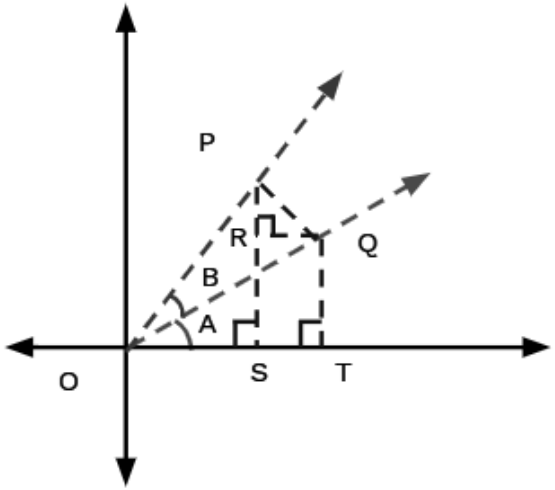
Compound Angles

Trigonometry 5



If $\tan\theta = \frac{3}{4}$ and θ is not in the 1st Quadrant, then the find the value of

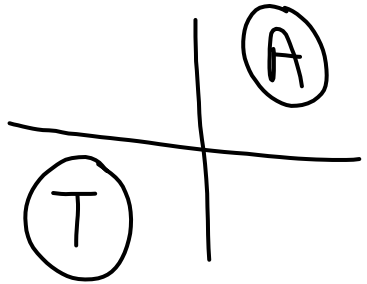
$$\frac{\sin(90^0+\theta) - \cot(180^0-\theta)}{\tan(270^0-\theta) - \cos(270^0+\theta)}$$

$$\frac{(+\cos\theta) - (-\cot\theta)}{(+\cot\theta) - (+\sin\theta)}$$

$$\left(\frac{\cos\theta + \cot\theta}{\cot\theta - \sin\theta}\right) \quad -(1)$$

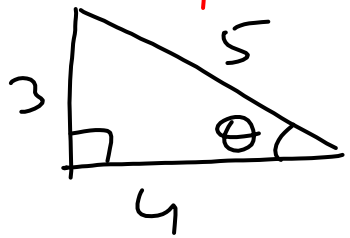
Now.

$\tan\theta = \frac{3}{4}$ (+ve)



$\Rightarrow$ (θ lies in 3rd Quad)

$\tan\theta = \frac{3}{4}$



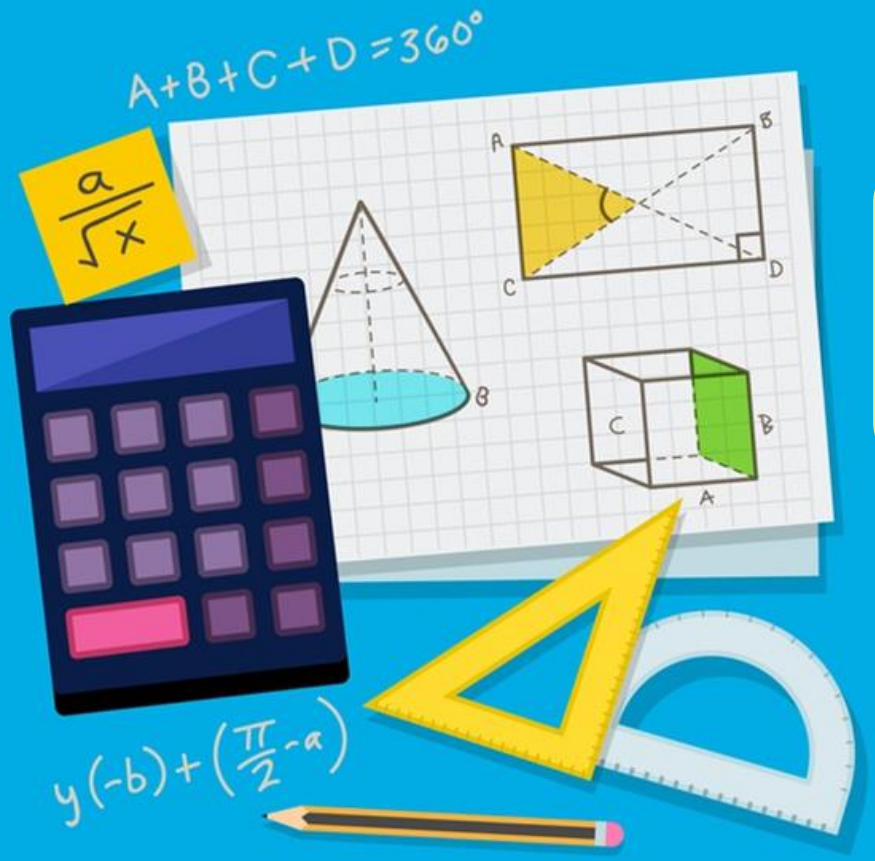
$\sin\theta = -\frac{3}{5}$

$\cos\theta = -\frac{4}{5}$

Use in Exp ①:

$$\frac{-\frac{4}{5} + \frac{4}{3}}{\frac{4}{3} - \left(-\frac{3}{5}\right)}$$

$$= \frac{-12 + 20}{20 + 9} = 8/29$$



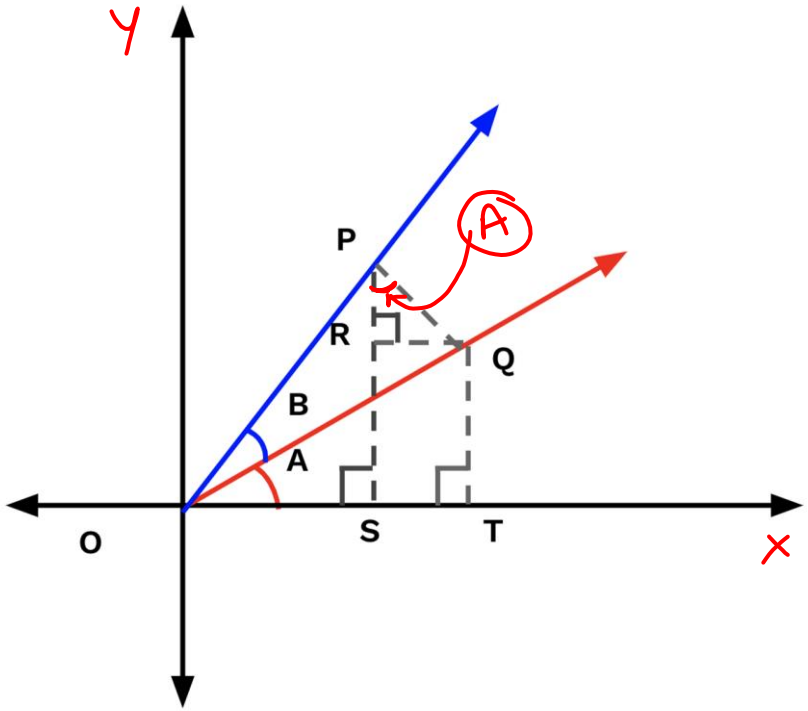
Compound Angle Formulae

How much is sin75°?

$$\sin(45^\circ + 30^\circ)$$

$$\sin(A + B) = ?$$

1. sin(A+B)



$$\sin(A+B) = \frac{PS}{OP}$$

$$= \frac{PR+RS}{OP}$$

$$= \frac{PR+QT}{OP}$$

$$= \frac{PR}{OP}\times\frac{PQ}{PQ} + \frac{QT}{OP}\times\frac{OQ}{OQ}$$

$$= (\cos A)(\sin B) + (\sin A)(\cos B)$$

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① $\sin(A+B) = \sin A \cos B + \cos A \sin B$

2. sin(A-B)

$$\begin{cases} \cos(-\theta) = \cos\theta \\ \sin(-\theta) = -\sin\theta \end{cases}$$

$$= \sin(A + (-B))$$

$$= \sin(A)\cos(-B) + \cos A \sin(-B)$$

$$= \boxed{\sin A \cos B - \cos A \sin B}$$

3. cos(A+B)

$$\sin\left(\frac{\pi}{2}-\theta\right)=\cos\theta$$

$$\cos\left(\frac{\pi}{2}-\theta\right)=\sin\theta$$

$$\sin\left(\frac{\pi}{2}-(A+B)\right)$$

$$\sin\left(\left(\frac{\pi}{2}-A\right)-B\right)$$

$$=\sin\left(\frac{\pi}{2}-A\right)\cos B-\cos\left(\frac{\pi}{2}-A\right)\sin B$$

$$=\boxed{\cos A\cos B-\sin A\sin B}$$

4. cos(A-B)

$$\cos(A-B)$$

$$= \cos(A+(-B))$$

$$= \cos A \cos(-B) - \sin A \sin(-B)$$

$$= \boxed{\cos A \cos B + \sin A \sin B}$$

5. tan(A+B)

$$\tan(A+B) = \frac{\sin(A+B)}{\cos(A+B)}$$

$$= \frac{\sin A \cos B + \cos A \sin B}{\cos A \cos B - \sin A \sin B}$$

$$= \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

6. tan(A-B)

$$= \tan(A + (-B))$$

$$= \frac{\tan A + \tan(-B)}{1 - \tan A \tan(-B)}$$

$$= \boxed{\frac{\tan A - \tan B}{1 + \tan A \tan B}}$$

T-Ratios for 75°?

① $\sin(75^\circ) = \sin(45^\circ + 30^\circ)$

$= \sin 45^\circ \cos 30^\circ + \cos 45^\circ \sin 30^\circ$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \boxed{\frac{\sqrt{3}+1}{2\sqrt{2}}}$

② $\cos 75^\circ = \cos(45^\circ + 30^\circ)$

$= \cos 45^\circ \cos 30^\circ - \sin 45^\circ \sin 30^\circ$

$= \boxed{\frac{\sqrt{3}-1}{2\sqrt{2}}}$

③ $\tan 75^\circ$

$= \frac{\sqrt{3}+1}{\sqrt{3}-1}$

$= 2+\sqrt{3}$

T-Ratios for 15°?

① $\sin 15^\circ = \sin(45^\circ - 30^\circ)$

$\hookrightarrow \sin(90 - 75^\circ) = \cos 75^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$

② $\cos 15^\circ = \cos(90 - 75^\circ) = \sin 75^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$

③ $\tan 15^\circ = \frac{\sin 15^\circ}{\cos 15^\circ} = \frac{\sqrt{3}-1}{\sqrt{3}+1}$

$$\sin(\alpha+\beta)\cos(\alpha-\beta)+\cos(\alpha+\beta)\sin(\alpha-\beta)=$$

A. $\sin 2\beta$

B. $\sin 2\alpha$

C. $\cos 2\beta$

D. $\cos 2\alpha$

$$\begin{cases}\alpha+\beta=A\\ \alpha-\beta=B\end{cases}\longrightarrow (A+B)=2\alpha$$

$$\sin A\cos B+\cos A\sin B$$

$$=\sin(A+B)$$

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

A. $\tan\left(\frac{\pi}{4} + \theta\right)$ **B.** $\tan\left(\frac{\pi}{4} - \theta\right)$

C. $\cot\left(\frac{\pi}{4} + \theta\right)$ **D.** $\cot\left(\theta - \frac{\pi}{4}\right)$

$$\frac{1 + \tan\theta}{1 - \tan\theta}$$

$$= \frac{\tan\left(\frac{\pi}{4}\right) + \tan\theta}{1 - (\tan\theta)\left(\tan\frac{\pi}{4}\right)}$$

$$= \tan\left(\frac{\pi}{4} + \theta\right)$$

If $A + B = \frac{\pi}{4}$, Find the value of **(1 + tan A) (1 + tan B)**

A. 1 **B.** 2 **C.** -1 **D.** 0

$B = \left(\frac{\pi}{4} - A\right)$

Now:

$(1 + \tan A)(1 + \tan B)$

$(1 + \tan A)\left(1 + \tan\left(\frac{\pi}{4} - A\right)\right)$

$(1 + \tan A)\left(1 + \frac{1 - \tan A}{1 + \tan A}\right)$

$(1 + \tan A)\left(\frac{1 + \tan A + 1 - \tan A}{(1 + \tan A)}\right)$

$= 2$

M-2

$$A+B=\frac{\pi}{4}$$

$$\tan(A+B)=1$$

If **tan A + tan B = p,** and **cot A + cot B = q,** then cot (A + B) =

A. $\frac{p-q}{pq}$

B. $\frac{p+q}{pq}$

C. $\frac{q-p}{pq}$

D. None of these

$$\cot(A+B) = \frac{1}{\tan(A+B)}$$

$$= \frac{1-\tan A\tan B}{\tan A+\tan B}$$

Now:

$$\frac{1}{\tan A}+\frac{1}{\tan B}=q$$

$$\frac{(\tan A+\tan B)}{\tan A\tan B}=q$$

$$(\tan A\tan B)=\frac{p}{q}$$

$$\therefore \cot(A+B) = \frac{1 - p/q}{p}$$

$$= \frac{q-p}{pq}$$

If $\tan 70^0 = \tan 20^0 + K \tan 50^0$ then K is equal to:

A. 1 **B.** 2 **C.** 3 **D.** None

$70 = 20 + 50$

$\tan 70^\circ = \tan(20^\circ + 50^\circ)$

$\tan 70^\circ = \dfrac{\tan 20 + \tan 50}{1 - \tan 20 \tan 50}$

$\tan 70^\circ - \tan 20^\circ \tan 50 \tan 70^\circ = \tan 20 + \tan 50^\circ$

$\tan 70^\circ = \tan 20^\circ + 2\tan 50^\circ$

If $0 < \alpha, \beta < \frac{\pi}{4}$ such that $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, then the value of $\tan 2\alpha =$ $\tan(A+B)$

A. $\frac{56}{35}$ B. $\frac{35}{56}$ C. $\frac{56}{33}$ D. $\frac{65}{33}$

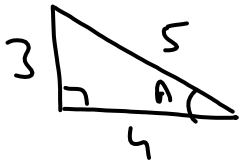
$\alpha + \beta = A$

$\alpha - \beta = B$

Add: $2\alpha = A + B$

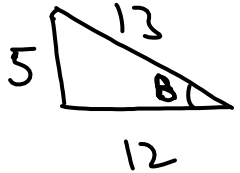
$\cos A = \frac{4}{5}$

$\sin B = \frac{5}{13}$



$\therefore \sin A = \frac{3}{5}$

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



$\therefore \cos B = \frac{12}{13}$

$\tan B = \frac{5}{12}$

$$\tan 2\alpha = \tan(A+B)$$

$$= \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$= \frac{3/4 + 5/12}{1 - \left(\frac{3}{4}\right)\left(\frac{5}{12}\right)}$$

$$= \frac{\frac{36+20}{48}}{\frac{48-15}{48}}$$

$$= \frac{56}{33}$$

In a triangle ABC, angle A is an obtuse angle such

$$\sin A = \frac{3}{5} \text{ and } \sin B = \frac{5}{13} \text{ then } \sin C =$$

HW

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Namo Sir | Physics

6:00 - 7:30 PM

Ashwani Sir | Chemistry

7:30 - 9:00 PM

Sameer Sir | Maths

9:00 - 10:30 PM

12th

Jayant Sir | Physics

1:30 - 3:00 PM

Anupam Sir | Chemistry

3:00 - 4:30 PM

Nishant Sir | Maths

4:30 - 6:00 PM

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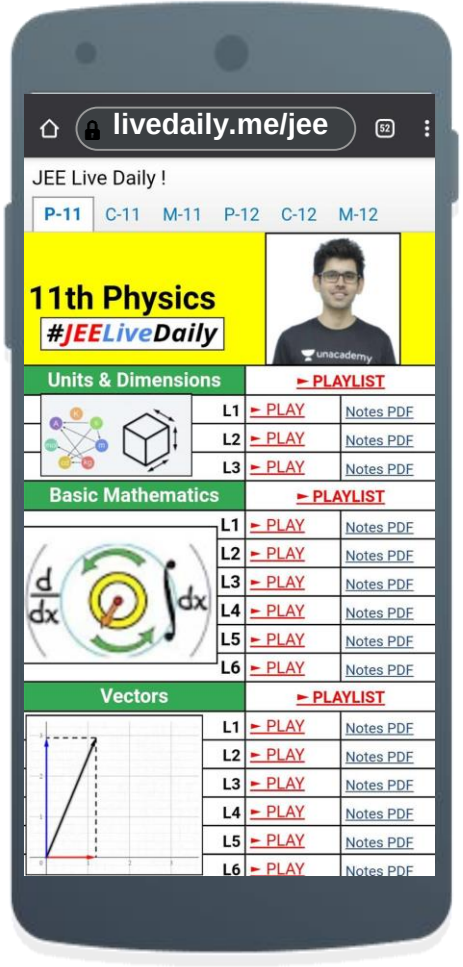

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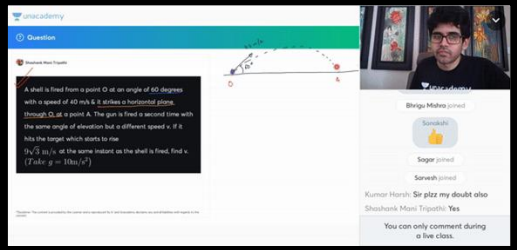

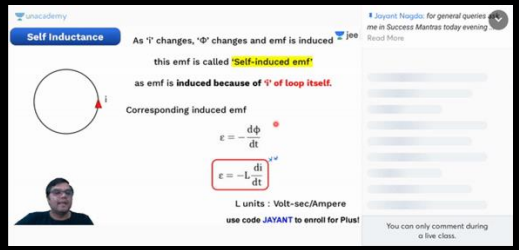

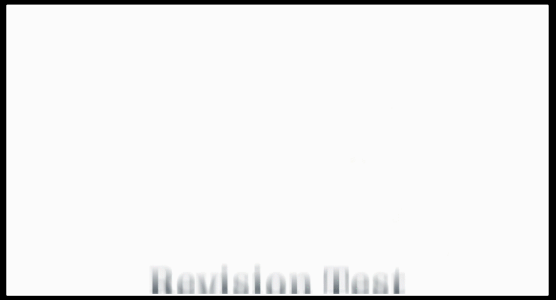

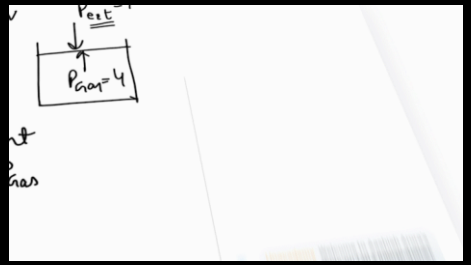

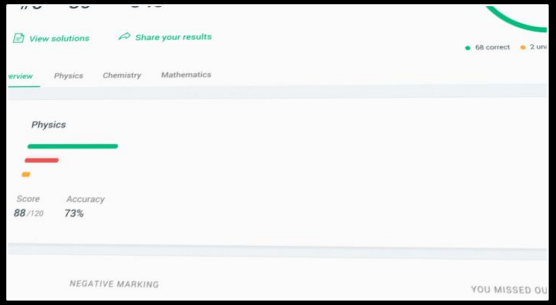

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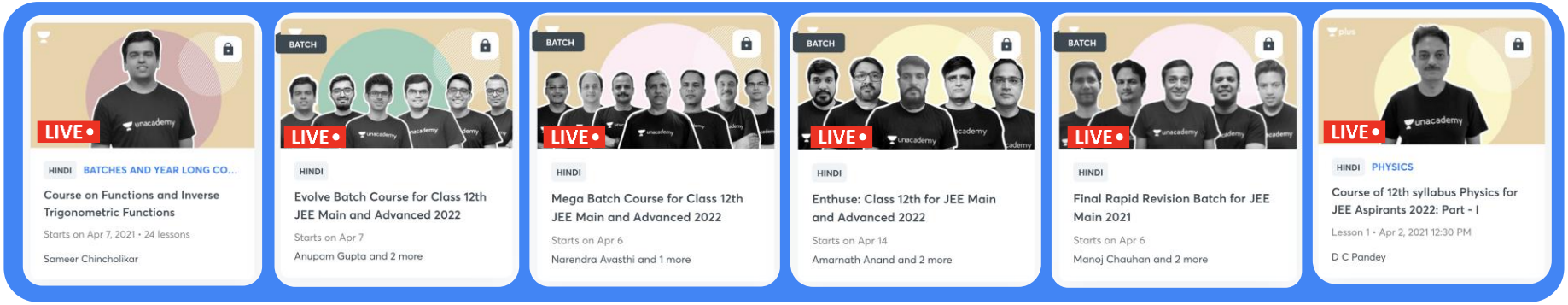

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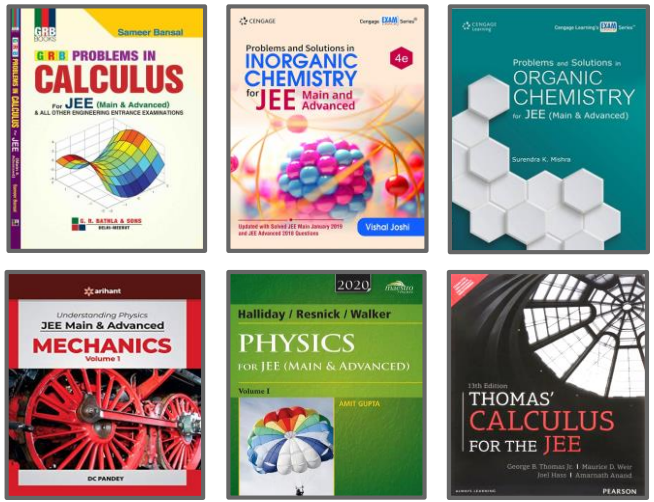

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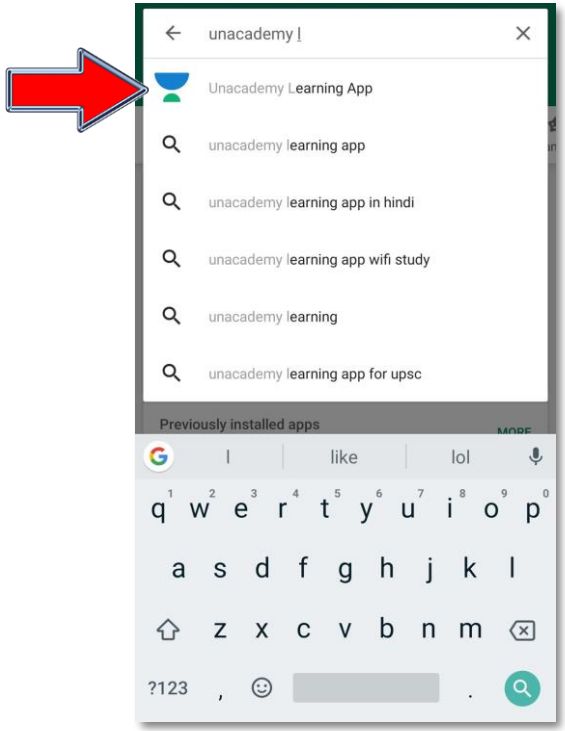

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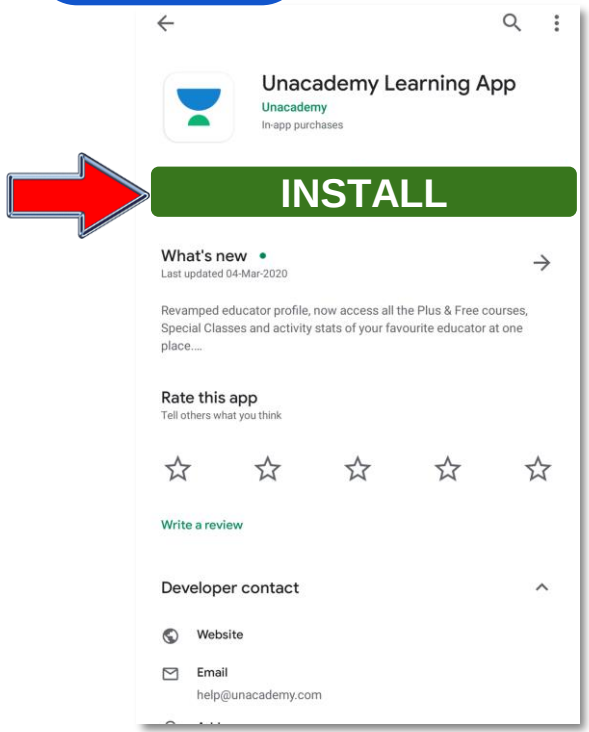

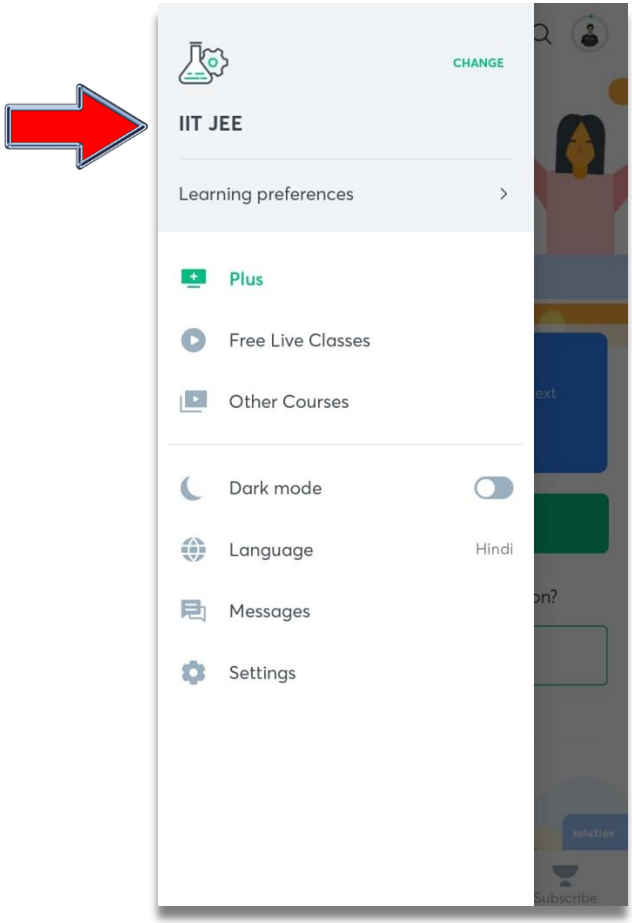
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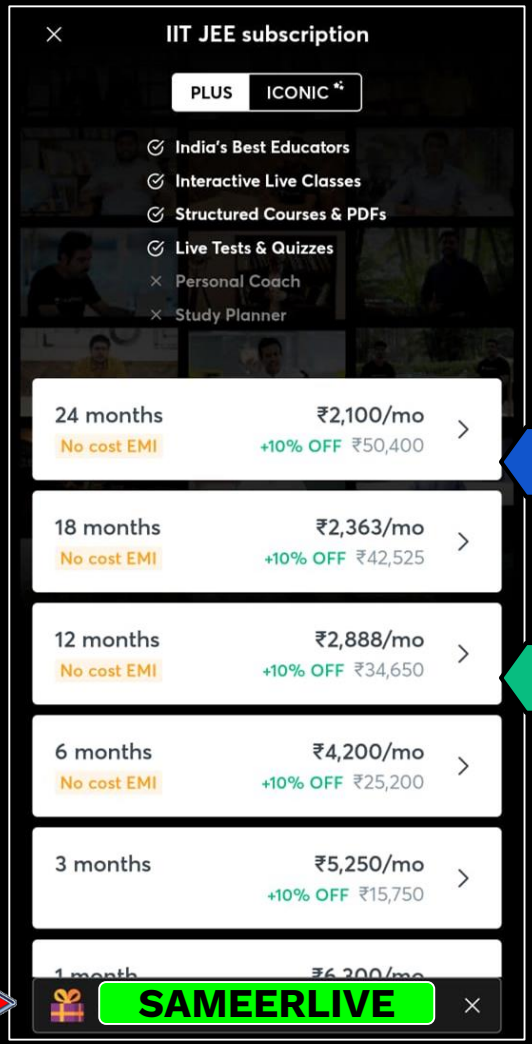

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