



MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

SOLUTION OF TRIANGLES

Example

1. In any ΔABC , prove that
 $a(\sin B - \sin C) + b(\sin C - \sin A) + c(\sin A - \sin B) = 0$.

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2. In any ΔABC , prove that
 $a \sin(B - C) + b \sin(C - A) + c \sin(A - B) = 0$.

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3. In any triangle ABC , prove that:
$$\frac{\sin(B - C)}{\sin(B + C)} = \frac{b^2 - c^2}{a^2}$$

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4. In any ΔABC , prove that
$$\frac{(a - b)}{c} \cos \frac{C}{2} = \sin \frac{(A - B)}{2}$$

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5. In any ΔABC , prove that

$$\frac{(b^2 - c^2)}{a^2} \sin 2a + \frac{(c^2 - a^2)}{b^2} \sin 2B + \frac{(a^2 - b^2)}{c^2} \sin 2C = 0$$

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6. In any triangle ABC , prove that:
$$\frac{b - c}{b + c} = \frac{\tan\left(\frac{b - C}{2}\right)}{\tan\left(\frac{B + C}{2}\right)}$$

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7. In any ΔABC prove that $a(\cos C - \cos B) = 2(b-c)\cos^2 \frac{A}{2}$

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8. In any triangle ABC , prove that:

$$a \cos A + b \cos B + c \cos C = 2a \sin B \sin C$$

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9. In any ΔABC , prove that

$$(b^2 - c^2) \cot A + (c^2 + a^2) \cot B + (a^2 - b^2) \cot C = 0.$$

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10. In any triangle ABC , prove that:

$$a^3 \sin(B - C) + b^3 \sin(C - A) + c^3 \sin(A - B) = 0$$

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11. In any $\triangle ABC$, prove that $(a - b)^2 \cos^2 \frac{C}{2} + (a + b)^2 \sin^2 \frac{C}{2} = c^2$.



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12. In any triangle ABC , prove that:

$$(b - c) \frac{\cot A}{2} + (c - a) \frac{\cot B}{2} + (a - b) \frac{\cot C}{2} = 0$$



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13. In a triangle ABC , if $\cos A = \frac{\sin B}{2 \sin C}$, show that the triangle is isosceles.



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14. In a triangle ABC , if $a \cos A = b \cos B$, show that the triangle is either isosceles or right angled.



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15. In a $\triangle ABC$, if $a = 18$, $b = 24$, $c = 30$, find

(i) $\sin A$, $\sin B$, $\sin C$

(ii) $\cos A$, $\cos B$, $\cos C$



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16. If in a ABC , $\angle A = 45^0$, $\angle B = 60^0$, and $\angle C = 75^0$, find the ratio of its sides.



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17. In a ABC , if $a = 2$, $b = 3$ and $s \in A = \frac{2}{3}$, $f \in d \triangle B$.



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18. The angles of a triangle ABC are in AP and if it is being given the $b:c = \sqrt{3}:\sqrt{2}$, find $\angle A$, $\angle B$ and $\angle C$.

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19. In a $\triangle ABC$, if $\angle A = 30^\circ$ and $b:c = 2:\sqrt{3}$, find $\angle B$.

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20. Solve the triangle in which $a = (\sqrt{3} + 1)$, $b = (\sqrt{3} - 1)$ and $\angle C = 60^\circ$.

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Example Problems Based On Sine Cosine Formulae

1. Two ships leave port at the same time. One goes 24 km per hour in the direction $N 45^{\circ} E$ and other travels 32 km per hour in the direction $S 75^{\circ} E$. Find the distance between the ships at the end of 3 hours.



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2. Two trees A and B are on the same side of a river. From a point C in the river, the distance of trees A and B are 250 m and 300 m and respectively. If angle of $C=45^{\circ}$. find the distance between trees.



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3. The angle of elevation of to be top point P of the vertical tower PQ of height h from poin A is 45° and from a point B, the angle of elevation is 60° , where B is point at a distance d from the point A measured along the line AB which makes an angle 30° with AQ . Prove that $d = (\sqrt{3} - 1)h$.



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4. A lamp post is situated at the middle point M of the side AC of a triangular plot of ABC with $BC = 7m$, $CA = 8$ and $AB = 9m$. Lamp post subtends an angle of 15^0 at the point B . determine the height of the lamp post.

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5. A tree stands vertically on a hill side which makes an angle of 15^0 with the horizontal. From a point on the ground 35 m down the hill from the base of tree, the angle of elevation of the top of the tree is 60^0 . Find the height of the tree.

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1. In any $\triangle ABC$, prove that

$$a(b \cos C - c \cos B) = (b^2 - c^2)$$

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2. In any $\triangle ABC$, prove that

$$ac \cos B - bc \cos A = (a^2 - b^2)$$

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3. In any $\triangle ABC$, prove that:
$$\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$$

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4. In any $\triangle ABC$, prove that

$$\frac{c - b \cos A}{b - c \cos A} = \frac{\cos B}{\cos C}$$

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5. In any $\triangle ABC$, prove that

$$4\left(bc \cos^2 \frac{A}{2} + ca \cos^2 \frac{B}{2} + ab \cos^2 \frac{C}{2}\right) = (a + b + c)^2$$

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6. In any $\triangle ABC$, prove that $a \sin A - b \sin B = c \sin(A - B)$

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7. In any $\triangle ABC$, prove that

$$a^2 \sin(B - C) = (b^2 - c^2) \sin A$$

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8. In any triangle ABC , prove that following:

$$a^2 \sin(B - C) = (b^2 - c^2) \sin A$$



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9. In any $\triangle ABC$, prove that

$$\frac{\sin(A-B)}{\sin(A+B)} = \frac{(a^2 - b^2)}{c^2}$$



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10. In any $\triangle ABC$, prove that $((b-c))/\cos A/2 = \sin((B-C))/2$



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11. In any $\triangle ABC$, prove that

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



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12. In any $\triangle ABC$, prove that

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

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13.

$$a^2(\cos^2 B - \cos^2 C) + b^2(\cos^2 C - \cos^2 A) + c^2(\cos^2 A - \cos^2 B) = 0.$$

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14. In any triangle ABC , prove that following:

$$\frac{\cos^2 B - \cos^2 C}{b+c} + \frac{\cos^2 C - \cos^2 A}{c+a} + \frac{\cos^2 A - \cos^2 B}{a+b} = 0$$

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15. In any $\triangle ABC$, prove that

$$\frac{\cos 2A}{a^2} - \frac{\cos 2B}{b^2} = \left(\frac{1}{a^2} - \frac{1}{b^2} \right)$$

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16. In any $\triangle ABC$, prove that

$$(c^2 - a^2 + b^2)\tan A = (a^2 - b^2 + c^2)\tan B = (b^2 - c^2 + a^2)\tan C$$

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17. In any $\triangle ABC$, prov

If in a $\triangle ABC$, $\angle C = 90^\circ$, then prove that $\sin(A - B) = \frac{(a^2 - b^2)}{(a^2 + b^2)}$

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18.

In a $\triangle ABC$, if $\frac{\cos A}{a} = \frac{\cos B}{b}$, show that the triangle is isosceles.

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19. In a ABC , if $\sin^2 A + \sin^2 B = \sin^2 C$, show that the triangle is right angled.

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20. Solve the triangle in which $a = 2$ cm, $b = 1$ cm and $c = \sqrt{3}$ cm.

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21.

In a ΔABC , if $a = 3$ cm, $b = 5$ cm and $c = 7$ cm, find $\cos A$, $\cos B$, $\cos C$.

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22. If in triangle the angles be to the one another as $1 : 2 : 3$, prove that the corresponding sides are $1 : \sqrt{3} : 2$.

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Exercise 18 B

1. Two boats leave a port at the same time. One travels 60 km in the direction $N50^\circ E$ while the other travels 50 km in the direction $S70^\circ E$.

What is the distance between the boats ?

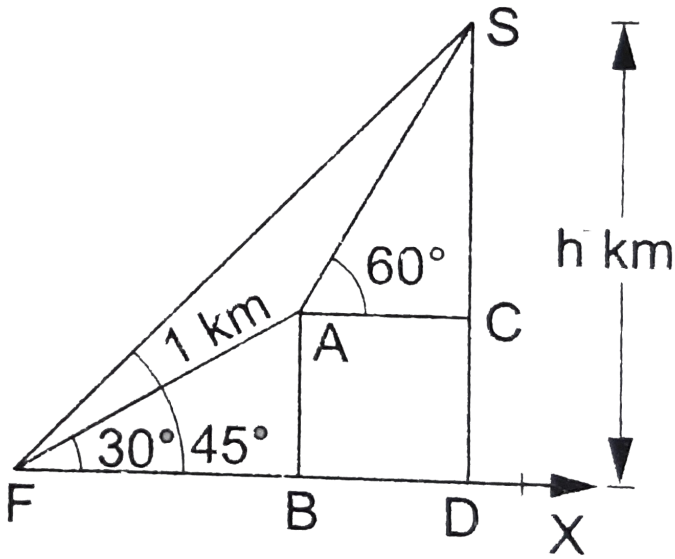
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2. A town B is 12 km south and 18 km west of a town A. Show that the bearing of B from A is $S56^\circ 20' W$. Also, find the distance of B from A.

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3. At the foot of a mountain, the angle of elevation of its summit is 45° . After ascending 1 km towards the mountain up an incline of 30° , the elevation changes to 60° (as shown in the given figure). Find the height

of the mountain. [Given: $\sqrt{3} = 1.73$.]



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