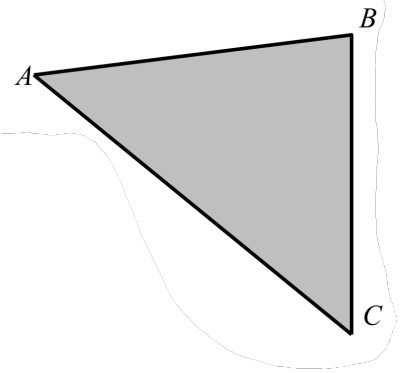
Question 1 **(25 marks)**

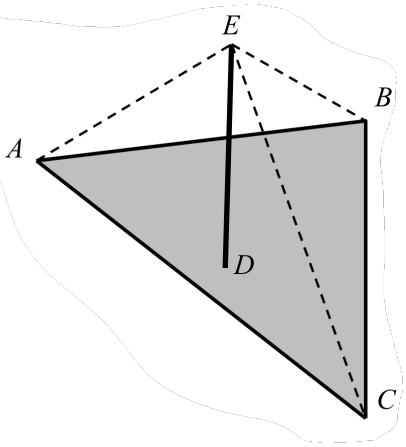
The lengths of the sides of a flat triangular field ACB are, $|AB| = 120$ m, $|BC| = 134$ m and $|AC| = 150$ m.



(a) **(i)** Find $|\angle CBA|$. Give your answer, in degrees, correct to two decimal places.

(ii) Find the area of the triangle ACB correct to the nearest whole number.

(b) A vertical mast, $[DE]$, is fixed at the circumcentre, D, of the triangle. The mast is held in place by three taut cables $[EA]$, $[EB]$ and $[EC]$. Explain why the three cables are equal in length.

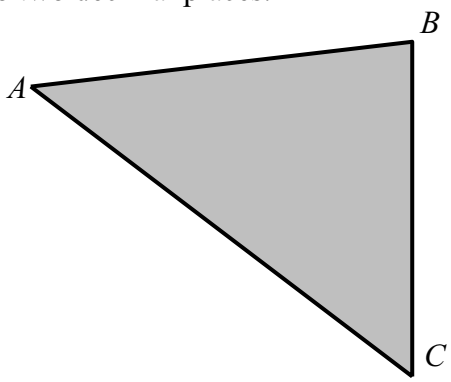


Question 1 **(25 marks)**

The lengths of the sides of a flat triangular field ACB are,
$|AB| = 120$ m, $|BC| = 134$ m and $|AC| = 150$ m.

(a) **(i)** Find $|\angle CBA|$. Give your answer, in degrees, correct to two decimal places.

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$
$$= \frac{120^2 + 134^2 - 150^2}{2(120)(134)}$$
$$= \frac{9856}{32160}$$
$$= 0 \cdot 306468$$
$$\Rightarrow B = 72 \cdot 15°$$



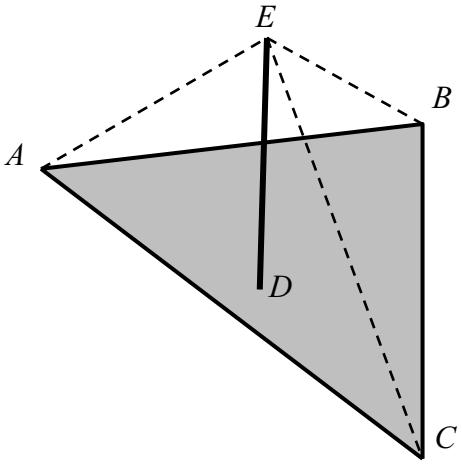
(ii) Find the area of the triangle ACB correct to the nearest whole number.

$$\text{Area } \Delta ABC = \tfrac{1}{2} ac \sin B = \tfrac{1}{2}(120)(134)\sin 72 \cdot 15$$
$$= 7652 \cdot 97$$
$$\approx 7653 \text{ m}^2$$

Or

$$\text{Area } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)} \text{ where } s = \frac{a+b+c}{2}$$
$$= \sqrt{202(202-134)(202-150)(202-120)}$$
$$= \sqrt{58570304} = 7653 \cdot 12$$
$$\approx 7653 \text{ m}^2$$

(b) A vertical mast, $[DE]$, is fixed at the circumcentre, D, of the triangle. The mast is held in place by three taut cables $[EA]$, $[EB]$ and $[EC]$. Explain why the three cables are equal in length.



Circumcentre at $D \Rightarrow |AD| = |BD| = |CD|$

Each of the triangles EAD, EBD, ECD is right-angled at D and has the two sides, the base and the perpendicular, equal.
Hence, by theorem of Pythagoras, the third side of each, the hypotenuse (the cables), must be equal.

Detailed Marking Notes

Section A

Question 1 **(25 marks)**

(a)(i) Scale 15D (0, 4, 7, 11, 15)

Low Partial Credit:

- Identifies Cosine Rule formula

Mid Partial Credit:

- All values correctly inserted

High Partial Credit:

- $Cos\angle CBA$ evaluated but angle not found
- Substantially correct work with one non arithmetic error

(ii) Scale 5C(0, 2, 3, 5)

Low Partial Credit:

- Relevant area formula
- Effort at finding a perpendicular height

High Partial Credit

- Substantially correct work with one non arithmetic error
- Values correctly inserted

(b) Scale 5C(0, 2, 3, 5)

Low Partial Credit:

- Recognises $|AD| = |DB| = |DC|$ (any two)
- Recognises one relevant right angle
- Indicates some understanding of circumcentre of a triangle

High Partial Credit

- Recognises $|AD| = |DB| = |DC|$ and relevant right angles but fails to conclude fully
- Clearly identifies two congruent triangles but does not make reference to the remaining triangle