CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

GCSE

Mathematics

Session: 2000 June
Type: Question paper
Code: 1662

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education

former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/1

PAPER 1 (Foundation Tier)

Wednesday **7 JUNE 2000** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Geometrical instruments
Tracing paper (optional)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You are **not** allowed to use a calculator in this paper.

FOR EXAMINER'S USE

This question paper consists of 18 printed pages and 2 blank pages.

[Turn over

1 **(a)** Write in figures, the number 'Eight thousand two hundred and nine'.

Answer (a) _____ [1]

(b) Work out

(i) 326 + 147

.....

.....

.....

Answer (b)(i) _____ [1]

(ii) 326 – 147

.....

.....

.....

Answer (b)(ii) _____ [1]

(c) Write 2364

(i) to the nearest 10,

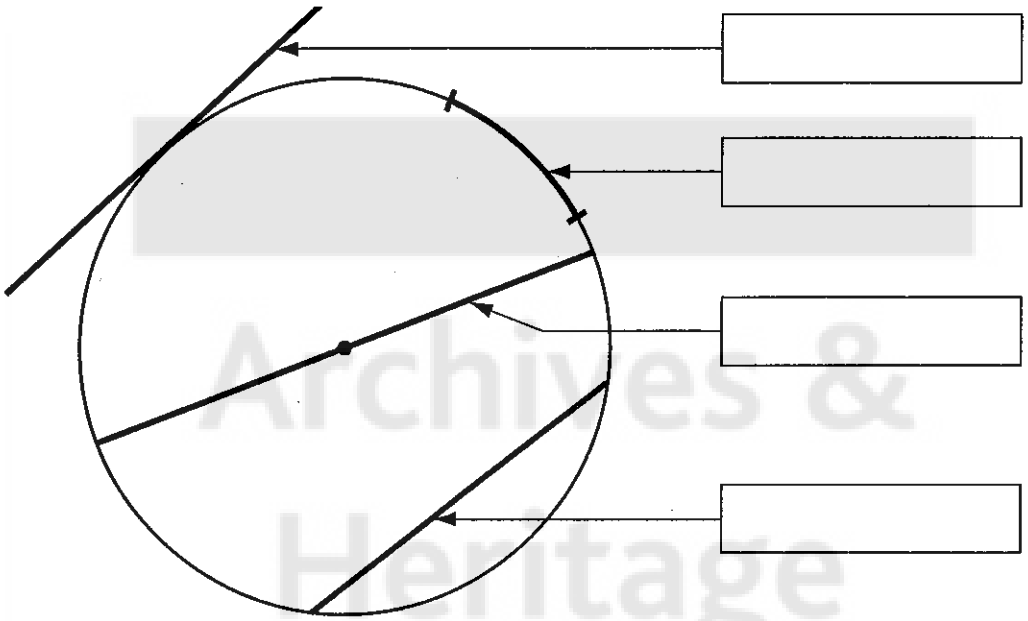
Answer (c)(i) _____ [1]

(ii) to the nearest 100.

Answer (c)(ii) _____ [1]

2 From the six words below, pick the correct four and write them in the boxes on the diagram.

Diameter
Arc
Chord
Tangent
Radius
Circumference



[4]

3 **(a)** Write down all the factors of 20.

Answer (a) _____ [2]

(b) Write down the value of

(i) 7^2

.....

Answer (b)(i) _____ [1]

(ii) $\sqrt{81}$.

.....

.....

Answer (b)(ii) _____ [1]

(c) Here is a list of numbers:-

8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18.

From this list, select

(i) an even number, *Answer (i)* _____ [1]

(ii) a multiple of 6, *Answer (ii)* _____ [1]

(iii) a prime number, *Answer (iii)* _____ [1]

(iv) a cube number, *Answer (iv)* _____ [1]

---

4 Terry bought his girlfriend a bunch of carnations on Valentine's Day.
He had £10 to spend and bought as many carnations as possible.
Carnations were 85p each.
Work out how many carnations he bought and how much money he had left.

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Answer Number of carnations _____

Money left _____ [3]

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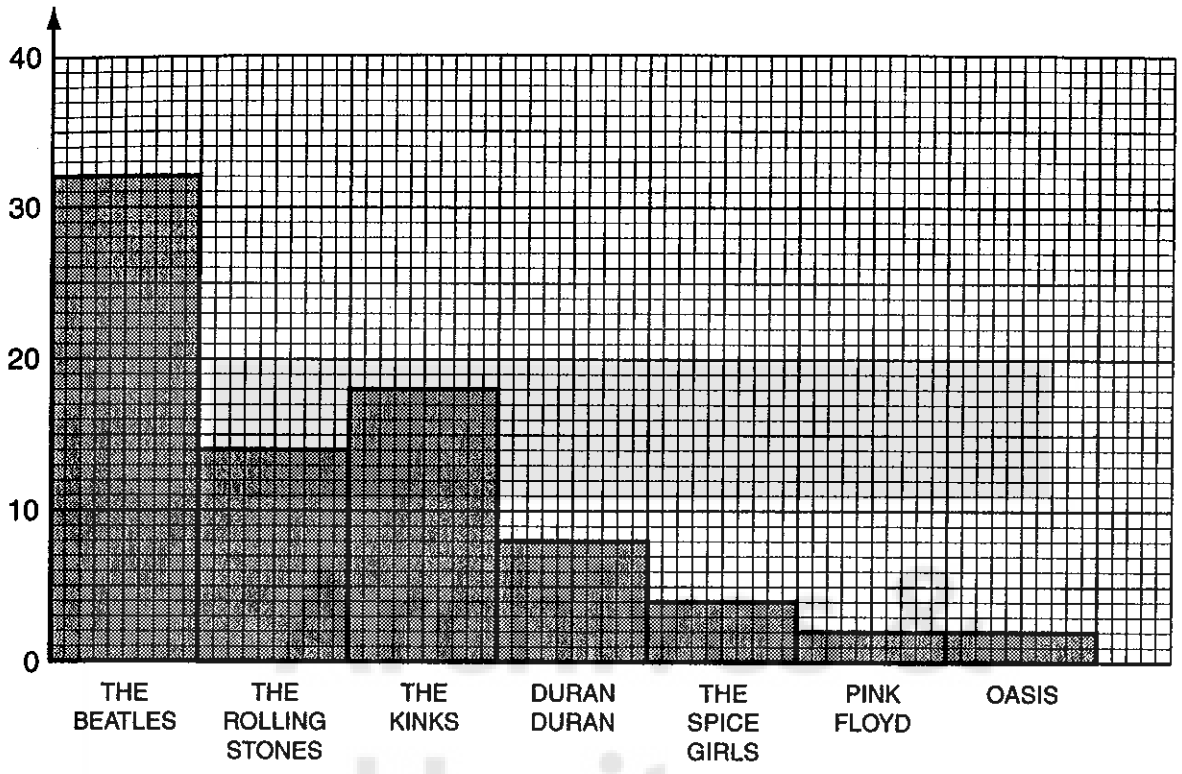
5 **"What is your favourite group?"**

The bar chart shows what some people said.



(a) Which group got 14 votes?

Answer (a) _____ [1]

(b) How many people voted altogether?

.....

.....

Answer (b) _____ [2]

(c) The information was collected between 10 o'clock and 11 o'clock on a Wednesday morning in Chesterfield market square.
Give two reasons why this was not a good way to collect the information.

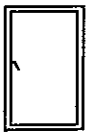
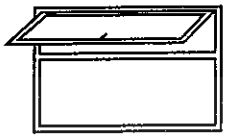
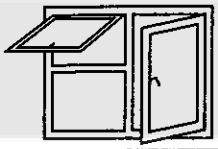
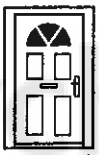
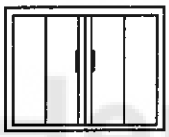
Reason 1.....

..... [1]

Reason 2.....

..... [1]

6 "Clearview Double Glazing" sells three different types of windows, each in two different sizes. They also sell doors and patio doors.

Type A		600mm by 1050mm 750mm by 1200mm	**£65** **£80**
Type B		1000mm by 1000mm 1250mm by 1200mm	**£85** **£100**
Type C		1200mm by 1000mm 1500mm by 1200mm	**£140** **£170**
Doors		**All sizes the same price**	**£240**
Patio Doors		**All sizes the same price**	**£550**

Work out the total charge for
2 Type A windows measuring 600 by 1050 each,
3 Type B windows measuring 1250 by 1200 each,
1 Type C window measuring 1500 by 1200 and
1 Patio door.

SHOW ALL YOUR WORKING

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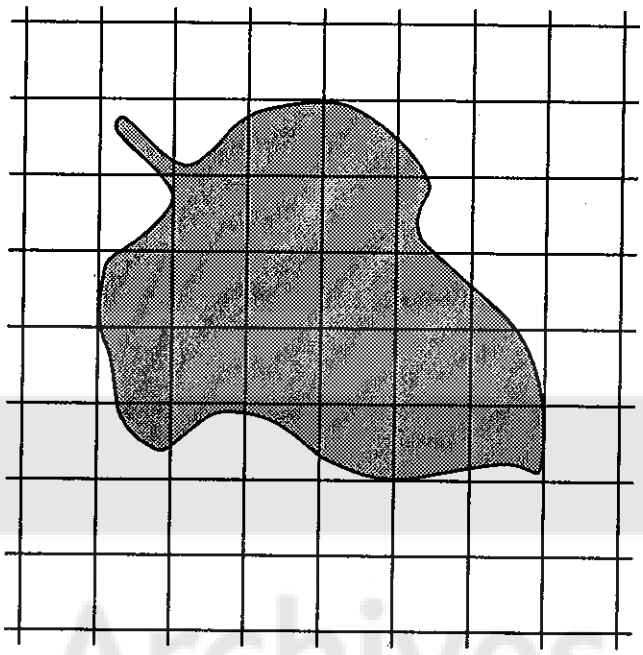
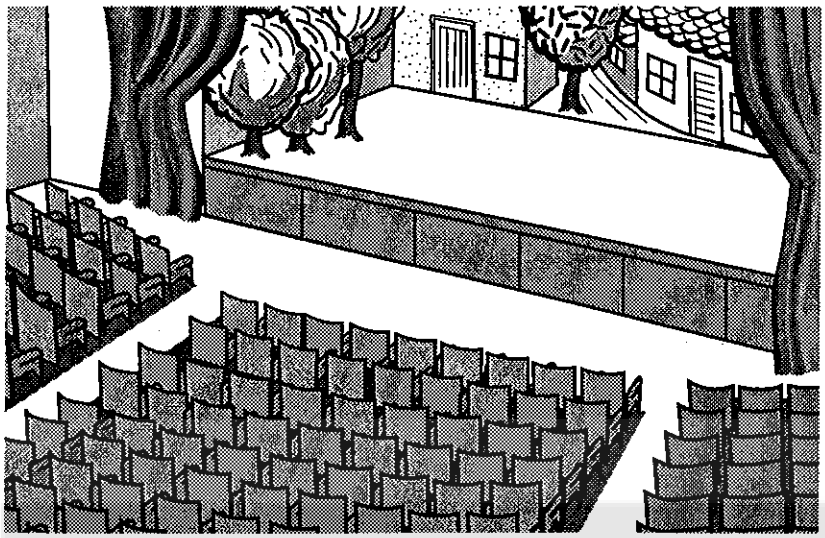
Answer £ _____ [5]

7 A leaf is drawn below, full size, on a 1cm grid.
Estimate the area of the leaf, stating the units of your answer.



Answer _____ [3]

8



A theatre has 792 seats.
A pantomime is going to be performed 29 times.
All the tickets are sold.
Each ticket costs £10.

(a) (i) Do an approximate calculation to estimate how much money has been taken.

.....

.....

.....

.....

Answer (a)(i) _____ [2]

(ii) Is your estimate more or less than the actual amount of money taken?
Explain your answer.

Answer (a)(ii) _____

_____ [1]

(b) Calculate the exact number of tickets sold.

.....

.....

.....

..... [3]

Answer (b) _____

9 In a small class, the marks for a maths test were

4, 5, 8, 7, 8, 7, 1, 8, 6

For these marks, find

(a) the median,

.....

.....

Answer (a) _____ [2]

(b) the mean.

.....

.....

.....

Answer (b) _____ [3]

---

10 In a raffle there are 100 tickets
All the tickets are sold.
Mr. Brown has 20 tickets.
Mr. Green has 14 tickets.
Mrs. Green has 35 tickets.

Work out the probability that,

(a) Mr. Brown will win the first prize.

.....

.....

Answer (a) _____ [1]

(b) either Mr. Green or Mrs. Green will win the first prize.

.....

.....

Answer (b) _____ [1]

(c) the first prize will be won by a person not mentioned above.

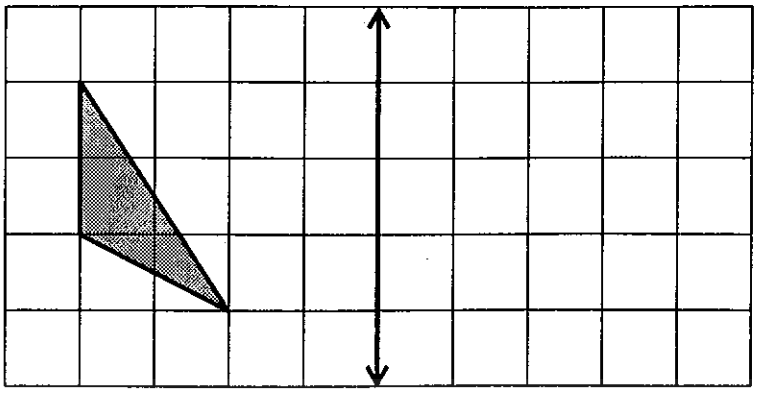
.....

.....

Answer (c) _____ [2]

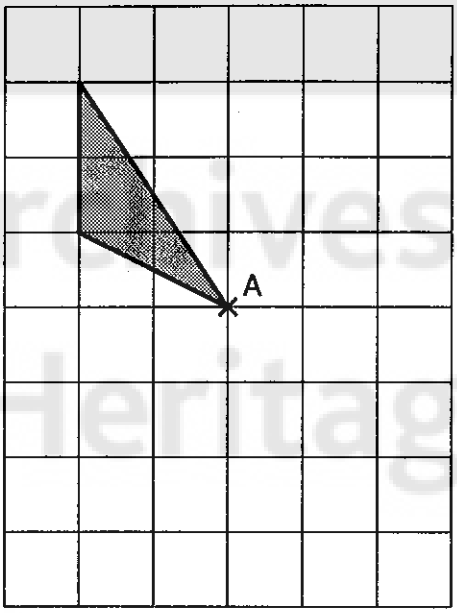
For Examiner's use

11 **(a)** Reflect the triangle in the mirror line.



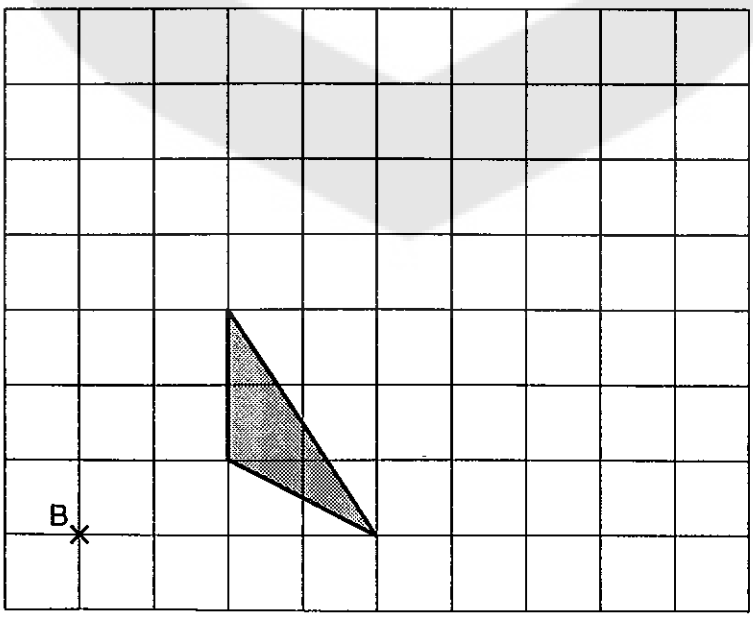
[1]

(b) Rotate the triangle through 180° about centre A.



[2]

(c) Enlarge the triangle by scale factor 2, centre B.



[3]

12 **(a)** Write 48% as a fraction in its simplest form

.....

.....

Answer (a) _____ [1]

(b) Write $\frac{7}{20}$ as a percentage.

.....

.....

Answer (b) _____ [1]

(c) **(i)** Change $\frac{3}{8}$ into a decimal.

.....

.....

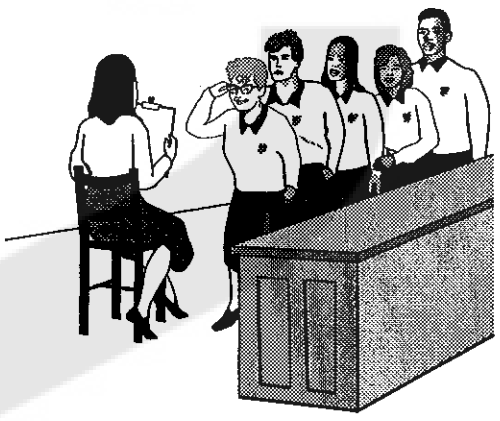
Answer (c)(i) _____ [2]

(ii) Use your answer to part (c)(i) to write $\frac{3}{80}$ as a decimal.

Answer (c)(ii) _____ [1]

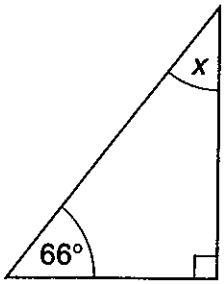
---

13 Annie is doing a survey of all the pupils in her class. She is interested in finding out whether there is a connection between the colour of their hair and the colour of their eyes.
In the space below design a suitable observation sheet to record the information she needs.



[3]

14 **(a)** Find the size of the angle marked x in the triangle.



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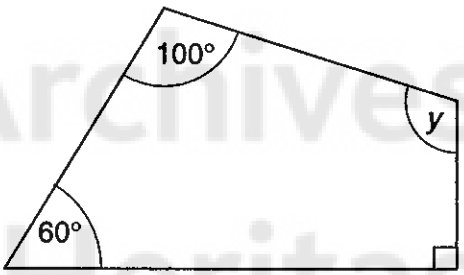
Answer (a) _____° [1]



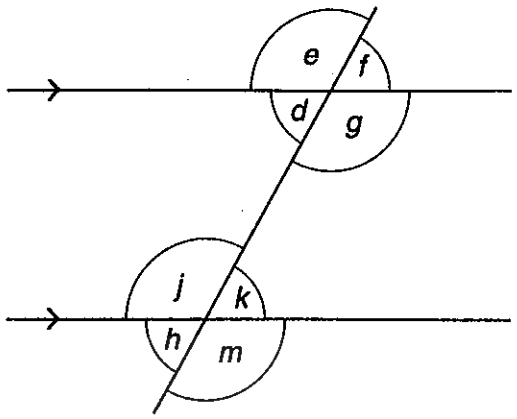
(b) Find the size of the angle marked y in the quadrilateral.

.....

.....

Answer (b) _____° [2]

(c)



In the diagram above, which angle is

(i) vertically opposite to angle *e*,

Answer (c)(i) _____ [1]

(ii) alternate to angle *d*,

Answer (c)(ii) _____ [1]

(iii) corresponding to angle *h*.

Answer (c)(iii) _____ [1]

15 A small village in Africa recorded the number of days of sunshine it had each year for 20 years. The results are listed below.

284, 277, 264, 288, 291, 281, 288, 286, 279, 272
285, 285, 295, 273, 287, 274, 281, 289, 272, 286

(a) Work out the range of these values.

.....

.....

Answer (a) _____ [1]

(b) Complete the frequency table below.

Number of Days		Number of Years
261 to 270		
271 to 280		
281 to 290		
291 to 300		

[2]

(c) Write down the modal class.

Answer (c) _____ [1]

(d) Using the circle opposite, draw and label a pie chart to show the information in the frequency table.

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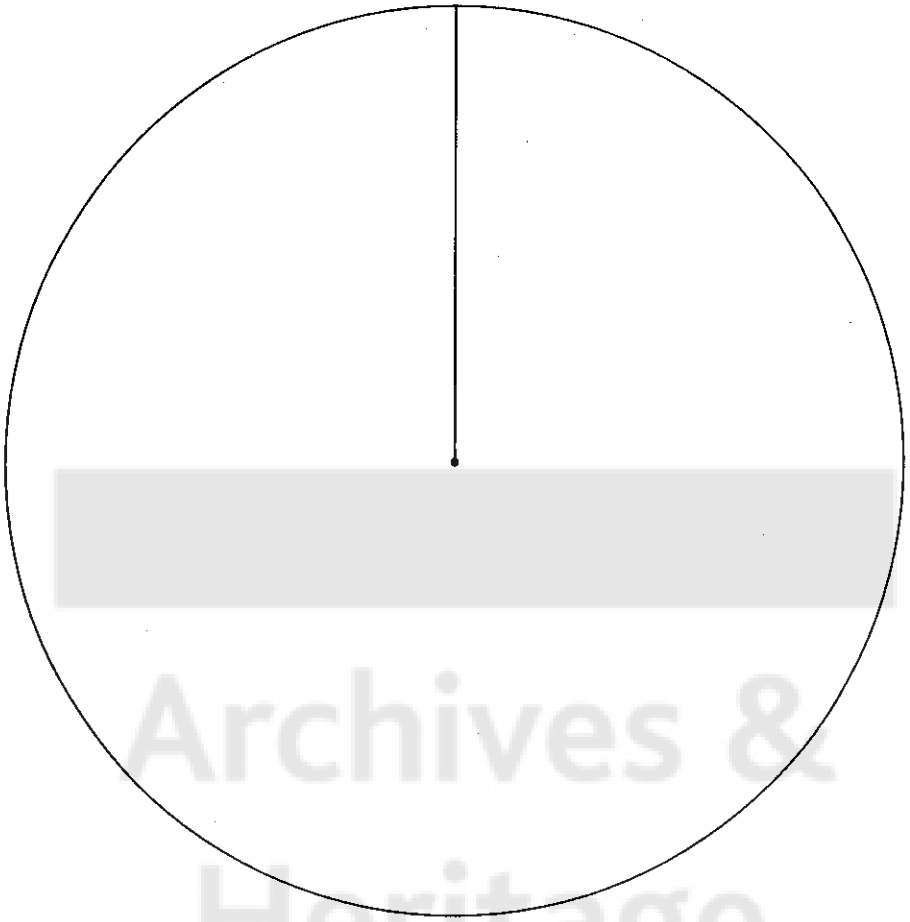

[4]

For Examiner's use

16 **(a)** Solve

(i) $2x = 7$,

.....

Answer (a)(i) _____ [1]

(ii) $3x - 5 = 13$,

.....

.....

Answer (a)(ii) _____ [2]

(iii) $6x - 9 = x + 26$.

.....

.....

Answer (a)(iii) _____ [2]

(b) Simplify

(i) $4q + 9q + 3q$,

Answer (b)(i) _____ [1]

(ii) $6n + 5p + 2n - p$,

.....

.....

Answer (b)(ii) _____ [2]

---

17 Find the nth term of each of the following sequences.

(a) 3, 6, 9, 12, 15, ...

.....

.....

Answer (a) _____ [1]

(b) 5, 9, 13, 17, 21, ...

.....

.....

Answer (b) _____ [2]

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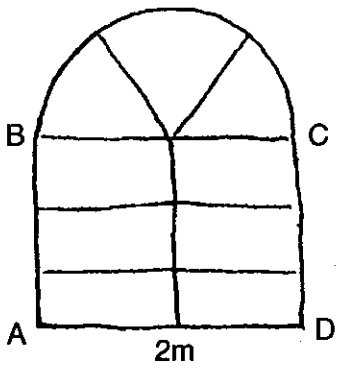
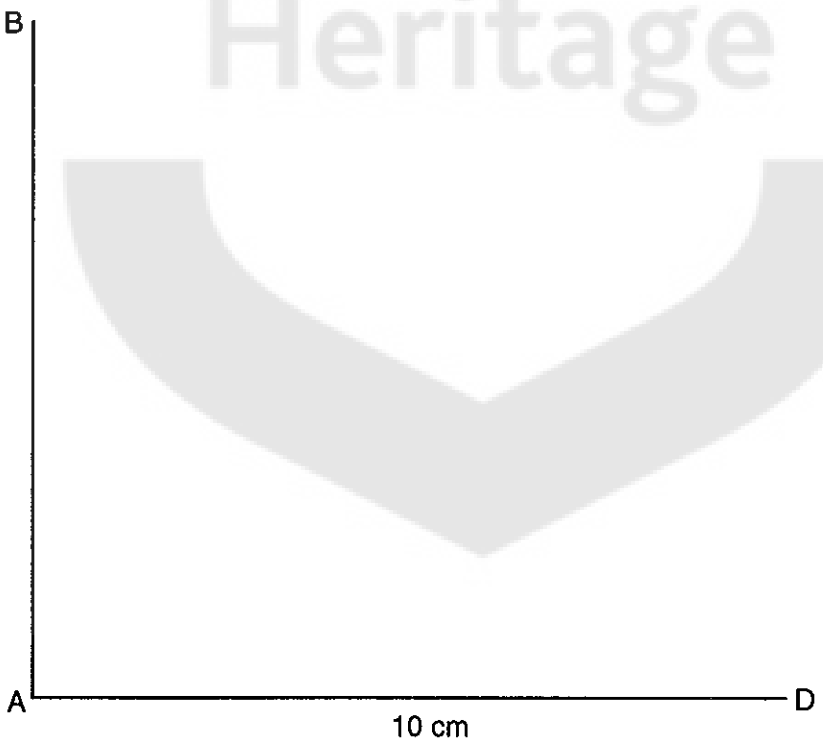
18 Here is a sketch of a church window. It has six equal rectangular panes. The top is a semi-circle with three equal panes.



NOT TO SCALE

(a) Complete an **accurate** scale drawing of the window. The bottom, AD, and the left side, AB, have already been drawn for you.

[4]



(b) What is the scale of your drawing?

.....

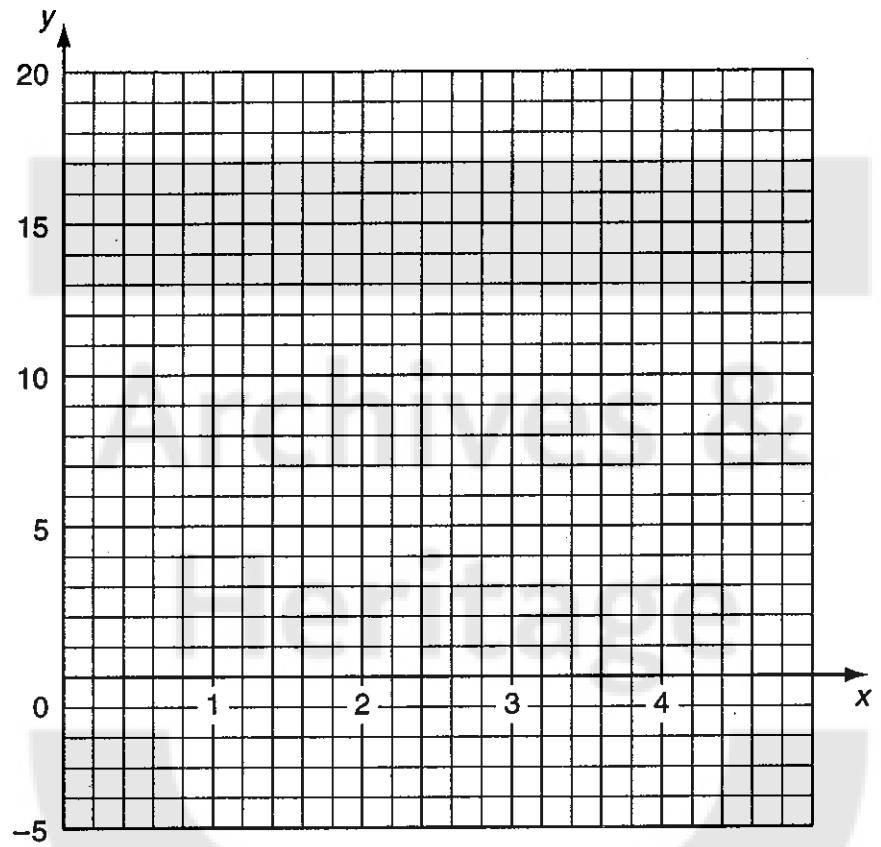
.....

Answer (b) 1 cm represents _____cm [2]

19 (a) (i) Complete the table below for $y = 3x - 1$. [1]

x	0	1	2	3	4
y					

(ii) Draw the graph of $y = 3x - 1$ on the grid below. [2]



(b) (i) Complete the table below for $y = x^2 - 1$.

x	0	1	2	3	4
y		0		8	

[1]

(ii) Draw the graph of $y = x^2 - 1$ on the grid above.

.....

.....

..... [3]

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For Examiner's use

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OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education

former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/2

PAPER 2 (Foundation Tier)

Tuesday **13 JUNE 2000** Morning 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Geometrical instruments
Tracing paper (optional)

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You are expected to use an electronic calculator for this paper.

Unless otherwise instructed in the question, take π to be 3.142 or use the π button on your calculator.

FOR EXAMINER'S USE

This question paper consists of 16 printed pages

[Turn over

1

World Service Radio

8.00 a.m.	From our own Correspondent
8.20	Off the Shelf
8.35	The Works
8.55	World News
9.10	Network
9.20	Britain Today
9.50	Sports Round-up till 10.00 a.m.

(a) How many minutes long was 'The Works'?

.....

Answer (a) _____ [1]

(b) Which was the longest programme of those listed?

.....

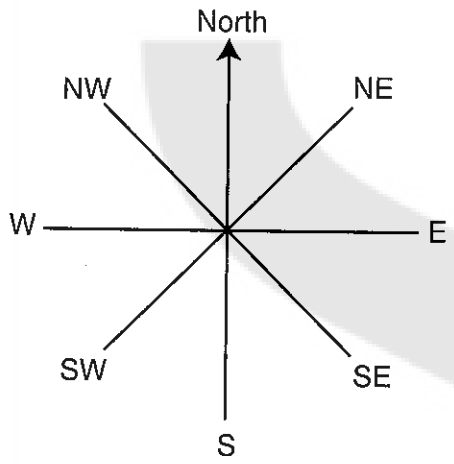
Answer (b) _____ [1]

(c) Which programmes were 15 minutes long?

.....

Answer (c) _____ [2]

2



(a) What fraction of a complete turn is it from

(i) North to East,

Answer (a)(i) _____ [1]

(ii) North to South-East?

Answer (a)(ii) _____ [1]

(b) Jill faces West. She makes a $\frac{1}{4}$ turn anticlockwise.
What direction does she face now?

Answer (b) _____ [1]

(c) How many degrees are there in a $\frac{1}{4}$ turn?

Answer (c) _____ [1]

---

3 1, 3, 5, 7, 9, 11, 13, 15, ...

(a) (i) What name is given to the numbers in this pattern?

Answer (*a*)(i) _____ [1]

(ii) Write down the next two numbers in the pattern.

Answer (*a*)(ii) _____ , _____ [1]

(b) (i) Write down the next two lines in the following pattern.

$1 = 1$
$1 + 3 = 4$
$1 + 3 + 5 = 9$
$1 + 3 + 5 + 7 = 16$

.....

..... [2]

(ii) What name is given to the numbers in the right hand column?

Answer (*b*)(ii) _____ [1]

---

4 'Start with a number, double it and then add one'.
Use this rule to fill in the boxes below.

0 ⟶ 1
1 ⟶ 3
2 ⟶ 5
3.5 ⟶ ☐
5 ⟶ ☐
☐ ⟶ 15.

[3]

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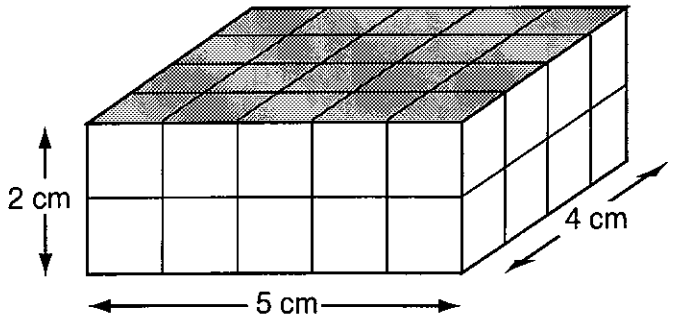
5 (a)



(i) What is the volume of the cuboid?

.....

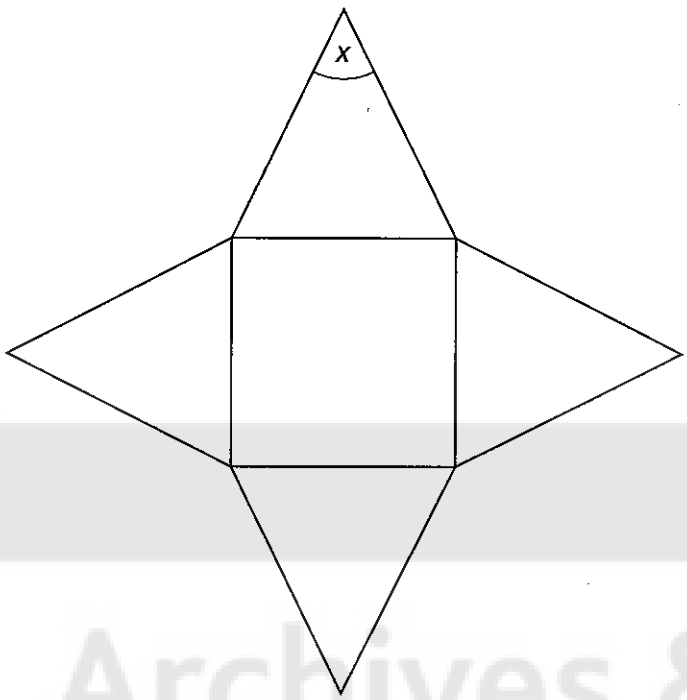
Answer (*a*)(i) _____ cm^3 [1]

(ii) What is the area of the shaded top of the cuboid?

.....

Answer (*a*)(ii) _____ cm^2 [1]

(b)



The diagram above is the net of a solid.

(i) Write down the name of the solid.

Answer (*b*)(i) _____ [1]

(ii) Measure and write down the size of the angle marked *x*.

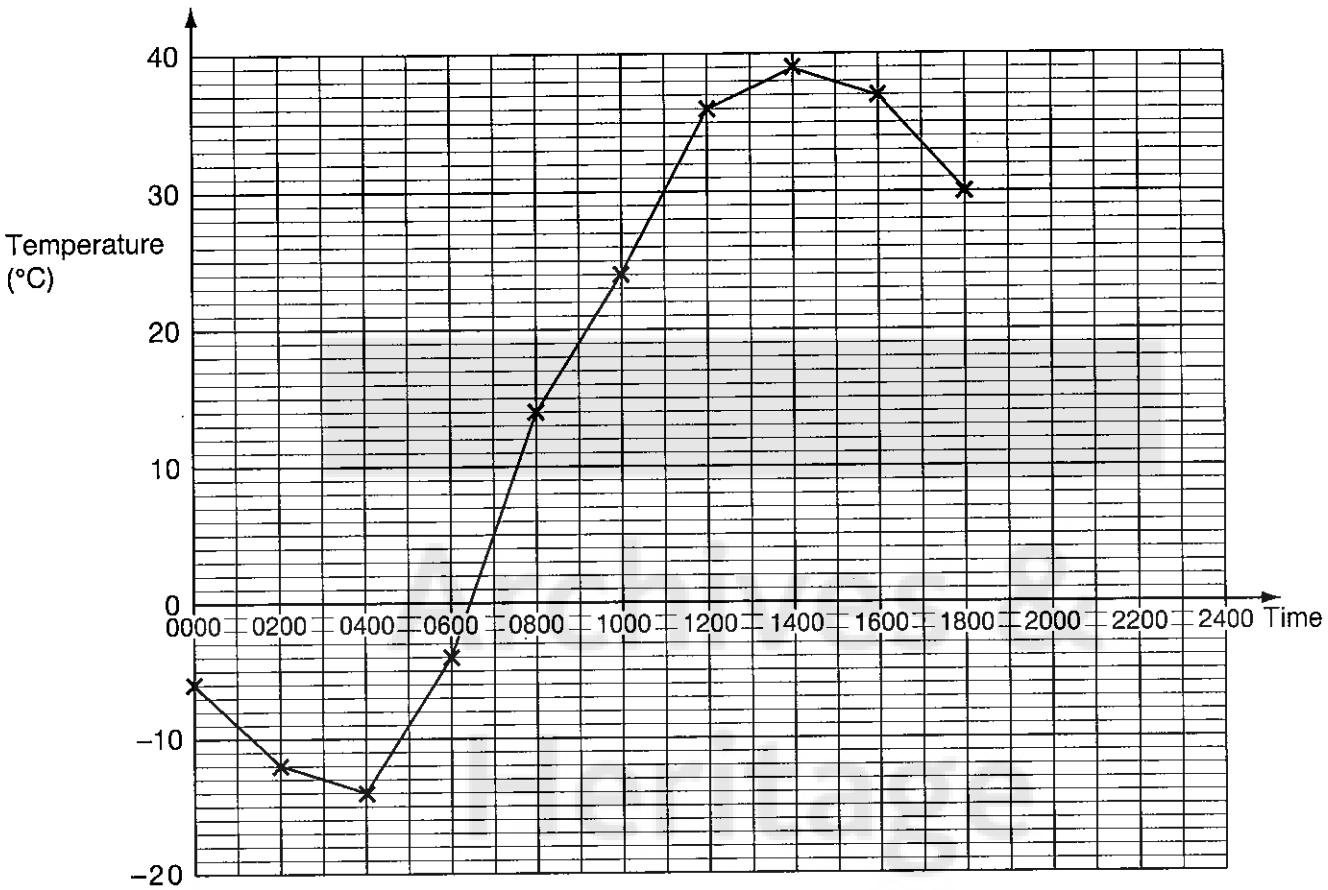
Answer (*b*)(ii) _____ [1]

(iii) Draw the lines of symmetry on the diagram. [2]

(iv) The diagram also has rotational symmetry.
Write down the order of rotational symmetry.

Answer (*b*)(iv) _____ [1]

6 The temperature in the Namib Desert was measured every two hours through a 24 hour period. The results are shown in the line graph and table below.



(a)

Time	20 00	22 00	24 00
Temperature (°C)	18	3	−8

Plot these remaining three points on the grid, and complete the graph. [2]

(b) What is

(i) the highest temperature recorded,

Answer (*b*)(i) _____ °C [1]

(ii) the lowest temperature recorded?

Answer (*b*)(ii) _____ °C [1]

(c) Work out the difference between the highest and the lowest recorded temperatures.

.....

Answer (*c*) _____ °C [1]

(d) Estimate the temperature at 07 00 on the day that these readings were taken.

Answer (*d*) _____ °C [1]

(e) Estimate for how long the temperature was above 30°C on that day.

.....

Answer (*e*) _____ hours [1]

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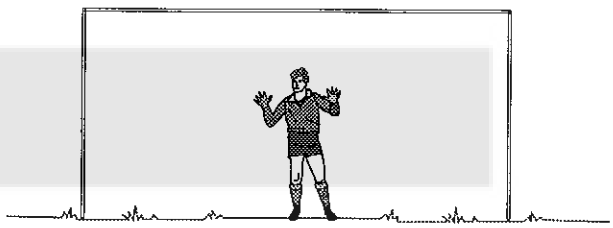
7 **(a)** The diagram shows a goalkeeper standing between goalposts. Estimate the height, in metres, of a goalpost.



Answer (*a*) _____ m [1]

(b) The length of a football pitch is 95 metres.

(i) Write this length in centimetres.

Answer (*b*)(i) _____ cm [1]

(ii) By how many metres is the length of the football pitch less than one tenth of a kilometre?

.....

Answer (*b*)(ii) _____ m [2]

(iii) 1 yard = 0.9144 metres.
Work out the length of the football pitch in yards.

.....

.....

Answer (*b*)(iii) _____ yards [2]

(c) The transfer fee for a footballer was £2 300 000.

(i) Round this figure to the nearest million.

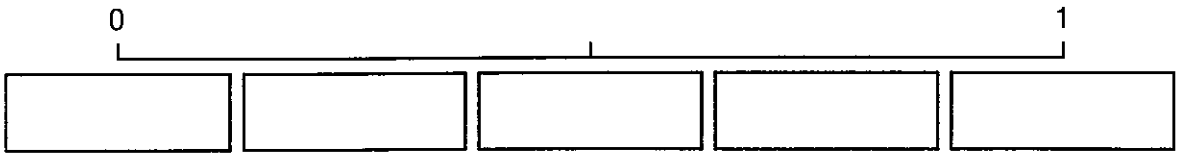
Answer (*c*)(i) £_____ [1]

(ii) Round this figure to the nearest half million.

Answer (*c*)(ii) £ _____ [1]

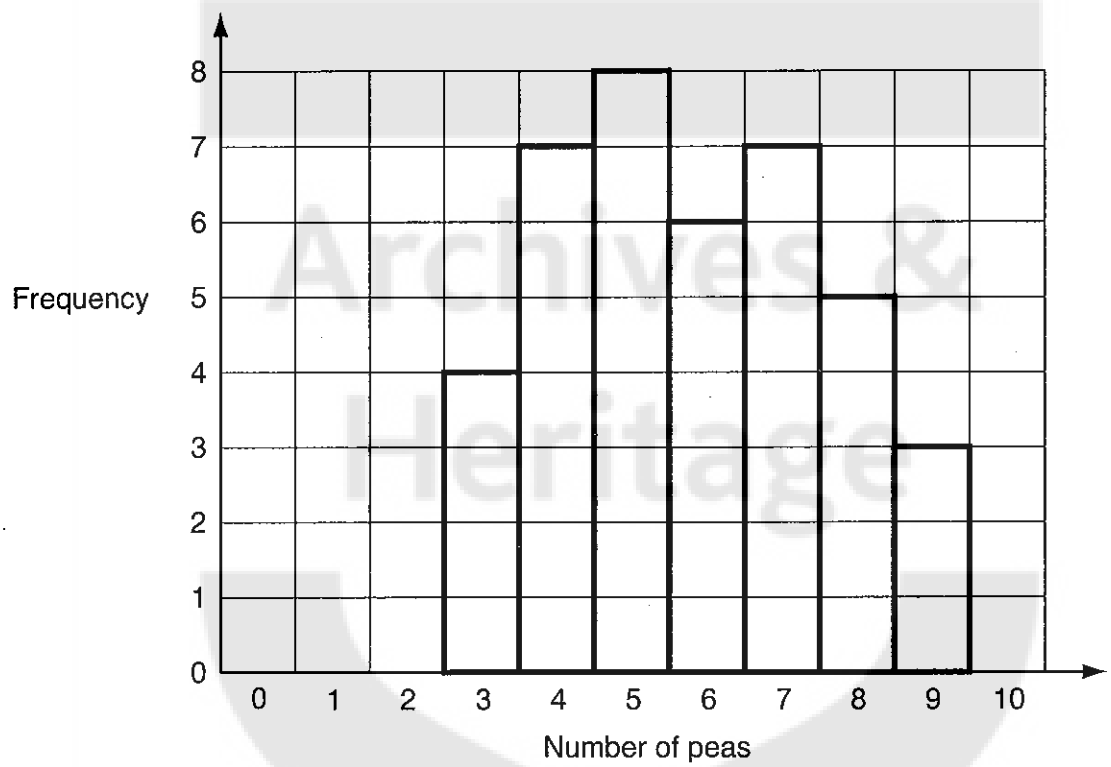
---

8 **(a)** Write the five words – Certain, Impossible, Evens, Likely, Unlikely – in the correct boxes under the probability line.



[2]

(b) The number of peas in each of 40 pods was counted.
The results are shown in the bar chart.



(i) What is the range of the number of peas in a pod?

Answer (*b*)(i) _____ [2]

(ii) What is the mode?

Answer (*b*)(ii) _____ [1]

(iii) Another pod is taken at random. Use the information in the bar chart to estimate the probability that it contains exactly 8 peas.

Answer (*b*)(iii) _____ [2]

9 **(a)** Work out $\frac{2}{3}$ of £4.56.

.....

.....

Answer (*a*) £ _____ [2]

(b) A travel firm offers a discount of 12% on a holiday costing £490.
Work out the amount of the discount.

.....

.....

Answer (*b*) £ _____ [2]

(c) Three tins of dog food cost £1.38
What will 8 tins of the same dog food cost?

.....

.....

.....

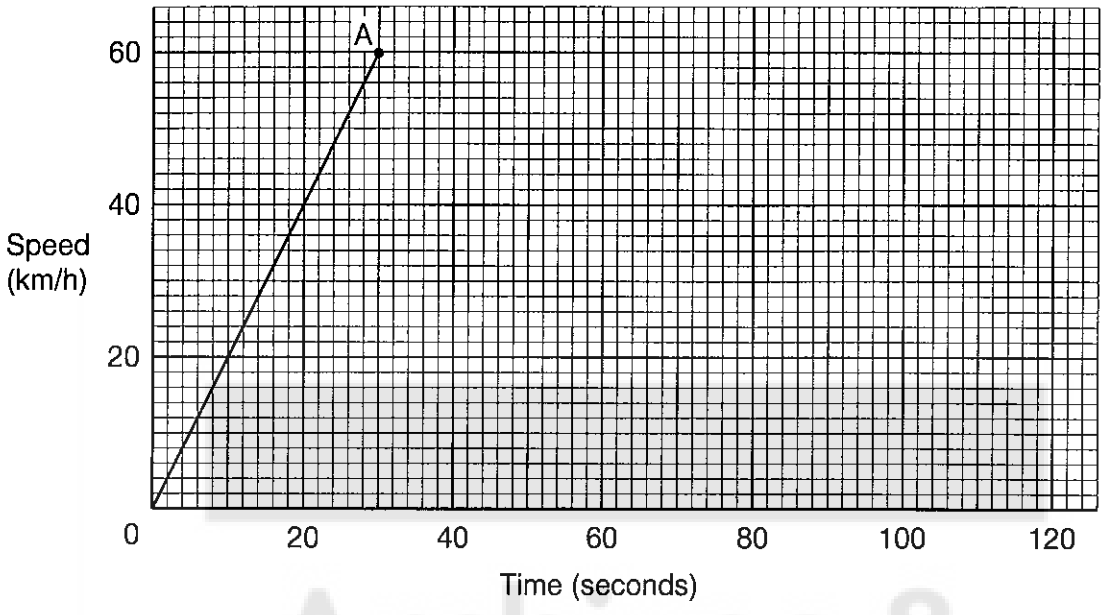
Answer (*c*) £ _____ [3]

(d) Use your calculator to multiply 450 000 by 800 000.

.....

Answer (*d*) _____ [1]

10 The graph shows the speed of a car in kilometres per hour (km/h).



(a) What is the speed of the car after 10 seconds?

Answer (*a*) _____ km/h [1]

(b) After 30 seconds, the car travels at a steady speed of 60 km/h for 1 minute. Continue the graph by drawing a line AB to show this. [2]

(c) Draw a straight line from B to the point C (110, 0). [1]

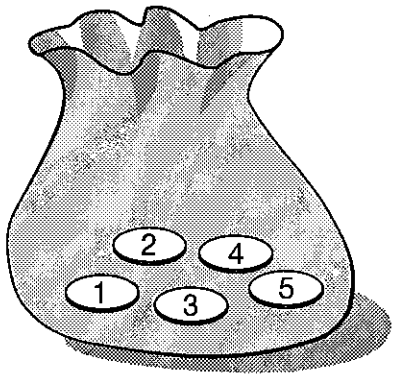
(d) What does the graph between B and C tell you about what the car is doing?

Answer (*d*) _____

_____

_____ [1]

11



A bag contains five discs that are numbered 1, 2, 3, 4 and 5.
Rachel takes a disc at random from the bag.
She notes the number and puts the disc back.
She shakes the bag and picks again.
She adds the number to the first number.

(a) Complete the table to show all the possible totals.

		First number				
	+	1	2	3	4	5
Second number	1	2				
	2					
	3				7	
	4					
	5					

[2]

(b) Find the probability that Rachel's total is

(i) 10,

Answer (*b*)(i) _____ [1]

(ii) 1,

Answer (*b*)(ii) _____ [1]

(iii) 3 or 4.

Answer (*b*)(iii) _____ [2]

12 A French supermarket buys coffee for 25.80 francs per kilogram.

(a) The supermarket sells the coffee to make a profit of 60%.

Calculate the selling price of one kilogram of coffee.

.....

.....

.....

.....

Answer (a) _____ francs [3]

(b) A British importer also buys the coffee at 25.80 francs per kilogram.

The exchange rate is £1 = 9.63 francs.

Calculate the cost of one kilogram of coffee in British money.
Give your answer to an appropriate degree of accuracy.

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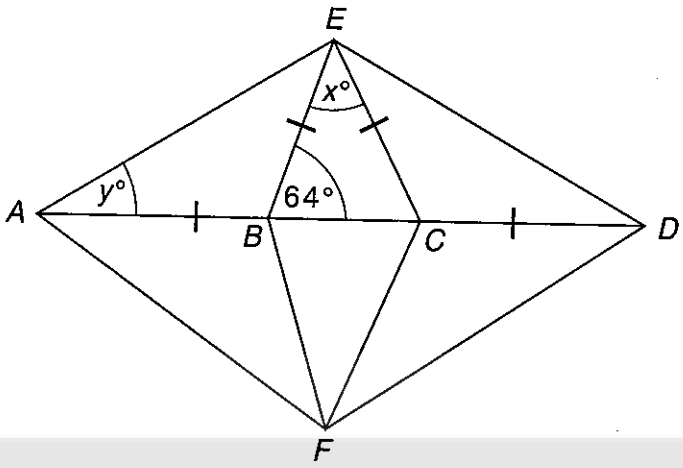
Answer (b) £ _____ [3]

13



NOT TO SCALE

In the diagram the lengths of *AB*, *BE*, *EC* and *CD* are equal.

Angle *EBC* = 64°.

(a) Find the value of

(i) *x*,

.....

Answer (*a*)(i) *x* = _____ [2]

(ii) *y*.

.....

Answer (*a*)(ii) *y* = _____ [2]

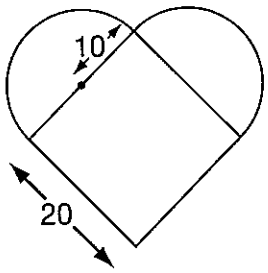
(b) Quadrilateral *AEDF* is symmetrical about the line *AD*.

What special name is given to this quadrilateral?

Answer (*b*) _____ [2]

14 *Instructions for making a heart-shaped cake.*

- Bake a square cake of side 20 cm.
- Bake a round cake of radius 10 cm.
- Cut the round cake in half.
- Join the two halves to the square cake, as shown in the diagram.



(a) Find the area of the heart-shape. State the units of your answer.

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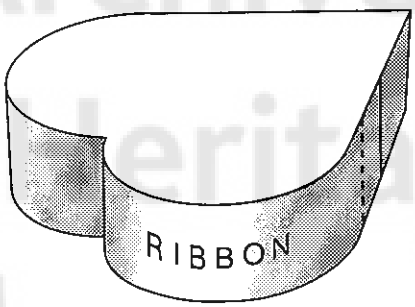
*Answer (a)*_____ [4]



A red ribbon is fixed around the sides of the heart-shaped cake with the ends overlapping by 3 cm.

(b) Find the length of ribbon required.

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*Answer (b)*_____ cm [3]

15 An apple costs y pence.

An orange costs 5 pence more than an apple.

(a) Write down an expression, in terms of y, for the cost of one orange.

Answer (*a*) _____ p [1]

(b) Write down an expression, in terms of y, for the total cost of 3 apples and one orange.

.....

Answer (*b*) _____ [2]

(c) The total cost of 3 apples and one orange is 61 pence.
Form an equation in terms of y and solve it to find the cost of one apple.

.....

.....

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Answer (*c*) _____ p [3]

---

16 An electricity company supplies electricity to a family with the following charges:

Standing charge: 9.13 pence per day
Electricity used: 6.19 pence per unit
VAT of 5% is added to the total

The Green family receives a bill for 91 days.
In that time they had used a total of 1272 units of electricity.
Calculate the amount that the Greens have to pay. Show your working clearly.

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Answer £ _____ [5]

17 **(a)** The five vowels in our alphabet are A, E, I, O, and U.
You are asked to investigate which of them is used the least often in the English language.
Describe how you would do it.

[3]

(b) Alex used the spell-check on her computer to find spelling mistakes in some course-work.

The table below shows the distribution of spelling mistakes.

Number of spelling mistakes on the page	0	1	2	3	4
Number of pages	10	6	1	1	2

Calculate the mean number of spelling mistakes per page.

.....

.....

.....

Answer (b) _____ [3]

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education

former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/3

PAPER 3 (Intermediate Tier)

Wednesday **7 JUNE 2000** Afternoon 2 hours

Candidates answer on the question paper.
Additional materials:
Geometrical instruments
Tracing paper (optional)

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You are **not** allowed to use a calculator in this paper.

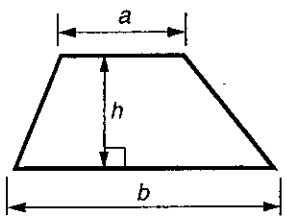
FOR EXAMINER'S USE

This question paper consists of 17 printed pages and 3 blank pages.

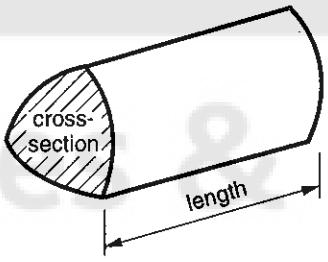
[Turn over

Formulae Sheet: Intermediate Tier

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



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



1 **(a)** Write 48% as a fraction in its simplest form.

.....

.....

Answer (a) _____ [1]

(b) Write $\frac{7}{20}$ as a percentage.

.....

.....

Answer (b) _____ [1]

(c) **(i)** Change $\frac{3}{8}$ into a decimal.

.....

.....

Answer (c)(i) _____ [2]

(ii) Use your answer to part (c)(i) to write $\frac{3}{80}$ as a decimal.

Answer (c)(ii) _____ [1]

[Turn over

2 A small village in Africa recorded the number of days of sunshine it had each year for 20 years. The results are listed below.

285, 277, 264, 288, 291, 281, 288, 286, 279, 272,
284, 285, 295, 273, 287, 274, 281, 289, 272, 286

(a) Work out the range of these values.

.....

.....

Answer (a) _____ [1]

(b) Complete the frequency table below.

Number of Days		Number of Years
261 to 270		
271 to 280		
281 to 290		
291 to 300		

[2]

(c) Write down the modal class.

*Answer (c)*_____ [1]

(d) Using the circle opposite, draw and label a pie chart to show the information in the frequency table.

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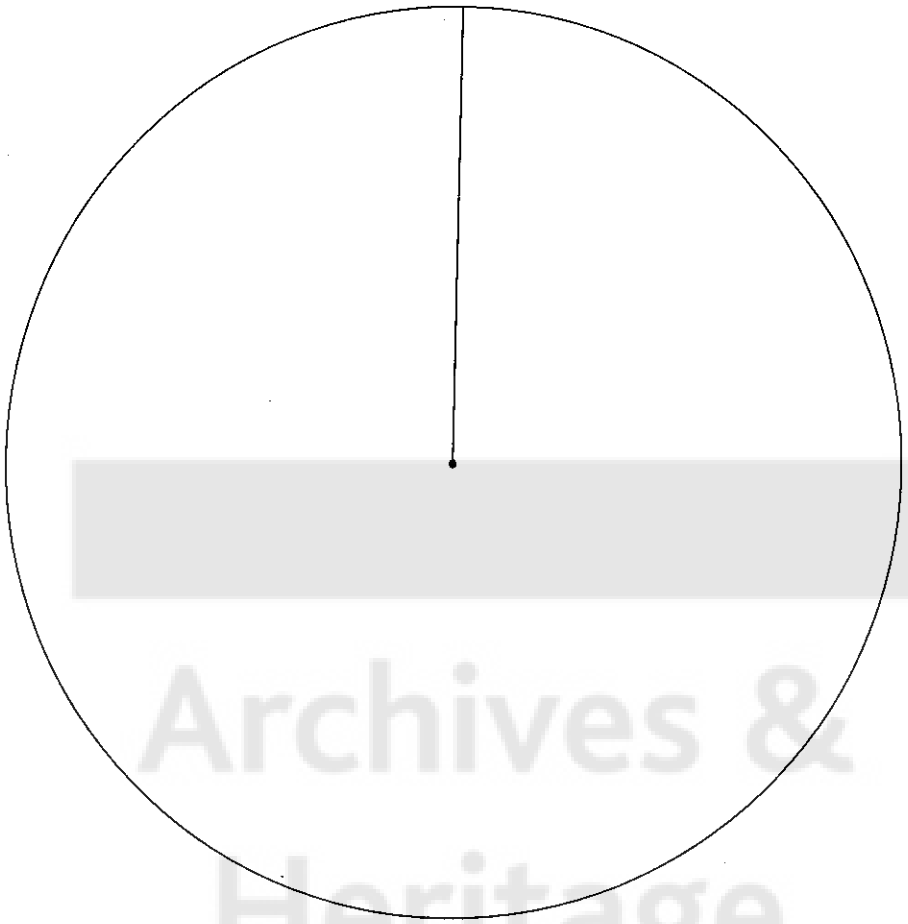
For Examiner's use



[4]

[Turn over

3 **(a)** Solve

(i) $2x = 7$,

.....

Answer (a)(i) _____ [1]

(ii) $3x - 5 = 13$,

.....

.....

Answer (a)(ii) _____ [2]

(iii) $6x - 9 = x + 26$.

.....

.....

Answer (a)(iii) _____ [2]

(b) Simplify

(i) $4q + 9q + 3q$,

Answer (b)(i) _____ [1]

(ii) $6n + 5p + 2n - p$.

.....

.....

Answer (b)(ii) _____ [2]

(c) Expand the brackets and simplify

$(x + 4)(x + 1)$.

.....

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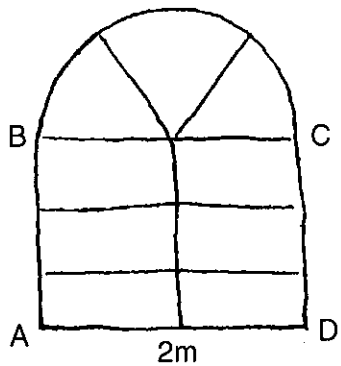
.....

Answer (c) _____ [2]

4 Here is a sketch of a church window. It has six equal rectangular panes. The top is a semi-circle with three equal panes.



NOT TO SCALE

(a) Complete an **accurate** scale drawing of the window. The bottom, AD, and the left side, AB, have already been drawn for you.

[4]

(b) What is the scale of your drawing?

.....

.....

Answer (b) 1 cm represents _____cm [2]

5 Find the *n*th term of each of the following sequences.

(a) 3, 6, 9, 12, 15, ...

.....

.....

Answer (a) _____ [1]

(b) 5, 9, 13, 17, 21, ...

.....

.....

Answer (b) _____ [2]

---

6 In a Primary school, children have Brown, Black, Blonde or Red hair.
Complete the table below for the probability that a child in this school, chosen at random, has Black hair.

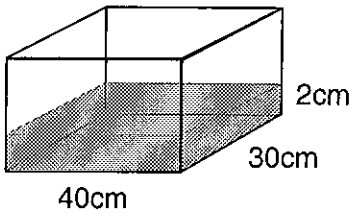
.....

.....

Hair Colour	Brown	Black	Blonde	Red
Probability	0.35	___	0.2	0.15

[2]

7



NOT TO SCALE

(a) During a tropical rainstorm, 2 cm of rain fell into a rectangular tank. The base of the tank measures 40 cm by 30 cm.

(i) Calculate the volume of water in the tank.

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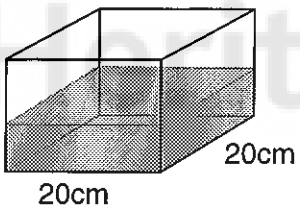
Answer (a)(i) _____ cm^3 [2]

(ii) Change your answer to part (a)(i) into litres.

Answer (a)(ii) _____ litres [1]



NOT TO SCALE

(b) On another day, 2000 cm^3 of water was collected in a different tank. The base of this tank is a square of side 20 cm.

Calculate the depth of the water in the tank.

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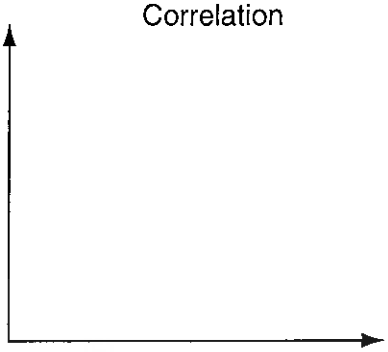
Answer (b) _____ cm [3]

[Turn over

8 On each of the grids provided, draw an example of a scatter diagram with eight points to show the correlation stated.

(a) Strong Positive Correlation



(b) No Correlation

[3]

9 In 1849, gold was found in the hills near a small town in America. In the month after its discovery, the population of the town increased from 400 to 480.

(a) Find the percentage increase in the population.

.....

.....

.....

Answer (a) _____ % [3]

In 1850 a 'Town Income Tax' was introduced on the earnings of all gold miners.

(b) In that year 1000 people lived in the town.
$\frac{4}{5}$ of these were gold miners.
The average earnings of a gold miner were $200.
Their earnings were taxed at 5%.

Calculate the amount of money collected in tax.

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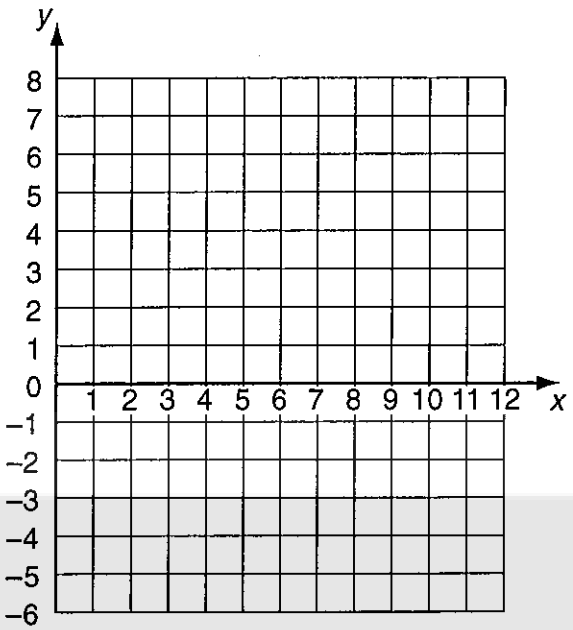
Answer (b) $ _____ [5]

10



(a) A translation moves (3, 4) to (7, –2).
The same translation moves (2, 1) to point P.

(i) Write down the coordinates of point P.

Answer (a)(i) (_____, _____) [2]

(ii) Write down the column vector which describes this translation.

Answer (a)(ii) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(b) A reflection moves (9, 1) to (9, 5).
The same reflection moves (11, 7) to point Q.

(i) Write down the coordinates of point Q.

Answer (b)(i) (_____, _____) [2]

(ii) Write down the equation of the mirror line of this reflection.

Answer (b)(ii) _____ [2]

---

11 Calculate an **estimate** of

$$\sqrt{(5.84^2 - 3.19^2)}.$$

.....

.....

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Answer _____ [2]

[Turn over

12 A student conducts a survey of the heights of fathers and their adult daughters.
From the data collected she finds that the height, f inches, of a father is related to the height, d inches, of his adult daughter by the formula

$$f = 32 + 0.6d.$$

(a) Calculate the height of a daughter whose father is 68 inches tall.

.....

.....

Answer (a) _____inches [2]

(b) A father and daughter are the same height.
By putting $f = d$, find this height.

.....

.....

Answer (b) _____inches [2]

(c) Rearrange the original formula to make d the subject.

.....

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Answer (c) $d =$ _____ [2]

---

13 The scores of 30 students in a 'surprise' test are summarised in the table below.

Score (s)	Number of Students
$1 \leqslant s \leqslant 5$	16
$6 \leqslant s \leqslant 10$	12
$11 \leqslant s \leqslant 15$	0
$16 \leqslant s \leqslant 20$	2

Calculate an estimate of the mean score for the test.

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Answer _____ [4]

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14 There were 1200 fans at the game between City and United.

(a) The ratio of City fans to United fans was 3 : 2.
How many fans of each team were there?

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.....

Answer (a) City _____

United _____ [3]

150 of the fans attending were women and children.

(b) What fraction of the fans were women and children?
Give your answer in its simplest form.

.....

.....

.....

Answer (b) _____ [2]

---

15 The letters *f*, *g* and *h* all represent lengths.
For each of the following expressions, state whether it could represent a length, an area, a volume or none of these.

(a) $f^2(h+g)$ *Answer (a)* _____

(b) $\sqrt{(h^2gf)}$ *Answer (b)* _____

(c) $\pi(3f+2g)$ *Answer (c)* _____ [3]

---

16 The length and width of a rectangular piece of paper were measured to the nearest centimetre.
The measurements recorded were 22 cm and 13 cm.
Find the smallest possible value of the perimeter of the piece of paper.

.....

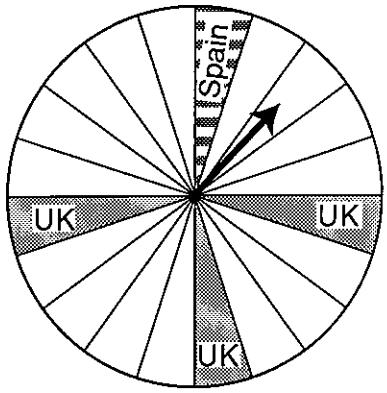
.....

.....

Answer _____cm [2]

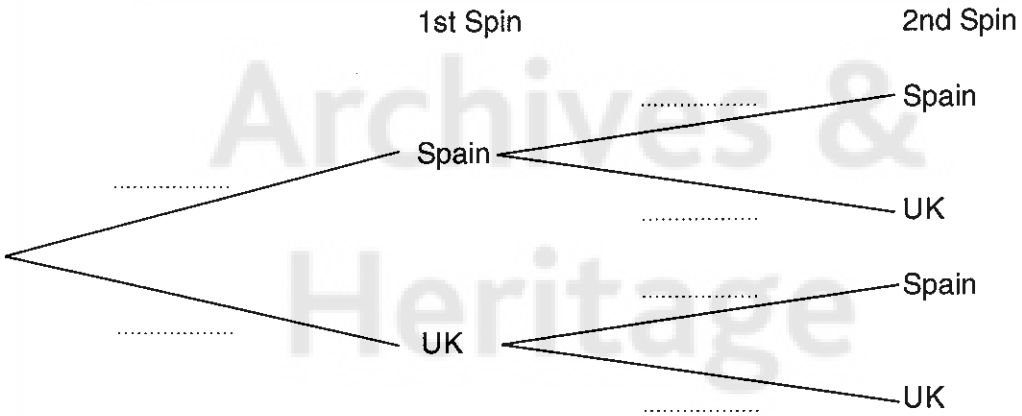
---

17 A game gives you the chance to win a holiday in Spain or the UK.
It involves spinning a pointer on a wheel.
The wheel is split into twenty equal sections, as shown in the diagram.
The pointer is spun twice in each attempt to win a holiday.



(a) Part of the tree diagram for two spins is shown below.
Fill in the probabilities.

[2]



If the pointer lands on Spain on both spins, then the player wins a holiday in Spain.

(b) **(i)** Find the probability of winning a holiday in Spain.

.....

.....

Answer (b)(i) _____ [2]

(ii) 2000 people played the game.
How many of them would you expect to win a holiday in Spain?

.....

Answer (b)(ii) _____ [1]

To win a holiday in the UK, the point must **EITHER**:

- land on a UK section on each of the two spins **OR**
- land on the Spain section on the first spin and a UK section on the second spin.

(c) Calculate the probability of winning a holiday in the UK.

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Answer (c) _____ [3]

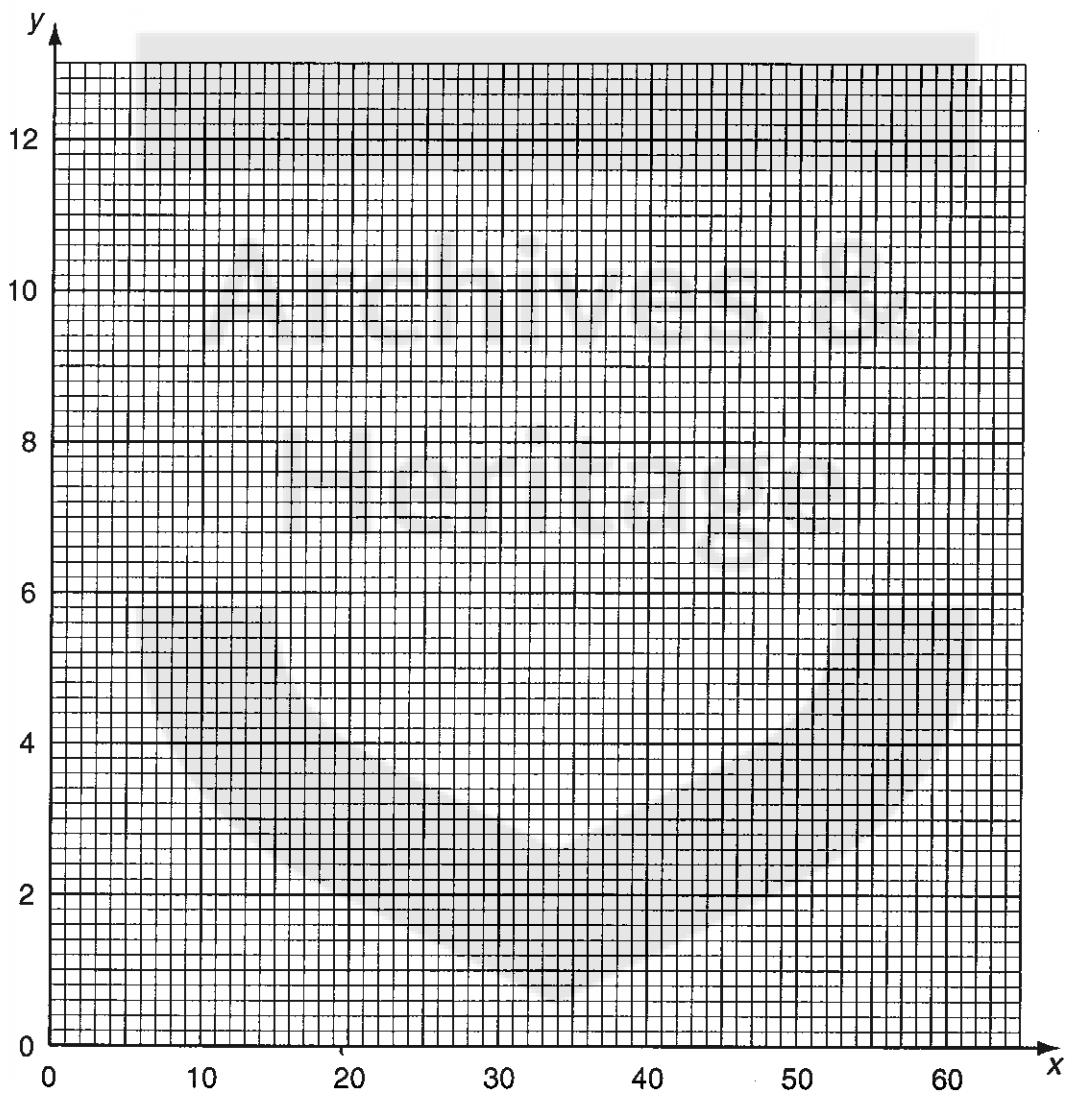
18 **(a)** Complete the table of values below for the equation

$$y = \frac{120}{x}.$$

x	10	15	20	30	40	50	60
y						2.4	

[1]

(b) Hence draw the graph of $y = \frac{120}{x}$.



[2]

(c) **Use your graph** to find the time to travel 120 km at a speed of 37 km/h.

Answer (c) _____hours [1]

(d) Given that 1 gallon is equivalent to 4.5 litres, **use your graph** to find the number of gallons in 120 litres.

Answer (d) _____gallons [2]

For Examiner's use

19 **(a)** Evaluate 3^{-2}.

.....

.....

Answer (a) _____ [1]

(b) Write the following expression as a power of 2.

$$\frac{2}{2^4 \times 2^3}$$

.....

.....

Answer (b) _____ [1]

(c) Evaluate each of the following. Give your answers in standard form.

(i) $(3 \times 10^5) \times (6 \times 10^4)$

.....

Answer (c)(i) _____ [1]

(ii) $\frac{2 \times 10^6}{5 \times 10^2}$

.....

.....

.....

Answer (c)(ii) _____ [2]

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RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education

former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/4

PAPER 4 (Intermediate Tier)

Tuesday **13 JUNE 2000** Morning 2 hours

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Geometrical instruments
Tracing paper (optional)

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You are expected to use an electronic calculator for this paper.

Unless otherwise instructed in the question, take π to be 3.142 or use the π button on your calculator.

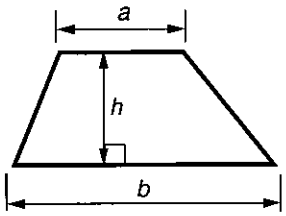
FOR EXAMINER'S USE

This question paper consists of 17 printed pages and 3 blank pages.

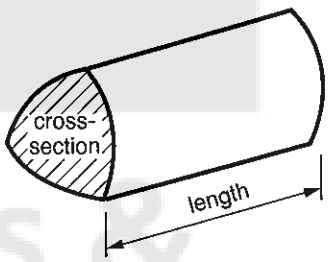
[Turn over

Formulae Sheet: Intermediate Tier

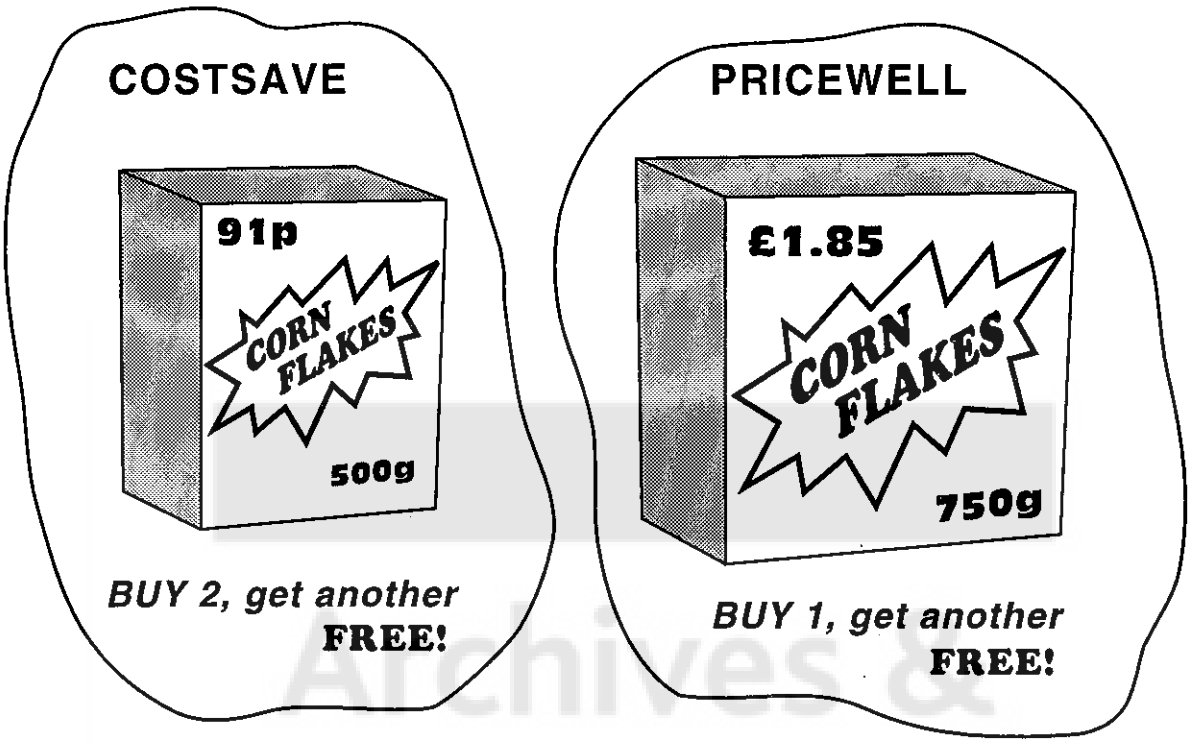
Area of trapezium = $\frac{1}{2}(a + b)h$



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



1 Costsave and Pricewell supermarkets have cornflakes on special offer.



Which supermarket has the better offer?

Show clear working to explain your answer.

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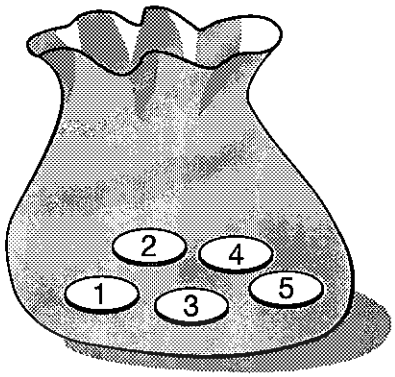
Answer Supermarket_____ [3]

2 A bag contains five discs that are numbered 1, 2, 3, 4 and 5.



Rachel takes a disc at random from the bag. She notes the number and puts the disc back.

She shakes the bag and picks again. She adds this number to the first number.

(a) Complete the table to show all the possible totals.

First number

+	1	2	3	4	5
1	2				
2					
3				7	
4					
5					

Second number

[2]

(b) Find the probability that Rachel's total is

(i) 10,

Answer (b)(i) _____ [1]

(ii) 1,

Answer (b)(ii) _____ [1]

(iii) 3 or 4.

Answer (b)(iii) _____ [2]

3 A French supermarket buys coffee for 25.80 francs per kilogram.

(a) The supermarket sells the coffee to make a profit of 60%.

Calculate the selling price of one kilogram of coffee.

.....

.....

.....

.....

Answer (a) _____ francs [3]

(b) A British importer also buys the coffee at 25.80 francs per kilogram.

The exchange rate is £1 = 9.63 francs.

Calculate the cost of one kilogram of coffee in British money.
Give your answer to an appropriate degree of accuracy.

.....

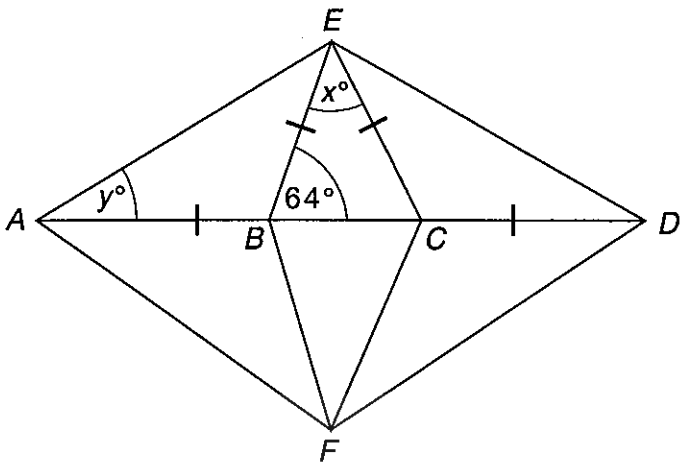
.....

.....

.....

Answer (b) £ _____ [3]

4



NOT TO SCALE

In the diagram the lengths *AB*, *BE*, *EC* and *CD* are equal.

Angle *EBC* = 64°.

(a) Find the value of

(i) *x*,

.....

Answer (a)(i) *x* = _____ [2]

(ii) *y*.

.....

Answer (a)(ii) *y* = _____ [2]

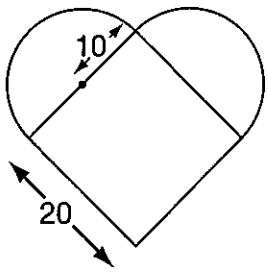
(b) Quadrilateral *AEDF* is symmetrical about the line *AD*.

What special name is given to this quadrilateral?

Answer (b) _____ [2]

5 *Instructions for making a heart-shaped cake.*

- Bake a square cake of side 20 cm.
- Bake a round cake of radius 10 cm.
- Cut the round cake in half.
- Join the two halves to the square cake, as shown in the diagram.



(a) Find the area of the heart-shape. State the units of your answer.

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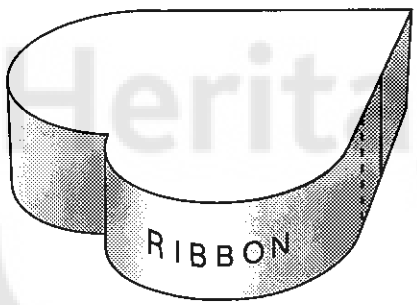
Answer (a) _____ [4]



A red ribbon is fixed around the sides of the heart-shaped cake with the ends overlapping by 3 cm.

(b) Find the length of ribbon required.

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Answer (b) _____cm [3]

6 An apple costs y pence.

An orange costs 5 pence more than an apple.

(a) Write down an expression, in terms of y, for the cost of one orange.

.....

Answer (a) _____ p [1]

(b) Write down an expression, in terms of y, for the total cost of 3 apples and one orange.

.....

Answer (b) _____ p [2]

(c) The total cost of 3 apples and one orange is 61 pence.

Form an equation in terms of y and solve it to find the cost of one apple.

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Answer (c) _____ p [3]

---

7 **(a)** Simplify

(i) $n \times n \times n$,

Answer (a)(i) _____ [1]

(ii) $3a \times 2b$.

Answer (a)(ii) _____ [1]

(b) Multiply out the brackets

$6(2x - 3)$.

.....

Answer (b) _____ [1]

---

8 An electricity company supplies electricity to a family with the following charges:-

Standing charge : 9.13 pence per day

Electricity used : 6.19 pence per unit

VAT of 5% is added to the total.

The Green family receives a bill for 91 days.

In that time they had used a total of 1272 units of electricity.

Calculate the amount that the Greens have to pay. Show your working clearly.

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Answer £ _____ [5]

For Examiner's use

9 **(a)** Ian and Alex decide to conduct a survey on the use of computers.

They want to know whether boys and girls use a computer in their coursework for word-processing, spreadsheets or both.

In the space below, design an observation sheet to collect information from a group of boys and girls.

[3]

(b) Alex used the spell-check on her computer to find spelling mistakes in some course-work.

The table below shows the distribution of spelling mistakes.

Number of spelling mistakes on the page	0	1	2	3	4
Number of pages	10	6	1	1	2

Calculate the mean number of spelling mistakes per page.

.....

.....

.....

Answer (b) _____ [3]

10 **(a)** Use your calculator to find the value of $3.2^2 - \sqrt{4.84}$.

Answer (a) _____ [1]

(b) **(i)** Use your calculator to find the value of $\dfrac{3.9^2 + 0.53}{3.9 \times 0.53}$.

Write down all the figures on your calculator display.

Answer (b)(i) _____ [1]

(ii) Round your answer to part (b) (i) to 2 decimal places.

Answer (b)(ii) _____ [1]

(iii) Write down a calculation you can do in your head to check your answer to part (b)(i).

Calculation:

Write down your answer to this calculation.

Answer (b) (iii) _____ [2]

---

11 Use a trial and improvement method to find the value of x correct to **one** decimal place when

$$x^3 - 2x = 68.$$

You must show all your trials.

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Answer $x =$ _____ [4]

12 **(a)** Kelly invested £450 for 3 years at a rate of 6% per year Compound Interest.

Calculate the total amount that the investment is worth at the end of the 3 years.

.....

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Answer (a) £ _____ [3]

(b) Kelly decides to buy a television.

After a reduction of 15% in the sale, the one she bought cost her £319.60.

What was the original price of the television?

.....

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Answer (b) £ _____ [3]

---

13 Solve the simultaneous equations

$$5x+4y=13$$
$$3x+8y=5.$$

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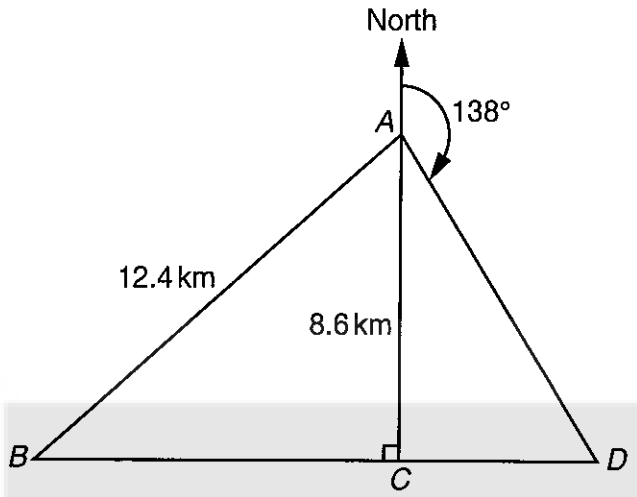
Answer $x=$ _____

$y=$ _____ [3]

14



NOT TO SCALE

The diagram shows the positions of points *A*, *B*, *C* and *D*.

A is due North of *C*. The straight line *BCD* is perpendicular to *AC*.

A is 12.4 km from *B* and 8.6 km from *C*.

(a) Calculate the distance *BC*.

.....

.....

.....

.....

Answer (a) _____ km [3]

(b) The bearing of *D* from *A* is 138°.

Calculate the distance *DC*.

.....

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Answer (b) _____ km [3]

15 **(a)** Multiply out the brackets and simplify

$$4(x-5)+2(3x-1).$$

.....

.....

*Answer (a)*_____ [2]

(b) Find the integer values of n which satisfy the inequality

$$0 < 3n < 14.$$

.....

.....

*Answer (b)*_____ [2]

(c) Factorise completely $6x^2 - 9xy$.

.....

.....

*Answer (c)*_____ [2]

(d) **(i)** Factorise $x^2 - 8x + 12$.

.....

.....

Answer (d)(i) _____ [2]

(ii) Hence solve $x^2 - 8x + 12 = 0$.

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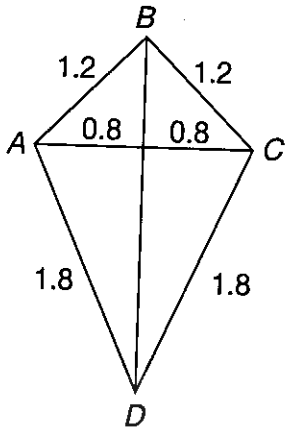
.....

Answer (d)(ii)_____ [1]

For Examiner's use

16 (a)



NOT TO SCALE

The diagram shows a kite *ABCD* with measurements in metres.

BD bisects *AC* at right angles.

Calculate the angle *ABC*.

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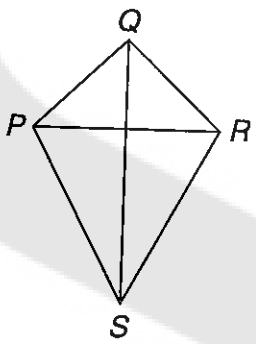
Answer (a) _____ ° [4]

(b)



NOT TO SCALE

PQRS is similar to *ABCD*.
PR is of length 1 metre.

Calculate the length of the side *PS*.

.....

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Answer (b) _____ m [2]

17 **(a)** The Morgan family leaves Manchester to catch the 12 noon ferry from Dover.
The probability that they will catch the ferry is 0.9.
The Collins family leaves Croydon to catch the same ferry.
The probability that they will catch the ferry is 0.8.
These two events are independent.

Find the probability that

(i) both families will catch the ferry,

.....

Answer (a)(i) _____ [2]

(ii) neither family will catch the ferry.

.....

.....

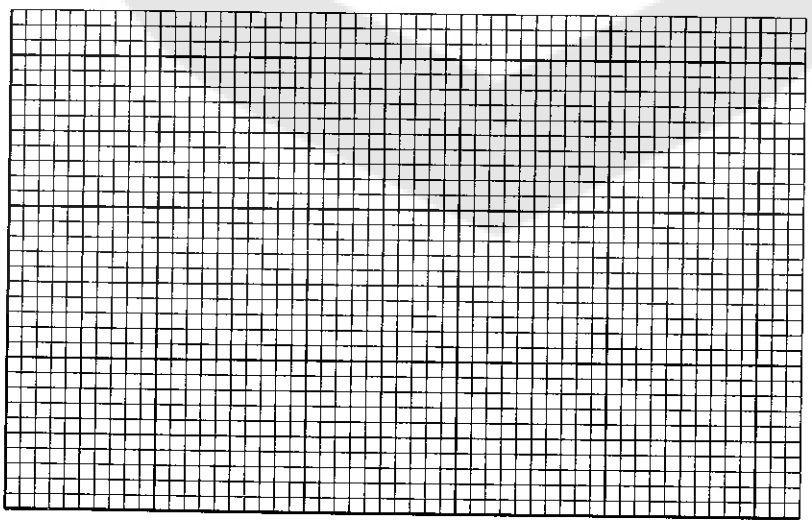
Answer (a)(ii) _____ [2]

The ferry company conducted a survey of 80 families on the 12 noon ferry to find how long they had waited on the quayside before boarding the ferry.

The results of the survey are shown in the table below.

Time (t minutes)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 100$
Number of families (frequency)	4	19	30	18	9

(b) On the grid below draw a frequency polygon to represent the distribution.



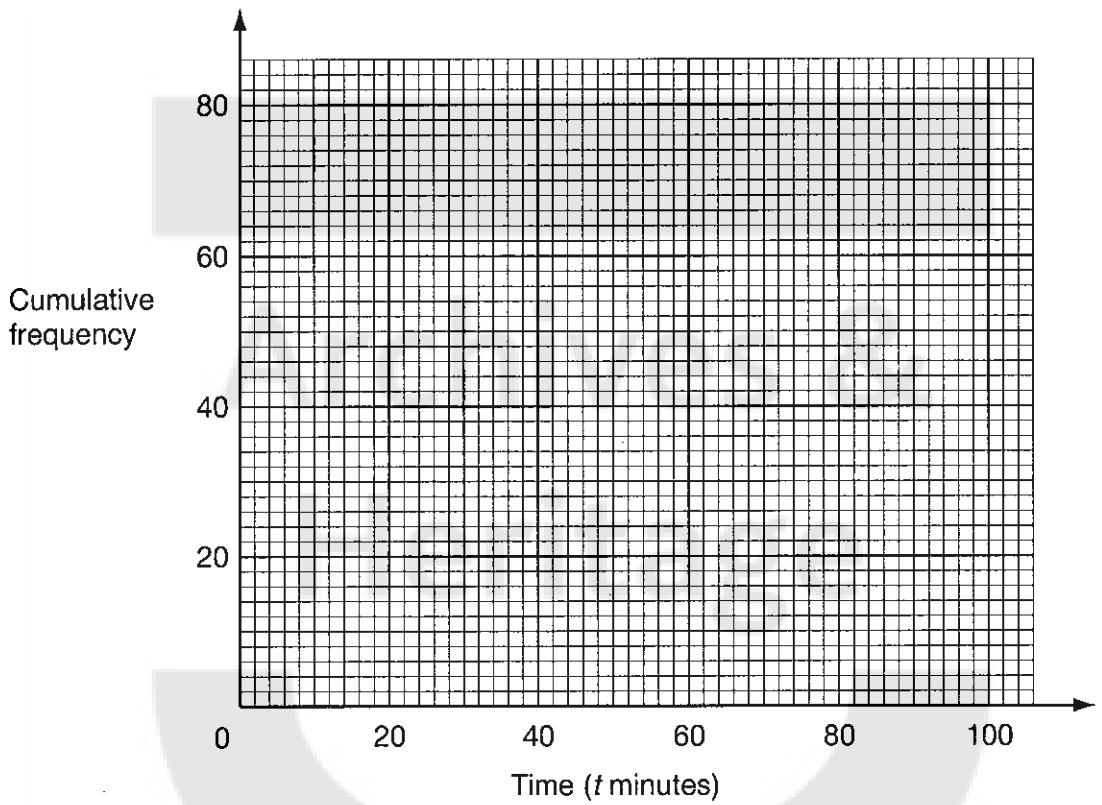
[3]

(c) (i) Complete the cumulative frequency table below.

Time (t minutes)	$t \leqslant 20$	$t \leqslant 40$	$t \leqslant 60$	$t \leqslant 80$	$t \leqslant 100$
Number of families					

[1]

(ii) On the grid below, draw the cumulative frequency diagram of the waiting times of the 80 families.



[2]

(d) Showing your method clearly, use the cumulative frequency diagram to find

(i) the median waiting time,

Answer (d)(i) _____ minutes [1]

(ii) the inter-quartile range of the waiting times.

.....

Answer (d)(ii) _____ minutes [2]

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OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education

former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/5

PAPER 5 (Higher Tier)

Wednesday **7 JUNE 2000** Afternoon 2 hours

Candidates answer on the question paper.
Additional materials:
Geometrical instruments
Tracing paper (optional)

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

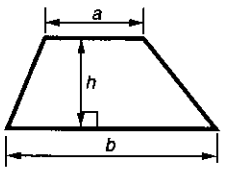
You are **not** allowed to use a calculator in this paper.

FOR EXAMINER'S USE

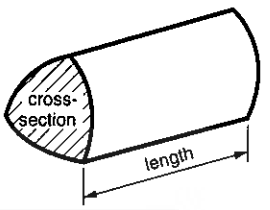
This question paper consists of 19 printed pages and 1 blank page.

Formulae Sheet: Higher Tier

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



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

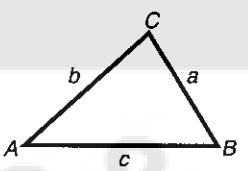


In any triangle *ABC*

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

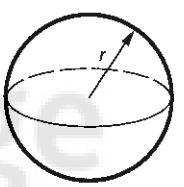
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



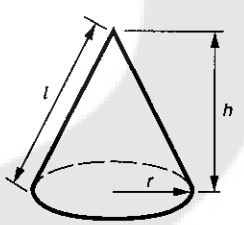
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl



The Quadratic Equation

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

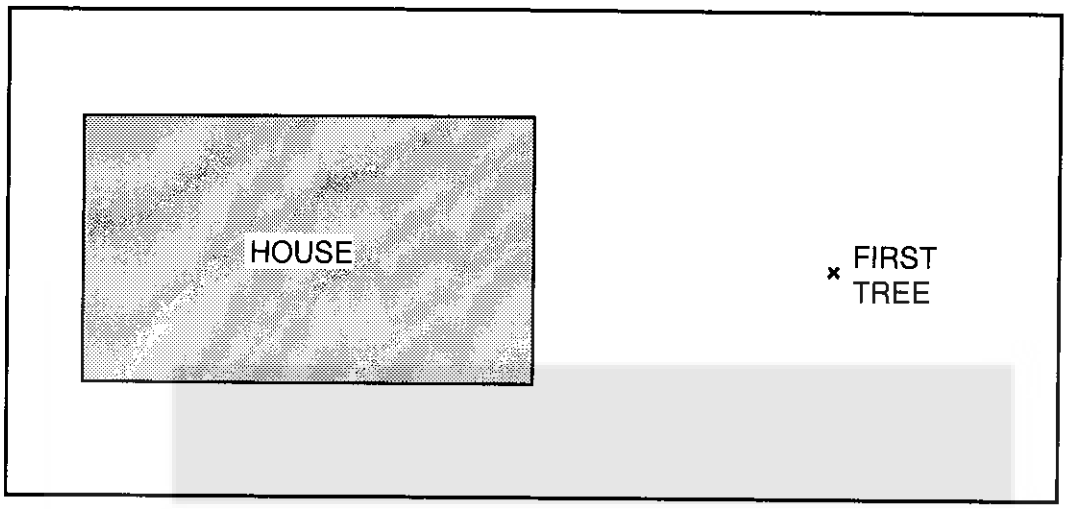
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Standard Deviation

Standard deviation for a set of numbers $x_1, x_2, \ldots, x_n$ having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}} \text{ or } s = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

1 The diagram represents a plan of Aisha's house and garden.
It is drawn to a scale of 1cm to 2 metres.

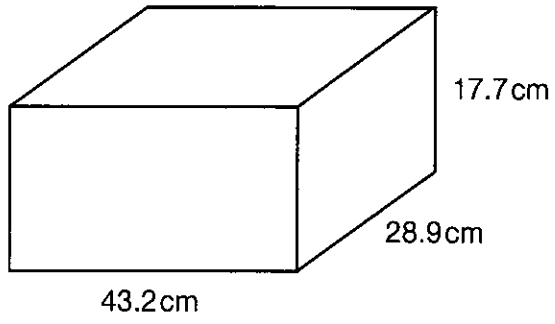


Aisha wants to plant a second tree in the garden.
It must be at least 4 metres from the house and at least 5 metres from the first tree.

Shade the region which shows all of the possible positions in which the tree can be planted. [6]

2 This box is a cuboid of length 43.2 cm, width 28.9 cm and height 17.7 cm.

NOT TO SCALE



(a) By rounding each of the measurements to 1 significant figure, estimate the volume of the box.

.....

.....

Answer (a) _____ cm^3 [2]

Janine accurately worked out the volume of the box using a calculator.
She wrote down the answer as 22098096 cm^3, forgetting to put in the decimal point.

(b) Write down the volume of the box correct to 1 decimal place.

.....

Answer (b) _____ cm^3 [2]

(c) The box weighs 15 kg, correct to the nearest kg.
Write down the greatest and least weight that the box could be.

Answer (c) Greatest _____ kg

Least _____ kg [2]

3 In the game of "Soap", two fair dice, with the faces numbered 1 to 6, are thrown.
The total of the scores on the dice is the score for that turn.
The player then moves the same number of places as their score.
For example, if (3, 5) is thrown, the player moves on 8 places.

(a) Khalid wants to land on the space marked "Albert Square". He is now on "Coronation Street" which is 6 spaces away.

By considering the possibility space (all possible outcomes), work out the probability that Khalid lands on "Albert Square" on his next turn.

.....

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Answer (a) _____ [3]

Caroline does not want to land on "Ramsey Street" which is 7 spaces away.

(b) What is the probability that Caroline does not land on "Ramsey Street" on her next turn?

.....

.....

Answer (b) _____ [2]

You can only escape from "Cell Block H" if you score the same number on each dice.
John is on "Cell Block H".

(c) What is the probability that John escapes on his next turn?

.....

.....

Answer (c) _____ [1]

4 **(a)** Simplify $t^4 \times t^2$.

.....

.....

Answer (a) _____ [1]

(b) Solve

(i) $3(x - 1) = x + 4$,

.....

.....

.....

.....

Answer (b)(i) $x =$ _____ [3]

(ii) $8x + 5 > 25$.

.....

.....

Answer (b)(ii) _____ [2]

(c) Factorise $4x^2 - 25$.

.....

.....

Answer (c) _____ [2]

(d) **(i)** Factorise $x^2 + 7x + 6$.

.....

.....

Answer (d)(i) _____ [2]

(ii) Hence solve the equation

$x^2 + 7x + 6 = 0$.

.....

.....

.....

Answer (d)(ii) $x =$ _____ [1]

5 The heights of 100 plants were measured.
The results are shown in the table below.

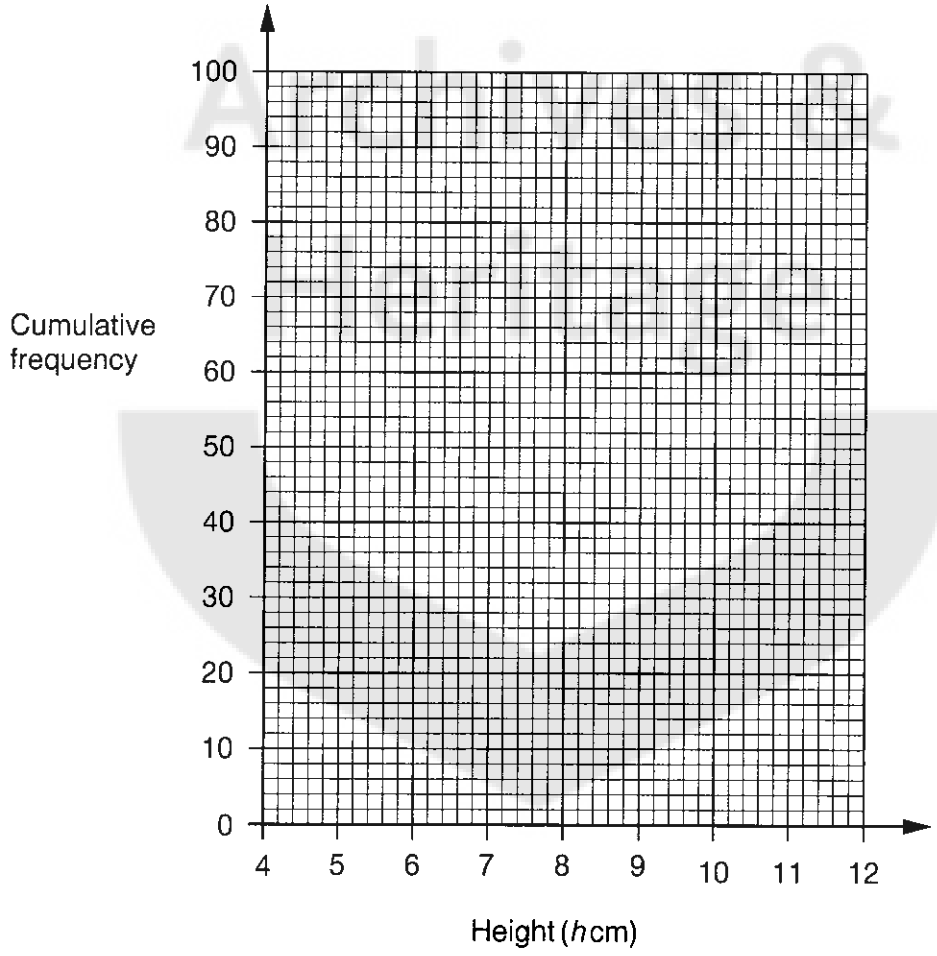
Height (h cm)	$4 < h \leqslant 5$	$5 < h \leqslant 6$	$6 < h \leqslant 7$	$7 < h \leqslant 8$	$8 < h \leqslant 9$	$9 < h \leqslant 10$	$10 < h \leqslant 11$	$11 < h \leqslant 12$
Frequency	3	7	11	28	24	17	8	2

(a) Complete the cumulative frequency table for the 100 plants.

Height (h cm)	$h \leqslant 4$	$h \leqslant 5$	$h \leqslant 6$	$h \leqslant 7$	$h \leqslant 8$	$h \leqslant 9$	$h \leqslant 10$	$h \leqslant 11$	$h \leqslant 12$
Cumulative Frequency	0	3							

[1]

(b) Draw the cumulative frequency diagram on the grid below.



[3]

(c) Use your graph to estimate how many plants are less than 9.4 cm high.

Answer (c) _____ [1]

(d) Use your cumulative frequency diagram to estimate the inter-quartile range of the heights.

.....

.....

Answer (d) _____ cm [2]

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6 On the grid below shade the single region which satisfies both the inequalities

$y \geqslant 3x$ and $3x + 2y \leqslant 12$.

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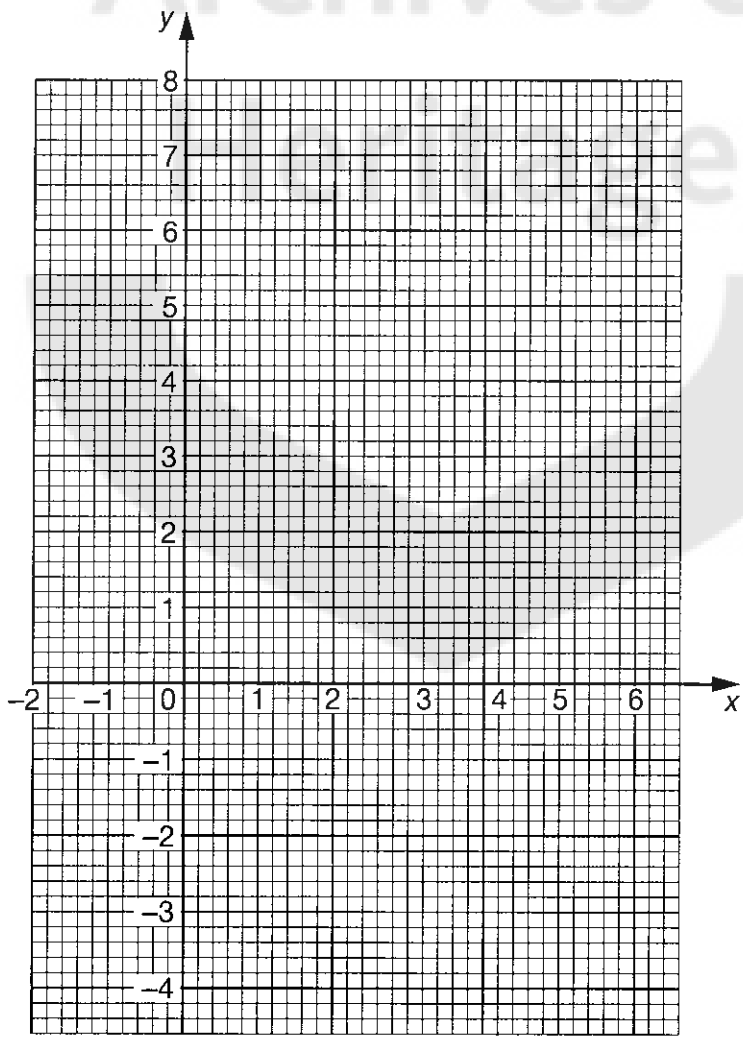
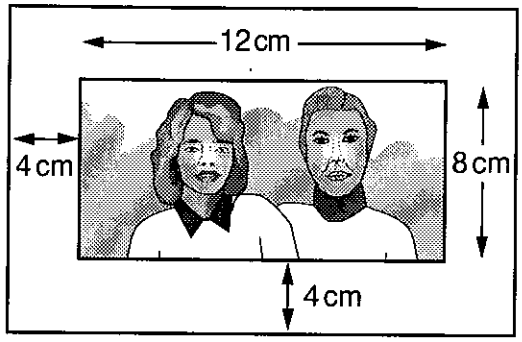


[4]

7 A rectangular photograph, 12 cm long and 8 cm wide, fits into a rectangular frame so that there is a border 4 cm wide all the way round it.



NOT TO SCALE

Use calculations to show whether or not the two rectangles are similar.

Answer .....

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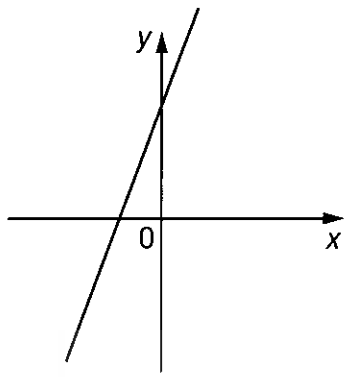
..... [4]

For Examiner's use

8 The graphs of eight functions are sketched below.



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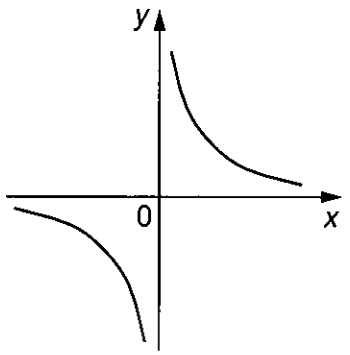

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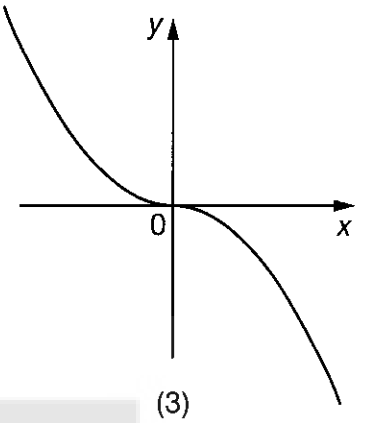

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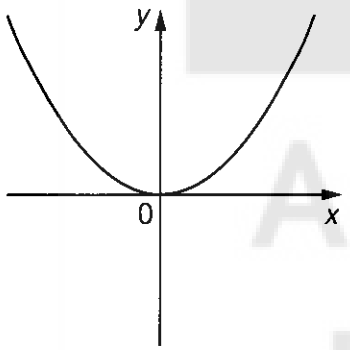

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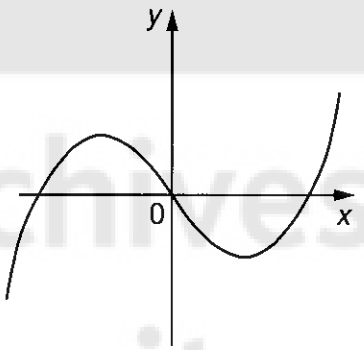

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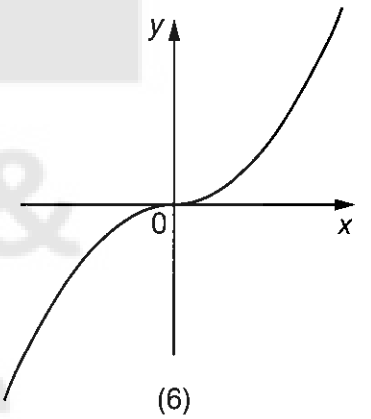
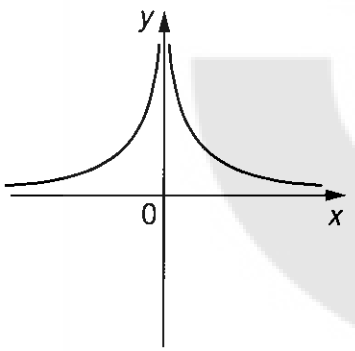
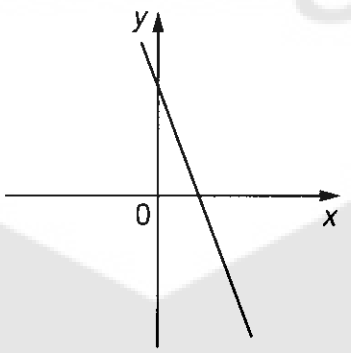


(6)



(7)



(8)

Which graph could represent

(a) $y = 5 - 3x$,

Answer (a) _____ [1]

(b) $y = \frac{12}{x}$,

Answer (b) _____ [1]

(c) $y = 2x^3$?

Answer (c) _____ [1]

[Turn over

9 **(a)** Solve this inequality.

$$2x + 3 < 5x + 12$$

.....

.....

.....

Answer (a) _____ [3]

(b) **(i)** Solve this equation.

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

.....

.....

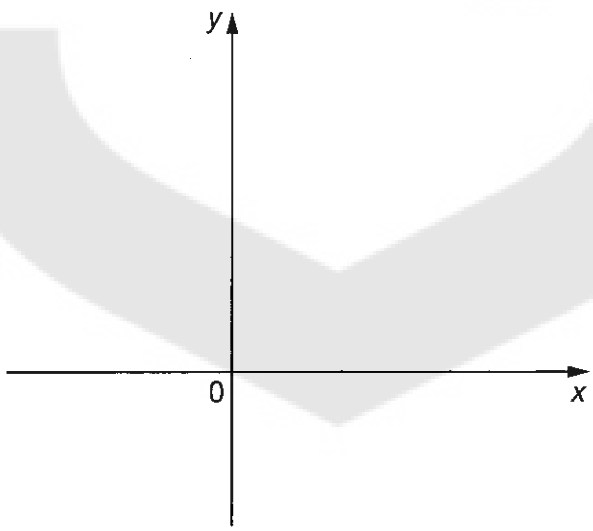
.....

Answer (b)(i) $x =$ _____ [3]

(ii) Sketch the graph of $y = 2x^2 + x - 3$.

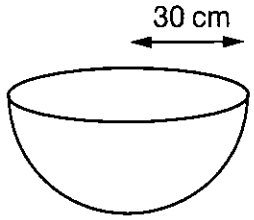
Show clearly where the graph crosses the x-axis.

Answer (b)(ii)



[2]

10



A hemispherical bowl has a radius of 30 cm.

(a) (i) Calculate the volume of the bowl. Leave your answer as a multiple of π.

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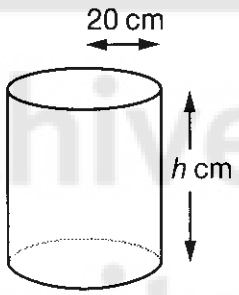
.....

Answer (a)(i) _____ cm^3 [2]



(ii) A cylinder of radius 20 cm and height h cm has the same volume as the bowl. Calculate the value of h.

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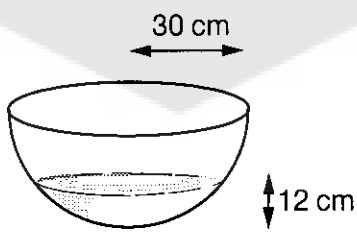
Answer (a)(ii) h = _____ [2]

Water is poured into the bowl to a depth of 12 cm.



(b) Calculate the radius of the surface of the water.

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Answer (b) _____ cm [3]

11 In a class of 20 pupils, 11 have dark hair, 7 have fair hair and 2 have red hair.
Two pupils are chosen at random to collect the homework.
What is the probability that they

(a) both have fair hair,

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Answer (a) _____ [3]

(b) each have hair of a different colour?

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Answer (b) _____ [4]

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12 A cable is 50 m long correct to the nearest metre.
Barrie cuts off a piece which is 15 m long, correct to the nearest 10 cm.

Calculate the maximum length of the remaining cable.

.....

.....

Answer _____ [2]

---

13 **(a)** Express the following in the form $p\sqrt{q}$ where p and q are integers and q is as small as possible.
For example $\sqrt{8} = 2\sqrt{2}$.

(i) $\sqrt{72}$

.....

.....

Answer (a)(i) _____ [1]

(ii) $\sqrt{20} \times \sqrt{15}$

.....

.....

.....

Answer (a)(ii) _____ [2]

(iii) $\dfrac{\sqrt{50} \times \sqrt{27}}{\sqrt{18}}$

.....

.....

.....

Answer (a)(iii) _____ [2]

(b) Given that $(5 + \sqrt{7})^2 = a + b\sqrt{7}$, find the value of a and the value of b.

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Answer (b) $a =$ _____ $b =$ _____ [2]

14 You are doing a survey about kitchen appliances. You are going to sample the households in a small town. You decide to take a stratified sample of 10% of the households.

(a) Describe carefully how you would choose your stratified sample.

Answer (a) .....

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.....

..... [3]

(b) State one advantage your method has over a simple random sample.

Answer (b) .....

..... [1]

(c) State one advantage your method has over taking every 10th name from the local telephone directory.

Answer (c) .....

..... [1]

15 A company was contracted to make 840 vans in 90 days.
After they made 540, the manager worked out the average production per day.
He worked out that, if they could increase this average by 1 van per day, they could fulfil the contract in exactly 90 days.

Let the average for the first 540 be x vans per day.

(a) Write down an equation in x and show that it simplifies to

$$\frac{18}{x} + \frac{10}{x+1} = 3$$

Answer (a) .....

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..... [2]

(b) Use algebra to solve the equation.
Hence find the average production for the first 540 vans.

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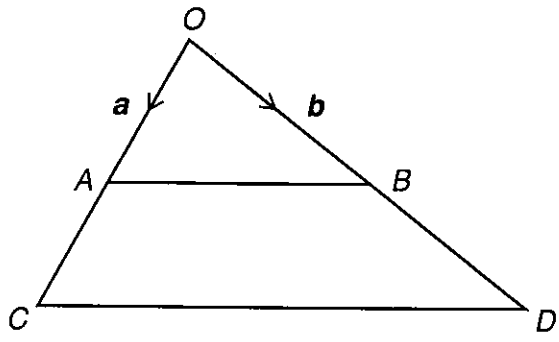
Answer (b) _____ [7]

16



In the diagram A and B are the midpoints of OC and OD respectively.
$\overrightarrow{OA} = \boldsymbol{a}$ and $\overrightarrow{OB} = \boldsymbol{b}$.

(a) Write down $\overrightarrow{OC}$ in terms of $\boldsymbol{a}$.

Answer (a) _____ [1]

(b) (i) Write down $\overrightarrow{AB}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$

Answer (b)(i) _____ [1]

(ii) Use a vector method to prove that CD is parallel to AB.

Answer (b)(ii) .....

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.....

..... [3]

(iii) What other conclusion can you make about AB and CD?

Answer (b)(iii) .....

..... [1]

E is the midpoint of CD.

(c) Use a vector method to prove that $OAEB$ is a parallelogram.

Answer (c).....

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..... [2]

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OCR
RECOGNISING ACHIEVEMENT

Candidate Name	Centre Number	Candidate Number

General Certificate of Secondary Education
former Midland Examining Group syllabus

MATHEMATICS SYLLABUS A 1662/6

PAPER 6 (Higher Tier)

Tuesday **13 JUNE 2000** Morning 2 hours

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Geometrical instruments
Tracing paper (optional)

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Show all your working. Marks may be given for working which shows that you know how to solve the problem, even if you get the answer wrong.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

You are expected to use a scientific calculator for this paper.

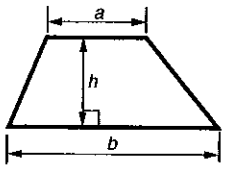
Unless otherwise instructed in the question, take π to be 3.142 or use the π button on your calculator.

FOR EXAMINER'S USE

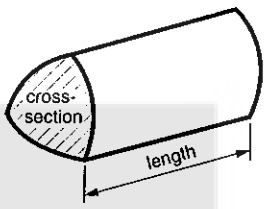
This question paper consists of 15 printed pages and 1 blank page.

Formulae Sheet: Higher Tier

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



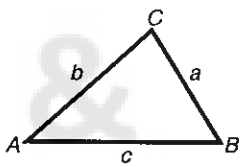
Volume of prism = (area of cross-section) × length



In any triangle *ABC*

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

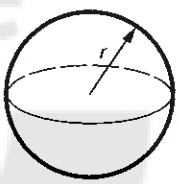
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$



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

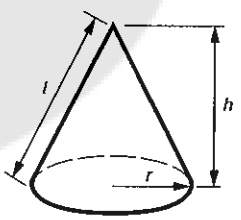
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl



The Quadratic Equation

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

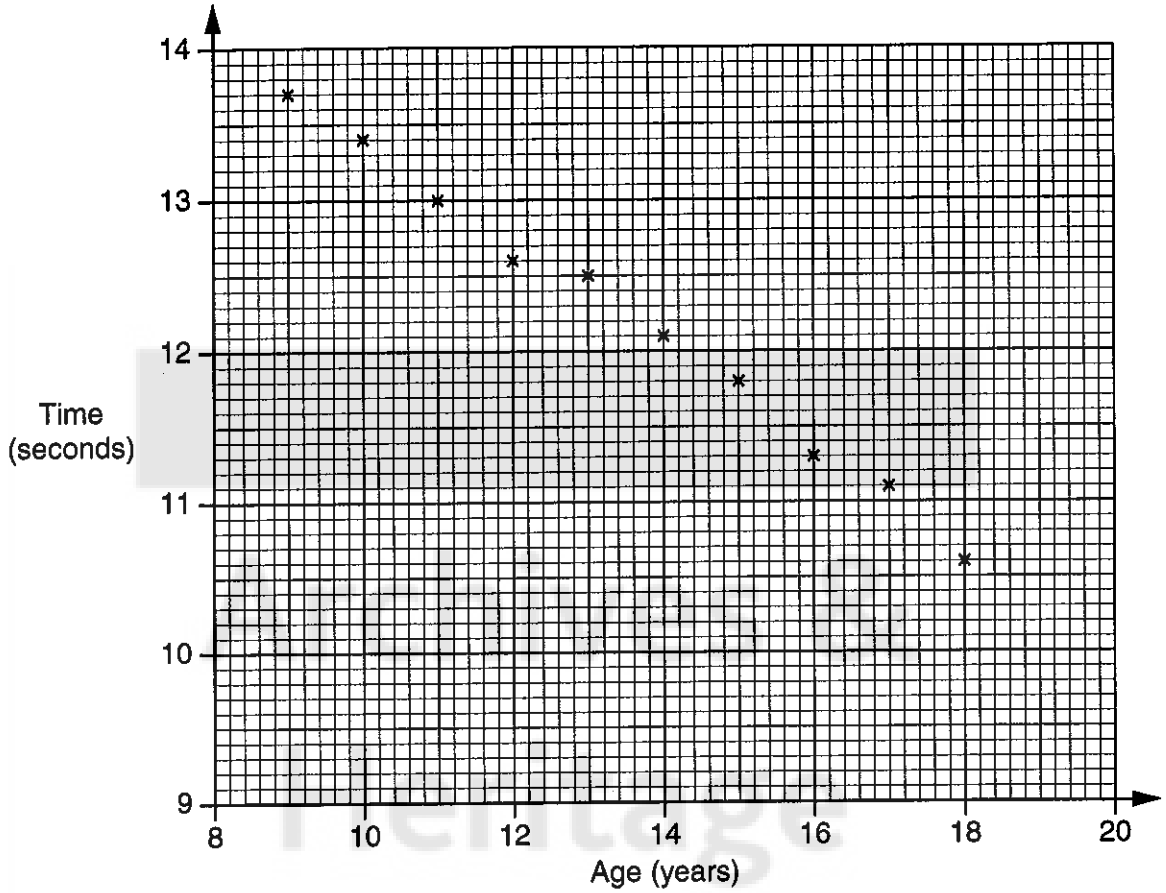
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Standard Deviation

Standard deviation for a set of numbers $x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}} \text{ or } s = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

1 The record times for the 100 metres for each age group of the schoolboys athletic championships in the country of Ocravia are plotted on the scatter graph below.



(a) Describe the correlation between the ages and the times.

Answer **(a)** .....

.....[1]

(b) Add a line of best fit to the diagram. [1]

(c) A 100 metres championship for 20 year old youths is held.

(i) Use your line of best fit to estimate the record for this age.

Answer **(c)(i)** ..... s [1]

(ii) Explain why your estimate may be unreliable.

Answer **(c)(ii)** .....

.....[1]

[Turn over

2 **(a)** Use your calculator to find the value of

$$\frac{3.9^2 + 0.53}{3.9 \times 0.53}.$$

(i) Write down the full calculator display of your answer.

Answer **(a)(i)** ..... [1]

(ii) Write your answer to part **(a)(i)** correct to 2 decimal places.

Answer **(a)(ii)** ..... [1]

(b) Write down a calculation you can do in your head to check your answer to part **(a)**.

Calculation.

Write down your answer to this calculation.

Answer **(b)** ..... [3]

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3 Use a trial and improvement method to find the value of x correct to **one** decimal place when

$$x^3 - 2x = 68.$$

You must show all your trials.

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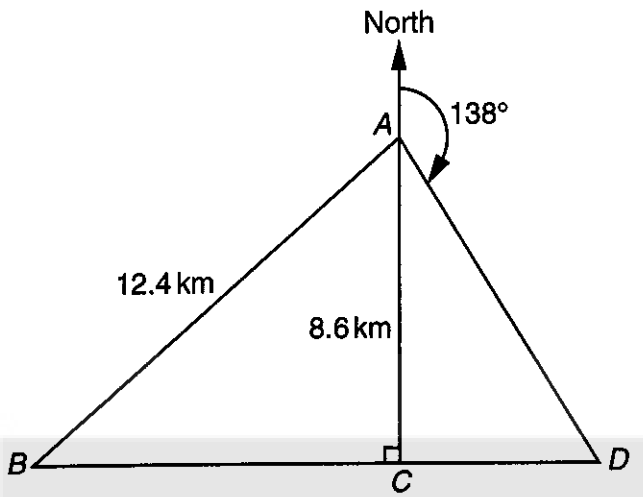
Answer $x =$ ..... [4]

4



NOT TO SCALE

The diagram shows the positions of points *A*, *B*, *C*, and *D*.

A is due North of *C*. The straight line *BCD* is perpendicular to *AC*.

A is 12.4 kilometres from *B* and 8.6 kilometres from *C*.

(a) Calculate the distance *BC*.

.....

.....

.....

.....

Answer **(a)** ..... km [3]

(b) The bearing of *D* from *A* is 138°.

Calculate the distance *DC*.

.....

.....

.....

.....

Answer **(b)** ..... km [3]

[Turn over

15 **(a)** The Morgan family leaves Manchester to catch the 12 noon ferry from Dover.
The probability that they will catch the ferry is 0.9.

The Collins family leave Croydon to catch the same ferry.
The probability that they will catch the ferry is 0.8.

These two events are independent.
Find the probability that

(i) both families will catch the ferry,

.....

Answer **(a)(i)** ..... [2]

(ii) neither family will catch the ferry.

.....

.....

Answer **(a)(ii)** ..... [2]

(b) The ferry company conducted a survey of 80 families on the 12 noon ferry to find how long they had waited on the quayside before boarding the ferry.

The results of the survey are shown in the table below.

Time (t minutes)	Number of families (frequency)
$0 < t \leq 20$	4
$20 < t \leq 40$	19
$40 < t \leq 60$	30
$60 < t \leq 80$	18
$80 < t \leq 100$	9

Calculate an estimate of the mean and standard deviation of the waiting times.

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.....

Answer **(b)** Mean = ... minutes

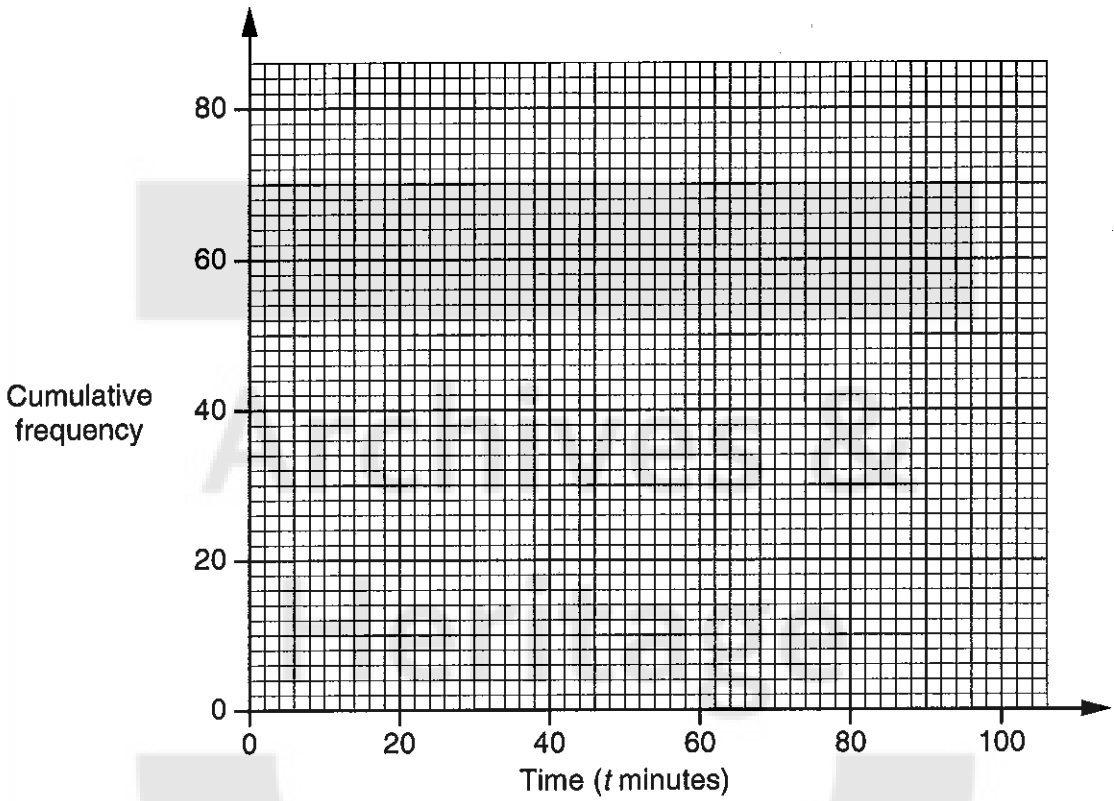
Standard deviation = ... minutes [5]

(c) **(i)** Use the table in part **(b)** to complete the cumulative frequency table below.

Time (t minutes)	$t \leq 20$	$t \leq 40$	$t \leq 60$	$t \leq 80$	$t \leq 100$
Number of families					

[1]

(ii) On the grid below, draw the cumulative frequency diagram of the waiting times of the 80 families.



[2]

(iii) Estimate the probability that a family chosen at random will have arrived at least 75 minutes before boarding of the ferry.

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Answer **(c)(iii)** ..... [2]

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6 Write down the nth term of each of the following sequences.

(a) 2 5 10 17 26 37 .....

.....

.....

Answer **(a)** ..... [2]

(b) 4 16 36 64 100 144 .....

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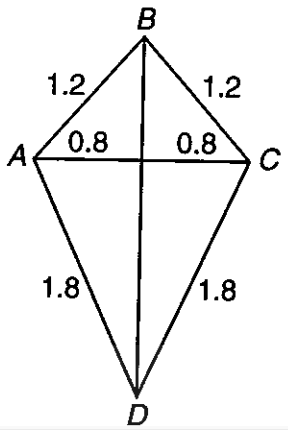
.....

Answer **(b)** ..... [2]

7 (a)



NOT TO SCALE

The diagram shows a kite *ABCD* with measurements in metres.

BD bisects *AC* at right angles.

Calculate the size of angle *ABC*.

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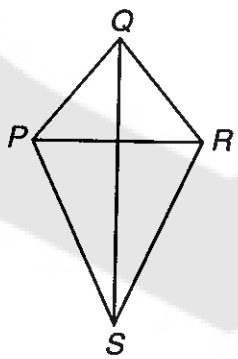
Answer **(a)** ..... ° [4]

(b)



NOT TO SCALE

PQRS is similar to *ABCD*.

PR is of length 1 metre.

Calculate the length of the side *PS*.

.....

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.....

Answer **(b)** ..... m [2]

8 **(a)** Factorise completely

$$6x^2 - 9xy \ .$$

.....

.....

Answer **(a)** ..... [2]

(b) Solve

$$4y^2 + 5y - 3 = 0 \ .$$

Give your answers correct to two decimal places.

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Answer **(b)** ..... [3]

---

9 **(a)** Kelly bought a television set.
After a reduction of 15% in a sale, the one she bought cost her £319.60.
What was the original price of the television set?

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Answer **(a)** £ ..... [3]

(b) A plant in a greenhouse is 10 cm high.
It increases its height by 15% each day.
How many days does it take to double in height?

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Answer **(b)** ..... days [2]

[Turn over

10 **(a)** Solve the simultaneous equations

$$5x + 4y = 13$$
$$3x + 8y = 5.$$

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Answer **(a)** $x =$ ..... ,

$y =$ ..... [3]

(b) Find the equation of the line passing through the points (–1, 8) and (2, –10).
Give your answer in the form $y = ax + b$.

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Answer **(b)** ..... [4]

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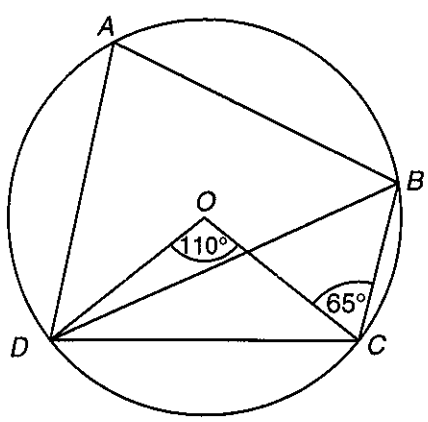
11 **(a)** O is the centre of a circle through A, B, C, and D.
Angle DOC is 110° and angle OCB is 65°.



NOT TO SCALE

(i) Find angle *DBC*.

.....

Answer **(a)(i)** ..... ° [1]

(ii) Find angle *DCO*.

.....

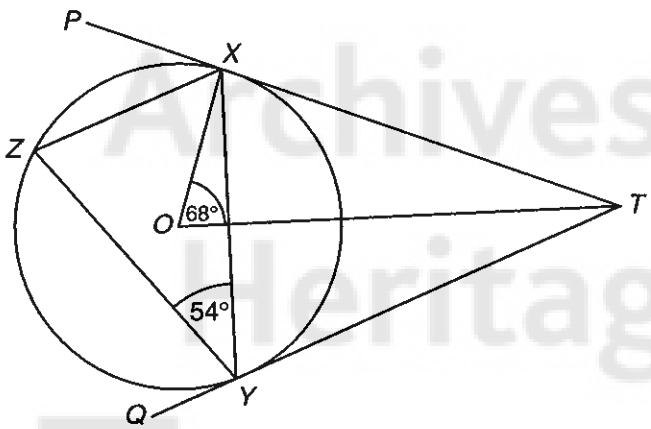
Answer **(a)(ii)** ..... ° [1]

(iii) Find angle *DAB*.

.....

Answer **(a)(iii)** ..... ° [1]

(b)



NOT TO SCALE

TXP and *TYQ* are tangents to a circle, centre *O*. *Z* is a point on the circumference. Angle *XYZ* is 54° and angle *XOT* is 68°.

(i) Find angle *PXZ*.

.....

Answer **(b)(i)** ..... ° [1]

(ii) Find angle *OTY*.

.....

Answer **(b)(ii)** ..... ° [2]

12 Given that

$$y + 4ax = 5y - 3x$$

(a) express a in terms of x and y.

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.....

Answer a = ... [3]

(b) express x in terms of y and a.

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Answer x = ... [3]

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13 **(a)** Convert the recurring decimal $0.\dot{3}\dot{5}$ to a fraction.

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Answer **(a)** ..... [2]

(b) Write down two different irrational numbers between 1 and 10 which multiply together to give a rational number.

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Answer **(b)** ..... and ..... [2]

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14 Anil has five bars of chocolate in a cupboard.
Three are Kit-Kats, one is a Mars bar and one is a Fudge bar.
He takes one at random on each weekday to eat at school.

(a) Calculate the probability that the bar of chocolate will be a Kit-Kat on both Monday and Tuesday of that week.

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Answer **(a)** ..... [2]

(b) Calculate the probability that the bar of chocolate will be a Kit-Kat on Monday, Tuesday and Wednesday and a Mars bar on Thursday.

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Answer **(b)** ..... [2]

(c) Calculate the probability that the bar of chocolate will not be a Kit-Kat on any two consecutive days in that school week.

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Answer **(c)** ..... [3]

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15 Graham has a plank of wood of length 610 cm, correct to the nearest 10 cm.
He uses a cutting machine to cut the plank into pieces, without any wastage.
Each piece of wood is of length 15 cm, correct to the nearest half centimetre.
Find the maximum number of pieces of wood that Graham can be certain of getting.

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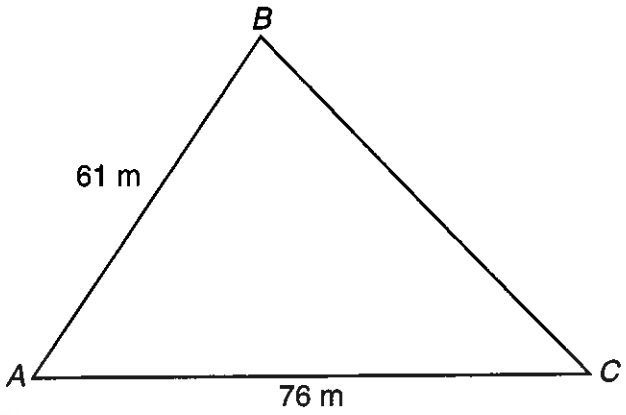
Answer ..... [3]

16



NOT TO SCALE

The diagram represents a level triangular piece of land.
$AB = 61$ metres, $AC = 76$ metres, and the area of the land is $2300\,m^2$.
Angle BAC is acute.
Calculate the length of BC. Give your answer to an appropriate degree of accuracy.

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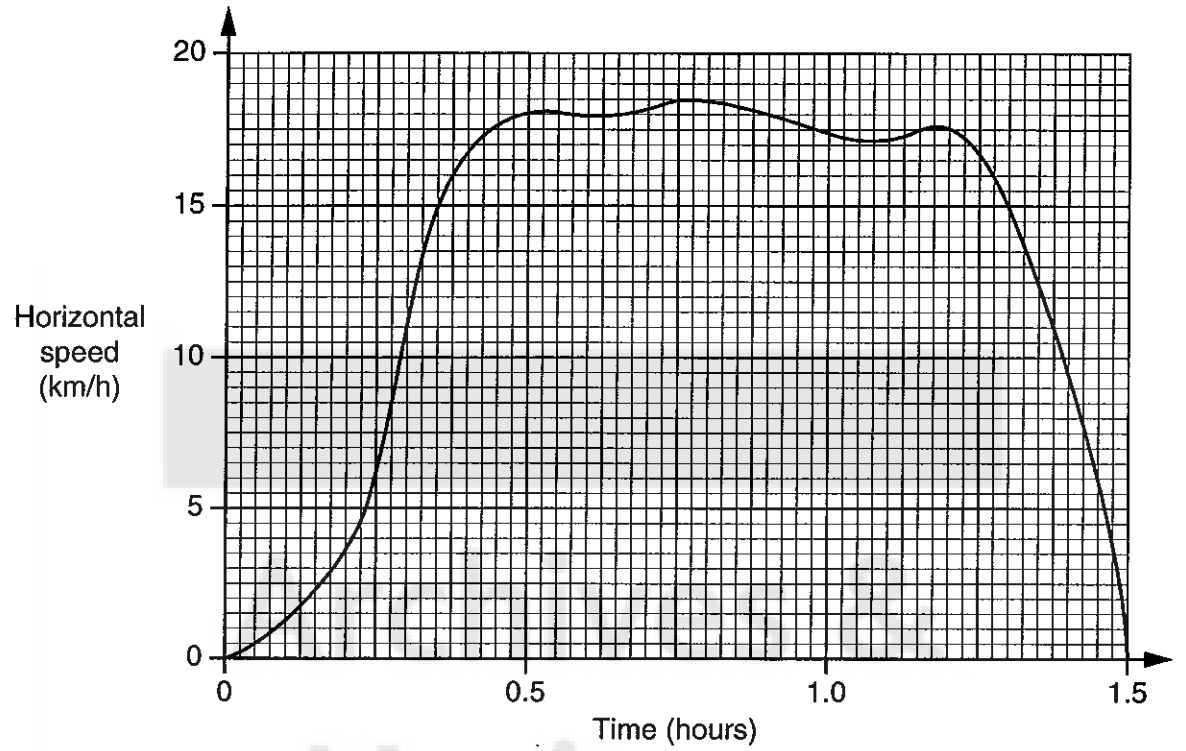
Answer ..... m [6]

17 Betty makes a flight in a hot air balloon. The graph below shows the horizontal speed in km/h plotted against the time in hours.



(a) Use the trapezium rule, with 6 strips of equal width, to find an estimate of the distance travelled.

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Answer **(a)** ..... km [4]

(b) Find the acceleration of the balloon after 15 minutes.
Give the units of your answer.

.....

.....

Answer **(b)** Acceleration = ... [3]

Units = ... [1]

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