Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2013

Mathematics

Unit T4
(With calculator)
Higher Tier

[GMT41]

TUESDAY 11 JUNE, 9.15 am – 11.15 am

MV18

TIME

2 hours, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Complete in blue or black ink only.
Answer **all twenty-two** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 11 and 15**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on pages 4 and 5.

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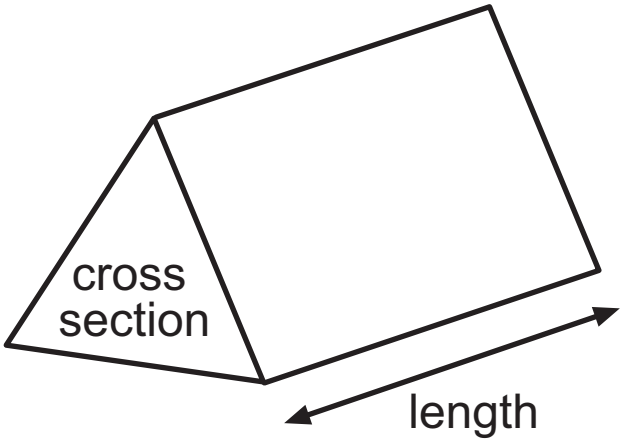
(Questions start on page 7)

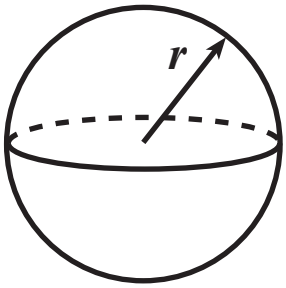
Formula Sheet

Volume of prism = area of cross section × length



Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



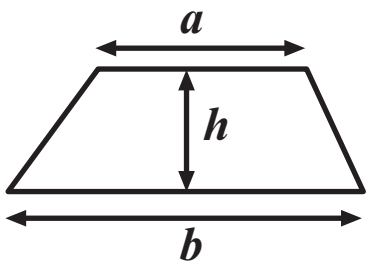
Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

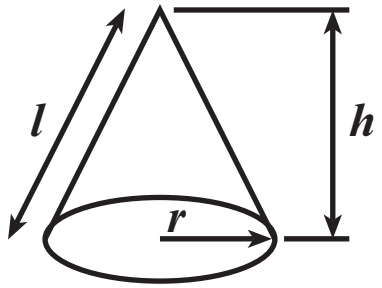
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Area of trapezium $= \frac{1}{2}(a + b)h$

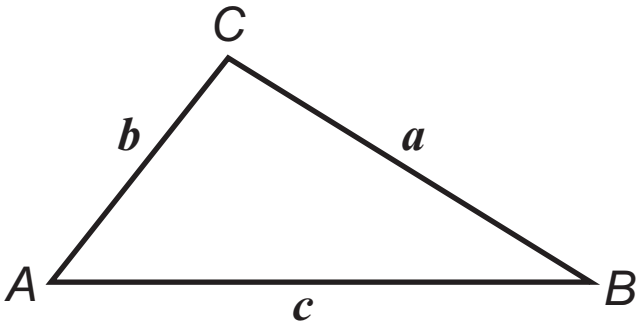


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



In any triangle *ABC*



Area of triangle $= \frac{1}{2}ab \sin C$

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$

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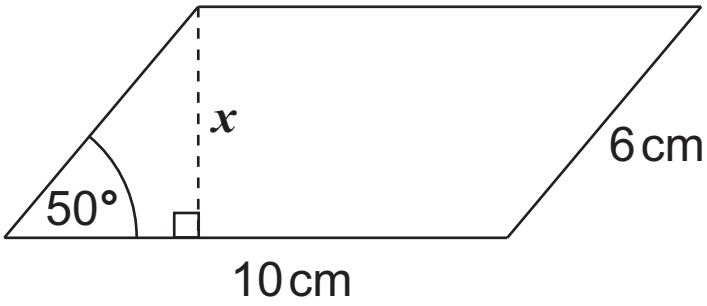
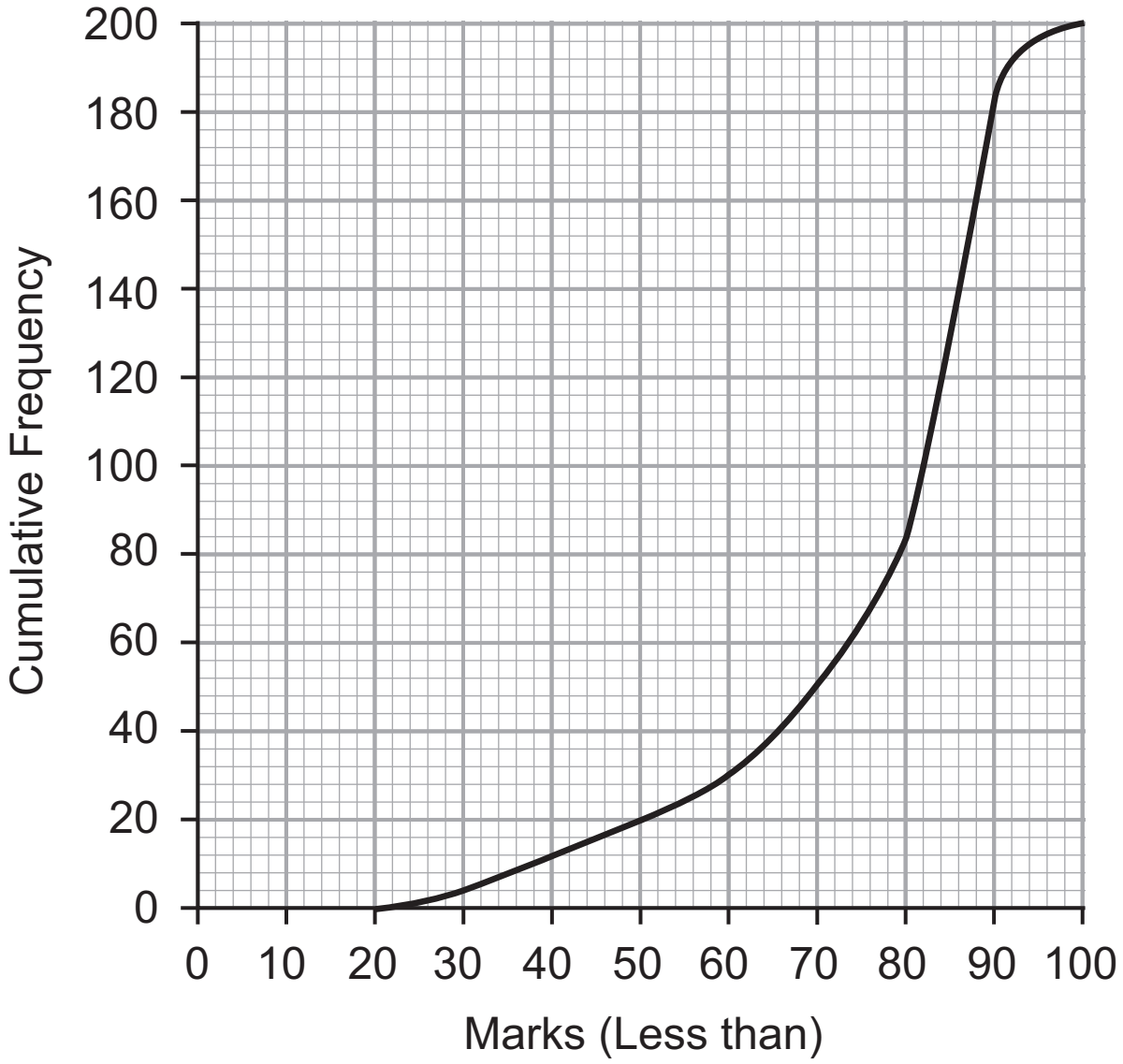
1



A parallelogram has sides of 6 cm and 10 cm, with an angle of 50° between the sides.
Calculate the height x of the parallelogram. [3 marks]

Answer x = _____ cm

2 The graph below shows the cumulative frequency of marks obtained in a spelling test.



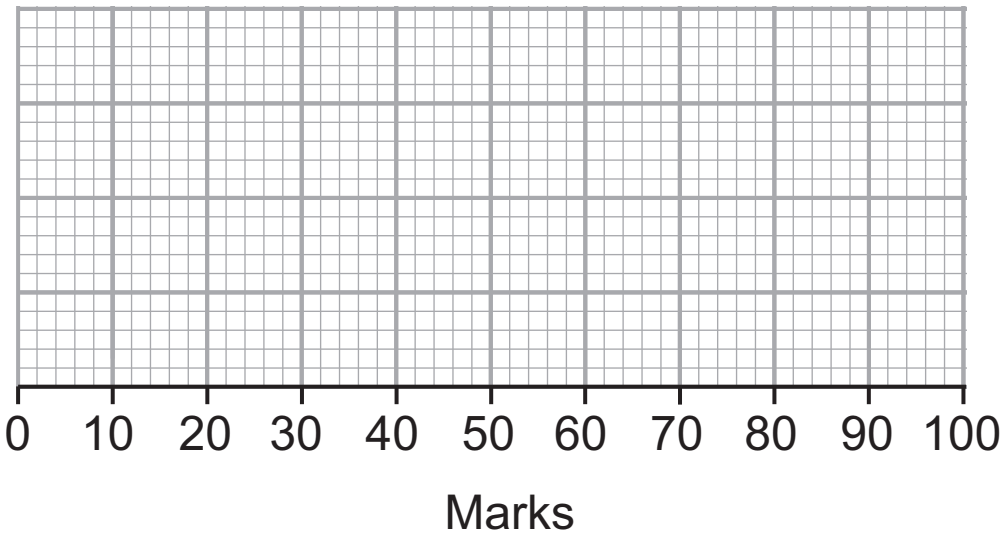
(a) Use the graph to estimate the inter-quartile range. [2 marks]

Answer _____

(b) The pass mark is 75
Estimate how many passed the spelling test. [2 marks]

Answer _____

(c) From the graph on page 8 draw a box plot. [3 marks]



3 **(a)** Solve the simultaneous equations [2 marks]

$5x - y = 9$
$-2x + y = 3$

Show your working clearly.

Answer $x =$ _____ $y =$ _____

(b) Solve $\frac{2}{3}(1 - x)\frac{1}{4}(3x - 1) = 8$ [4 marks]

Answer $x =$ _____

4 **(a)** Factorise $15xy - 5y^2$ [2 marks]

Answer _____

(b) **(i)** Factorise $x^2 - 9x - 36$ [2 marks]

Answer _____

(ii) Hence solve $x^2 - 9x - 36 = 0$ [2 marks]

Answer _____

5 What is the Highest Common Factor (HCF) of 210 and 252? [2 marks]

Answer _____

6 Tony opened a savings account with the Western Bank. After one year, the bank paid 6**%** per annum interest into his account.
The total amount in his account was then **£**710.20
Work out the amount of money with which Tony opened the account. [3 marks]

Answer **£** _____

7 **(a)** Write 7^{-2} as a fraction. [1 mark]

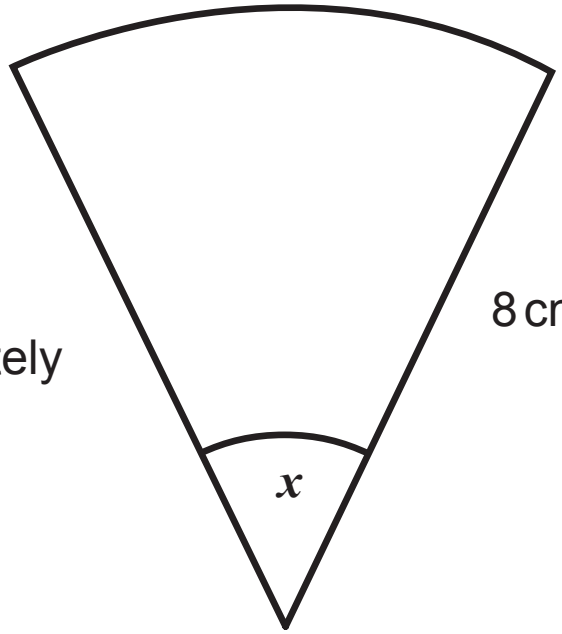
Answer _____

(b) Hence find the value of $7^{0} + 7^{-2}$ [1 mark]

Answer _____

8 The area of the sector is 20.11 cm^2
Calculate the angle x. [4 marks]

diagram not
drawn accurately



Answer _____ °

9 Find the equation of the line which passes through the points

(–2, 11) and (0, 5) [3 marks]

Answer _____

10 The load L which can be supported by a metal girder varies inversely as its length x.
A load of 10 tonnes can be supported by a girder 2 m long.
What length of girder will support a load of 12.5 tonnes?
[3 marks]

Answer _____ m

Quality of written communication will be assessed in this question.

11 The table shows information about 500 pupils in a school.

Year	Number of Boys	Number of Girls
8	70	90
9	85	75
10	80	100

The headmaster wants to carry out a survey of the pupils' views on the new school library. He decides to choose a stratified sample of 60 pupils to take part in the survey.

(a) How many boys in Year 9 should be in the sample? [2 marks]

Answer _____

(b) For this data, why is it better to select a stratified sample than a random sample? [2 marks]

Answer _____

_____

12

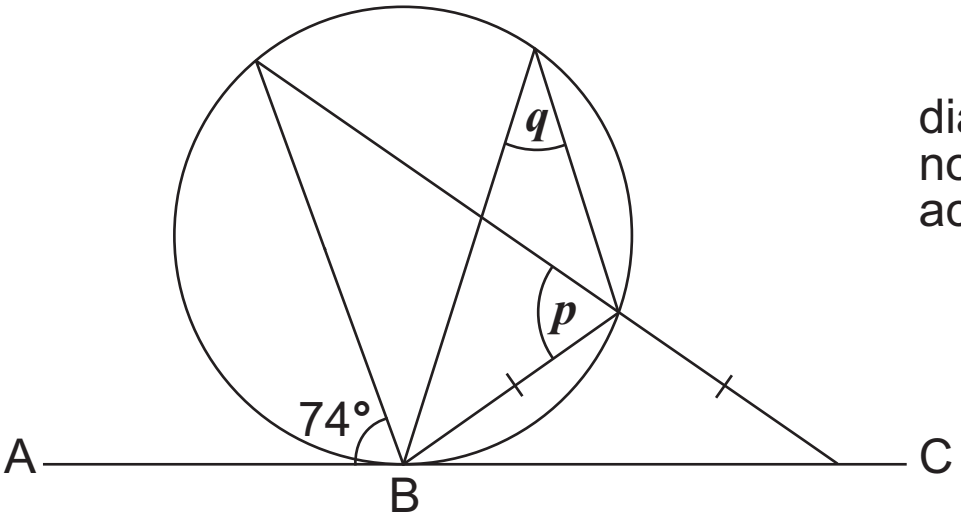


diagram
not drawn
accurately

(a) AC is a tangent to the circle at B.
Find the size of angle p, giving a reason. [2 marks]

Answer p = _____°,

because _____

(b) Calculate the size of angle q. [2 marks]

Answer q = _____°

13

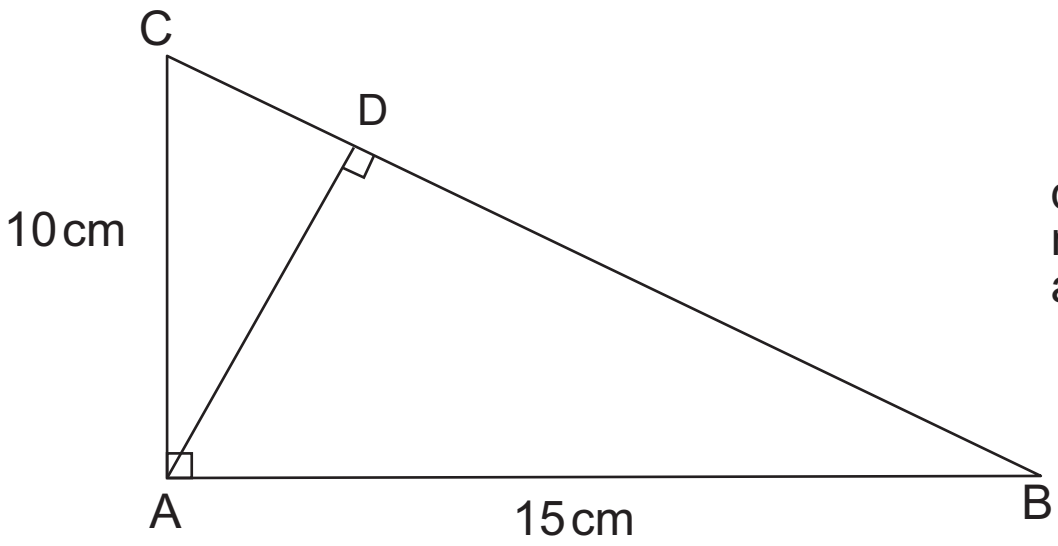


diagram not drawn accurately

Calculate the length AD. [5 marks]

Answer _____ cm

14 The median of ten numbers is 40
The mean of the numbers is 55
20 is subtracted from the smallest number.
Calculate the median and mean of the ten numbers now. [4 marks]

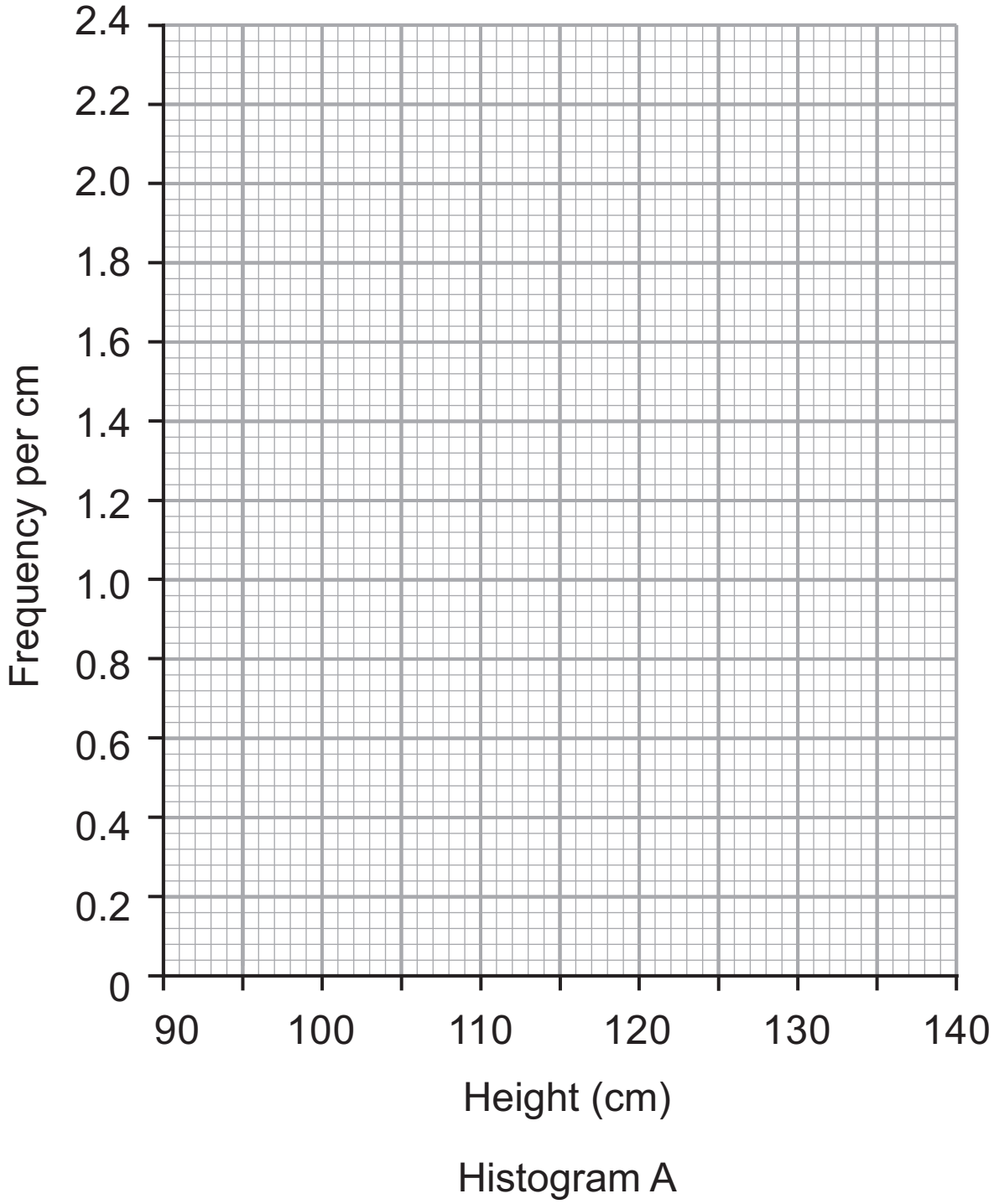
Answer median = _____, mean = _____

Quality of written communication will be assessed in this question.

15 The table gives information about heights of 60 swimmers.

Height, h cm	**Number of swimmers**
$90 \leqslant h < 95$	11
$95 \leqslant h < 105$	16
$105 \leqslant h < 120$	18
$120 \leqslant h < 130$	8
$130 \leqslant h < 140$	7

(a) Illustrate the data by drawing a histogram on the graph paper below. [3 marks]



Histogram A

(b) The histogram drawn opposite illustrates the heights of a different group of 60 swimmers.
Compare this histogram with the one you have drawn. [2 marks], [1 mark] for each part.
Give two comparisons.

1. _____

_____

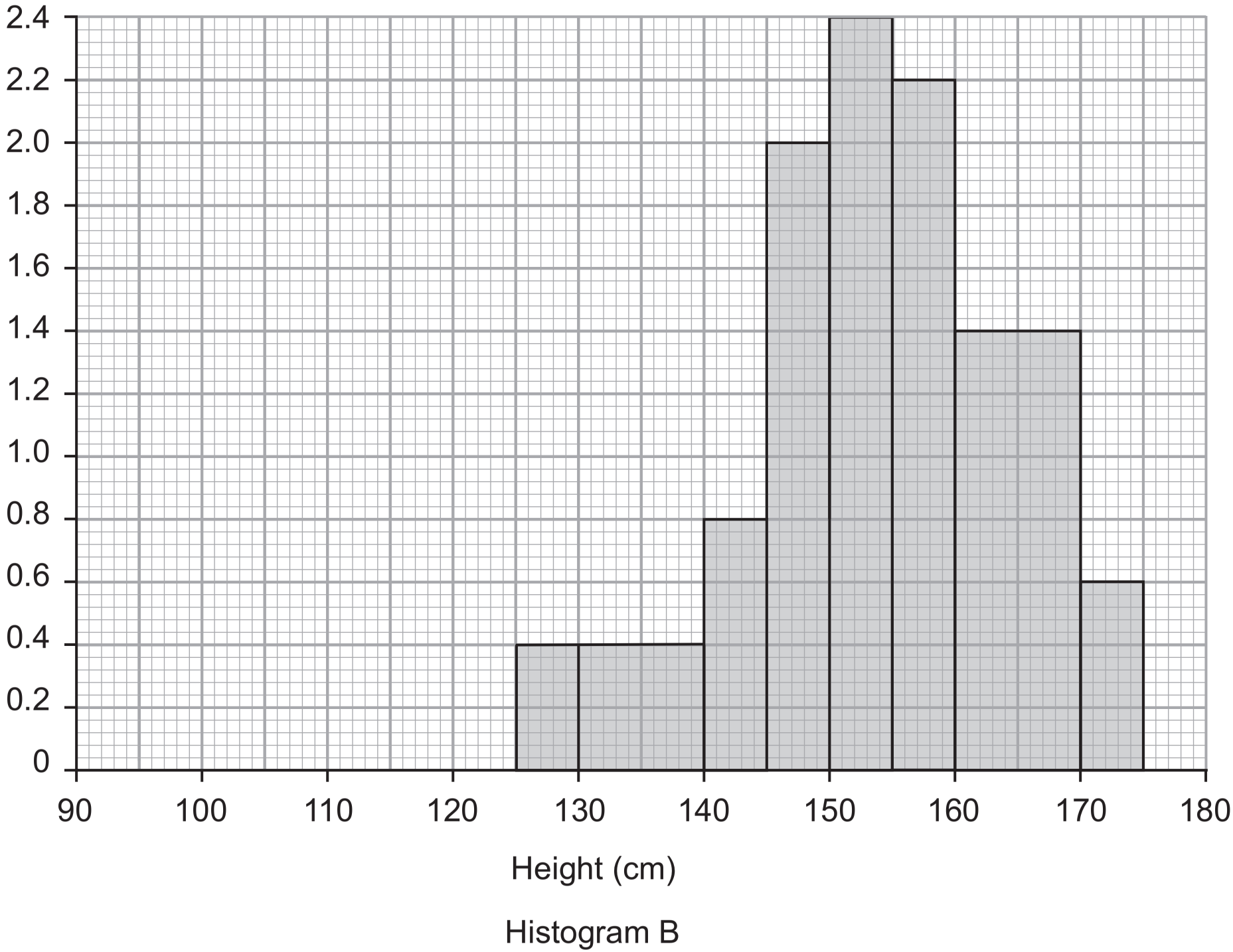
2. _____

_____

(c) Suggest a reason for the difference in the two histograms. [1 mark]

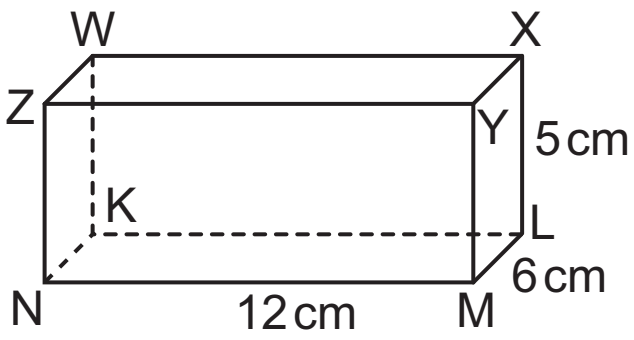
Answer _____

_____


2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
Frequency per cm
90
100
110
120
130
140
150
160
170
180
Height (cm)

Histogram B

16 A cuboid is shown.



(a) Calculate the length of the space diagonal NX. [2 marks]

Answer _____ cm

(b) Calculate the angle between NX and the base of the cuboid. [3 marks]

Answer _____ °

17 (a) Expand and simplify $(3x - y)(x + 2y)$ [3 marks]

Answer _____

(b) Factorise $4x^2 - 4xy - 3y^2$ [2 marks]

Answer _____

18 **(a)** What is the meaning of

(i) $15^{\frac{1}{2}}$ [1 mark]

Answer _____

(ii) $16^{\frac{2}{3}}$ [2 marks]

Answer _____

(b) Explain why $2^{-1} \times \left(\frac{1}{16}\right)^{\frac{1}{2}}$ is equal to $\frac{1}{8}$ [1 mark]

(c) Show how to evaluate $32^{-\frac{4}{5}}$ **without using a calculator**.

You must show clearly **each** stage of your method and write your final answer as simply as possible. [4 marks]

Answer _____

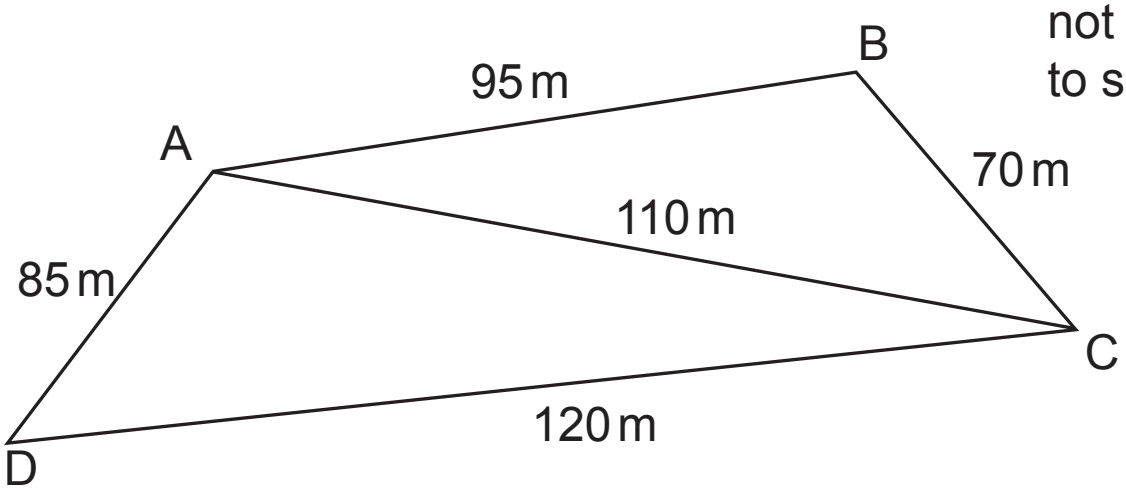
19 5 consecutive positive integers are such that twice the product of the smallest and largest integers exceeds the square of the middle integer by 41

By letting the smallest integer equal x, set up and solve a quadratic equation to find the middle integer. [5 marks]

Answer The middle integer is _____

20 A field ABCD is shown.

diagram not drawn to scale



A track AC runs diagonally from A to C. Angle CAB = 39.1°
Calculate the shortest distance from B to D. [4 marks]

Answer _____ m

21 Simplify $\frac{2x^2 - 8}{x^2 - 14x + 24}$ [4 marks]

Answer _____

22 Solve $\frac{x+1}{x-2} + \frac{x-2}{x+1} = \frac{5}{2}$ [7 marks]

Answer _____

THIS IS THE END OF THE QUESTION PAPER

For Examiner's use only	
Question Number	**Marks**
1	
2	
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22	
Total Marks	

Examiner Number

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