

Take up any questions from review/test

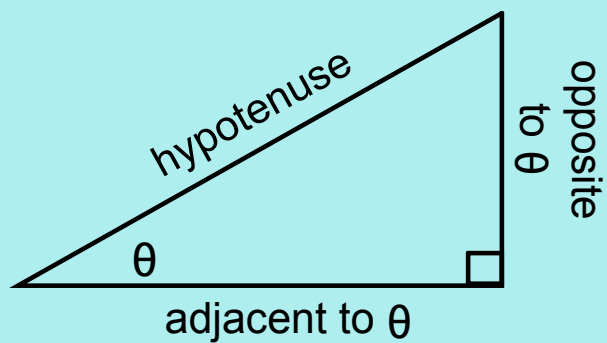
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For any angle of interest ( $\theta$ ), there are three (3) primary trigonometric ratios.

$$\text{sine of } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{cosine of } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{tangent of } \theta = \frac{\text{opposite}}{\text{adjacent}}$$

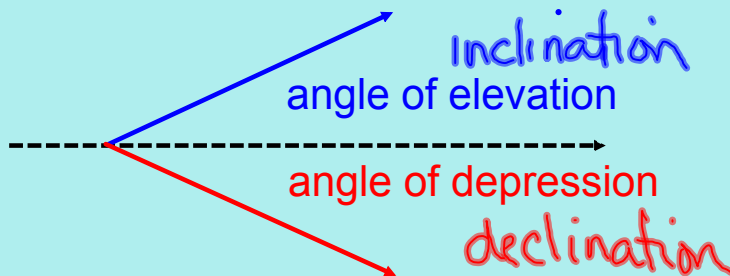


S o h C a h T o a

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Angle of Elevation (or Inclination): the angle measured above the horizontal.

Angle of Depression (or Declination): the angle measured below the horizontal.



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The Sine Law (2 formats):

In  $\triangle ABC$ ,

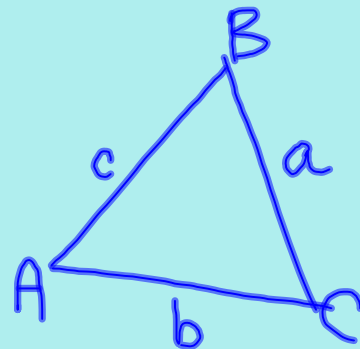
*find sides*

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

or

*find angles*

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



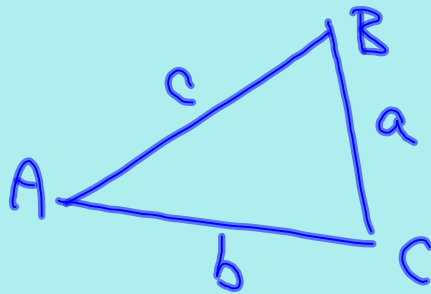
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The cosine law:

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

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

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



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Solving Trigonometric Problems

Apr. 20/2011

Ex.1

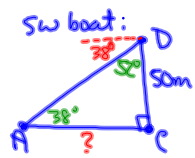
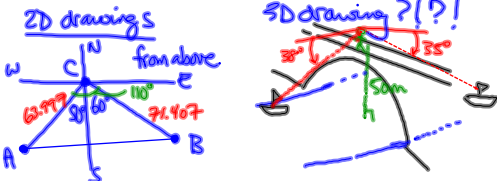
To calculate the height of an inaccessible cliff, data are collected and recorded on the diagram below. Calculate the height of the cliff to one decimal place.

$90 - 38 = 52^\circ$   
 $180 - 63 - 42 = 75^\circ$   
 $a = 75^\circ$   
 $68.5 \text{ m}$   
 $42^\circ$   
 $63^\circ$   
 $38^\circ$   
 $h$   
 $h$   
 $h$   
 $h = (47.452) \tan 38^\circ$   
 $h = 37.1$   
 $\therefore$  the height of the cliff is 37.1 m  
 Sine law:  $\frac{a}{\sin 42^\circ} = \frac{68.5}{\sin 75^\circ}$   
 $a = \frac{68.5}{\sin 75^\circ} \cdot \sin 42^\circ$   
 $a = 47.452$   
 \* don't round intermediate calculation results \*

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Ex.2

From the top of a 50 m high bridge, two boats are seen at anchor. One boat is S50°W and has an angle of depression of 38°. The other boat is S60°E and has a 35° angle of depression. How far apart are the boats?



$$\tan 52^\circ = \frac{AC}{50}$$

$$AC = 50 \tan 52^\circ$$

$$AC \approx 63.997$$



$$\tan 55^\circ = \frac{CB}{50}$$

$$CB = 50 \tan 55^\circ$$

$$CB \approx 71.407$$

Use cosine law (SAS):

$$AB^2 = AC^2 + BC^2 - 2(AC)(BC)\cos(\angle ACB)$$

$$AB^2 = (63.997)^2 + (71.407)^2 - 2(63.997)(71.407)\cos(110^\circ)$$

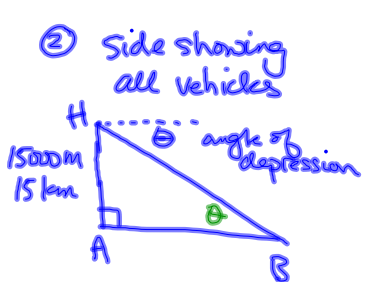
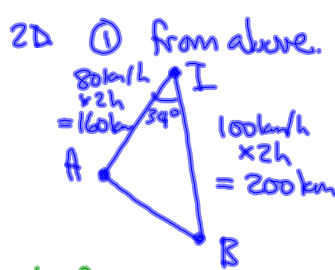
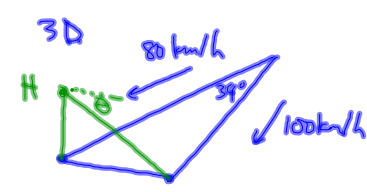
$$AB \approx 111.0$$

∴ the boats are 111m apart.

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Ex.3

Two roads intersect at 34°. At 9:00, two cars leave the intersection on different roads at speeds of 80 km/h and 100 km/h. At 11:00, a traffic helicopter is right above the slower car, at a height of 15000 m. Determine the angle of depression and the distance from the helicopter to the faster car.



to find  $\theta$ , need AB  
to find AB, cosine law.

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Assigned Work:

p.274 # 13, 16, 18, 19

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