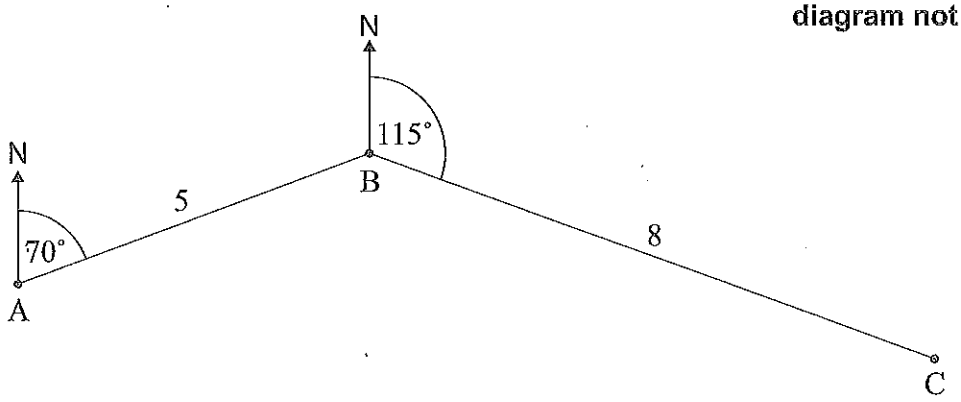
La Scuola d'Italia / Huson / IB Mathematics
.5 November 2025

1 Geometry: Law of Cosines, Law of Sines

The following diagram shows three towns A, B and C. Town B is 5 km from Town A, on a bearing of 070°. Town C is 8 km from Town B, on a bearing of 115°.

diagram not to scale



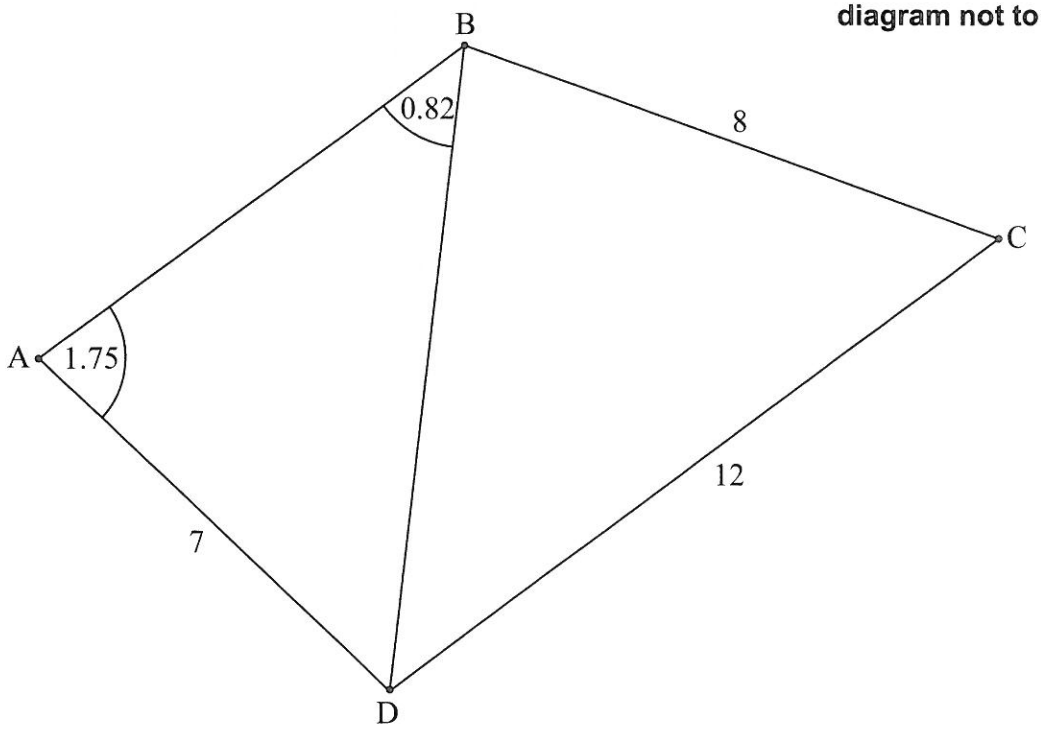
(a) Find $A\hat{B}C$. [2]

(b) Find the distance from Town A to Town C. [3]

(c) Use the sine rule to find $A\hat{C}B$. [2]

2. [Maximum mark: 6]

The following diagram shows a quadrilateral ABCD.



$AD = 7\,\text{cm}$, $BC = 8\,\text{cm}$, $CD = 12\,\text{cm}$, $D\hat{A}B = 1.75$ radians, $A\hat{B}D = 0.82$ radians.

(a) Find BD. [3]

(b) Find $D\hat{B}C$. [3]

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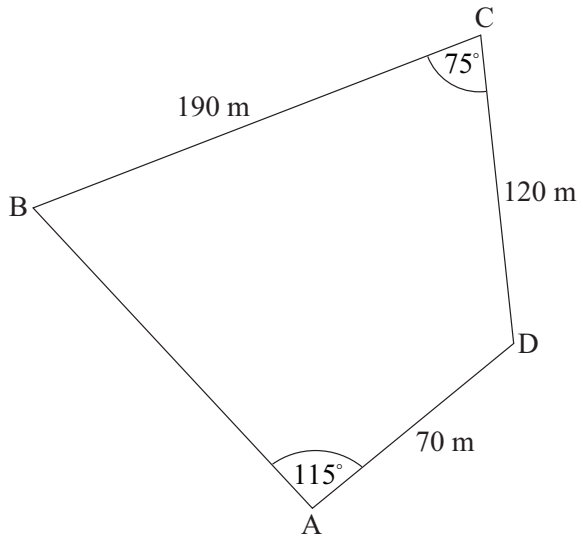
5. *[Maximum mark: 18]*

Pauline owns a piece of land ABCD in the shape of a quadrilateral. The length of BC is 190 m, the length of CD is 120 m, the length of AD is 70 m, the size of angle BCD is 75° and the size of angle BAD is 115°.

diagram not to scale



Pauline decides to sell the triangular portion of land ABD. She first builds a straight fence from B to D.

(a) Calculate the length of the fence. *[3 marks]*

The fence costs 17 USD per metre to build.

(b) Calculate the cost of building the fence. Give your answer correct to the nearest USD. *[2 marks]*

(c) Show that the size of angle ABD is 18.8°, correct to three significant figures. *[3 marks]*

(d) Calculate the area of triangle ABD. *[4 marks]*

She sells the land for 120 USD per square metre.

(e) Calculate the value of the land that Pauline sells. Give your answer correct to the nearest USD. *[2 marks]*

Pauline invests 300 000 USD from the sale of the land in a bank that pays compound interest compounded annually.

(f) Find the interest rate that the bank pays so that the investment will double in value in 15 years. *[4 marks]*

4. *[Maximum mark: 15]*

The diagram represents a small, triangular field, ABC, with $BC = 25\text{ m}$, angle $BAC = 55^\circ$ and angle $ACB = 75^\circ$.

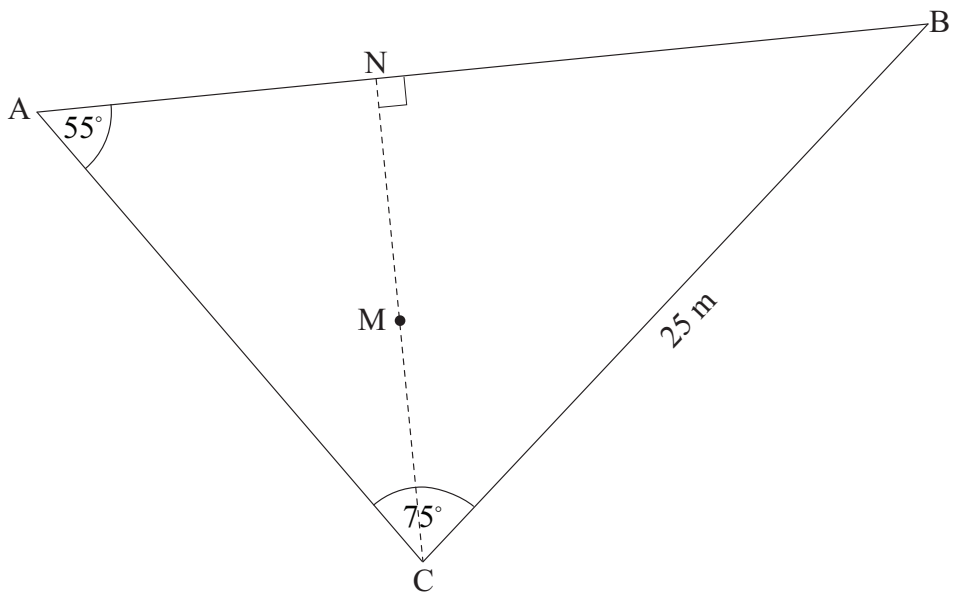


diagram not to scale

(a) Write down the size of angle ABC. *[1 mark]*

(b) Calculate the length of AC. *[3 marks]*

(c) Calculate the area of the field ABC. *[3 marks]*

N is the point on AB such that CN is perpendicular to AB. M is the midpoint of CN.

(d) Calculate the length of NM. *[3 marks]*

A goat is attached to one end of a rope of length 7 m. The other end of the rope is attached to the point M.

(e) Decide whether the goat can reach point P, the midpoint of CB. Justify your answer. *[5 marks]*