OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS B

Paper 4 (Higher Tier)

J567/04

SPECIMEN

Duration: 1 hour 45 minutes

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Answer all the questions.
- Do not write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Use the π button on your calculator or take π to be 3·142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper.

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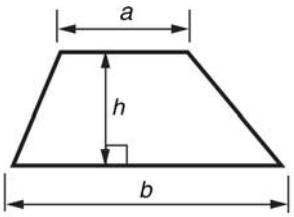
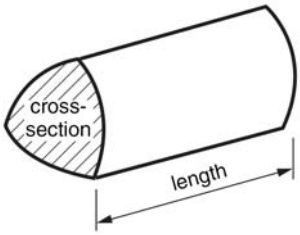
SPECIMEN

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

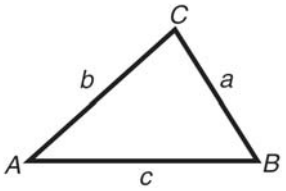


In any triangle *ABC*

Sine rule $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

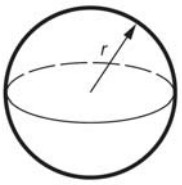
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



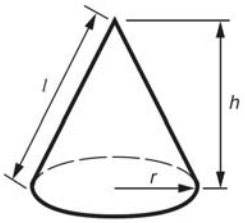
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi r l$



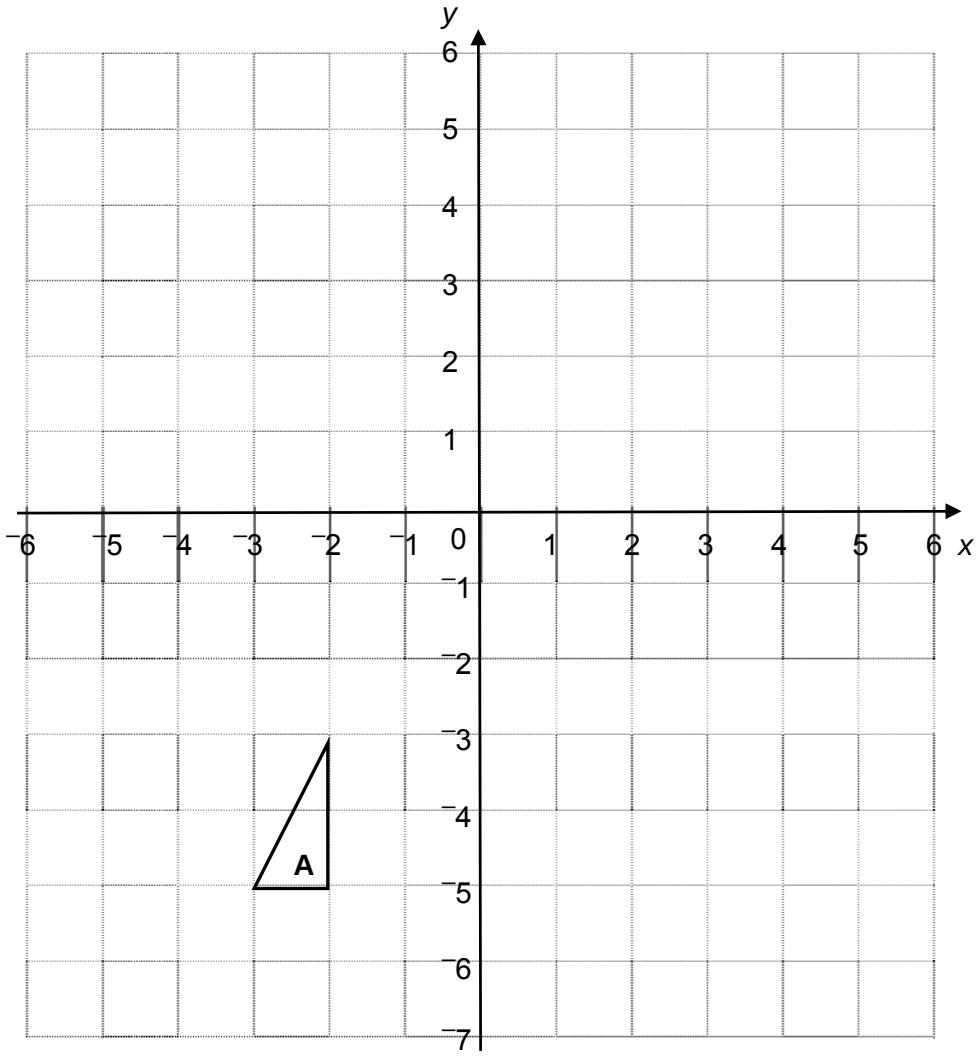
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

PLEASE DO NOT WRITE ON THIS PAGE

1



(a) Enlarge triangle **A** with centre ($^{-}5$, $^{-}6$) and scale factor 3. **[3]**

(b) The area of a rhombus is 4 cm^2.
The rhombus is enlarged with scale factor 2·5.

Work out the area of the enlarged rhombus.

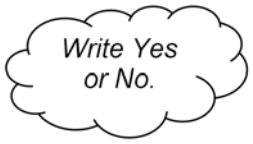
(b) _____ cm^2 **[2]**

2 Donna is doing a survey about the local library.

(a) Here is one of her questions.

> How many books do you borrow from the library in a year?

Do you think this is a good question?
Explain your answer.



_____ because _____

_____ **[1]**

(b) Here is another of her questions.

> Do you agree that the library is a good place to do your revision?
>
> Yes ☐ No ☐

Write a better version of this question.

_____

_____

_____

_____ **[1]**

(c) Donna stands inside the library on a Thursday afternoon to do her survey.

Explain why this is not a good idea.

_____

_____ **[1]**

3 Here is the information panel in Adele's car at the end of a journey.

Journey Time: 3 hours 45 minutes Average Speed: 77 km/h

(a) **Estimate** the distance, in kilometres, that she has travelled.
Show how you obtained your estimate.

_____ **[2]**

(b) **Calculate** the distance she has travelled.

(b) _____ km **[2]**

(c) This table summarises the weights of 25 cars.

Weight (w kg)	Frequency
$800 \leq w < 900$	1
$900 \leq w < 1000$	2
$1000 \leq w < 1100$	4
$1100 \leq w < 1200$	3
$1200 \leq w < 1300$	7
$1300 \leq w < 1400$	3
$1400 \leq w < 1500$	5

Calculate an estimate of the mean weight of these cars.

(c) _____ kg **[4]**

4 **(a)** In Year 9 at Mowden School there are 140 girls and 84 boys.

Write the ratio of girls to boys in its simplest terms.

(a) _____ **[2]**

(b) In Year 10 the ratio of girls to boys is 3 : 2.
There are 240 students in this year group.

How many boys are there?

(b) _____ **[2]**

5 **(a)** Factorise.

$6x - 3x^2$

(a) _____ **[2]**

(b) Solve.

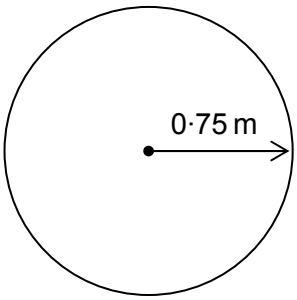
(i) $3(2x + 5) = 9$

(b)(i) _____ **[3]**

(ii)* $6x - 10 = 2x + 8$

(ii) _____ **[3]**

6 Kate has a pond in her garden.
The surface is a circle with radius 0·75 m.



Kate wants to keep fish in the pond.
She finds this information on the internet.

> Total length of all the fish should not be more than 5 cm for each 0·1 m^2 of the pond's surface area.

The fish she chooses are each 8 cm long.

What is the maximum number of these fish that Kate can buy for her pond?

[6]

7 You must use a ruler and a pair of compasses for this question.
Construct and shade the region which is both:

- nearer to B than to A
- within 5 cm of A.

Leave your construction lines clearly visible.

A •

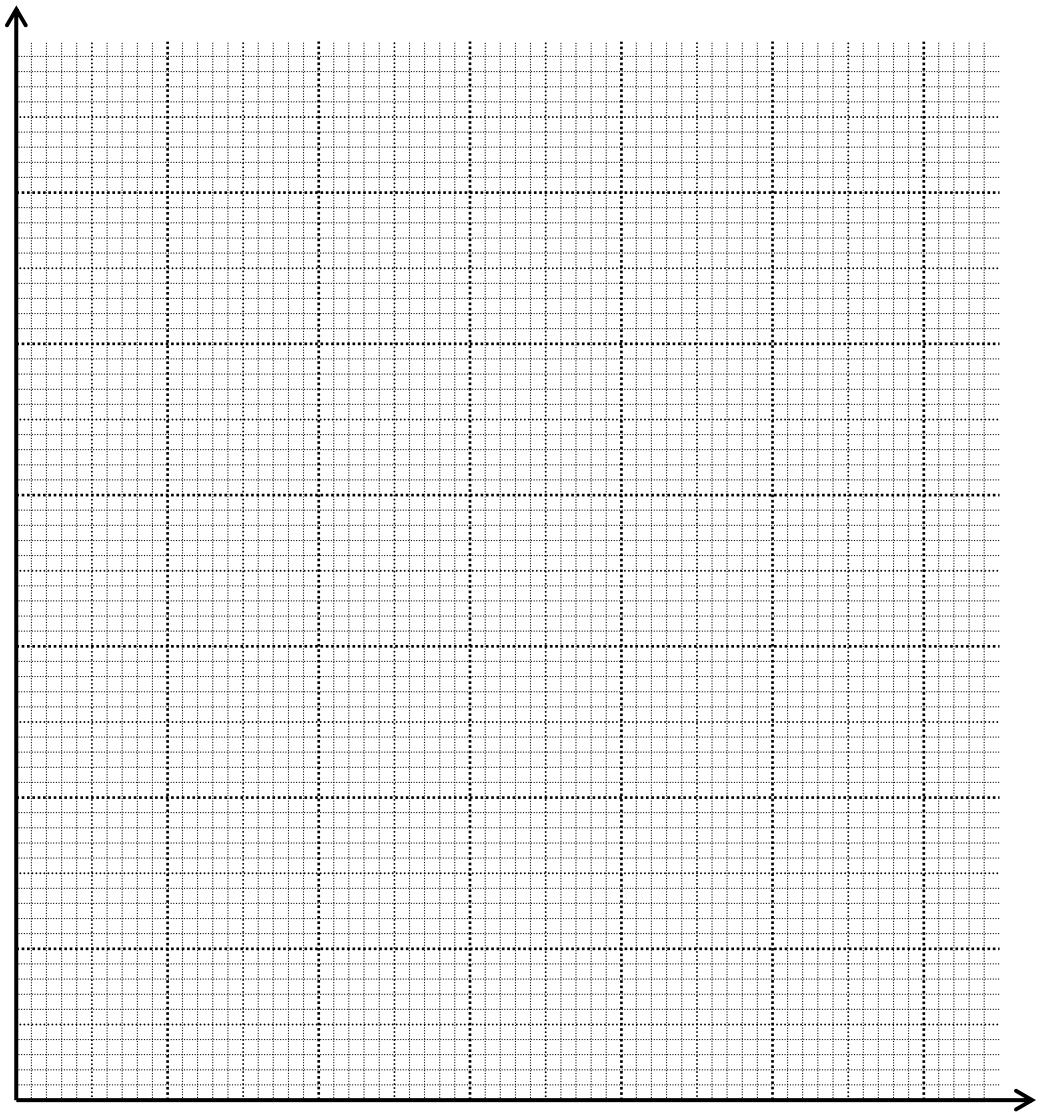
B •

[3]

8 Muttiah collects 8 leaves from his garden and measures their lengths and widths.
His results are shown in the table below.

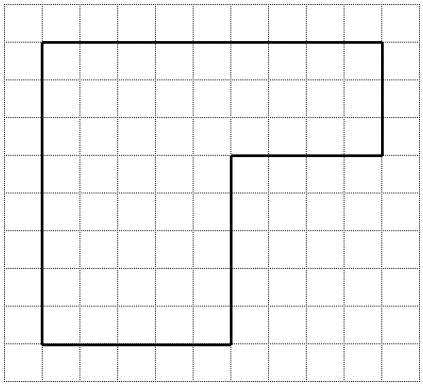
Which of these leaves come from the same type of tree and which do not?

Leaf	A	B	C	D	E	F	G	H
Length (mm)	144	123	116	149	126	148	118	137
Width (mm)	116	76	62	79	67	50	70	81



[5]

9* Adnan is insulating his loft.
One roll of insulation will cover an area of 1·97 m^2.
Here is the plan view of Adnan's loft.



Scale: 1 cm to 2 m

How many rolls of insulation does Adnan need to buy to insulate his loft?

[6]

10 The equation $x^3 - 4x = 20$ has a solution between 3 and 4.

Find this solution correct to 1 decimal place.
Show all your trials and their outcomes.

x = _____ **[3]**

11 Eyal's hard disk has a capacity of 240 gigabytes.

1 gigabyte (GB) = 1 000 000 000 bytes

(a) Write 240 GB as bytes in standard form.

(a) _____ bytes **[1]**

(b) The hard disk has 26% of its total capacity unused.

Work out the unused capacity.

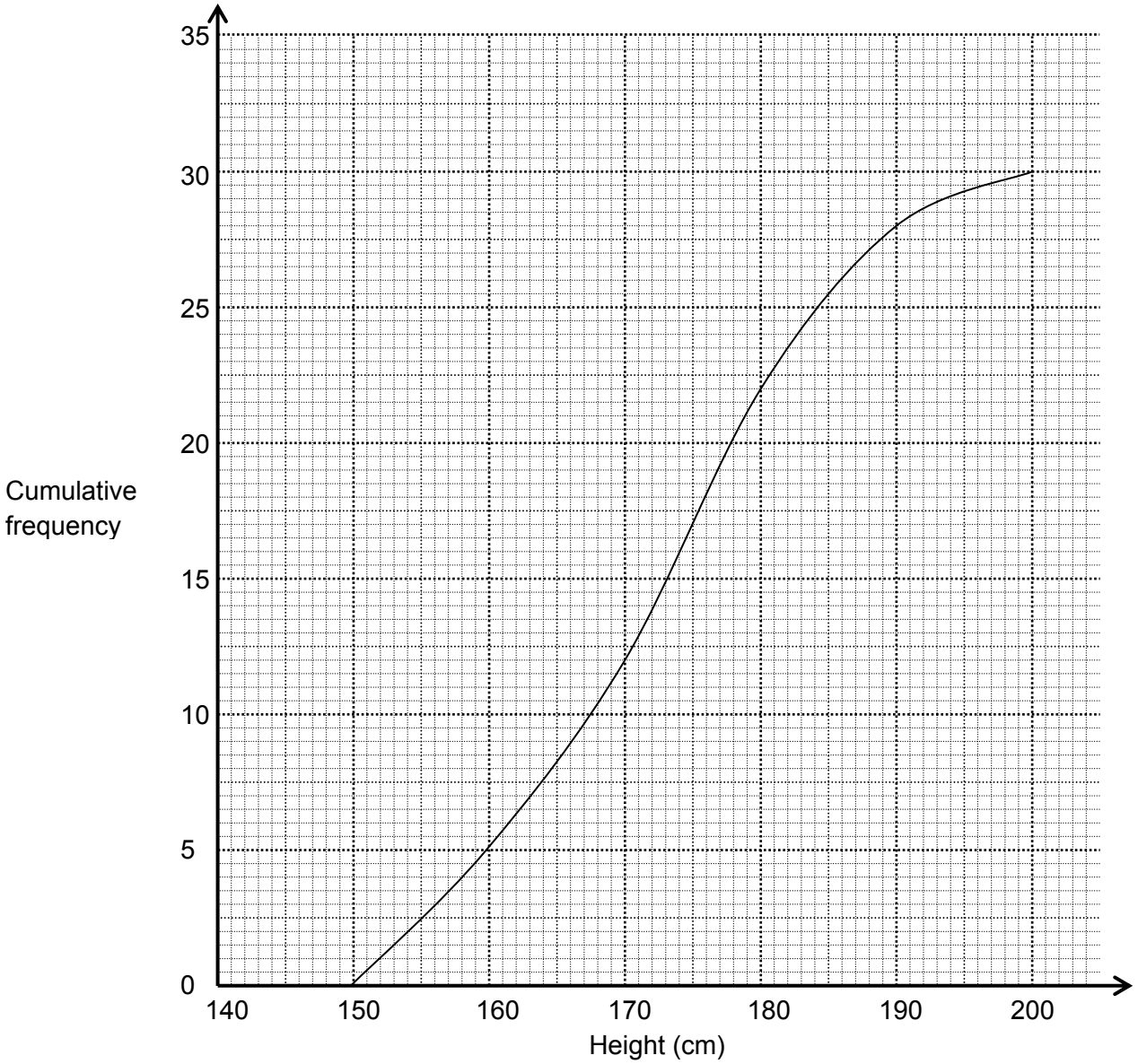
(b) _____ bytes **[2]**

(c) Eyal buys another hard disk with an unused capacity of 144 GB.

Work out the total unused capacity, in bytes, of both hard disks.
Write your answer in standard form, correct to 2 significant figures.

(c) _____ bytes **[3]**

12 The heights of pupils in classes 10A and 10B were measured.
This cumulative frequency graph summarises the heights of pupils in class 10A.



(a) Use the graph to complete this table.

Class	Median (cm)	Interquartile range (cm)
10A		
10B	169	12

[3]

(b) Use the information in the table to write one comment comparing the heights of the pupils in classes 10A and 10B.

_____

_____ **[1]**

13 Solve.

$3x + 2y = 8$
$2x - 5y = 18$

$x =$ _____

$y =$ _____ **[4]**

14 (a) y is inversely proportional to x^2 and $y = 6$ when $x = 5$.

Write an equation connecting x and y.

(a) _____ **[3]**

(b) Calculate the value of y when $x = 10$.

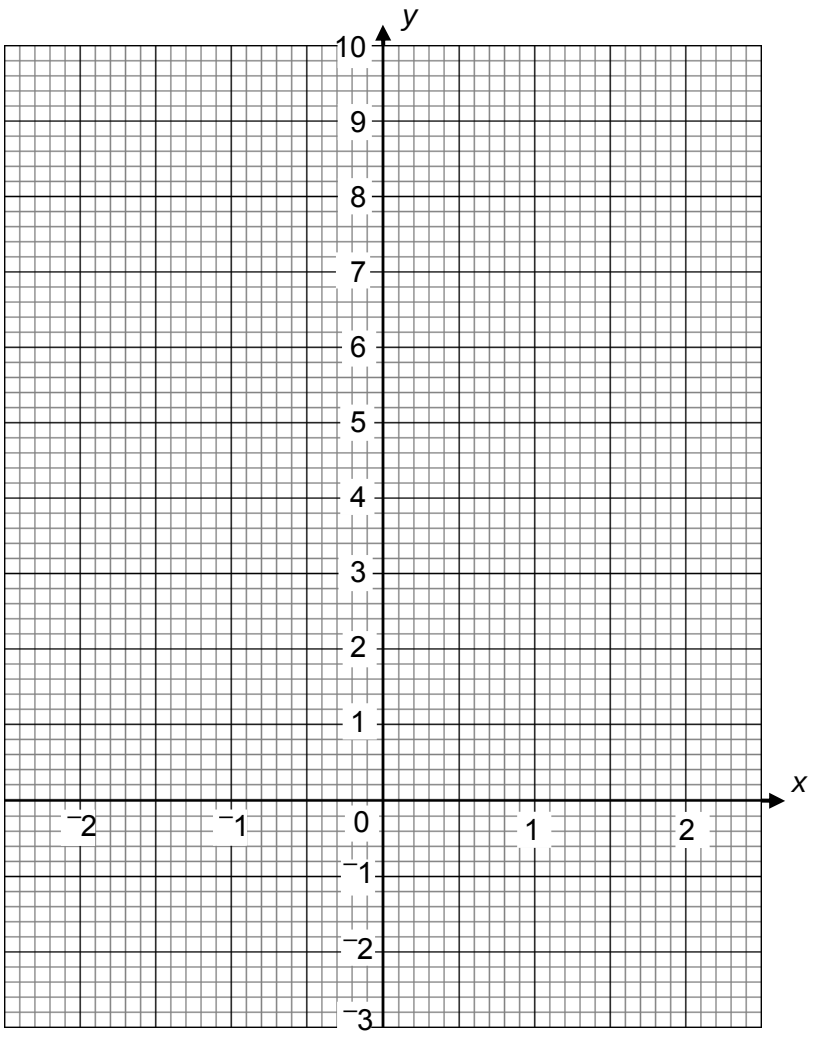
(b)_____ **[1]**

15 (a) Complete this table for the graph of $y = 2x^2 + x - 2$.

x	$^-2$	$^-1$	$^-0{\cdot}5$	0	0·5	1	2
y	4	$^-1$	$^-2$	$^-2$	$^-1$	1	

[1]

(b) Draw the graph of $y = 2x^2 + x - 2$.



[2]

(c) By drawing an appropriate line on the graph, solve this equation.

$$2x^2 + 2x - 3 = 0$$

(c) _____ **[3]**

16 (a) Factorise and solve.

$x^2 - x - 30 = 0$

(a) _____ **[3]**

(b) Solve this equation, leaving your answers in surd form.

$2x^2 + x - 2 = 0$

(b) _____ **[3]**

17 Show that $\frac{(3 + \sqrt{3})^2}{\sqrt{3}} \equiv 6 + 4\sqrt{3}$.

_____

_____

_____

_____

_____

_____ **[3]**

18 In a city 33% of the people have been vaccinated against influenza.
A person who has been vaccinated has a 6% chance of catching influenza.
A person who has not been vaccinated has a 41% chance of catching influenza.

What is the probability that a person in that city, selected at random, will catch influenza?

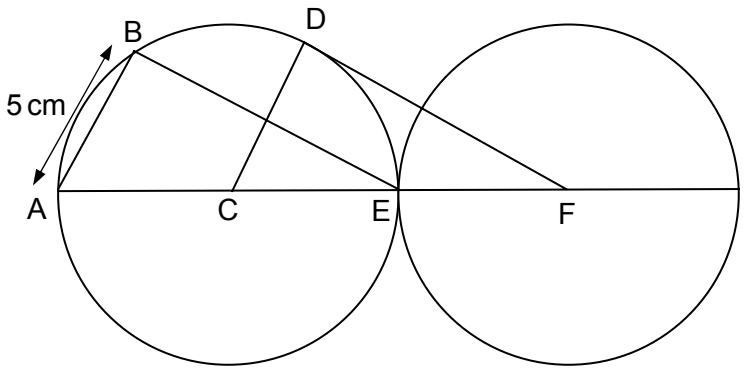
_____ **[3]**

19 A plane travels 125 km from A to B on a bearing of 030° and then 184 km from B to C on a bearing of 160°.

Calculate the direct distance from A to C.

_____km **[5]**

20 The diagram shows two circles, each of radius 5 cm, which touch at E and have centres at C and F.
AB = 5 cm.
ACEF is a straight line.
Line DF is a tangent to the circle at D.



Not to scale

Prove that triangles ABE and CDF are congruent.

[3]

21 *Maghomes* sells caravans.
This is the number of caravans sold each quarter in 2008 and 2009.

	2008				2009			
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Frequency	30	64	44	18	22	72	40	6

The first three 4-point moving averages have been calculated.

39 37 39

Calculate the two remaining moving averages.

_____ , _____ **[2]**

TURN OVER FOR QUESTION 22

22 A population of bacteria is growing according to this rule.

$$B = 1200 \times 3^t .$$

B is the number of bacteria,
t is the time in hours after 8 am on Tuesday.

(a) What is the value of B at 8 am on Tuesday, when $t = 0$?

(a) _____ **[1]**

(b) How many bacteria will there be at 12 noon?

(b) _____ **[1]**

(c) How many whole hours after 8 am will the number of bacteria first exceed 1 million?

(c) _____ **[1]**