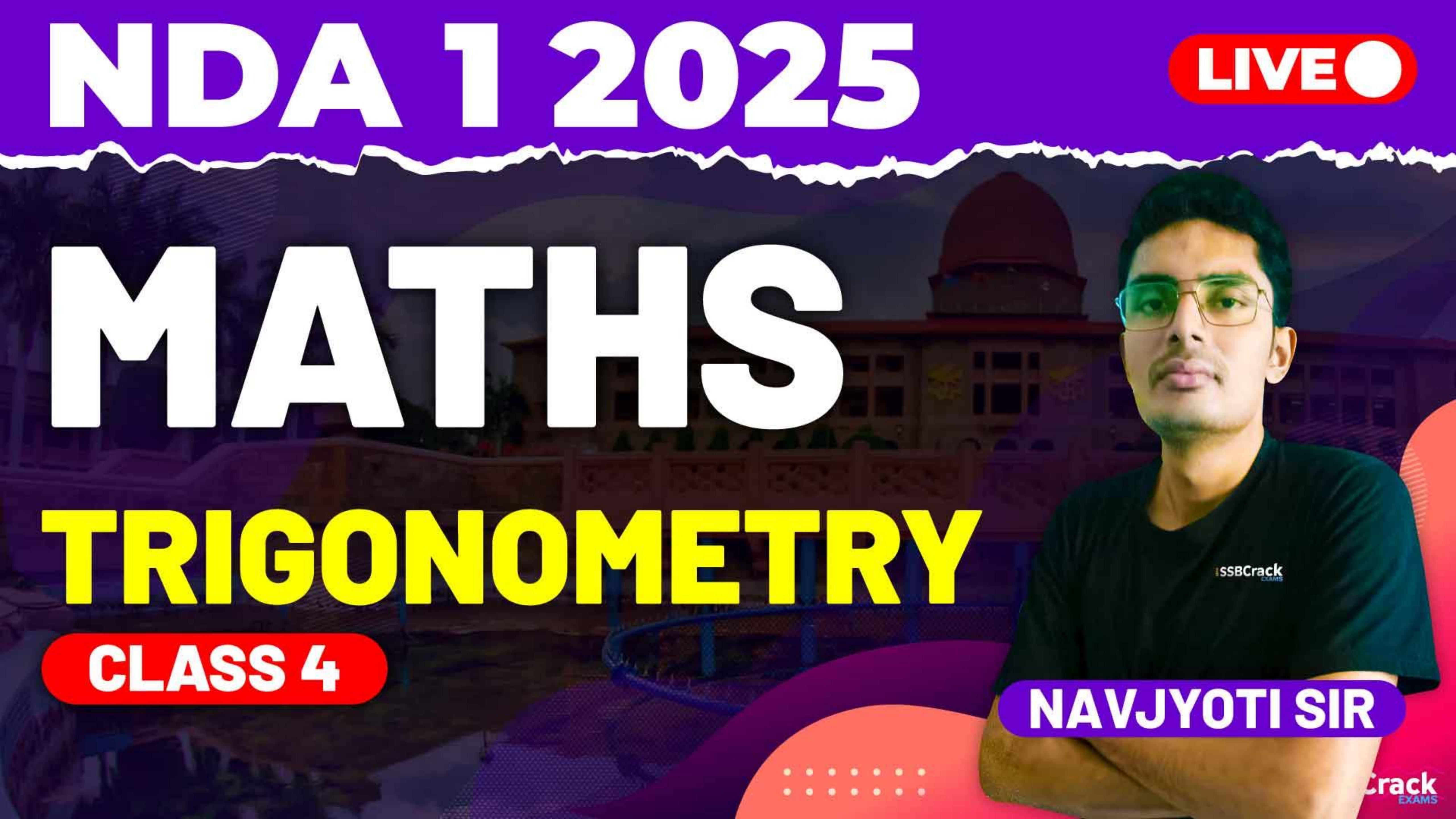
NDA 1 2025
LIVE
MATHS
TRIGONOMETRY
CLASS 4
SSBCrack EXAMS
NAVJYOTI SIR
Crack EXAMS

11 Oct 2024 Live Classes Schedule

8:00AM	11 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	11 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - MCQ - CLASS 4	SHIVANGI MA'AM
4:00PM	MATHS - TRIGONOMETRY - CLASS 4	NAVJYOTI SIR

CDS 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - MCQ - CLASS 4	SHIVANGI MA'AM
7:00PM	MATHS - RATIO & PROPORTION - CLASS 1	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - UNIVERSE & SOLAR SYSTEMS	DIVYANSHU SIR
7:00PM	MATHS - RATIO & PROPORTION - CLASS 1	NAVJYOTI SIR

SSBCrack EXAMS

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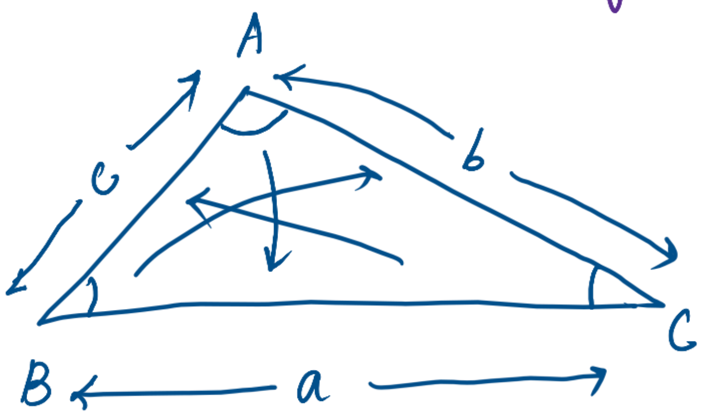
TRIANGLE - ANGLES AND SIDES

→ 3 sides, 3 angles



$a = BC$ $\angle A, \angle B, \angle C$

$b = AC$

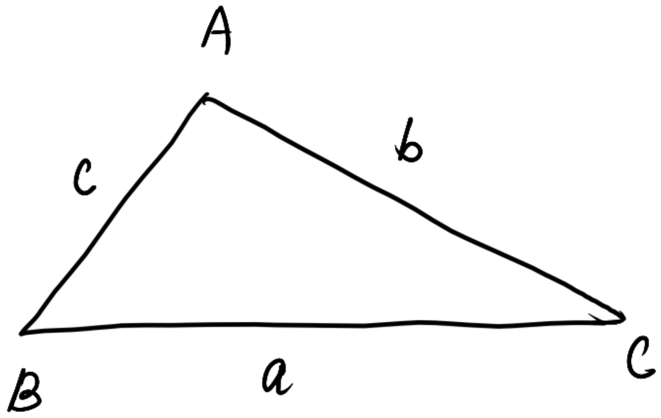
$c = AB$

$\triangle \longrightarrow$ Area

$s \longrightarrow$ semi-perimeter

$$\left(s = \frac{a+b+c}{2} \right)$$

LAW OF SINE

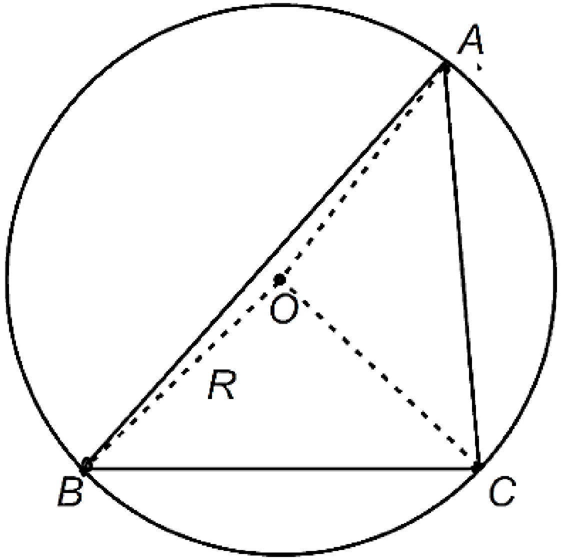


$$\boxed{\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = \text{constant} = 2R}$$

$R \longrightarrow$ radius of circumcircle

$$\rightarrow \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

CIRCUMCIRCLE OF TRIANGLE



circle passing through all the 3 vertices of triangle.

$$R = \frac{a}{2\sin A} \qquad R = \frac{b}{2\sin B} \qquad R = \frac{c}{2\sin C}$$

(radius of circumcircle)

(CIRCUMRADIUS)

$$R = \frac{abc}{4\Delta}$$

(Δ - area of triangle)

EXAMPLE

In a ΔABC, $A = 30°$, $b = 8$, $a = 6$, then $B = \sin^{-1} x$, where x is equal to

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ ✓ (d) 1

$$\frac{a}{\sin A} = \frac{6}{\sin B}$$

$$\frac{6}{\sin 30°} = \frac{8}{\sin B} \Rightarrow \sin B = \frac{8 \times \frac{1}{2}}{6} = \frac{4}{6} = \frac{2}{3}$$

$$\sin B = \frac{2}{3} \quad \text{---} (1)$$

$$B = \sin^{-1} x \rightarrow \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

$$\sin B = x \quad \text{---} (2)$$

$$\Rightarrow x = \frac{2}{3}$$

$$\frac{2}{3} \approx 0.66$$

$$0.66 \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

EXAMPLE

In a ΔABC, $A = 30°$, $b = 8$, $a = 6$, then $B = \sin^{-1} x$, where x is equal to

(a) $\frac{1}{2}$

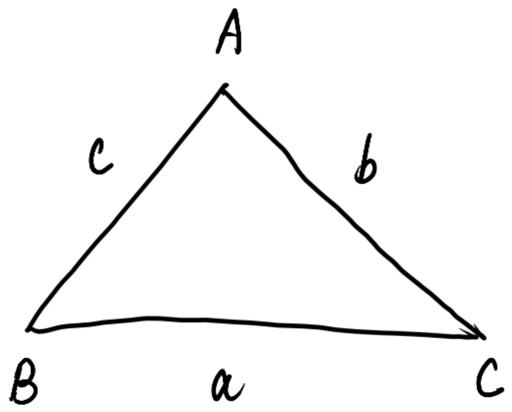
(b) $\frac{1}{3}$

(c) $\frac{2}{3}$

(d) 1

Ans: (c)

COSINE RULE

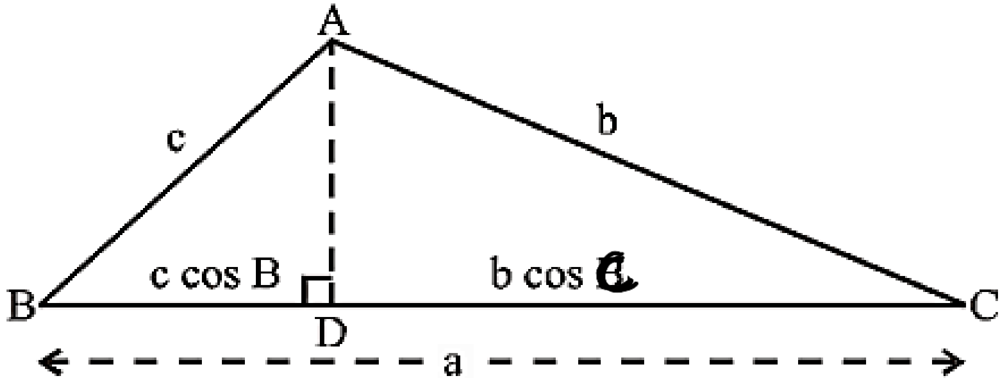


$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

PROJECTION FORMULAE



$$a = b \cos C + c \cos B$$

$$b = c \cos A + a \cos C$$

$$c = a \cos B + b \cos A$$

EXAMPLE

If in a $\Delta\, ABC$

$$\frac{2\cos A}{a}+\frac{\cos B}{b}+\frac{2\cos C}{c}=\frac{a}{bc}+\frac{b}{ac},\text{ then}$$

(a) $\angle A = 90°$ (b) $\angle B = 90°$

(c) $\angle C = 90°$ (d) None of these

$$\frac{2\left(\frac{b^2+c^2-a^2}{2bc}\right)}{a}+\frac{\left(\frac{a^2+c^2-b^2}{2ac}\right)}{b}+\frac{2\left(\frac{a^2+b^2-c^2}{2ab}\right)}{c}=\frac{a^2+b^2}{abc}$$

$$\frac{b^2+c^2-a^2}{abc}+\frac{a^2+c^2-b^2}{2abc}+\frac{a^2+b^2-c^2}{abc}=\frac{a^2+b^2}{abc}$$

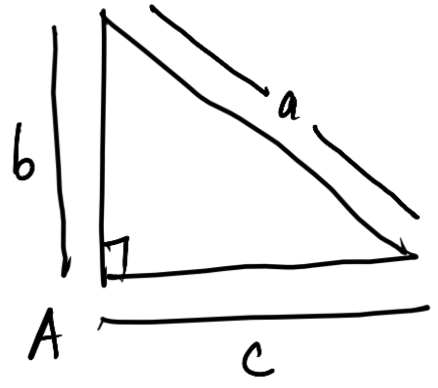
$$\frac{2(b^2+c^2-a^2) + a^2+c^2-b^2 + 2(a^2+b^2-c^2)}{2\cancel{abc}} = \frac{a^2+b^2}{\cancel{abc}}$$

$$3b^2 + a^2 + c^2 = 2a^2 + 2b^2$$

$$c^2 = a^2 - b^2$$

$$c^2 + b^2 = a^2$$

$$\underline{\angle A = 90^\circ}$$



EXAMPLE

If in a ΔABC

$$\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ac}, \text{ then}$$

(a) $\angle A = 90°$

(b) $\angle B = 90°$

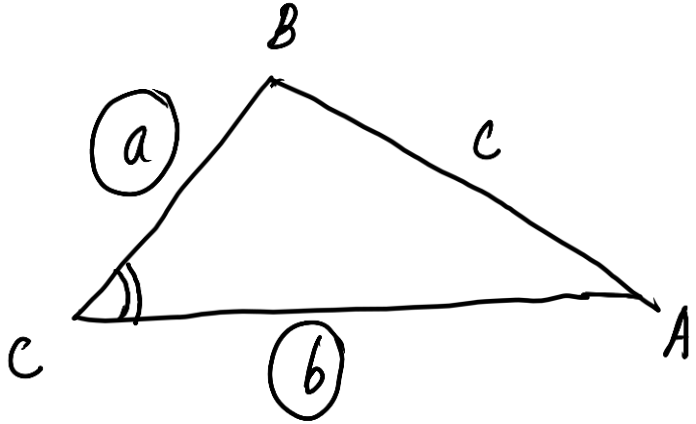
(c) $\angle C = 90°$

(d) None of these

Ans: (a)

AREA OF TRIANGLE

$$\Delta = \frac{1}{2}\, ab \sin C \qquad \Delta = \frac{1}{2}\, bc \sin A \qquad \Delta = \frac{1}{2}\, ca \sin B$$

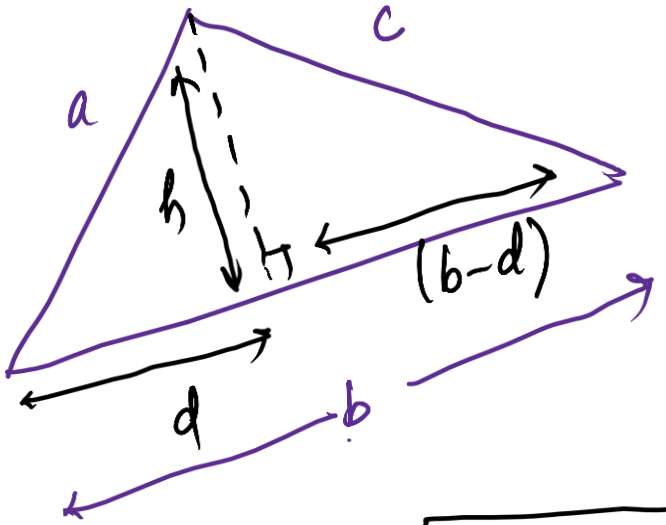


(Given, 2 sides and included angle)

AREA OF TRIANGLE

$$\Delta = \frac{c^2 \sin A \sin B}{2 \sin C} \qquad \Delta = \frac{a^2 \sin B \sin C}{2 \sin A} \qquad \Delta = \frac{b^2 \sin C \sin A}{2 \sin B}$$

(all 3 angles and any one side)



$$\boxed{\Delta = \frac{1}{2} \times b \times h}$$

Area, $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ (Heron's formula)

$s \longrightarrow$ semi-perimeter

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

EXAMPLE

In a ΔABC, if $a = 2x$, $b = 2y$ and $\angle C = 120°$, then the area of the triangle is

(a) xy (b) $xy\sqrt{3}$ ✓

(c) $3xy$ (d) $2xy$

$$\Delta = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2}(2x)(2y)\sin 120°$$

$$= 2xy\left(\frac{\sqrt{3}}{2}\right) = xy\sqrt{3}$$

EXAMPLE

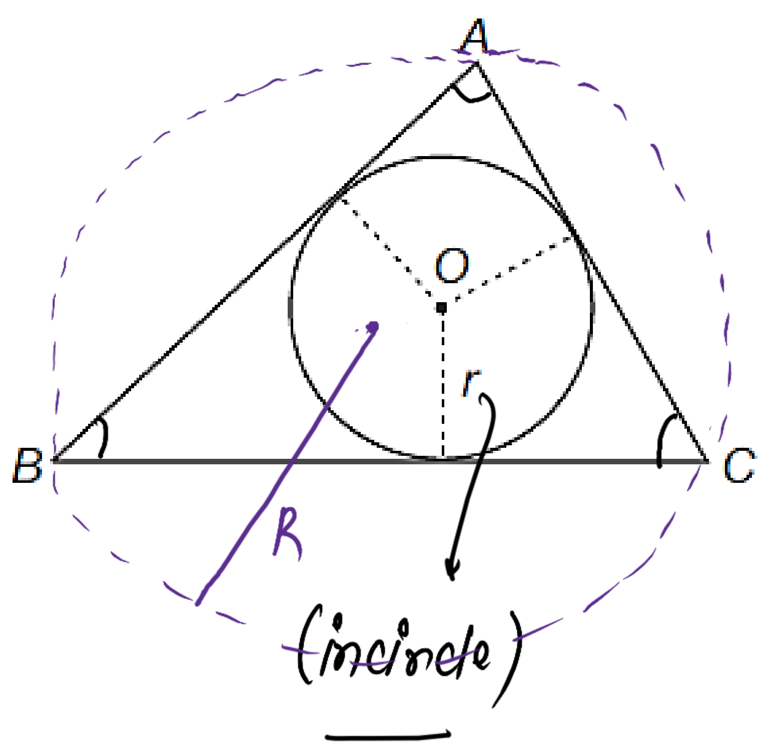
In a ΔABC, if $a = 2x$, $b = 2y$ and $\angle C = 120°$, then the area of the triangle is

(a) xy (b) $xy\sqrt{3}$

(c) $3xy$ (d) $2xy$

Ans: (b)

INCIRCLE OF TRIANGLE



r — in-radius (radius of incircle)

$$r = \frac{\Delta}{s}$$

Δ — Area

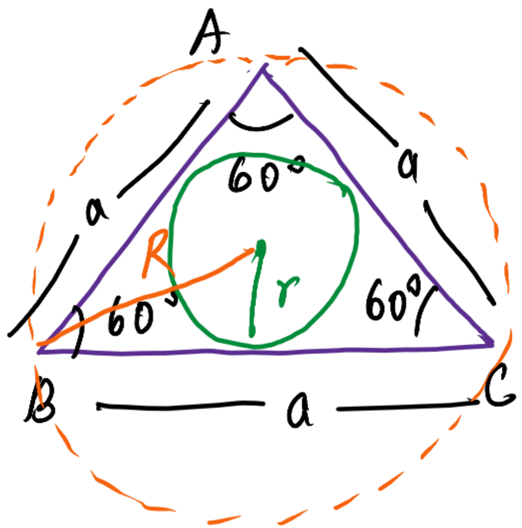
s — semi-perimeter

$$r = 4R \sin\frac{A}{2} \sin\frac{B}{2} \sin\frac{C}{2}$$

R — circumradius

$$r = (s-a)\tan\frac{A}{2} = (s-b)\tan\frac{B}{2} = (s-c)\tan\frac{c}{2}$$

Case : Equilateral triangle



$$\Delta = \frac{\sqrt{3}}{4}a^2 \qquad s = \frac{3a}{2}$$

$$r = \frac{\Delta}{s} = \frac{\frac{\sqrt{3}\,a^{\cancel{2}}}{\cancel{4}\,2}}{\frac{3\cancel{a}}{\cancel{2}}} = \underbrace{\frac{a}{\sqrt{3}}}$$

(OR)

$$r = 4R\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} \Rightarrow r = 4R\left(\frac{1}{8}\right)$$

$$r = \frac{R}{2} \text{ (for an equilateral triangle)}$$

$$\left(R = \frac{2a}{\sqrt{3}}\right)$$

SSBCrack EXAMS

Example If k be the perimeter of the ΔABC, then the value of $b\cos^2\frac{C}{2}+c\cos^2\frac{B}{2}$ is

(a) $2k$ (b) $k/2$ (c) $3k/2$ (d) k

$k = a+b+c$

$$2\cos^2\frac{C}{2} - 1 = \cos C$$

$$2\cos^2\frac{C}{2} = \cos C + 1$$

$$2\cos^2\frac{B}{2} = \cos B + 1$$

$$b\cos^2\frac{C}{2} + c\cos^2\frac{B}{2}$$

$$\frac{b}{2}(\cos C+1) + \frac{c}{2}(\cos B+1)$$

$$\frac{b\cos C}{2} + \frac{b}{2} + \frac{c\cos B}{2} + \frac{c}{2} = \frac{1}{2}(b\cos C + c\cos B) + \frac{b}{2} + \frac{c}{2} = \frac{1}{2}(a) + \frac{b}{2} + \frac{c}{2}$$

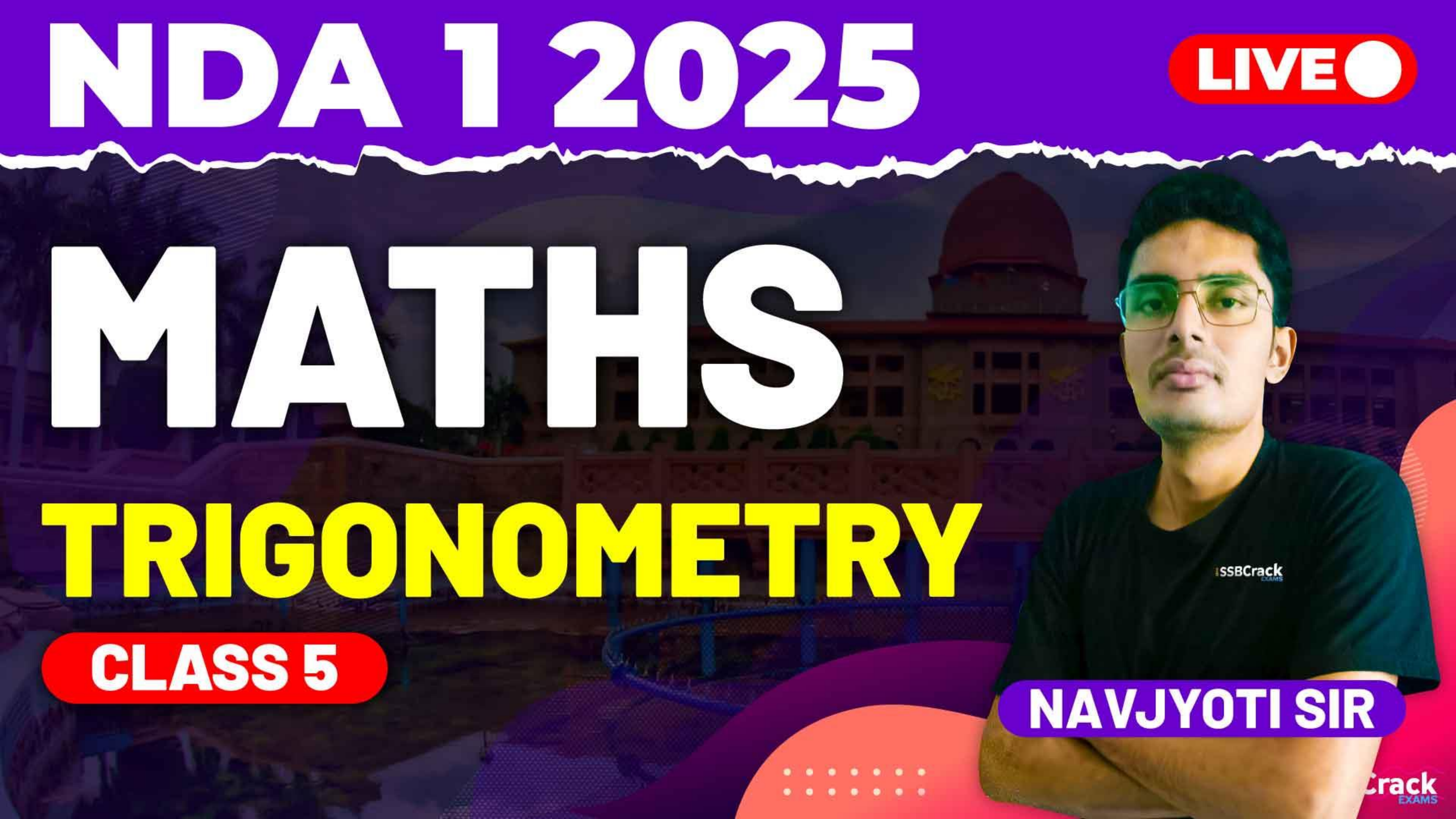
$$= \frac{1}{2}(k)$$

SSBCrack EXAMS

Example If k be the perimeter of the ΔABC, then the value of $b\cos^2\frac{C}{2}+c\cos^2\frac{B}{2}$ is

(a) $2k$ (b) $k/2$ (c) $3k/2$ (d) k

Ans: (b)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