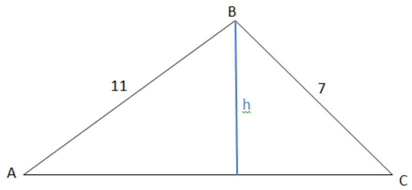
A-Level Unit Test: Trigonometry

Sine and Cosine Rule

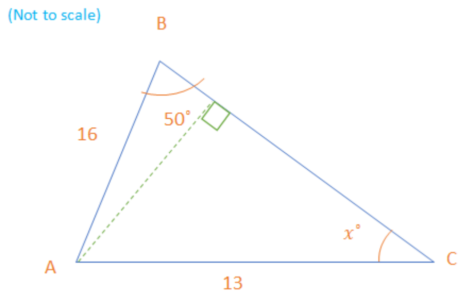
1. In the triangle ABC, $AB = 11$cm, $BC = 7$cm, $CA = 8$cm.



a. Find the size of angle C, giving your answer in radians to 3 significant figures. **(3)**

b. Find the area of the triangle ABC, giving your answer to 3 significant figures. **(2)**

2. In the triangle ABC, $AB = 16$cm, $AC = 13$cm, angle $ABC = 50^o$ and angle $BCA = x^o$. Find the two possible values for x, giving your answers to one decimal places. **(4)**

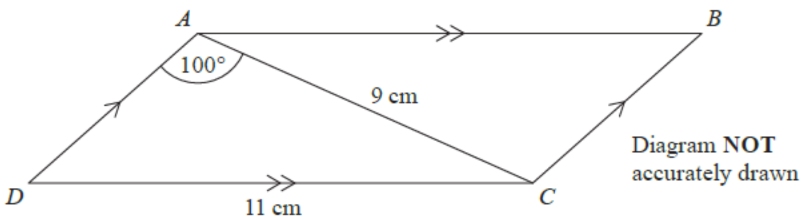


3. In a triangle ABC, the side AB has a length 10cm, side AC has length 5cm and angle $BAC = \emptyset$, where $\emptyset$ is measured in degrees. The area of triangle $ABC = 15$ cm^2

a. Find the two possible values of cos $\emptyset$ **(4)**

b. Given that BC is the longest side of the triangle, find the exact length of BC. **(3)**

4. $ABCD$ is a parallelogram.



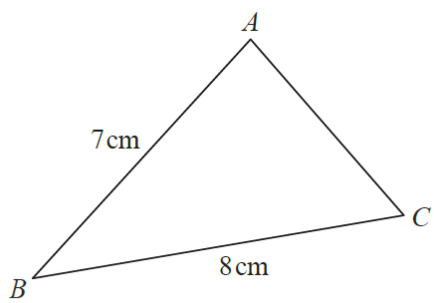
$AC = 9$ cm
$DC = 11$ cm
Angle $DAC = 100^o$

Calculate the area of the parallelogram. Give your answer to 3 significant figures. **(4)**

5. ABC is an acute angles triangle.

$BA = 7$cm, $BC = 8$cm.
The area of the triangle is 18cm^2.

Work out the size of angle BAC. Give your answer correct to 3 significant figures. You must show all your working.



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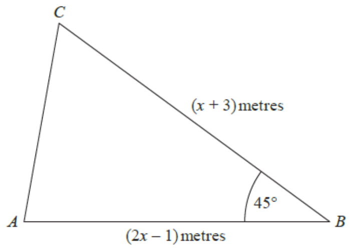
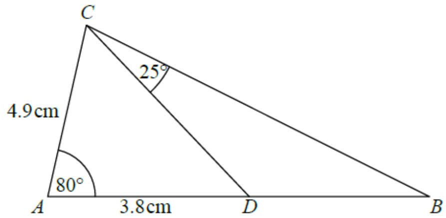
6. The area of triangle *ABC* is $6\sqrt{2}$ m^2.
Calculate the value of x and give your answer correct to 3 significant figures. **(5)**



7. *ABC* is a triangle. *D* is a point on *AB*. Work out the area of triangle *BCD*. Give your answer correct to 3 significant figures.



(5)

Total marks: 35

Mark Scheme

1a.

$11^2 = 8^2 + 7^2 - 2 \text{ x } 8 \text{ x } 7 \cos C$	**M1**
$C = \cos^{-1}(-\frac{8}{112})$	**M1**
$C = 1.64$	**M1**

1b.

Area $= \frac{1}{2}h \times 8$ $h = 7 \sin 1.64$ $h = 6.98$	**M1**
Area = 4 x 6.98 Area = 27.9 cm^2	**M1**

2.

l = 13 sin x and l = 16 sin 50	**M1**
Therefore, 13 sin x = 16 sin 50 $x = \sin^{-1}(0.943)$ $x = 70.5$	**M1**
Second answer: 180 – 70.5	**M1**
$x = 109.5^{o}$	**M1**

3a.

Area $= \frac{1}{2}ab \sin C$ $15 = \frac{1}{2}(10)(5)sin\emptyset$ $\sin \emptyset = \frac{3}{5}$	**M1**
Use of $\sin^2\emptyset + \cos^2\emptyset = 1$	**M1**
$\cos^2\emptyset = 1 - (\frac{3}{5})^2$ $\cos^2\emptyset = \frac{16}{25}$	**M1**
$\cos \emptyset = \pm\frac{4}{5}$	**M1**

3b.

$a^2 = b^2 + c^2 - 2bc \cos \emptyset$ $BC^2 = 10^2 + 5^2 - 2(10)(5) \cos\emptyset$ $BC^2 = 125 - 100(\pm\frac{4}{5})$	**M1**
$BC^2 = 205$ or 45	**M1**
As it is the longest side, $BC = \sqrt{205}$	**M1**

4.

$\frac{\sin B}{b} = \frac{\sin A}{a} \rightarrow \frac{\sin B}{9} = \frac{\sin 100}{11}$ $\sin B = \frac{9sin100}{11}$ $B = \sin^{-1}(\frac{9sin100}{11})$ $B = 53.68\ldots$	**M1**
$C = 180 - 100 - 53.86\ldots = 26.317\ldots$	**M1**
Area of triangle $= \frac{1}{2} \times 11 \times 9 \times \sin 26.317 \ldots$	**M1**
Area of parallelogram = area of triangle x 2 = 43.9 cm^2	**M1**

5.

Area = $\frac{1}{2}ab \sin c$ $18 = \frac{1}{2} \times 8 \times 7 \sin C$ $C = 40.0052\ldots$	**M1**
Using the cosine rule: $a^2 = 7^2 + 8^2 - 2 \text{ x } 7 \text{ x } 8 \text{ x } \cos 40.0052\ldots$	**M1**
$a = 5.216$	**M1**
Area = $18 = \frac{1}{2} \times 5.216 \times 7 \times \sin x$ $\sin x = \frac{18}{0.5 \times 5.216 \times 7}$	**M1**
$x = 80.4^{\circ}$	**M1**

6.

$6\sqrt{2} = \frac{1}{2}(x+3)(2x-1) \times \sin(45)$	**M1**
$6\sqrt{2} = \frac{\sqrt{2}}{2}[2x^2 - x + 6x - 3]$ $24 = 2x^2 + 5x - 3$	**M1**
$2x^2 + 5x - 27 = 0$	**M1**
$x = -\frac{5 \pm \sqrt{241}}{4}$ $x = 2.63$ or $x = -5.13$	**M1**
As x must be positive, $x = 2.63$ m	**M1**

7.

$x^2 = 4.9^2 + 3.8^2 - 2 \text{ x } 2.9 \text{ x } 3.8 \text{ x } \cos 80$ $x = 5.655$	**M1**
$\frac{sinB}{b} = \frac{sinA}{a} \rightarrow \frac{sinB}{4.9} = \frac{sin80}{5.655}$	**M1**
$\sin \emptyset = \frac{4.9 \text{ x } sin80}{5.655}$ $\emptyset = 58.57^{\circ}$	**M1**
$C\hat{D}B = 180 - 58.57 = 121.43^{O}$	**M1**
$D\hat{B}C = 180 - (121.43 + 25) = 35.57^{O}$	**M1**