

**Lesson 15.7 - Constructing Labelled Diagrams****EXAMPLE #1**

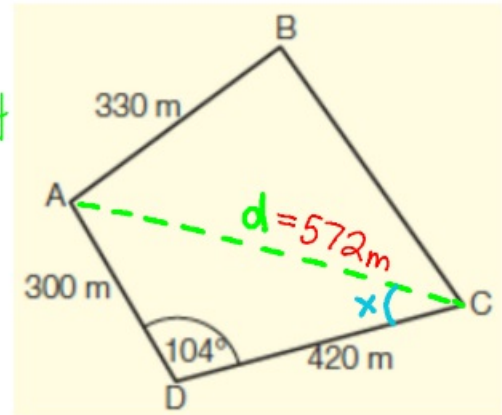
Farmer Giles has a four-sided field, ABCD. He decides to divide the field into two triangles with a fence from A to C.

- a) What is the length of the fence from A to C?

$$d^2 = (300)^2 + (420)^2 - 2(300)(420)\cos 104$$

$$d^2 = 327364.3177$$

$$d = \sqrt{327364.3177} \approx \boxed{572\text{m}}$$



- b) What is the area of field ACD?

$$\begin{aligned} \text{Area} &= \frac{1}{2}(300)(420)\sin 104 \\ &\approx 61100 \text{ m}^2 \end{aligned}$$

- c) What is the size of angle DCA?

$$\frac{\sin 104}{572} = \frac{\sin X}{300}$$

$$\frac{300\sin 104}{572} = \frac{\cancel{572}\sin X}{\cancel{572}}$$

$$.509 = \sin X$$

$$\sin^{-1}(.509) = X$$

$$\boxed{30.6^\circ = \hat{DCA}}$$

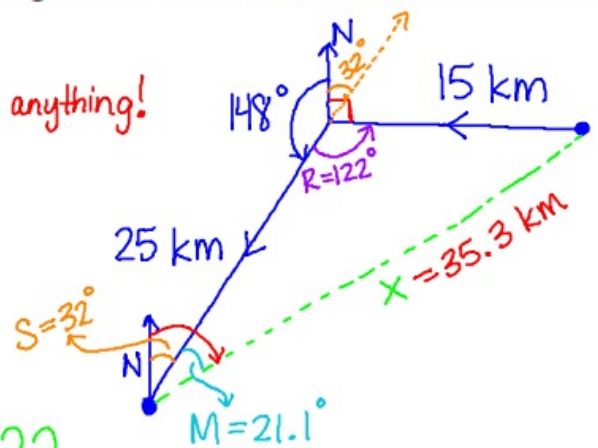
### EXAMPLE #2

A small plane flies due west for 15 km, then turns through an angle of  $148^\circ$  anticlockwise from North and flies another 25 km.

- a) How far is the plane from its starting point?

*You can name angles + sides anything!*

$$R = 360 - 148 - 90$$
$$= 122^\circ$$



$$X^2 = (25)^2 + (15)^2 - 2(25)(15)\cos 122$$

$$X^2 = 1247.439448$$

$$X = \boxed{35.3 \text{ km}}$$

- b) On the return journey, the plane flies on a straight path, direct to the starting point. What angle does its return flight make with the North line?

$$S = 180 - 148 = 32^\circ$$

$$\frac{\sin 122}{35.3} = \frac{\sin M}{15}$$

$$\frac{15 \sin 122}{35.3} = \frac{\cancel{35.3} \sin M}{\cancel{35.3}}$$

$$.360 = \sin M$$

$$\sin^{-1}(.360) = M$$

$$21.1^\circ = M$$

$$32 + 21.1 = \boxed{53.1^\circ}$$