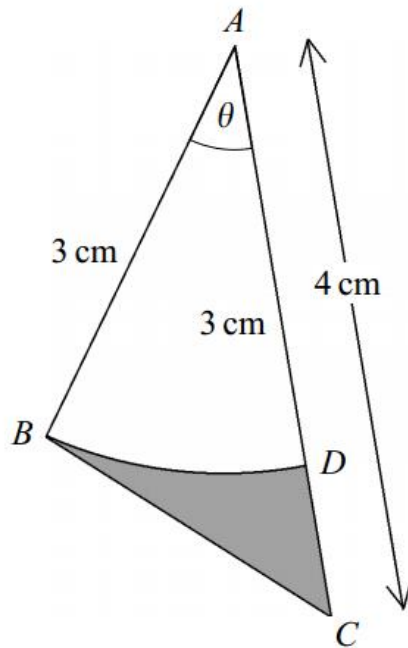# Core 2 – Triangles, Sectors, Arcs

Challenge 1

The diagram shows a triangle ABC with $AB = 3\,\text{cm}$, $AC = 4\,\text{cm}$ and angle $BAC = \theta$ radians.

The point D lies on AC such that $AD = 3\,\text{cm}$, and ABD is a sector of a circle with centre A and radius $3\,\text{cm}$.

(a) Write down, in terms of θ:
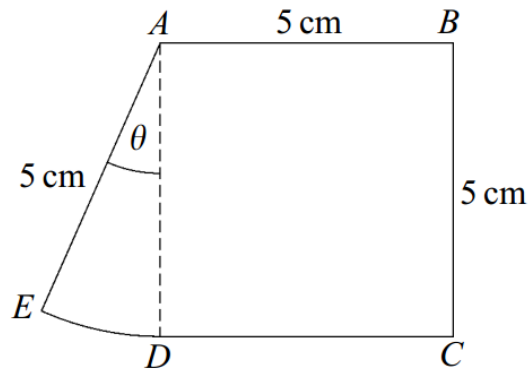
    (i)   the area of the sector ABD;   *(2 marks)*

    (ii) the area of triangle ABC.   *(2 marks)*

Challenge 2

The diagram shows a shape *ABCDE*. The shape consists of a square *ABCD*, with sides of length 5 cm, and a sector *ADE* of a circle with centre *A* and radius 5 cm. The angle of the sector is θ radians.

(a) Find the area of the sector *ADE* in terms of θ. *(2 marks)*

(b) The area of the sector *ADE* is a quarter of the area of the square *ABCD*.

    (i) Find the value of θ. *(2 marks)*

   (ii) Find the perimeter of the shape *ABCDE*. *(2 marks)*

# Challenge 3

The acute angle θ radians is such that

$$\sin \theta = \tfrac{5}{13}.$$

(a)　(i)　Show that $\cos \theta = \tfrac{12}{13}$.　　*(2 marks)*

　　(ii)　Find the value of $\tan \theta$, giving your answer as a fraction.　　*(2 marks)*

(b)　Use your calculator to find the value of θ, giving your answer to three decimal places.

(1 mark)

(c)　The diagram shows a sector of a circle of radius r cm and angle θ radians.　The length of the arc which forms part of the boundary of the sector is 5 cm.

5 cm

θ

r cm
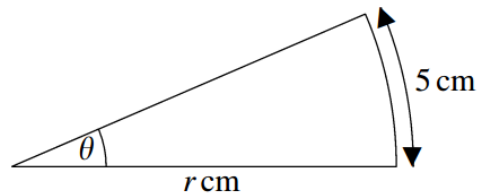
　　(i)　Show that $r \approx 12.7$.　　*(2 marks)*

　　(ii)　Find the area of the sector, giving your answer to the nearest square centimetre.

(3 marks)

Final Challenge
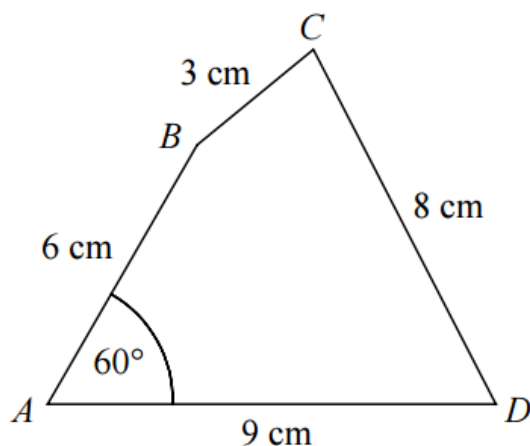
Figure 2

Figure 2 shows the quadrilateral $ABCD$ in which $AB = 6$ cm, $BC = 3$ cm, $CD = 8$ cm, $AD = 9$ cm and $\angle BAD = 60°$.

(a)   Using the cosine rule, show that $BD = 3\sqrt{7}$ cm.   **(4)**

(b)   Find the size of $\angle BCD$ in degrees.   **(3)**

(c)   Find the area of quadrilateral $ABCD$.   **(3)**