



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2014

Mathematics (Project Maths – Phase 3)

Paper 2

Ordinary Level

Monday 9 June Morning 9:30 – 12:00

300 marks

Examination number

Centre stamp

Running total	
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For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Grade

Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	3 questions

Answer all nine questions, as follows:

In Section A, answer:

Questions 1 to 5 and
either Question 6A **or** Question 6B.

In Section B, answer Questions 7 to 9.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

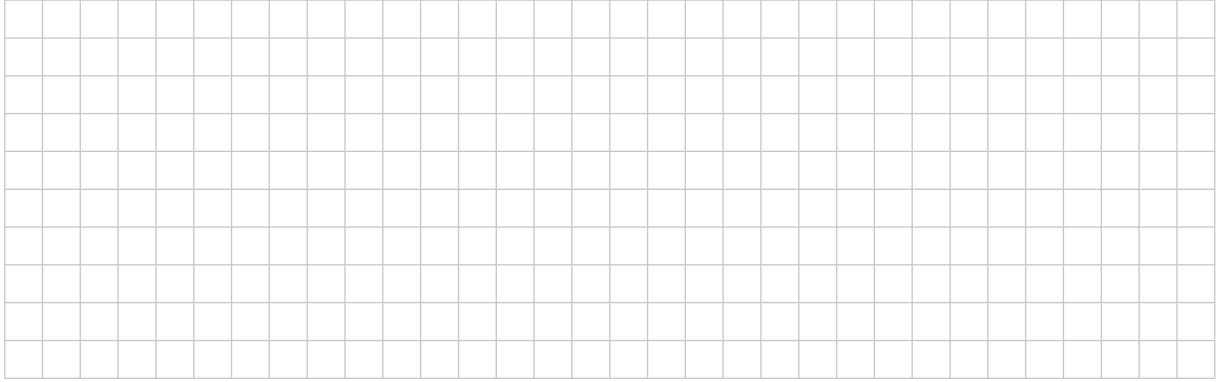
You will lose marks if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

(ii) Find the area of the triangle ABC .



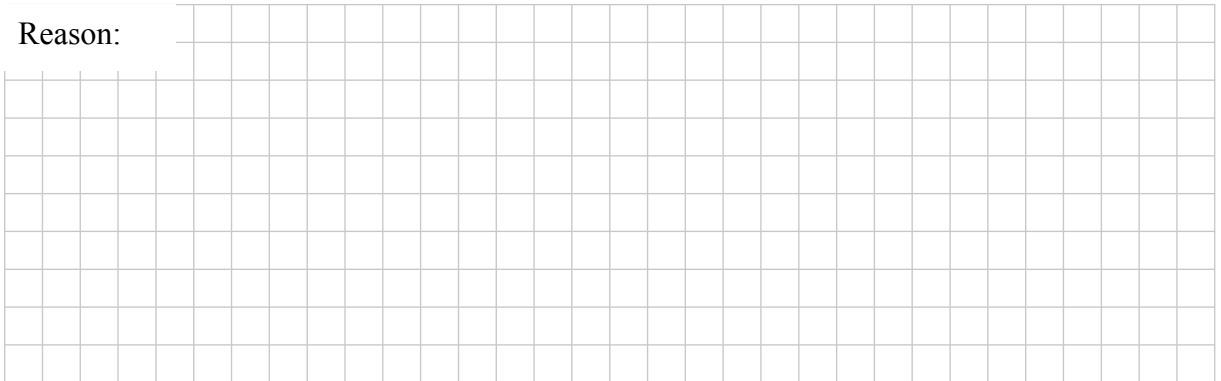
(b) $X(2, -4)$ and $Y(2, 1)$ are two points.

(i) Draw, on the diagram above, a triangle, XYZ , which is congruent to the triangle ABC .

(ii) Write down the co-ordinates of Z and explain why the triangle XYZ is congruent to the triangle ABC .

$$Z = (\quad , \quad)$$

Reason:

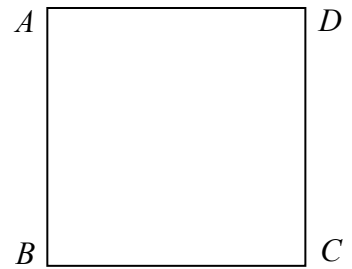
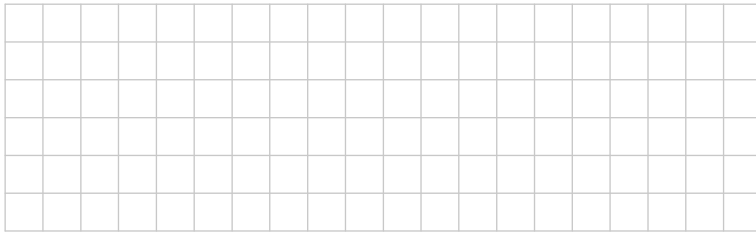


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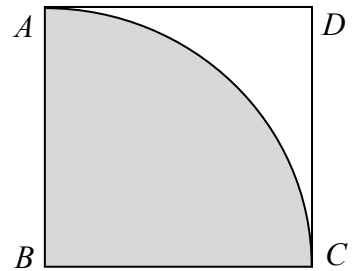
Question 5

(25 marks)

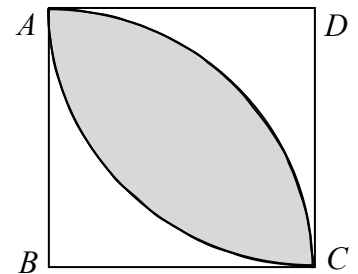
- (a) The square $ABCD$ has an area of 81 cm^2 . Find $|AD|$.



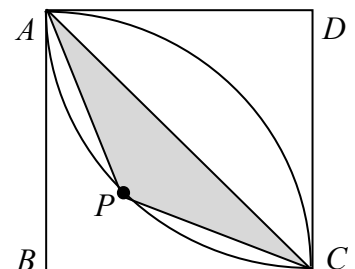
- (b) A sector of a circle, centre B and radius $|BC|$, is drawn inside $ABCD$ as shown by the shaded region.
 (i) Find the area of the sector, correct to one decimal place.



- (ii) A second sector of a circle, centre D and radius $|DA|$, is drawn. Find the area of the shaded region (the overlap of the two sectors), correct to one decimal place.



- (c) The point P is on the arc of the sector DAC , as shown. The triangle APC is isosceles. Find the area of the triangle APC , correct to one decimal place.



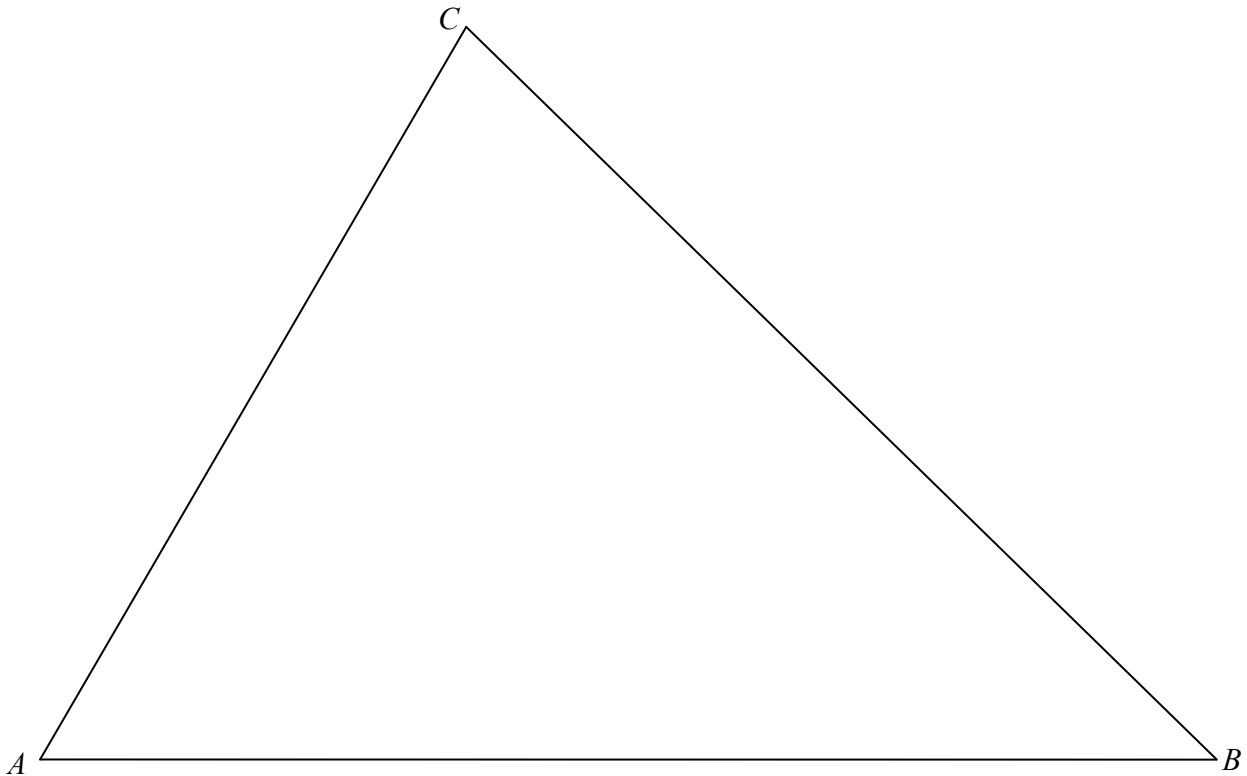
Question 6

(25 marks)

Answer **either** 6A **or** 6B.

Question 6A

- (a) (i) Construct the incircle of the triangle ABC below. Show all your construction lines clearly.

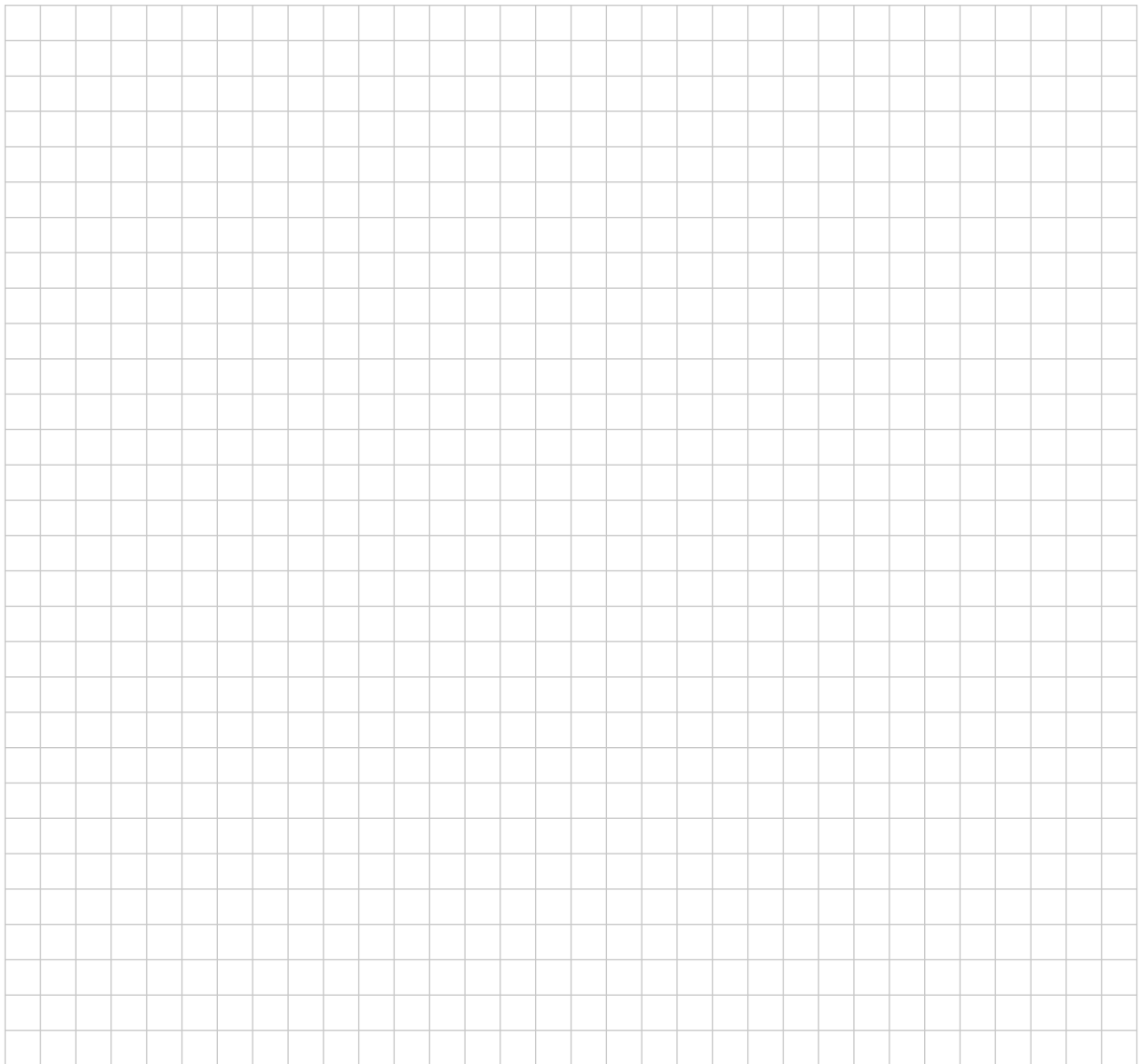
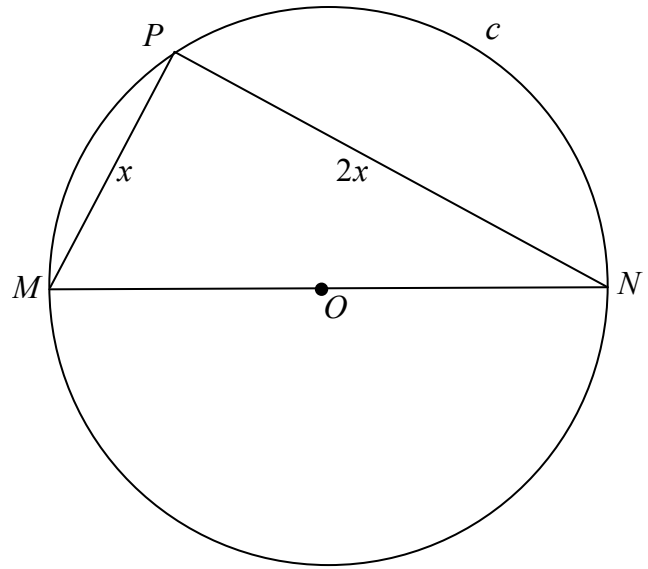


- (ii) Measure the length of the radius of the circle constructed in part (i).

Length of radius: _____

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- (b) The point P is on the circle c with centre O and diameter $[MN]$, as shown.
 The length of the radius of c is $2\sqrt{5}$ cm.
 $|MP| = x$ cm and $|PN| = 2x$ cm.
 Find the value of x .



OR

Question 6B

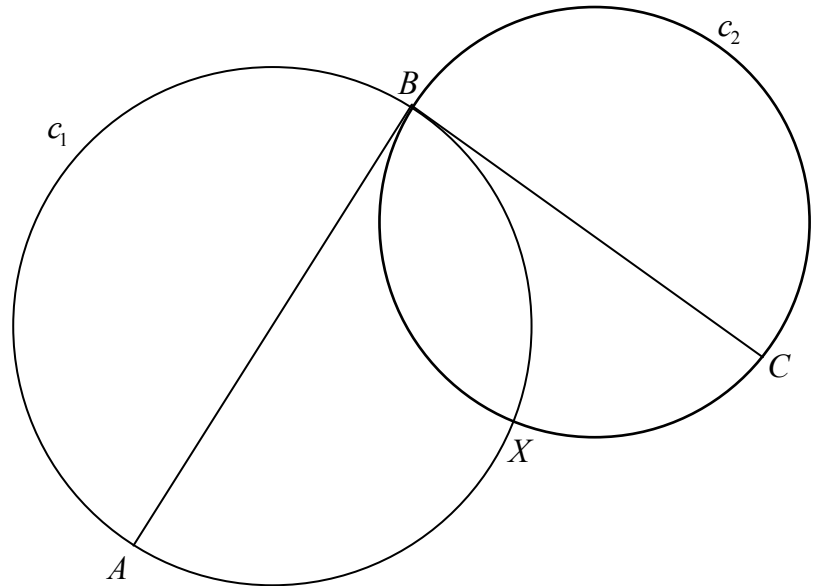
Two circles, c_1 and c_2 , intersect at the points B and X , as shown.

The circle c_1 has diameter $[AB]$.

The circle c_2 has diameter $[BC]$.

The line CB is a tangent to c_1 .

Prove that X is on the line AC .



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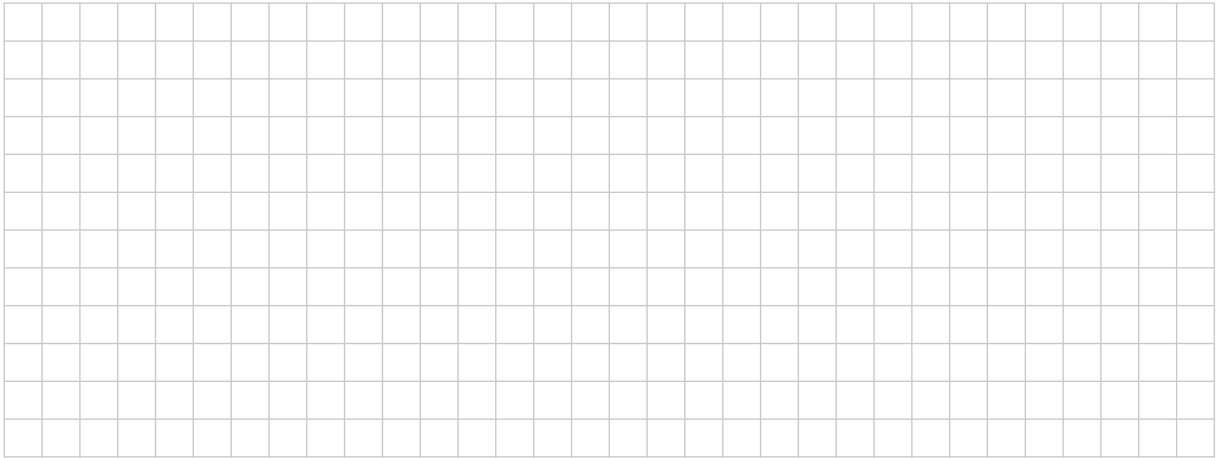
(c) (i) Use the data in the table above and your answer to part **(a) (i)** above to complete the following table.

Valuation Band	Tax per property	Number of properties	Total tax due (€)
€0 - €100 000	€45	425 790	19 160 550
€100 001 - €150 000	€112	489 060	
€150 001 - €200 000	€157		
€200 001 - €250 000	€202		
€250 001 - €300 000	€247		
Over €300 000	NA		NA

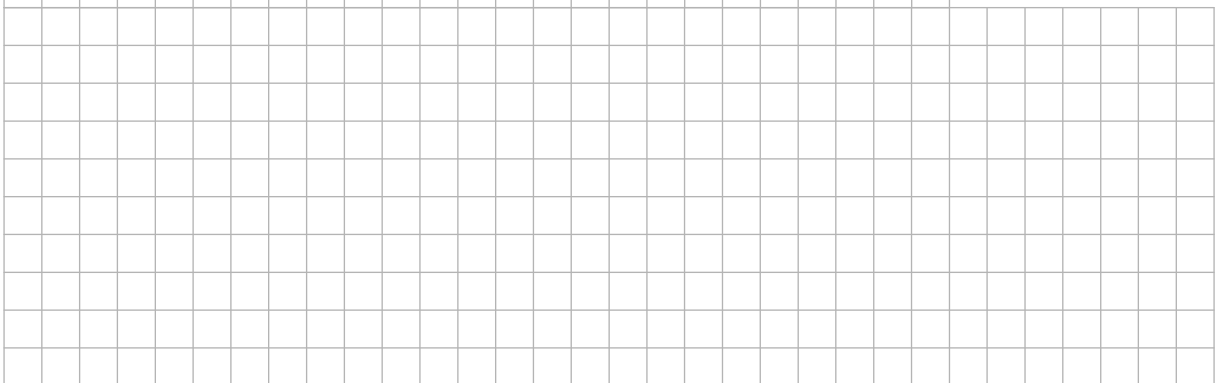
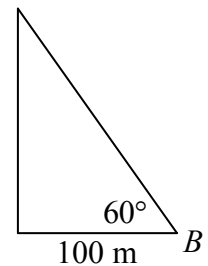
NA = Not Available

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- (iv) The expected lifetime of the turbine is 25 years. On average, the turbine operates 31% of the time. The blades rotate 15 times per minute when the turbine is operating. Find the number of times the blades will rotate during the expected lifetime of the turbine (ignore leap years). Write your answer in the form $a \times 10^n$, where $1 \leq a < 10$ and $n \in \mathbb{Z}$.

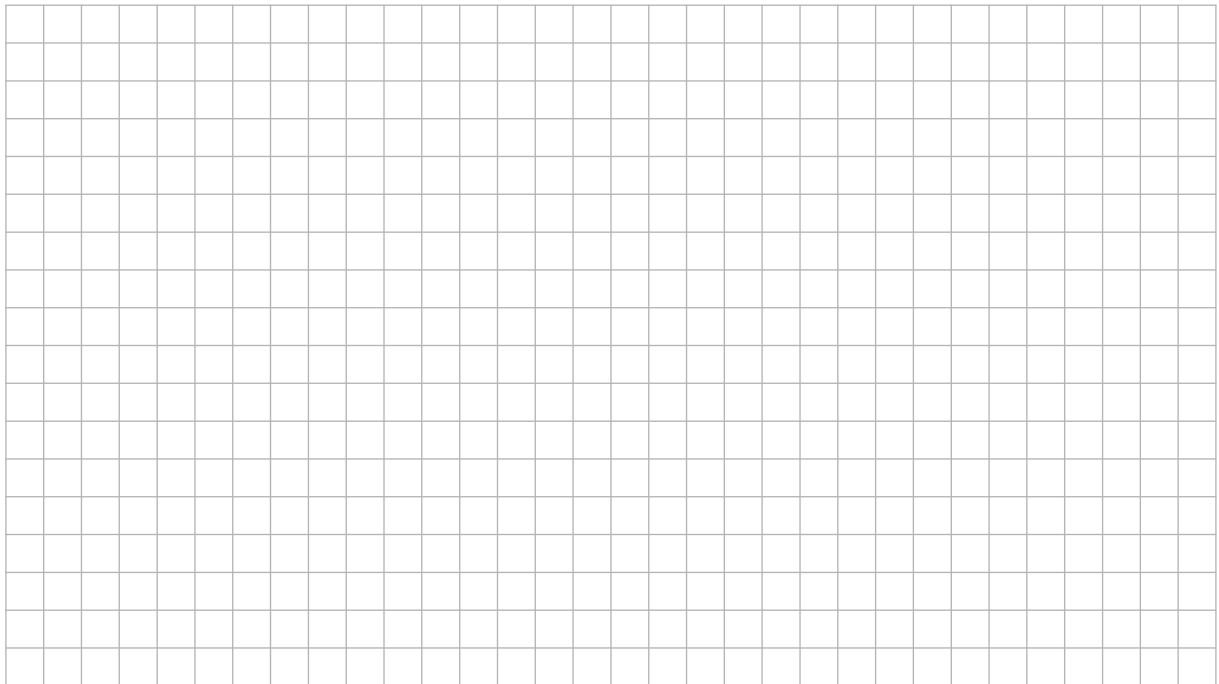


- (b) Gráinne stood at a point B , which is on level ground 100 metres from the base of the tower supporting the blades, as shown. From there, she measured the angle of elevation to the top of the tower as 60° . Find the height of the tower, using Gráinne's measurements. Give your answer correct to the nearest metre.

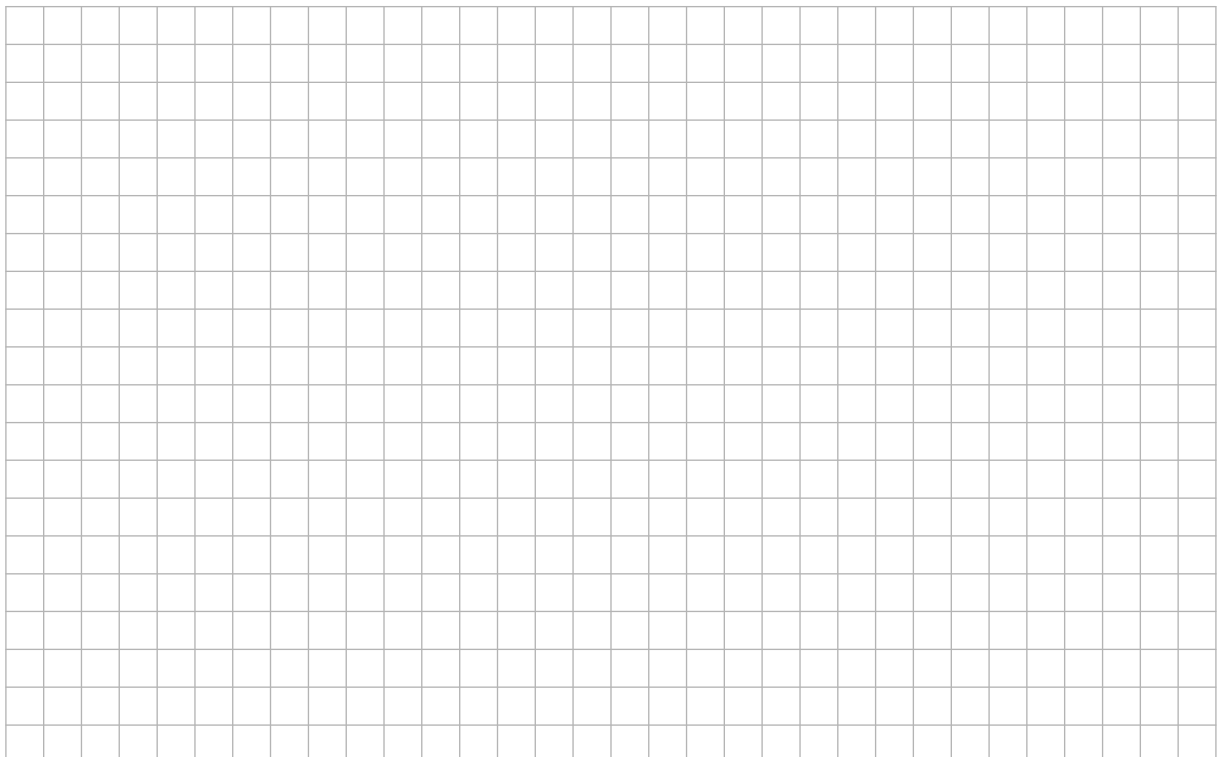


(c) Gráinne recognises that her measurement of the angle may not be totally accurate. She read elsewhere that the actual height of the tower is 154 m.

(i) If Gráinne measured the 100 m accurately, find the actual size of the angle at B , correct to the nearest degree.



(ii) Find the percentage error in Grainne's measurement of the angle of elevation, correct to one decimal place.



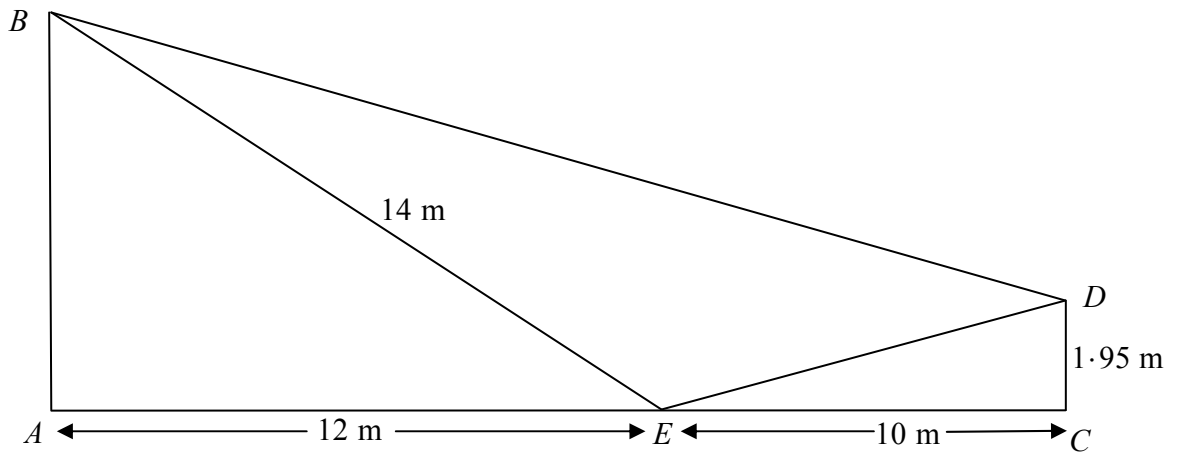
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Question 9

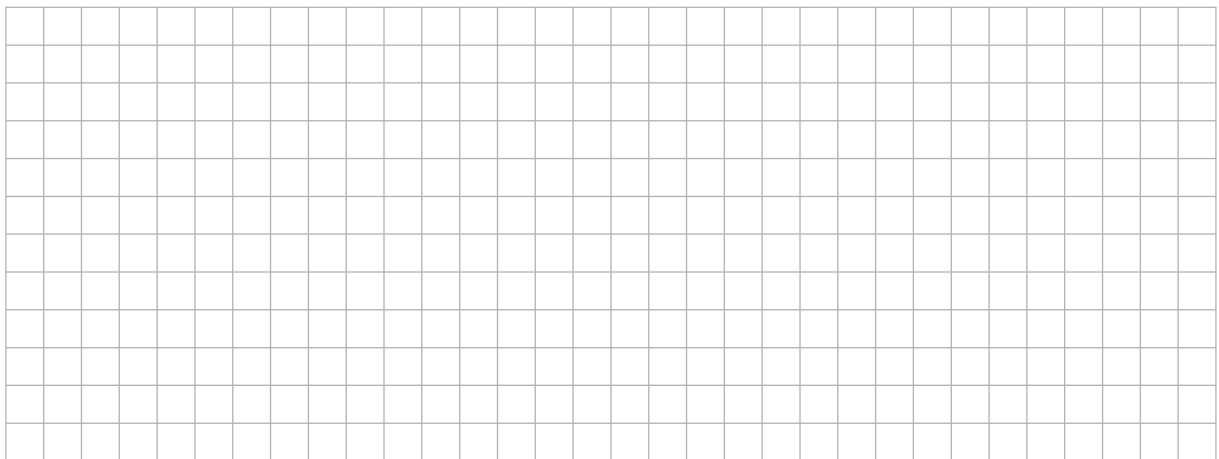
(30 marks)

At an activity centre a zip-line, $[BD]$, runs between two vertical poles, $[AB]$ and $[CD]$, on level ground, as shown. The point E is on the ground, directly below the zip-line.

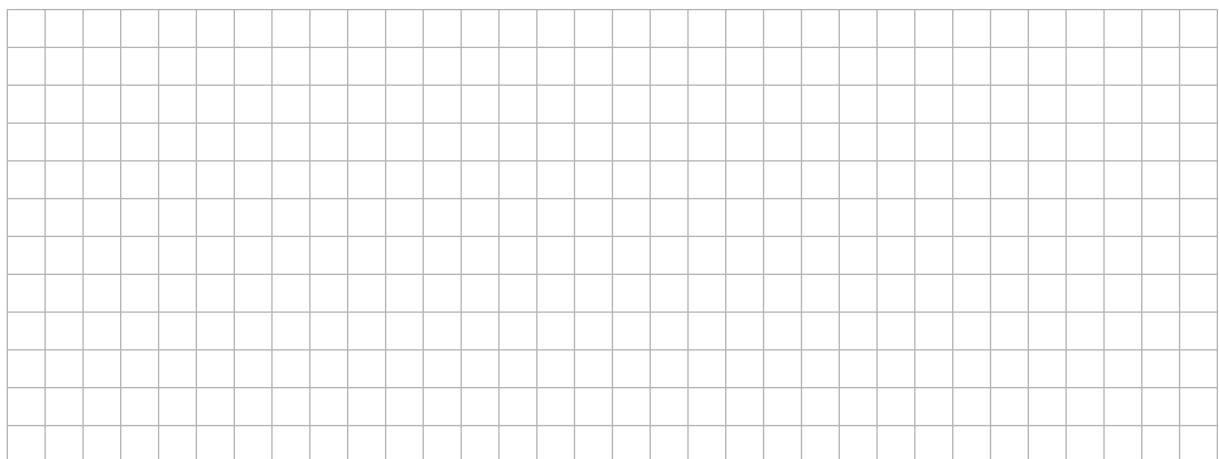
$|AE|=12\text{ m}$, $|BE|=14\text{ m}$, $|CD|=1.95\text{ m}$, and $|EC|=10\text{ m}$.



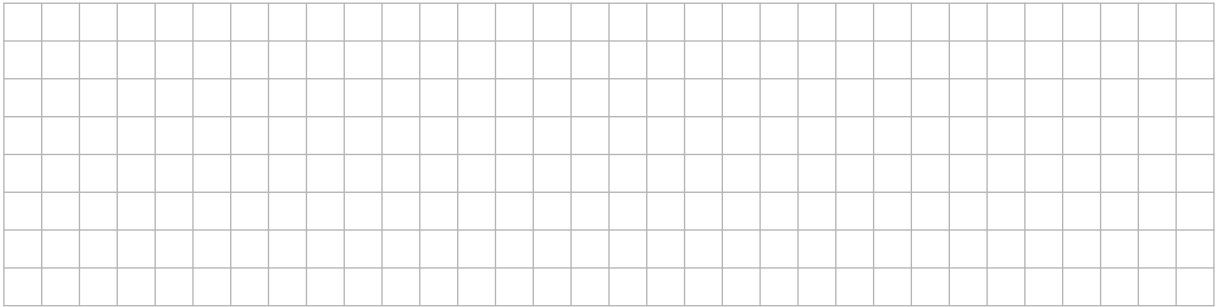
(a) (i) Find the distance $|ED|$, correct to one decimal place.



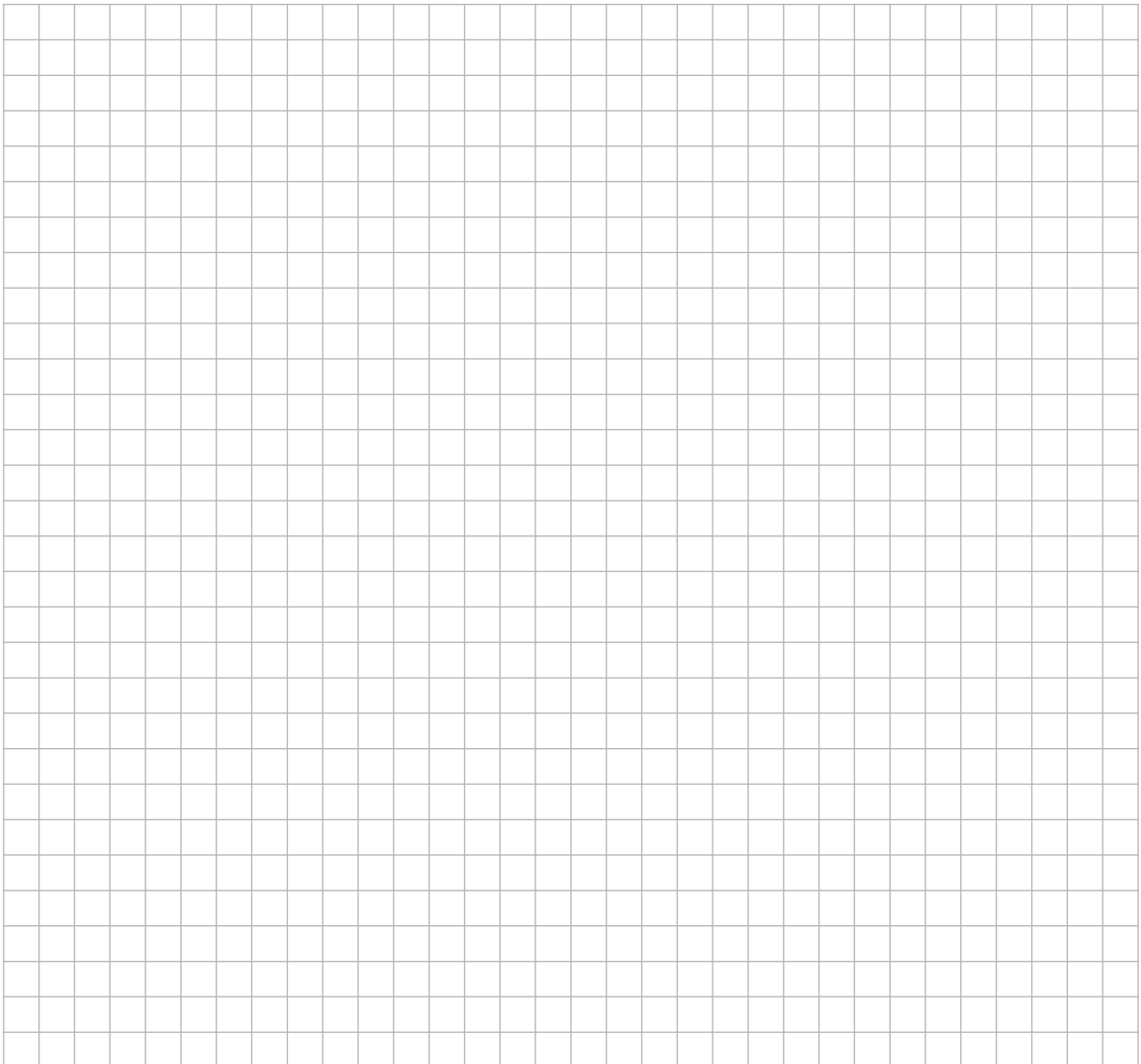
(ii) Find $|\angle AEB|$, correct to the nearest degree.



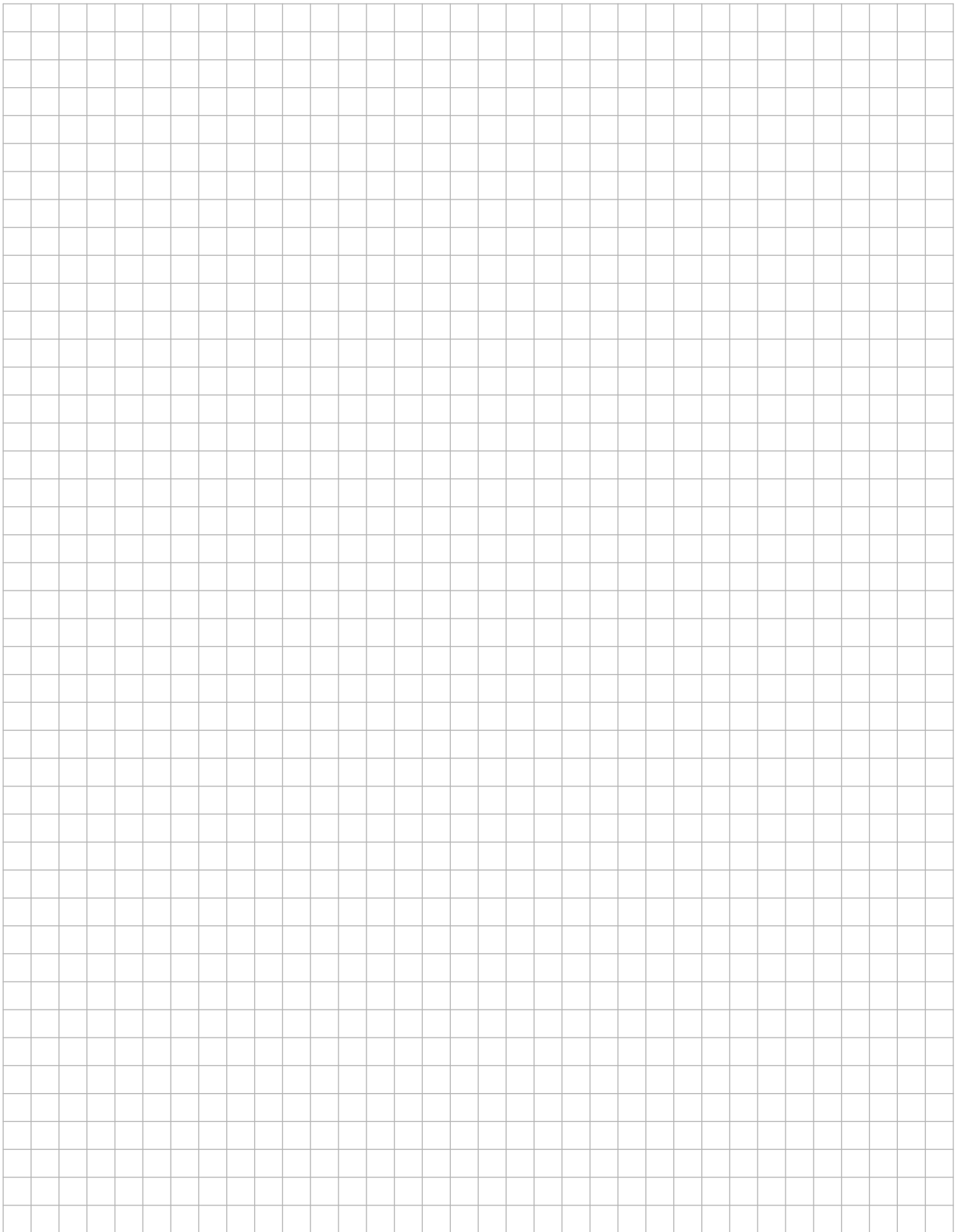
(b) (i) Find $|\angle DEB|$, given that $|\angle CED| = 11^\circ$, correct to the nearest degree.



(ii) Hence, or otherwise, find the distance $|DB|$.
Give your answer correct to one decimal place.



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