Week 3	Thursday 5 September
Chapter Three:	Geometry and Trigonometry
Topic:	3.4 The Cosine Rule
IB Syllabus:	5.3
Lesson Obj:	Students will identify when to use the Cosine Rule.
	Students will use the Cosine Rule to solve a triangle.

Review and Intro:

0. Vocab on board: cosine rule. Homework questions.
1. When do we use what rules?

Core Lesson:

2. Cosine Rule: use when we do not know an angle and the side opposite that angle
   Draw triangle and label. Show cosine rule. Use to get opposite side, then use sine rule.
3. Worksheet examples 1, 2, 3

Check for Understanding:

4. Worksheet IB Practice ABC
5. ANNOUNCE QUIZ next period

Assignment: Students will read examples on 122.
Students will complete 123-124: 1-9 all

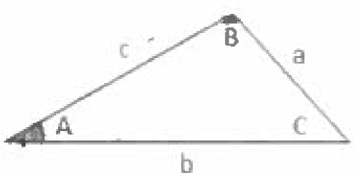
Evaluation:

IB Math Studies Year 2

3.4 The Cosine Rule

The Cosine Rule can be used to solve a triangle when all other simpler methods fail:

Right triangle:	Use Pythagorean Theorem and sine, cosine, or tangent
A non-right triangle using an angle and a side opposite:	Use the Sine Rule
Any other triangle:	Use the Cosine Rule



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

1. Suppose two sides of a triangle have lengths 3 cm and 7 cm, and the angle between them measures 130°. Solve the triangle.

$b^2 = 7^2 + 3^2 - 2(7)(3)\cos 130$

$b^2 = 16\cos(130)$

84.99

$b^2 = 85\text{cm}$

$b = 9.22\text{cm}$

$\cos(A) = \dfrac{7^2 + 9.22^2 - 3^2}{2(7)(9.22)}$

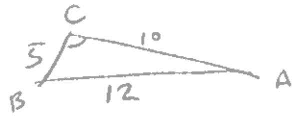
$\cos(A) = .9684$

$14.4° = \hat{A}$

$\cos(C) = \dfrac{3^2 + 9.22^2 - 7^2}{2(3)(9.22)}$

$35.6° = \hat{C}$

2. The lengths of the sides of a triangle are 5, 10 , and 12. Solve the triangle.



$$\cos C = \frac{5^2 + 10^2 - 12^2}{2(5)(10)}$$

$\cos(C) = -.19$

$100.952° = C$

$101° = \hat{C}$

$$\frac{\sin 101}{12} = \frac{\sin A}{5}$$

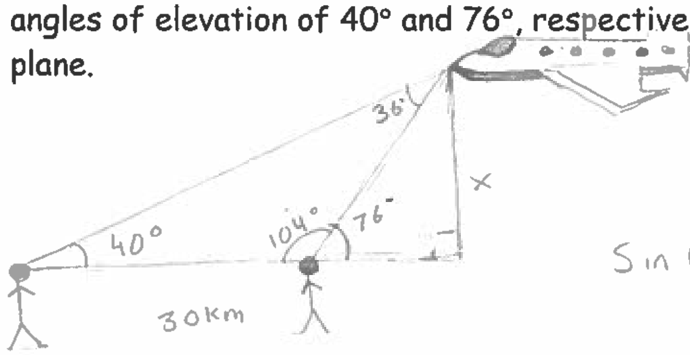
$4.90813 = \sin A \; 12$

$.4090 = \sin A$

$24.1° = \hat{A}$

$\hat{B} = 54.9°$

3. Observers on the ground at points A and B, 30 km apart, sight an airplane at angles of elevation of 40° and 76°, respectively. Find the altitude of the plane. Soh Cah Toa



$$\frac{\sin(40)}{y} = \frac{\sin(36)}{30}$$

$32.8072 = y$

$\sin(76) = \frac{x}{32.8072}$

$x = 31.83275$

31.8 km height

IB Practice A

The diagram below shows an equilateral triangle ABC, with each side 3 cm long. The side BC is extended to D so that CD = 4 cm.

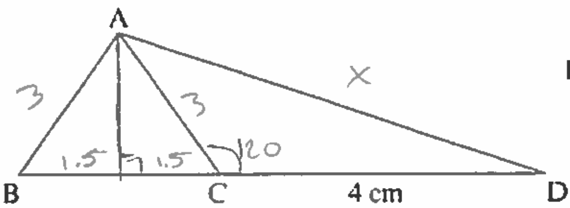


Diagram not to scale

Calculate, correct to two decimal places, the length of AD.

$x^2 = 4^2 + 3^2 - 2(3)(4)\cos 120$

$x^2 + 1.5^2 = 3^2$

$x^2 + 2.25 = 9$

$\hookrightarrow 2.5980^2 + 5.5 = x$

$x = 6.0827$

6.08 cm = AD

IB Practice B

A gardener pegs out a rope, 19 metres long, to form a triangular flower bed as shown in this diagram.

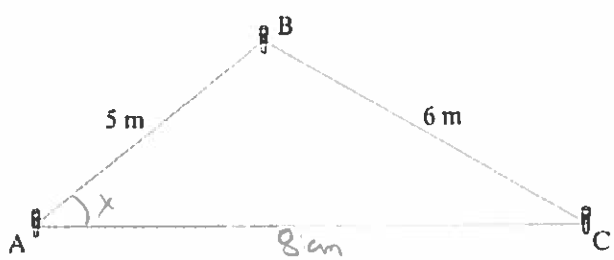


Diagram not to scale

Calculate the size of angle BAC.

$\cos(x) = \dfrac{8^2 + 5^2 - 6^2}{2(8)(5)}$

$\cos(x) = .6625\text{m}$

$x = 48.509$

$48.5° = BAC$

IB Practice C

The diagram below shows a crane PQR that carries a flat box W. PQ is vertical, and the floor PM is horizontal.

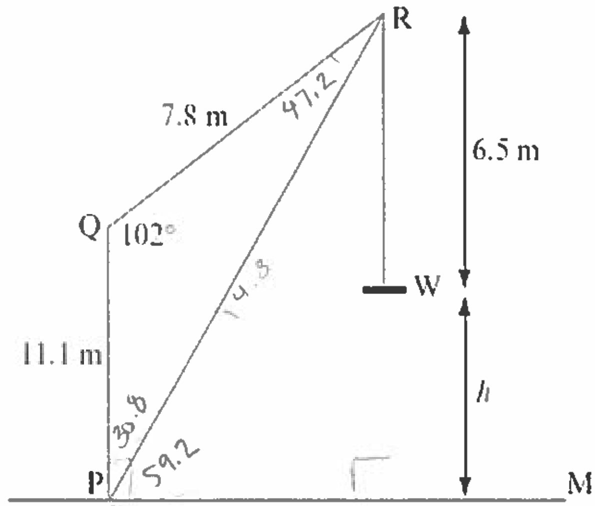


Diagram not to scale

Given that PQ = 11.1 m, QR = 7.8 m, angle PQR = 102° and RW = 6.5 m, calculate

a) PR
b) angle PRQ
c) the height, h, of W above PM.

a. $\cos(102) = \frac{7.8^2 + 11.1^2 - x^2}{2(7.8)(11.1)}$

$\cos(102) = \frac{184.05 - x^2}{173.16}$

$-36.6019 = 184.05 - x^2$

$-220.0519 = -x^2$

$14.8 = x = PR$

b. $\frac{\sin(\hat{R})}{11.1} = \frac{\sin 102}{14.8}$

$\hat{R} = 47.18995$

$47.2° = PRQ$

c. $\sin(59.2) = \frac{R}{14.8}$

$R = 12.712 - 6.5$

6.212

$6.21\text{ m} = h$