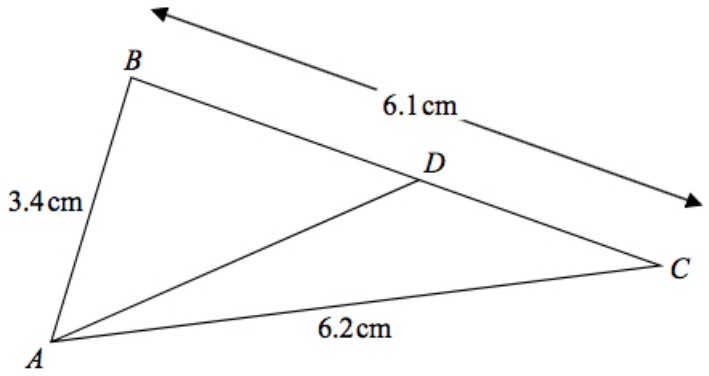
Dr Oliver Mathematics
Worked Examples
Super Trigonometry 2

From: Edexcel 2019 November Paper 3H (Calculator)

1. The diagram shows triangle ABC. (5)



$AB = 3.4$ cm.
$AC = 6.2$ cm.
$BC = 6.1$ cm.

D is the point on BC such that

$$\text{size of angle } DAC = \tfrac{2}{5} \times \text{size of angle } BCA.$$

Calculate the length DC.
Give your answer correct to 3 significant figures.
You must show all your working.

Solution

We use the cosine rule:

$$\cos BCA = \frac{AC^2 + BC^2 - AB^2}{2 \times AC \times BC} \Rightarrow \cos BCA = \frac{6.2^2 + 6.1^2 - 3.4^2}{2 \times 6.2 \times 6.1}$$
$$\Rightarrow \cos BCA = \frac{64.09}{75.64}$$
$$\Rightarrow \angle BCA = 32.080\,469\,13 \text{ (FCD)}$$
$$\Rightarrow \angle DAC = \tfrac{2}{5} \times 32.080\,469\,13 \text{ (FCD)}$$
$$\Rightarrow \angle DAC = 12.832\,187\,65 \text{ (FCD)}.$$

Finally, we use the sine rule:

$$\frac{DC}{\sin DAC} = \frac{AC}{\sin ABC} \Rightarrow \frac{DC}{\sin 12.832\ldots^\circ} = \frac{6.2}{\sin(180 - 32.080\ldots - 12.832\ldots)^\circ}$$
$$\Rightarrow DC = \frac{6.2 \sin 12.832\ldots^\circ}{\sin 135.087\ldots^\circ}$$
$$\Rightarrow DC = 1.950\,343\,185 \text{ (FCD)}$$
$$\Rightarrow \underline{\underline{DC = 1.95 \text{ cm } (3 \text{ sf})}}.$$