Sample assessment materials

GCSE

Edexcel GCSE in Applications of Mathematics

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Contents

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, ie if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of, QWC is being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear.
  Comprehension and meaning is clear by using correct notation and labelling conventions.

  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter.
  Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.
  The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme
M1 – method mark
A1 – accuracy mark
B1 – working mark
C1 – communication mark
QWC – quality of written communication
oe – or equivalent
cao – correct answer only
ft – follow through

Unit 1: Applications 1

Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 1: Applications 1

For Approved Pilot Centres ONLY

Foundation Tier

Sample Assessment Material
Time: 1 hour 45 minutes

Paper Reference
5AM1F/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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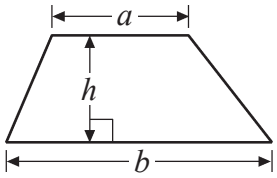
GCSE Mathematics 2AM01

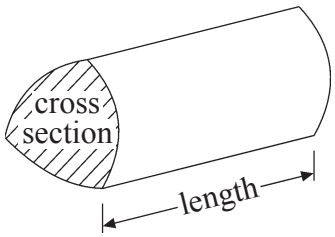
Formulae: Foundation Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

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



Volume of prism = area of cross section × length



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Here are some road signs.

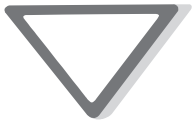
A

B

C

D

E



F

G

Some of these road signs have only **one** line of symmetry.

(a) Write down the letter of each of the road signs with only one line of symmetry.

(2)

.....

Some of these road signs have rotational symmetry.

(b) Write down the letters of these road signs and state their order of rotational symmetry.

(2)

.....

Signs **B** and **G** are in the shape of a special type of triangle.

(c) What is the name of this special triangle?

(1)

.....

(Total for Question 1 = 5 marks)

2 Daniel carried out a survey of each of his friends' favourite flavour of crisps.
Here are his results.

Plain	Chicken	Cheese and Onion	Salt and Vinegar
Plain	Salt and Vinegar	Plain	Chicken
Plain	Cheese and Onion	Plain	Chicken
Cheese and Onion	Salt and Vinegar	Cheese and Onion	Plain
Cheese and Onion	Plain	Plain	Salt and Vinegar

(a) Complete the table below to show Daniel's results.

(3)

Flavour of crisps	**Tally**	**Frequency**
Plain		
Chicken		
Cheese and Onion		
Salt and Vinegar		

(b) Write down the number of Daniel's friends whose favourite flavour is Salt & Vinegar.

(1)

.....

(c) Which was the favourite flavour of crisps for most of Daniel's friends?

(1)

.....

(Total for Question 2 = 5 marks)

3 The table below shows the distances in miles between six towns.

					London
120					Bristol
200	84				Exeter
56	74	154			Oxford
241	125	44	195		Plymouth
167	51	34	121	75	Taunton

(a) Write down the distance between London and Oxford.

(1)

..... miles

(b) Which two towns are the **least** distance apart?

(1)

..... and .....

Nazim drives a delivery van.

He starts in London and has to return to London at the end of each day.

One day he has to make deliveries in Bristol, Oxford and Taunton.

(c) Work out the **least** distance that Nazim drove on that day.

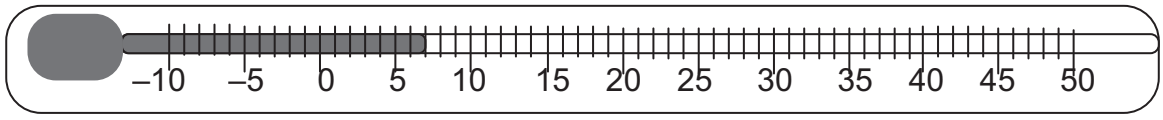
You must show clearly how you got your answer.

(4)

..... miles

(Total for Question 3 = 6 marks)

4 The diagram below shows the temperature at 10 pm on one night.



(a) Write down the temperature shown on the thermometer.

(1)

..... °C

By 8 am the next morning, the temperature had fallen by 10°C.

(b) Work out the new temperature.

(1)

..... °C

By 12 noon on the same day the temperature was 20°C.

(c) By how many degrees Celsius has the temperature increased since 8 am that morning?

(1)

..... °C

(Total for Question 4 = 3 marks)

5 Some bulbs were planted in October.
The ticks in the table below show the months in which each type of bulb flowers.

Type of bulb	**Month**				
	Jan	Feb	Mar	Apr	May
Allium					✓
Crocus	✓	✓			
Daffodil		✓	✓	✓	
Iris	✓	✓			
Tulip				✓	✓

(a) In which months do tulips flower?

(1)

.....

(b) Which type of bulb flowers in March?

(1)

.....

(c) In which month do most types of bulb flower?

(1)

.....

(d) Which type of bulb flowers in the same months as the iris?

(1)

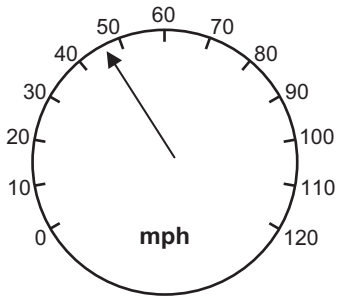
.....

(Total for Question 5 = 4 marks)

6

Rachel drove her car past a speed camera.

The diagram shows the reading on the speedometer of her car.



The speedometer of her car always reads 3 mph more than her actual speed.

The speed limit was 40 mph.

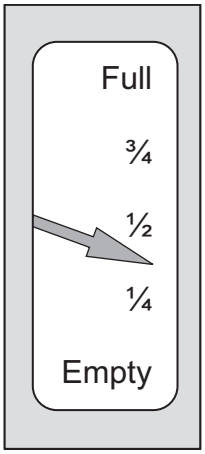
The camera allows a vehicle to exceed the 40 mph speed limit by 2 mph.
For every car that exceeds the speed limit, a fine is issued.

*(a) Did Rachel receive a fine?

(3)

You must show clearly how you got your answer.

The diagram shows the petrol gauge on Rachel's car.



When full the petrol tank holds 48 litres.
The cost of a litre of petrol is 103.9p

Rachel fills the tank with petrol.

(b) Work out an estimate for the cost of the petrol.

(4)

You must show clearly how you got your answer.

£.....

(Total for Question 6 = 7 marks)

7 Joan collects information for a national bird watching survey.
She wants to record the types of birds that visit her garden during a day.
Design a suitable data collection sheet that she could use.

(Total for Question 7 = 3 marks)

8 *AB* is a straight line.

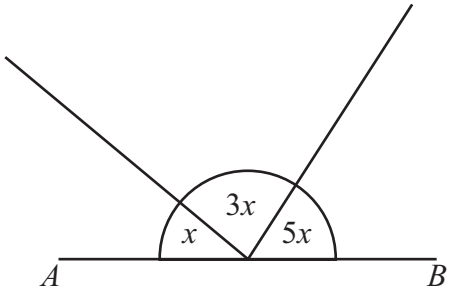


Diagram **NOT** accurately drawn

(a) Find the value of *x*.

(2)

..... °

ABCD is a parallelogram.

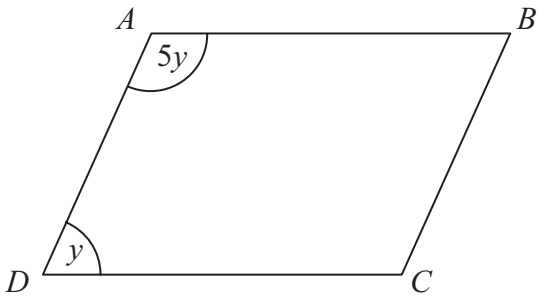


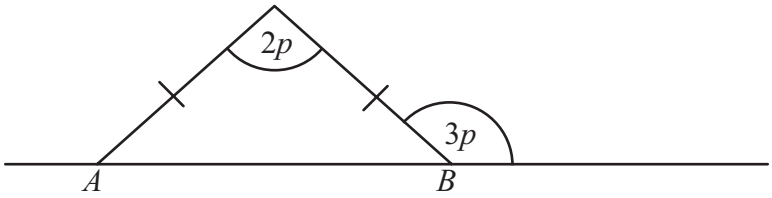
Diagram **NOT** accurately drawn

(b) Find the value of *y*.

(2)

..... °

AB is a straight line.



(c) Find the value of *p*.

(3)

..... °

(Total for Question 8 = 7 marks)

***9** In a survey, 100 male voters and 100 female voters were asked

"Which party are you going to vote for in the next election?"

The table below shows information about their answers.

	Liberals	**Conservatives**	**Labour**	**Other**
Male	25	30	44	1
Female	20	42	35	3

Represent this information in a suitable chart or diagram.

(Total for Question 9 = 4 marks)

10 Rob runs a café in a lay-by near the A1.

Rob's Café — Menu

Drinks		Food	
Tea	75p	Roll	£1.70
Coffee	85p	Sandwich	£1.35
Cola	75p	Burger	£1.25
Lemonade	70p	Chips	75p
		Sausage	80p

Meal deals

Sandwich & drink	£2
Burger & chips with drink	£2.50
All day breakfast (including drink)	£2.75

Joe's car broke down near Rob's café.

Joe has £2 in his pocket.

He decides to buy a drink and one item of food.

(a) Show all the combinations of food and drink he could buy.

(2)

Jill stopped at Rob's café with her two children.
She bought a tea and two colas, a sandwich, a burger and chips.

(b) What is the least price Jill can pay?
You must show clearly how you got your answer.

(3)

£ .....

(Total for Question 10 = 5 marks)

11 Here is a rectangle.

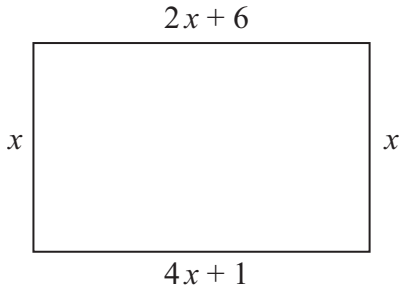


Diagram **NOT** accurately drawn

All the measurements are in centimetres.

Find the numerical value of the perimeter of the rectangle.

.....

(Total for Question 11 = 5 marks)

12 A student buys a pair of sunglasses in the USA.

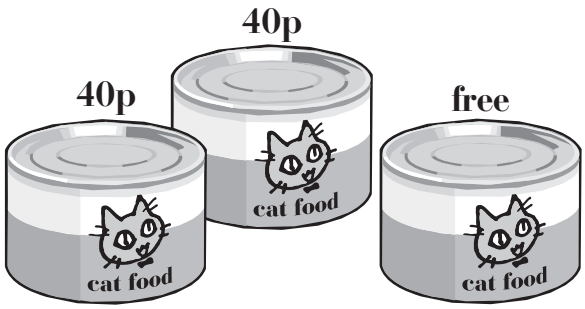
He pays $35.50
In England, an identical pair of sunglasses costs £26.99
The exchange rate is £1 = $1.42

In which country are the sunglasses cheaper, and by how much?
You must show clearly how you got your answer.

(Total for Question 12 = 3 marks)

13 Tins of cat food normally cost 40p each.

A shop has a special offer on the cat food.



Special Offer
Pay for two tins and get one tin free!

Julie wants to buy 12 tins of cat food.

(a) Work out how much she pays.
You must show clearly how you got your answer.

(3)

.....

4 of the 12 tins are tuna.

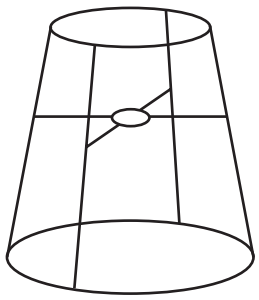
(b) What percentage of the tins are tuna?

(1)

..... %

(Total for Question 13 = 4 marks)

***14** Ian makes lampshade frames using wire.
Each frame needs 240 cm of wire to make it.



Ian buys the wire in 12 metre lengths.
Each 12 m length costs him £1.50

He sells the lampshade frames for 99p each.

One week he makes and sells 100 lampshade frames.

How much profit or loss did he make that week?
You must show clearly how you got your answer.

.....

(Total for Question 14 = 5 marks)

***15** A tyre manufacturer investigates the durability of a UBX45 car tyre.

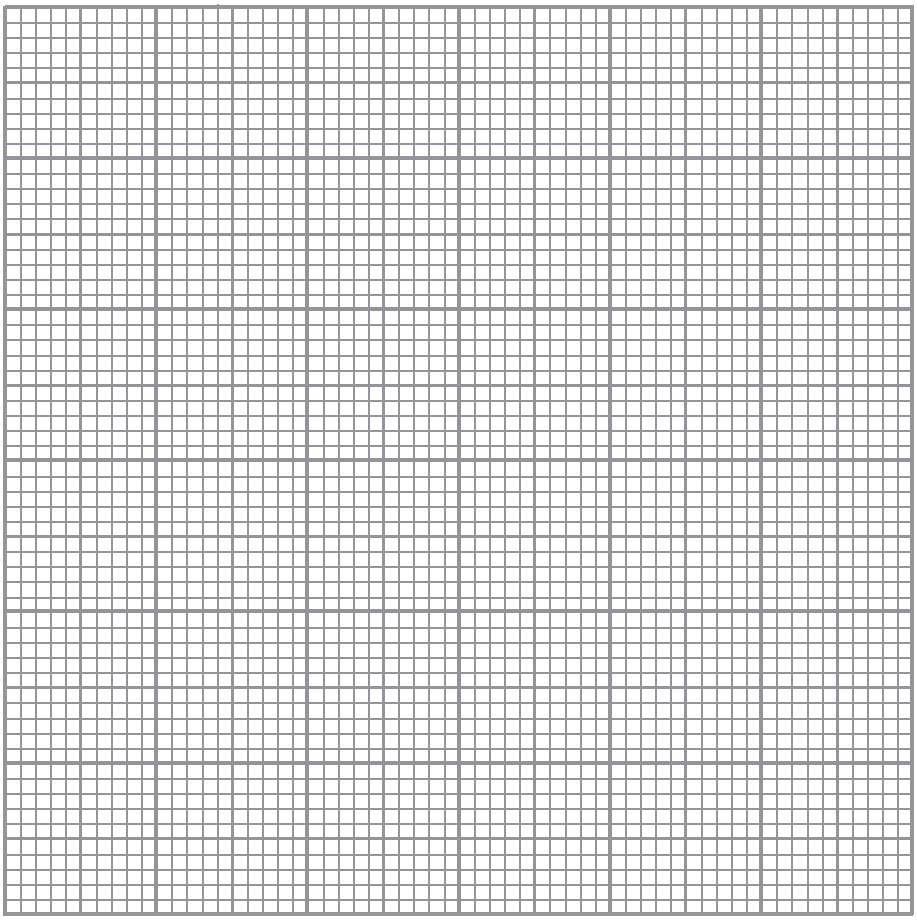
The table below shows information about the depth of tread (in mm) and the distance travelled (in miles) for six UBX45 car tyres.

	Car tyre					
	A	B	C	D	E	F
Distance travelled (in miles)	3100	14 900	12 500	25 250	18 000	8750
Depth of tread (in mm)	8.3	6.1	6.4	3.9	5.5	7.1

The minimum depth of the tread of a UBX45 car tyre before it should be replaced is 2 mm.
The tyre manufacturer recommends that a UBX45 car tyre should be replaced after x miles.

Find a suitable value for x.
Comment on the reliability of your answer.

You can use the graph paper to help you find your answer.



(Total for Question 15 = 5 marks)

16 The diagram is the plan of a hall floor.
All the corners are right angles.

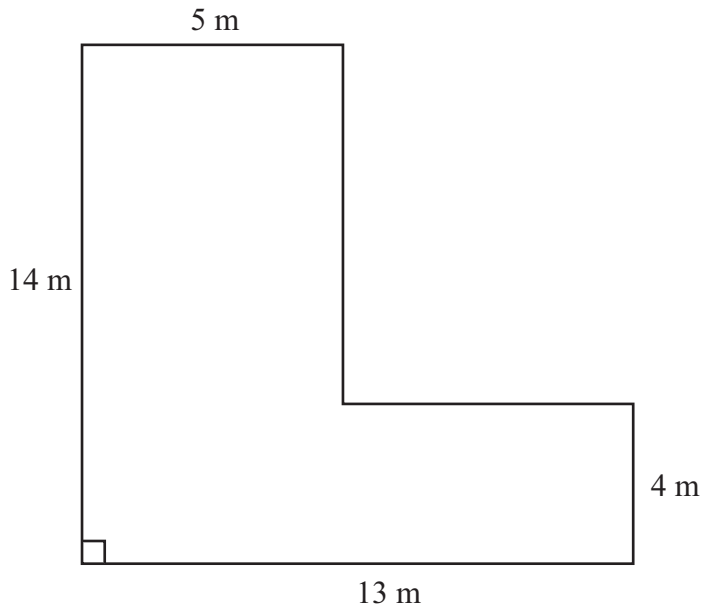


Diagram **NOT** accurately drawn

Ben is going to varnish the hall floor with two coats of varnish.
1 tin of varnish will cover 13 m^2.
1 tin of varnish costs £7.49

Work out the total cost of the tins of varnish that Ben buys.
You must show clearly how you got your answer.

£ .....

(Total for Question 16 = 5 marks)

17 Bob works as a bricklayer.

On average he can lay 200 bricks in one hour.

He builds a wall that needs 960 bricks.

He starts work at 8 am and has a quarter of an hour break at 11 am.

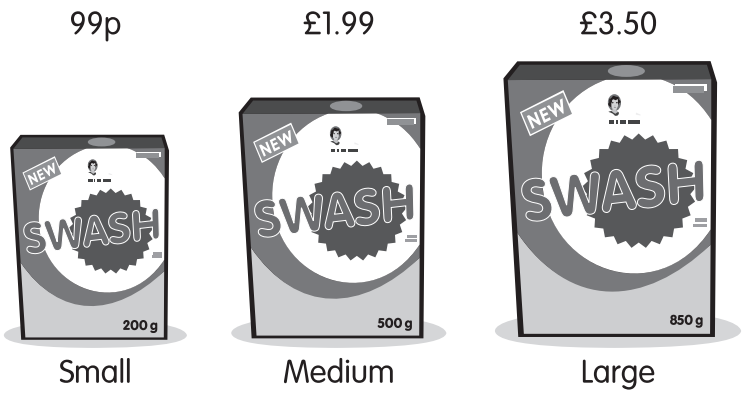
Work out at what time Bob finished building the wall.

.....

(Total for Question 17 = 5 marks)

***18** Packets of "Swash" detergent are sold in three sizes.

Small packets cost	99p and hold 200 g
Medium packets cost	£1.99 and hold 500 g
Large packets cost	£3.50 and hold 850 g



Which is the best buy?
You must show clearly how you got your answer.

(Total for Question 18 = 3 marks)

19 The table below gives information about the speed of 100 cars passing a motorway checkpoint.

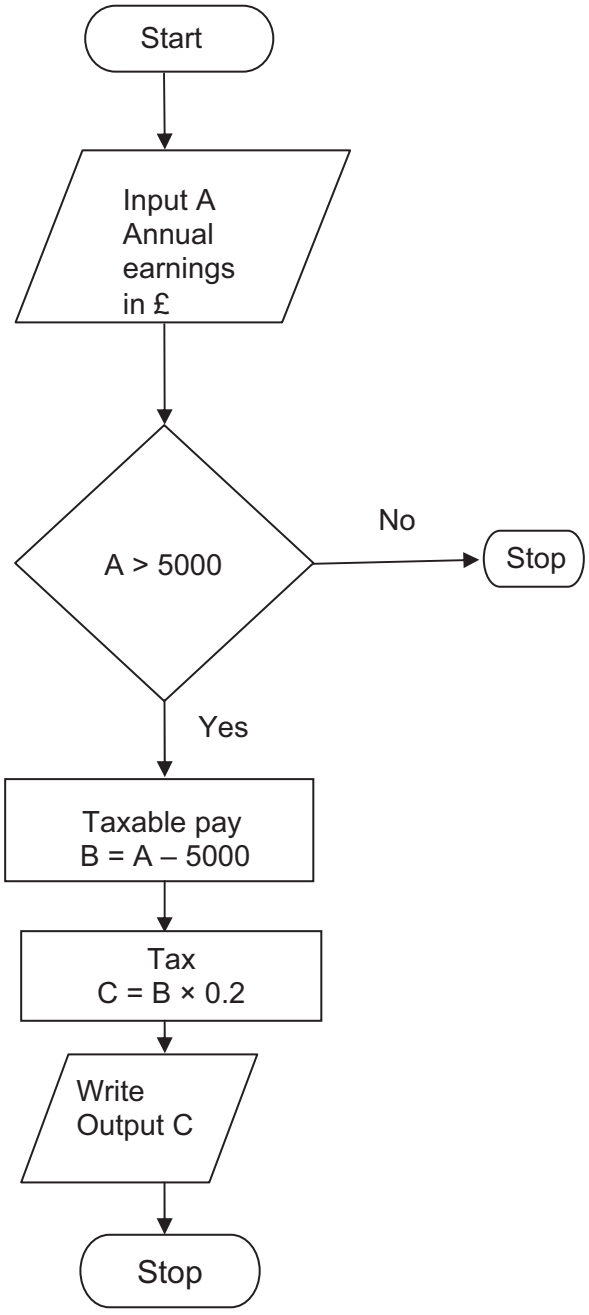
Speed (x miles per hour)	**Frequency**
$40 < x \leqslant 50$	16
$50 < x \leqslant 60$	25
$60 < x \leqslant 70$	42
$70 < x \leqslant 80$	17

Work out an estimate for the mean speed of the cars.

..... miles per hour

(Total for Question 19 = 4 marks)

20 Here is a flow chart which Jim uses to work out how much tax he has to pay.



One year, Jim's annual earnings were £32 800

Use the flow chart to work out A, B and C.

Input A .....

Taxable Pay B .....

Output C .....

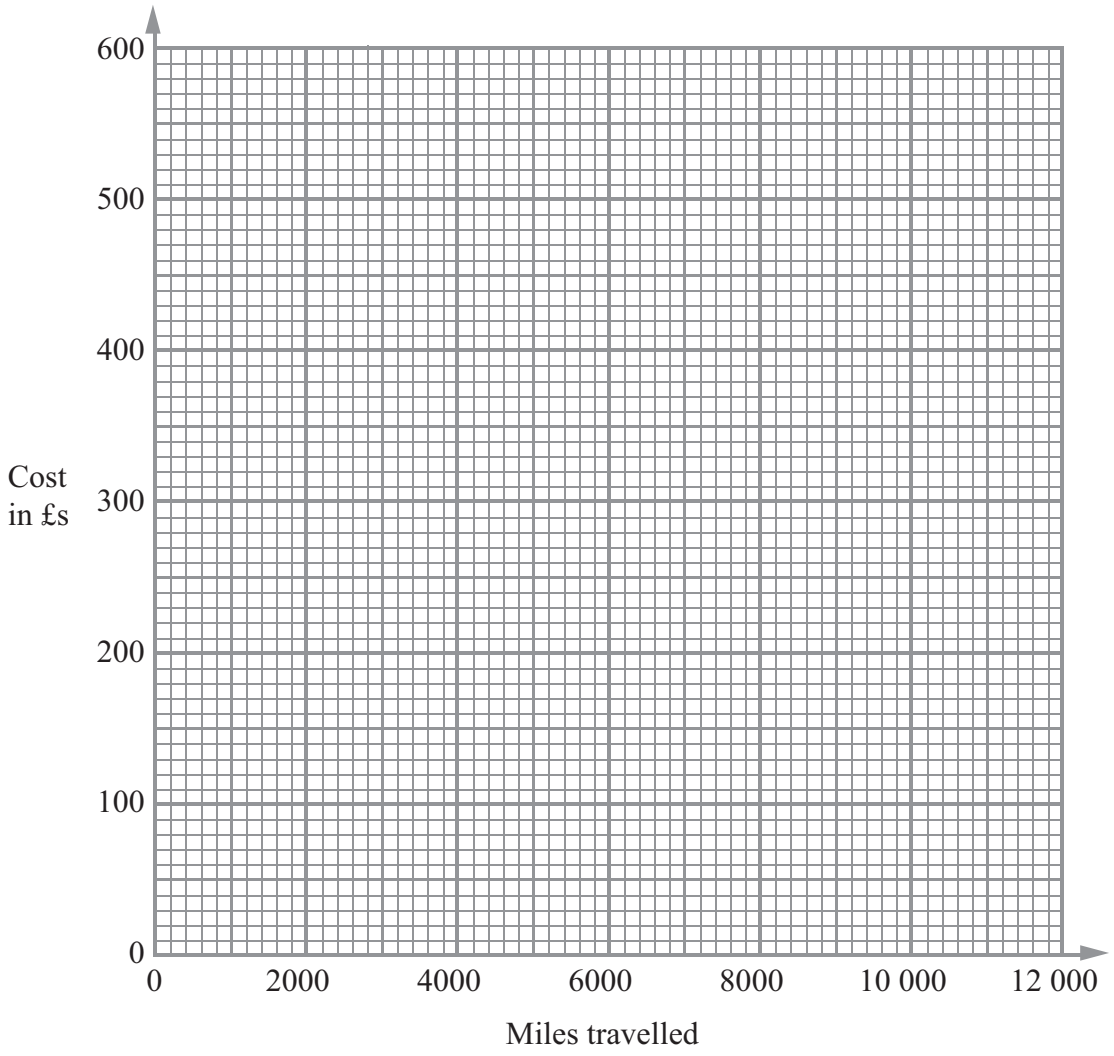
(Total for Question 20 = 3 marks)

21 Erica is thinking of changing her car insurance.

She can choose from these quotes from three different insurance companies.

Prudence £50 per thousand miles travelled
Arrivo £100 plus £30 per thousand miles travelled
Moon-life £400 plus £100 per thousand miles travelled

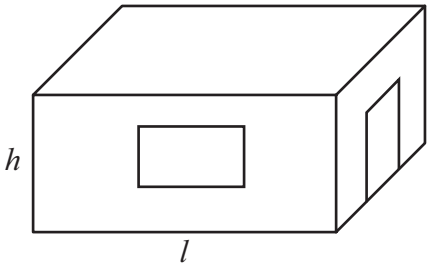
On the grid below, draw and label graphs to represent these three quotes so that Erica can compare them.



(Total for Question 21 = 5 marks)

22 Ayesha owns a DIY store.

She decides to make a spreadsheet so that her customers can work out how many litres of paint they need to buy when they paint a wall in a room in their home.



The length of the wall is l and the height is h.

The customer will also need to enter the area that will not be painted eg doors and windows.

One litre of paint covers 15 m²

Ayesha's DIY Store

	A	B	C	D	E	F
1	**Length (l)**	**Height (h)**	**Area of wall**	**Area not painted**	**Area to be painted**	**Number of litres of paint**
2						
3						

Write down the formulae that will have to go into cells C2, E2 and F2.

C2 Area of wall .....

E2 Area to be painted .....

F2 Number of litres of paint .....

(Total for Question 22 = 4 marks)

TOTAL FOR PAPER = 100 MARKS

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5AM1F					
Question		Working	Answer	Mark	Additional Guidance
1.	(a)		B, D, F & G	2	B2 for all correct B1 for at least 2 correct
	(b)		C2 E3	2	B1 for C and 2 B1 for E and 3
	(c)		equilateral	1	B1 cao
					Total for Question:5 marks
2.	(a)	8,3,5,4	Frequencies correct	3	M1 for minimum of 2 tallies or frequencies correct M1 for all tallies or at least 3 frequencies correct A1 all frequencies correct
	(b)		"4"	1	B1 ft
	(c)		"Plain"	1	B1 ft for mode
					Total for Question: 5 marks
3. **FE**	(a)		56	1	B1 cao
	(b)		Exeter & Taunton	1	B1 any order
	(c)	London to Oxford 56 Oxford to Bristol 74 Bristol to Taunton 51 Taunton to London 167	348	4	M1 for relating all 4 towns in one journey M1 for attempting to get the least distance with 4 distances, 2 of which need to be correct M1 adding 4 correct numbers A1 cao
					Total for Question: 6 marks
4.	(a)		7	1	B1 cao
	(b)		–3	1	B1 ft from (a)
	(c)		23	1	B1 ft from (b)
					Total for Question: 3 marks
5.	(a)		Apr & May	1	B1 for both
	(b)		Daffodil	1	B1 cao
	(c)		Feb	1	B1 cao
	(d)		Crocus	1	B1 cao
					Total for Question: 4 marks

5AM1F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
6. **FE** **QWC** **ii**	(a)	Speedometer reading is 47 Speed is 44 Allowance 42 so yes or 40 + 2 + 3 = 45 so yes	44 > 42	3	M2 for mentioning all 3 variables, speedometer reading, for deducting 3 mph for inaccurate speedometer, for adding 2 mph to speed limit (M1 for mentioning 2 out of the 3 variables) C1 for making correct decision dep on M2 scored **QWC: Correct decision should be justified by attributable working**
	(b)	Tank is $\frac{1}{3}$ full "$\frac{2}{3}$" × 48 "32" × 103.9 3324.8	£33.25	4	B1 for tank is $\frac{1}{3}$ full (use any fraction in range 0.3 to 0.4 inclusive M1 for "1 – $\frac{1}{3}$" × 48 or finding 48 – "$\frac{1}{3}$" × 48 or sight of 32 M1 for ""1 – $\frac{1}{3}$" × 48" × 103.9 or finding "48 – "$\frac{1}{3}$" × 48" × 103.9 A1 for answer in range £29.92 to £34.91 Allow estimates based on "$\frac{2}{3}$" × 48 × £1 or "$\frac{2}{3}$" × 48 × £1.04
					Total for Question: 7 marks
7			Correct table	3	B1 for type of bird or table with list of birds B1 for tally or tally marks in a table B1 for frequency or total
					Total for Question: 3 marks
8	(a)	$9x = 180$	$x = 20$	2	M1 for $9x = 180$ A1 cao
	(b)	$6y = 180$ or $12y = 360$	$y = 30$	2	M1 for $6y = 180$ or $12y = 360$ A1 cao
	(c)	$180 - 3p = (180 - 2p) \div 2$ $90 = 2p$	$p = 45$	3	M1 for $180 - 3p$ and $(180 - 2p) \div 2$ oe M1 for $90 = 2p$ oe A1 cao
					Total for Question: 7 marks

5AM1F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
9. **QWC (i)**			Chart or diagram	4	B1 for a key or suitable labels to identify males and females B1 for Liberals, Conservatives, Labour and Other labelled M1 for a diagram or chart (combined or separate) set up for comparison, eg dual bar chart, back-to-back stem and leaf diagrams, pie charts, pictograms, vertical (stick) diagrams A1 fully correct diagram(s) or chart(s) **QWC: Charts/diagrams are fully correct and labelled clearly**
					Total for Question: 4 marks
10. **FE**	(a)	Tea & Burger or Chips or Sausage Coffee & Chips or Sausage Cola & Burger or Chips or Sausage Lemonade & Burger or Chips or Sausage Meal Deal Drink & sandwich	Correct combination	2	B2 for all 12 combinations (B1 for at least 6 combinations)
	(b)	Drinks 75p + 75p + 75p Food £1.35 + £1.25 + 75p Total without specials £5.60 Or specials Burger Chips & Drink £2.50 Sandwich & Drink £2 Drink 75p	£5.25	3	M1 for basic drink and food prices M1 for realising savings can be made with Meal Deals A1 cao
					Total for Question: 5 marks
11.		$2x + 6 = 4x + 1$ $2x = 5$ so $x = 2.5$ Perimeter = 11 + 11 + 2.5 + 2.5	27	5	M1 for $2x + 6 = 4x + 1$ M1 for $2x = 5$ A1 for $x = 2.5$ M1 for Perimeter = 11 + 11 + 2.5 + 2.5 or $8x + 7$ A1 cao
					Total for Question: 5 marks
12. **FE**		$35.50 ÷ 1.42 = £25$ £26.99 × 1.42 = $38.3258	USA and £1.99 or $2.82 or $2.83	3	M1 conversion $ to £ or £ to $ A1 correct conversion to £25 or $38.32 C1 Comparison/deduction and answer
					Total for Question: 3 marks

5AM1F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
13. **FE**	(a)	12 ÷ 3 × 2 (= 8) 8 × 40 **OR:** 3 tins = 40 × 2 = 80 12 tins = 80 × 4	3.20	3	M2 for 40 × 12 ÷ 3 × 2 or better (inc adding 8 lots of 40p) (M1 for using 2 of the 3 operations or 8 seen) A1 cao **OR** M1 for 3 tins = 40 × 2 (=80) M1 for "80" × 4 A1 cao
	(b)	$\frac{4}{12} \times 100$	33.(33)	1	B1 for 33 or 33.33...
					Total for Question: 4 marks
14. **FE** **QWC (ii, iii)**		12 ÷ 2.4 = 5 lampshades 1 costs £1.50 ÷ 5 Profit for 1 is 99 – 30 Total profit 69 × 100 100 needs 100 × 2.40 m No. lengths 240 ÷ 12 Cost = 20 × £1.50 Profit = 100 × 0.99 – 30	£69 profit	5	M1 for attempt to find number of lampshades that can be made from 1 piece of wire (12 ÷ 2.4) **or** the length of wire needed for 100 lampshades (100 × 2.4) M1 for attempt to find the cost of one lampshade (£1.50 ÷ 5) **or** attempt to find the number of lengths of wire needed 240 ÷ 12 M1 for attempt to find the profit on 1 lampshade (99p – 30p) **or** attempt to find the cost of the lengths of wire needed (20 × £1.50) M1 for attempt to find total profit (69 × 100) or (0.99×100 – 30) A1 for £69 profit **QWC: Correct decision must be stated clearly with calculations attributable and profit stated.**
					Total for Question: 5 marks

5AM1F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
15. **FE** **QWC (i)**		Scatter diagram Plot points/draw line of best fit by eye/use line of best fit to estimate distance travelled **OR** Calculator Use a calculator to find the equation of the line of best fit/use equation to estimate distance travelled. depth of tread(y) = 8.9(999) − 0.0002 × distance travelled(x) **OR** Use two points to generate an approximate line of best fit /use the equation to estimate distance travelled	34 000 (miles)	5	M1 for attempt to plot 6 points in a scatter diagram (condone distance travelled plotted on y-axis) M1 for line of best fit within guidelines M1 for reading line of best fit at 2 mm A1 for 34000-35000 C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: A suitable comment referring to either the number of data points or to extrapolation and technical language is correct** B2 for depth of tread(y) = 8.9(999) − 0.0002 × distance travelled (x) oe M1 for 2 = '8.8(888) − 0.0002 × distance travelled' A1 for 34000 (or better) C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: A suitable comment referring to either the number of data points or to extrapolation and technical language is correct** M1 for attempt to find gradient of line, eg (3.9 − 8.3)/(25250 − 3100) oe M1 for attempt to find intercept, eg solve 6.1 = [(3.9 − 8.30/925250 −3100)] × 14900 + c or from intercept on 'y-axis' M1 for substituting (depth of tread=) 2 into '$y = mx + c$' A1 for 33000 - 35000 C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: A suitable comment referring to either the number of data points or to extrapolation and technical language is correct**
					Total for Question: 5 marks

5AM1F					
Question		Working	Answer	Mark	Additional Guidance
16.		4 × 13 + 5 × 10	£119.84	5	M1 split area into rectangles A1 102
FE		102 × 2 = 204 204 ÷ 13 gives 16 tins 16 × 7.49			M1 '102' or '204' ÷ 13 M1 '16' × 7.49 A1 cao.
					Total for Question: 5 marks
17.		960 bricks in $\frac{960}{200}$ = 4.8 hours 08:00 + 4:48 + 15 minutes **Alt** 8 – 9 am 200 bricks 9 – 10 am 200 bricks 10 – 11 am 200 bricks 11 – 11:15 break 11:15 – 12:15 200 bricks 12:15 – 13:03 160 bricks	13:03	5	M1 for $\frac{960}{200}$ or build up method (200 + 200 etc) A1 for 4.8 seen A1 for 4 hours 48 mins cao (SC B2 for 4 hours 8 minutes or B1 for 4 hours< answer< 5 hours) M1 for 08:00 + 4:48 + 15 minutes A1 cao
					Total for Question: 5 marks

5AM1F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18. **FE QWC iii**		99 ÷ 200 = 0.495p per g 199 ÷ 500 = 0.398 p per g 350 ÷ 850 = 0.41175 p per g Or 200 ÷ 99 = 2.02 g per p 500 ÷ 199 = 2.51 g per p 850 ÷ 350 = 2.43 g per p	Medium	3	M1 for calculating number of pence per gram or grams per penny for one pack of powder M1 for calculating number of pence per gram or grams per penny for all packs of powder C1 for a correct conclusion **QWC: Conclusion stated with attributable working for both M1 marks**
					Total for Question: 3 marks
19		(16 × 45 + 25 × 55 + 42 × 65 + 17 × 75)/100 = 6100/100	61	4	M1 for consistent use of values within intervals (including ends) to calculate fx M1 for using the mid interval values M1 for $\sum fx$ /100 A1 for 61
					Total for Question : 4 marks
20			32800 27800 5760	3	B3 all 3 entries correct (B2 two entries correct) (B1 1 entry correct)
					Total for Question:3 marks

5AM1F					
Question		Working	Answer	Mark	Additional Guidance
21			Correct graph	5	M1 for Prudence graph joining (0, 0) through (10 000, 500) M1 Arrivo graph starting at (0, 100) A1 if it goes through (10 000, £400) M1 for Moon-life graph starting at (0, £400) A1 if it goes through (10 000, £500)
					Total for Question: 5 marks
22		$A = l \times h$ $P = A - \text{D2}$ $L = P \div 15$	Correct formulae	4	B1 for $\text{A2} \times \text{B2}$ or $l \times h$ B1 for $\text{C2} - \text{D2}$ or $l \times w - \text{D2}$ B1 for $\text{E2} \div 15$ B1 for using correct spreadsheet notation throughout and condone missing =
					Total for Question: 4 marks

Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications of Mathematics

Unit 1: Applications 1

For Approved Pilot Centres ONLY

Higher Tier

Sample Assessment Material
Time: 1 hour 45 minutes

Paper Reference
5AM1H/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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S 3 8 4 2 5 A 0 1 2 7

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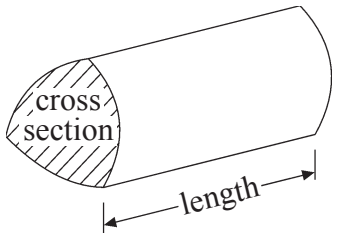
GCSE Mathematics 2AM01

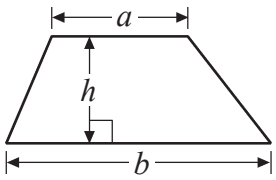
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length

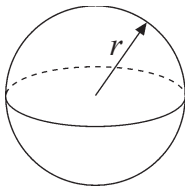


Area of trapezium $= \frac{1}{2}(a+b)h$



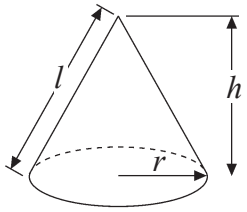
Volume of sphere $= \frac{4}{3}\pi r^3$

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

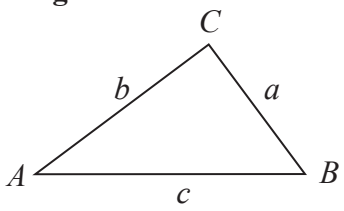


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



In any triangle *ABC*



The Quadratic Equation

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

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

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 $= \frac{1}{2}ab\sin C$

Answer ALL questions.

Write all your answers in the spaces provided.

You must write down all stages in your working.

1 The mass of 140 cm of gold wire is 3.5 g.

(a) Work out the mass of 110 cm of this wire.

(2)

..... g

The cost of 50 cm of this wire is £4

(b) Work out the cost of a piece of this wire with a mass of 1.8 g.

(3)

£ .....

(Total for Question 1 = 5 marks)

***2** A tyre manufacturer investigates the durability of a UBX45 car tyre.

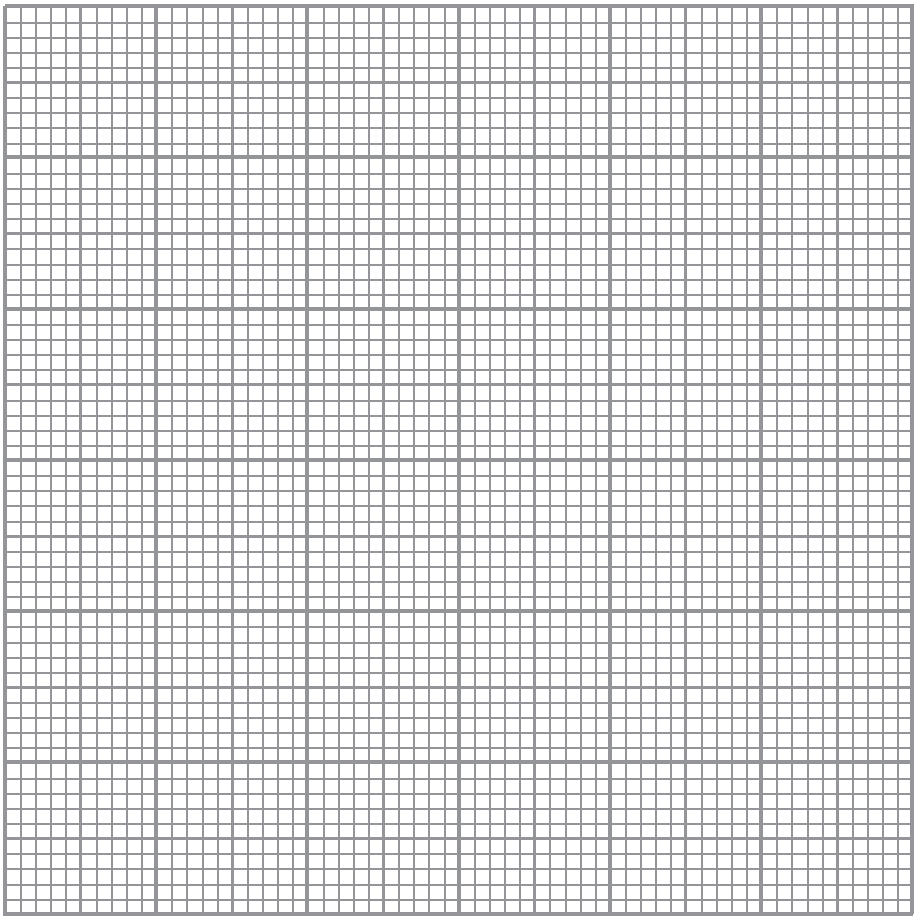
The table shows information about the depth of tread (in mm) and the distance travelled (in miles) for six UBX45 car tyres.

	Car tyre					
	A	B	C	D	E	F
Distance travelled (in miles)	3100	14 900	12 500	25 250	18 000	8750
Depth of tread (in mm)	8.3	6.1	6.4	3.9	5.5	7.1

The minimum depth of tread of a UBX45 car tyre before it should be replaced is 2 mm.
The tyre manufacturer recommends that a UBX45 car tyre should be replaced after x miles.

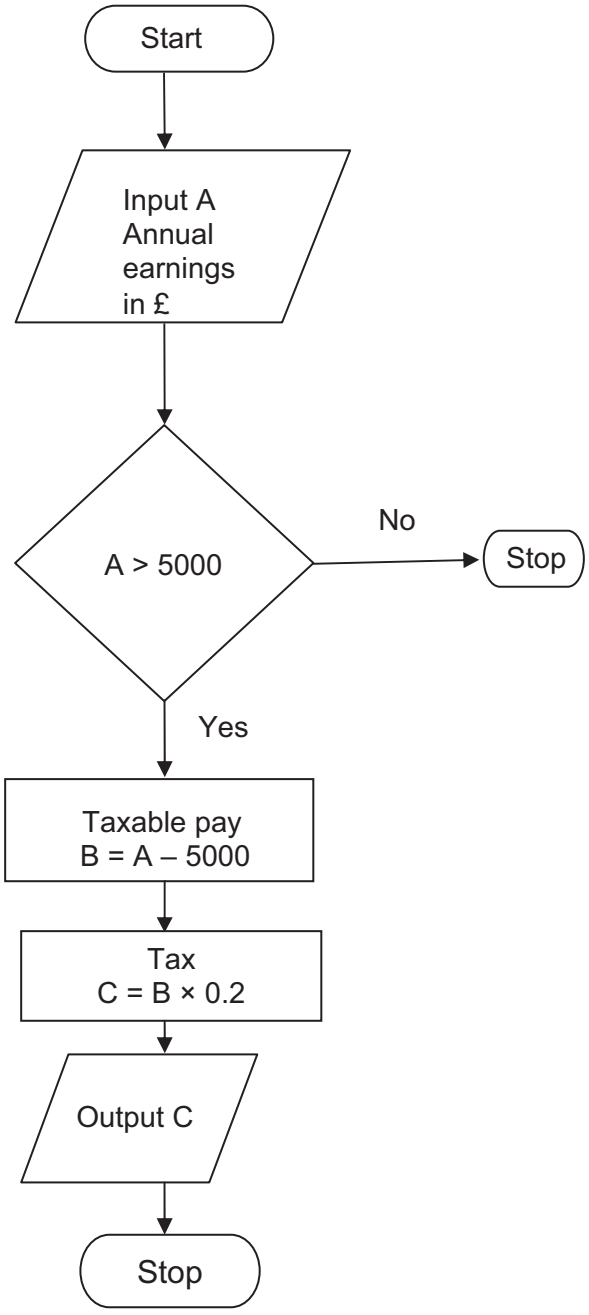
Find a suitable value for x.
Comment on the reliability of your answer.

You can use the graph paper to help find your answer.



(Total for Question 2 = 5 marks)

3 Here is a flow chart which Jim uses to work out how much tax he has to pay.



One year, Jim's annual earnings were £32 800

Use the flow chart to work out A, B and C.

Input A .....

Taxable Pay B .....

Output C .....

(Total for Question 3 = 3 marks)

4 The diagram below is the plan of a hall floor.
All the corners are right angles.

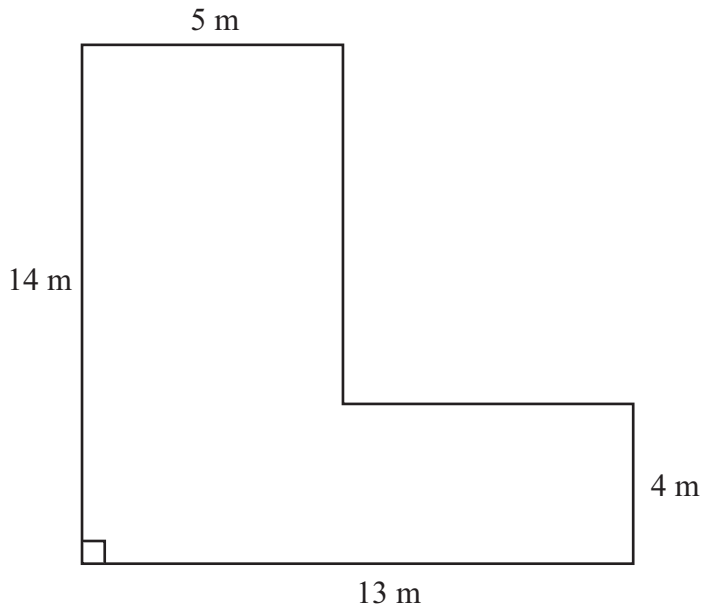


Diagram **NOT** accurately drawn

Ben is going to varnish the hall floor with 2 coats of varnish.
1 tin of varnish will cover 13 m^2.
1 tin of varnish costs £7.49

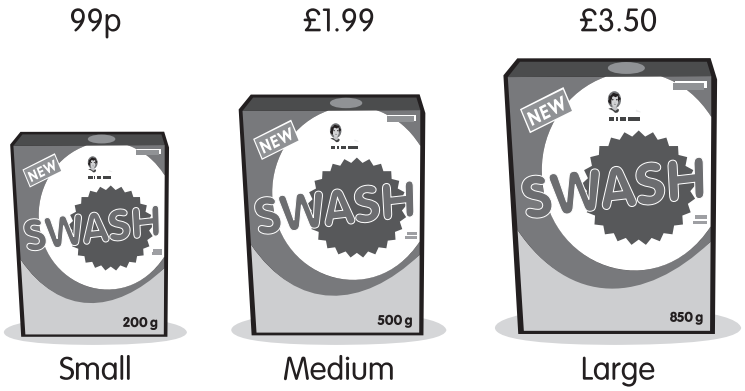
Work out the total cost of the tins of varnish that Ben buys.
You must show clearly how you got your answer.

£ .....

(Total for Question 4 = 5 marks)

***5** Packets of "Swash" detergent are sold in 3 sizes.

Small packets cost	99p and hold 200 g
Medium packets cost	£1.99 and hold 500 g
Large packets cost	£3.50 and hold 850 g



Which is the best buy?
You must show clearly how you got your answer.

(Total for Question 5 = 3 marks)

6 Bob works as a bricklayer.

On average he can lay 200 bricks in 1 hour.

He builds a wall that needs 960 bricks.

He starts work at 8 am and has a quarter of an hour break at 11 am.

Work out the time Bob finished building the wall.

.....

(Total for Question 6 = 5 marks)

7 Nick takes 24 boxes out of his van.
Some boxes are medium boxes and some are small boxes.
There are 3 times as many medium boxes as small boxes.

Medium boxes weigh 32.5 kg. each

The total weight of all the boxes is 723 kg.

(a) Work out the weight of a small box.

(4)

..... kg

Nick then fills the van with large boxes.
The weight of each large box is 69 kg.
The greatest weight the van can hold is 990 kg.

(b) Work out the greatest number of large boxes that the van can hold.

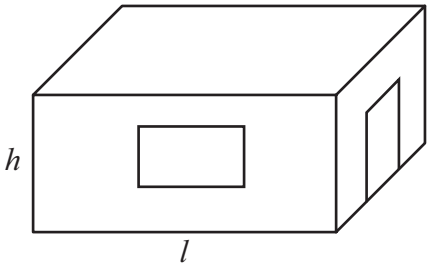
(3)

.....

(Total for Question 7 = 7 marks)

8 Ayesha owns a DIY store.

She decides to make a spreadsheet so that her customers can work out how many litres of paint they need to buy when they paint a wall in a room in their home.



The length of the wall is l and the height is h.

The customer will also need to enter the area that will not be painted eg doors and windows.

One litre of paint covers 15 m²

Ayesha's DIY Store

	A	B	C	D	E	F
1	**Length (l)**	**Height (h)**	**Area of wall**	**Area not painted**	**Area to be painted**	**Number of litres of paint**
2						
3						

Write down the formulae that will have to go into cells C2, E2 and F2

C2 Area of wall .....

E2 Area to be painted .....

F2 Number of litres of paint .....

(Total for Question 8 = 4 marks)

9 Here is some information about the contents of two chocolate bars.

StickeeChoc Original	
Sugar	**66 g**
Fat	**48 g**
Other	**36 g**

StickeeChoc Light

Now with 22% less fat than StickeeChoc Original!

The weight of each chocolate bar is 150 g.

The StickeeChoc company have to display on their packaging how much fat, in grams, is in 100 g of their chocolate bars.

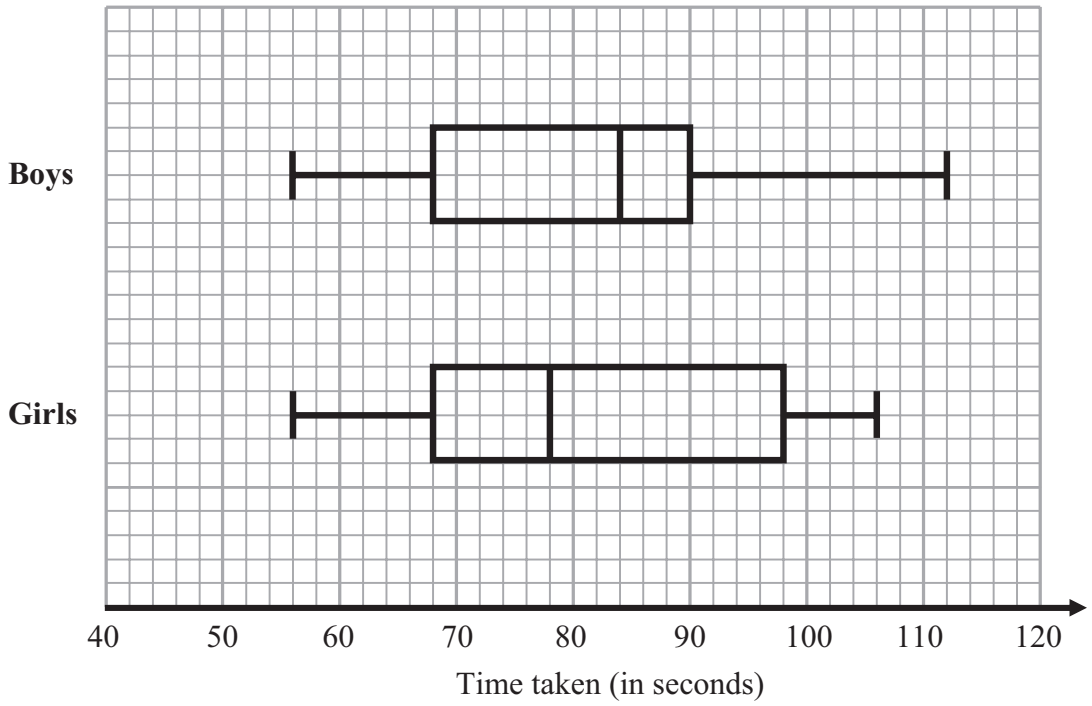
Work out how much fat there is, to the nearest gram, in 100 g of StickeeChoc Light.

(4)

..... g

(Total for Question 9 = 4 marks)

10 The box plots below show information about the time taken by some boys and girls to do a puzzle.



Compare the distributions.

.....

.....

.....

.....

(Total for Question 10 = 2 marks)

11 In 2009, a car maker raised the 2008 prices of all its cars by 5%.

The 2008 price of one model of car was £9850

(a) Work out the 2009 price of the car.

(2)

£ .....

The 2009 price of a different model of car was £14 595

(b) Work out the 2008 price of the car.

(3)

£ .....

(Total for Question 11 = 5 marks)

12 Jaz invested in a savings account.

For the first full year of the savings account the interest rate was 7.5%.
For the second full year of the savings account the interest rate was 4.0%.

Find the annual equivalent rate (AER) for Jaz's investment.

(Total for Question 12 = 5 marks)

13 *PQRS* is a parallelogram.

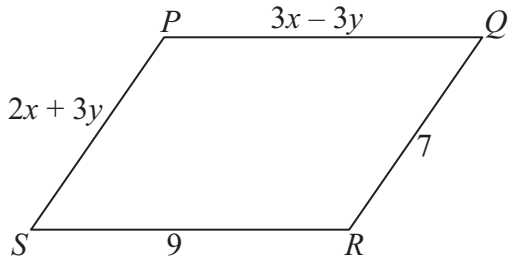


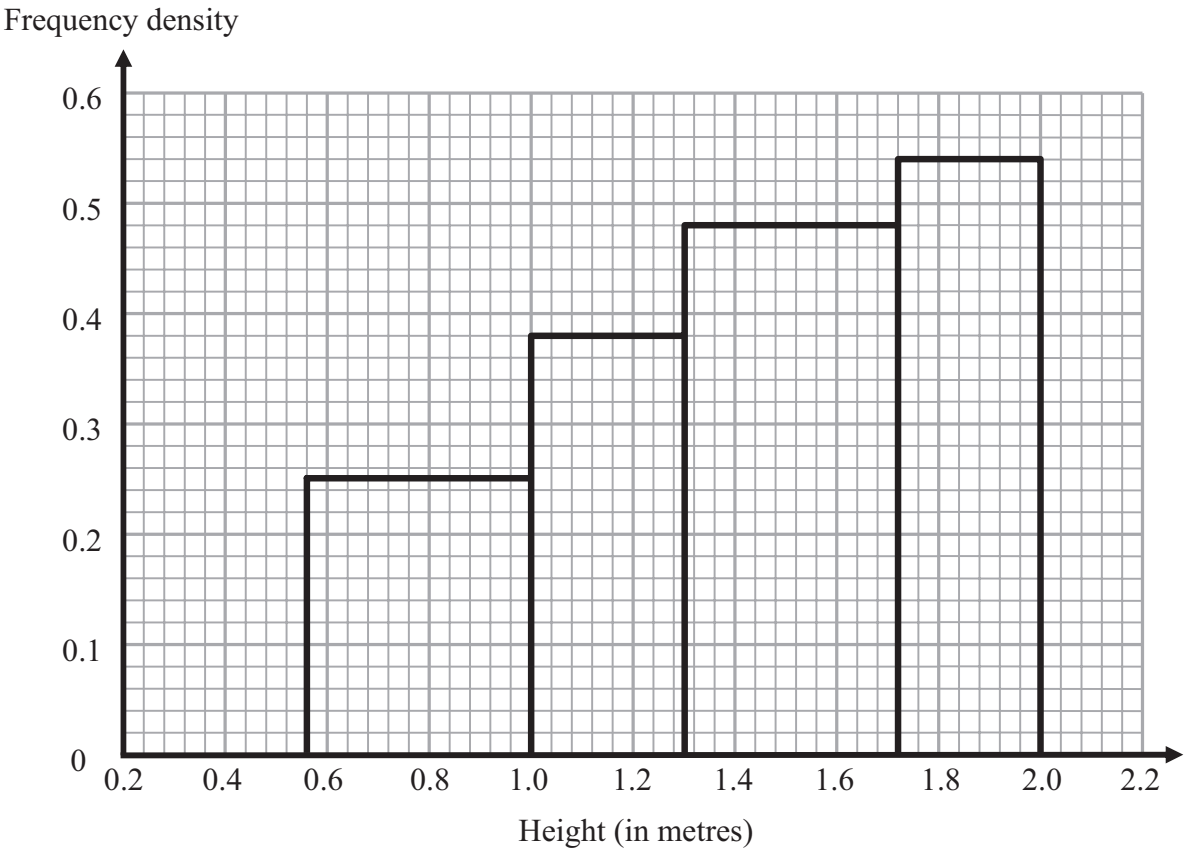
Diagram **NOT** accurately drawn.

Find the values of x and y.

.....

(Total for Question 13 = 4 marks)

14 The histogram shows information about the heights of people at a theme park.



At the theme park there is a ride with a height restriction.

Any person with a height less than 1 metre or greater than 1.8 metres is not allowed to go on the ride.

Work out the proportion of people at the theme park who will **not** be allowed to go on the ride.

.....

(Total for Question 14 = 4 marks)

15 Fiona is trying to predict what her electricity bill will be next year.

For her electricity bill next year, Fiona predicts that the number of units she will use will decrease by 10%

She also predicts that the cost of a unit will increase by 10%

Calculate the predicted percentage change in the total cost of the units used by Fiona next year.

..... %

(Total for Question 15 = 4 marks)

16 The table gives information about numbers of bedrooms in each of 4096 houses in a town.

Number of bedrooms	Frequency
1	642
2	1428
3	1718
4	301
More than 4	7

The town council wants to find out information about the amount of household waste produced in a week by houses with different numbers of bedrooms.

The council decides to take a sample of size 60 stratified by the number of bedrooms.

Calculate the number of houses in the sample with 2 bedrooms.

.....

(Total for Question 16 = 3 marks)

17 Gordon invests £2000 in an account paying compound interest per annum.
After 8 years the value of his investment is £3800

Work out the annual interest rate.
Give your answer correct to 2 decimal places.

.....

(Total for Question 17 = 4 marks)

18 RyderCo makes three different products, Alpha, Beta, and Gamma.

The table shows information about the parts needed for each product and the total cost of parts per product.

Product	**Number of Part A needed**	**Number of Part B needed**	**Number of Part C needed**	**Total cost of parts (£)**
Alpha	2	1	3	21
Beta	1	1	1	11
Gamma	1	2	2	16

Work out the cost of each part.

Part A = £ .....

Part B = £ .....

Part C = £ .....

(Total for Question 18 = 7 marks)

19 Imran makes some statues in 3 sizes.

Small

Medium

Large

The statues are made from resin which is poured into moulds and allowed to harden.

All the statues are similar in shape.

The mass of the small statue is 512 g.
The mass of the medium statue is 1 kg.
The height of the small statue is 20 cm.

(a) Find the height of the medium statue.

(3)

.....

The height of the large statue is 30 cm.

(b) Find the mass of the large statue.

(3)

.....

Imran also sells a range of the statues that are covered in gold.

It costs him £2.50 to cover the medium statue in gold.

(c) How much does it cost to cover the small and large statues in gold?

(3)

.....

(Total for Question 19 = 9 marks)

***20** A shop sells light bulbs.

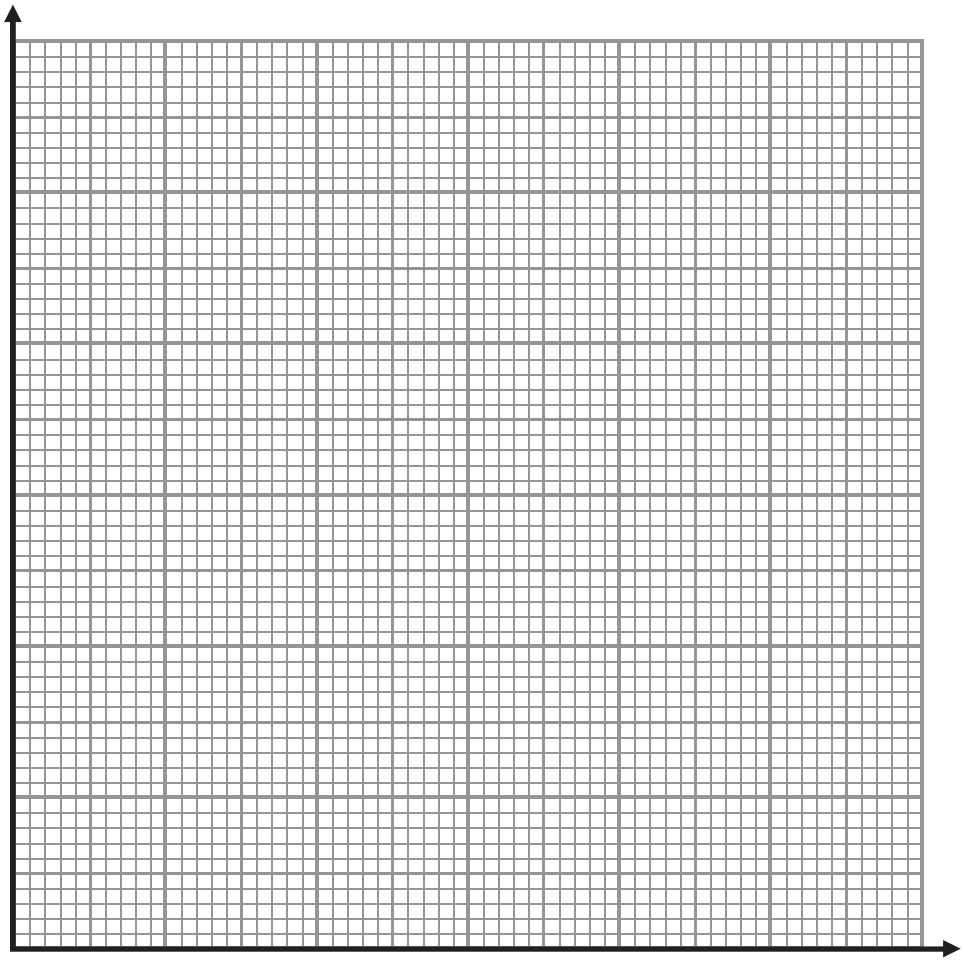
The table gives information about the number of light bulbs sold in each quarter from 2008 to 2009.

Year	2008				2009			
Quarter	1	2	3	4	1	2	3	4
Number of light bulbs sold	522	428	356	414	490	376	300	382

Stephen is analysing the information for the shop owner.

Analyse the information to decide what Stephen should say.

You can use the graph paper to help you find your answer.



(Total for Question 20 = 5 marks)

21 (a) On the grid, draw the line with equation $y = 2x$

(1)

A firm makes two types of industrial cleaner – type A and type B.

The total amount of cleaner that the firm makes each day is at most 100 litres.

Each day, the volume that is made of type B is at least twice the volume that is made of type A.
Each day, the volume that is made of type A must be at least 20 litres.

Let x litres be the volume that is made of type A each day.
Let y litres be the volume that is made of type B each day.

(b) For each condition, write down an inequality in x and/or y

(2)

(c) On the grid, shade the region that satisfies the three conditions.

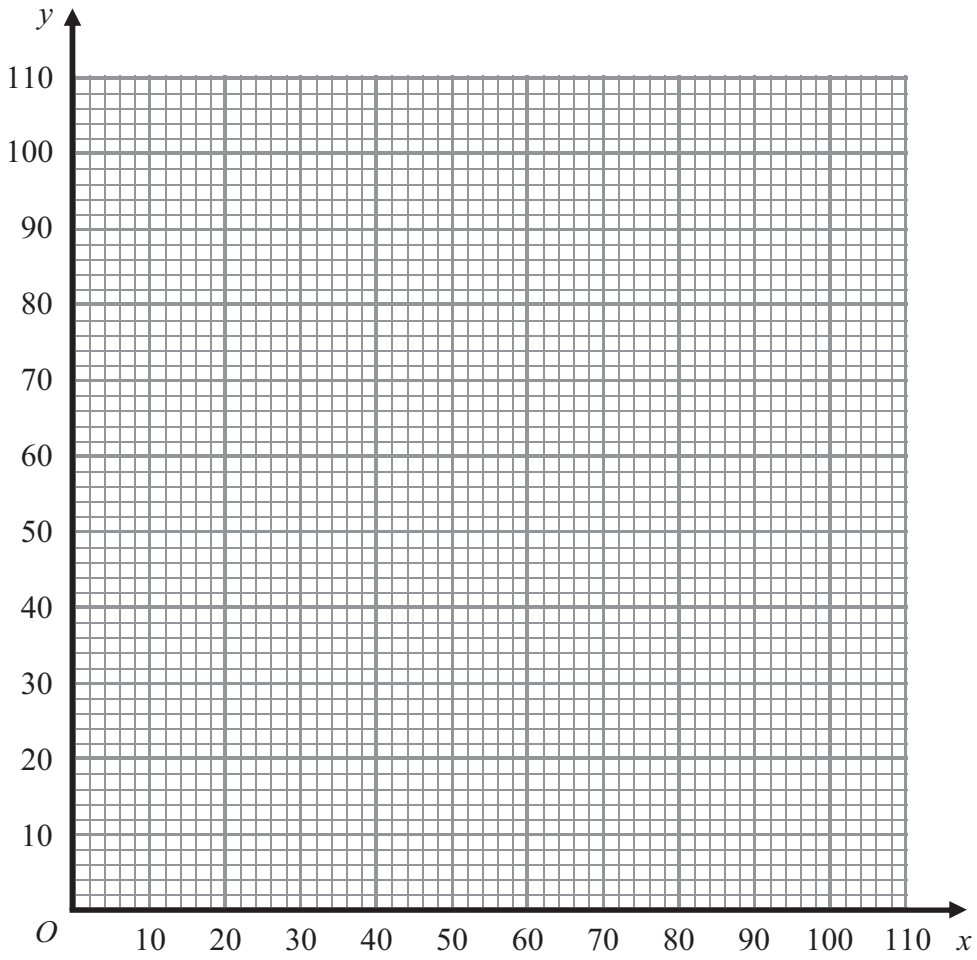
(2)

The profit from 1 litre of type A cleaner is £15
The profit from 1 litre of type B cleaner is £10

(d) Work out the maximum daily profit.

(2)

£ .....



(Total for Question 21 = 7 marks)

TOTAL FOR THE PAPER = 100 MARKS

5AM1H					
Question		Working	Answer	Mark	Additional Guidance
1.	a	1 cm of wire is 0.025 g 110 × 0.025	2.75 g	2	M1 ÷ 140 and × 110 A1 cao
	b	50 cm has a mass of 50 × 0.025 g = 1.25 g 1 g costs £4 ÷ 1.25 = £3.20 1.8 g = £3.20 × 1.8	£5.76	3	M1 Calc the cost of 1 g M1 '£3.20' × 1.8 A1 cao
					Total for Question: 5 marks
2. **FE** **QWC (i)**		Scatter diagram Plot points/ draw line of best fit by eye/ use line of best fit to estimate distance travelled **OR** Calculator Use a calculator to find the equation of the line of best fit/ use equation to estimate distance travelled. depth of tread (y) = 8.9(999) − 0.0002 × distance travelled(x) **OR** Use two points to generate an approximate line of best fit / use the equation to estimate distance travelled	34 000 (miles)	5	M1 for attempt to plot 6 points in a scatter diagram (condone distance travelled plotted on y-axis) M1 for line of best fit within guidelines M1 for reading line of best fit at 2 mm A1 for 34000-35000 C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: Comments must be justified, and all calculations attributable** **OR** B2 for depth of tread(y) = 8.9(999) − 0.0002 × distance travelled(x) oe M1 for 2 = '8.8(888) − 0.0002 × distance travelled' A1 for 34000 (or better) C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: Comments must be justified, and all calculations attributable** **OR** M1 for attempt to find gradient of line, eg (3.9 − 8.3)/(25250 − 3100) oe M1 for attempt to find intercept, eg solve 6.1 = [(3.9 − 8.30/925250 − 3100)] × 14900 + c or from intercept on 'y-axis' M1 for substituting (depth of tread=) 2 into '$y = mx + c$' A1 for 33000 - 35000 C1 for a suitable comment referring to either the number of data points or to extrapolation **QWC: Comments must be justified, and all calculations attributable**
					Total for Question: 5 marks

5AM1H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
3.			32800 27800 5760	3	B3 all 3 entries correct (B2 2 entries correct) (B1 1 entry correct)
					Total for Question: 3 marks
4. **FE**		4 × 13 + 5 × 10 102 × 2 = 204 204 ÷ 13 gives 16 tins 16 × 7.49	£119.84	5	M1 split area into rectangles A1 102 M1 '102' or '204' ÷ 13 M1 '16' × 7.49 A1 cao
					Total for Question: 5 marks
5 **FE** **QWC** **ii**		99 ÷ 200 = 0.495p per g 199 ÷ 500 = 0.398 p per g 350 ÷ 850 = 0.41175 p per g **OR** 200 ÷ 99 = 2.02 g per p 500 ÷ 199 = 2.51 g per p 850 ÷ 350 = 2.43 g per p	Medium	3	M1 for calculating number of pence per gram or grams per penny for one pack of powder M1 for calculating number of pence per gram or grams per penny for all packs of powder C1 for a correct conclusion **QWC: Conclusion should be supported by attributable working**
					Total for Question: 3 marks
6.		960 bricks in $\frac{960}{200}$ = 4.8 hours 08:00 + 4:48 + 15 minutes **Alt** 8 – 9 am 200 bricks 9 – 10 am 200 bricks 10 – 11 am 200 bricks 11 – 11:15 break 11:15 – 12:15 200 bricks 12:15 – 13:03 160 bricks	13:03	5	M1 for $\frac{960}{200}$ or build up method (200 + 200 etc) A1 for 4.8 seen A1 for 4 hours 48 mins cao (SC B2 for 4 hours 8 minutes or B1 for 4 hours < answer < 5 hours) M1 for 08:00 + 4:48 + 15 minutes A1 cao .
					Total for Question: 5 marks

5AM1H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
7.	a	18 Medium and 6 small Total weight of medium = 18 × 32.5 = 585 Total weight of small = 723 – 585 = 138 Weight of small = 138 ÷ 6 = 23	23	4	B1 for 18 or 6 M1 for '18' × 32.5 M1 for 723 – '18' × 32.5 and divide by 24 – '18' A1 cao
	b	14 r.. 69) 9 9 0	14	3	M1 for 990 ÷ 69 with 1 unit identified A1 for 14 (and other amount) A1 cao
					Total for Question: 7 marks
8.		$A = l \times h$ $P = A - D2$ $L = P \div 15$	Correct formula	4	B1 for A2 × B2 or $l \times h$ B1 for C2 - D2 or $l \times w - D2$ B1 for E2 ÷ 15 B1 for using correct spreadsheet notation throughout condone missing =
					Total for Question: 4 marks
9		**Original:** 150g has 48 g fat 100 g has $48 \times \frac{2}{3}$ = 32 g **Light:** 32 g × 0.78 = 24.96 g	25g	4	M1 for $48 \times \frac{2}{3}$ M1 for 32 seen M1 for 32 g × 0.78 or 24.96 seen A1 cao
					Total for Question: 4 marks
10.			Two comparisons	2	B1 for any comparisons from: median boys > median girls or a comparison of a single point, eg shortest time boys = shortest time girls B1 for any comparison from range boys > range girls oe or IQR girls > IQR boys oe or skew boys negative and skew girls positive
					Total for Question: 2 marks

5AM1H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
11.	(a)	9850 × 1.05	10342.50	2	M1 9850 × 1.05 A1 cao **OR** M1 9805 + 9805 × 0.05 or 9805 + 490.25 A1 cao
	(b)	14595÷1.05	13900	3	M1 Old value × 105% = 14595 M1 14595 ÷ 1.05 oe A1 cao
					Total for Question: 5 marks
12.		1.075 × 1.04 = 1.118 $(1 + a)^2 = 1.118$ $1 + a = \sqrt{1.118}$ = 1.057355(1..)	5.74 AG	5	M1 for using 1.075 M1 (dep) for using '1.075' × 1.04 M1 for $(1 + a)^2 = 1.118$ oe M1 sight of $\sqrt{1.18}$ or 1.574 or better A1 5.74 or better
					Total for Question: 5 marks
13.		$2x + 3y = 7$ $3x - 3y = 9$ $5x = 16, x = 3.2$ $y = (7 - 2 \times 3.2) \div 3$	$x = 3.2$ $y = 0.2$	4	M1 for setting up simultaneous equations M1 eliminate either x or y from the equations: allow 1 accuracy error only M1(dep) substitute the found value of x or y into an equation A1 cao **Alternative method** Use parallelogram properties to write M1 for $2x + 3y + 3x - 3y = 9 + 7$ M1 for $5x = 16\ x = 3.2$ M1 for substitution A1 cao
					Total for Question: 4 marks

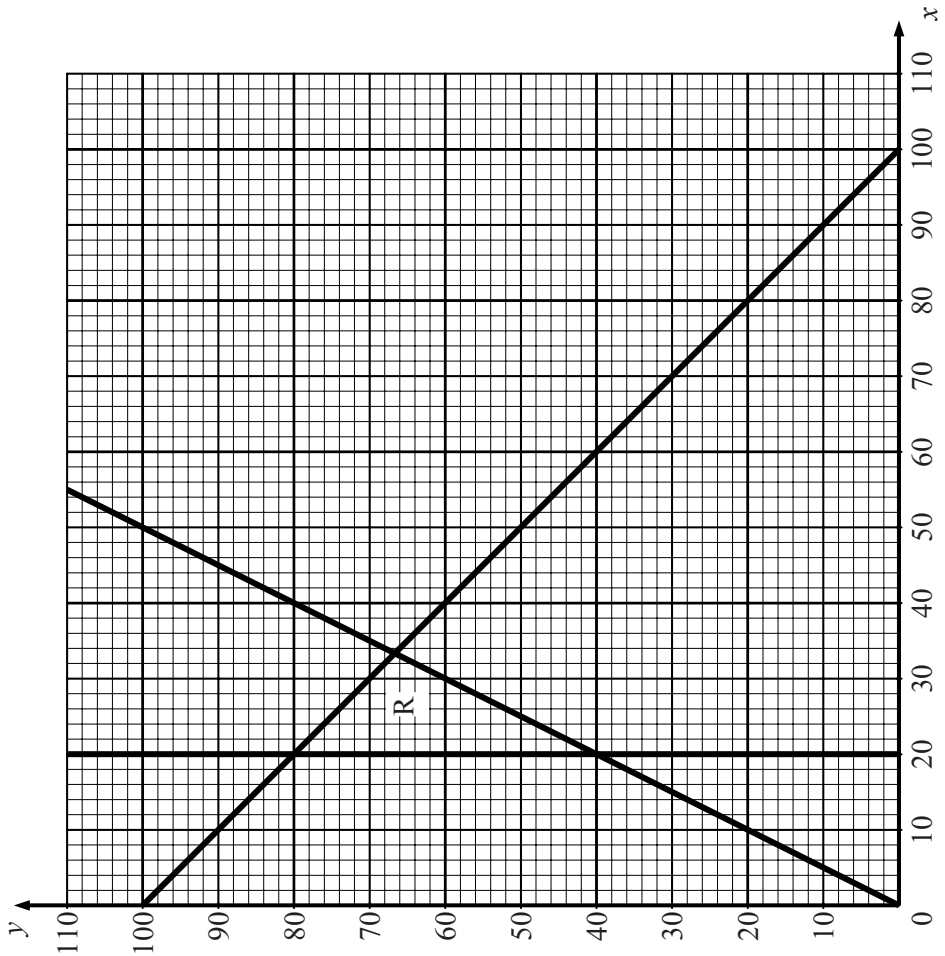
5AM1H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
14.		Area($h < 1$ and $h > 1.8$) = 0.44 × 0.25 + 0.2 × 0.54 = 0.218 Total area = 0.44 × 0.25 + 0.3 × 0.38 + 0.42 × 0.48 + 0.28 × 0.54 = 0.5768 Proportion = 0.218/0.5768	0.378	4	M1 for attempt to use frequency density × height, eg 0.44 × 0.25 M1 (dep) for '0.44 × 0.25'+'0.2 × 0.54' or 0.218 seen M1 (dep) for (0.44 × 0.25 + 0.2 × 0.54)/(0.44 × 0.25 + 0.3 × 0.38 + 0.42 × 0.48 + 0.28 × 0.54) or '0.218'/'0.5768' A1 for answer which rounds to 0.378 or 37.8%
					Total for Question: 4 marks
15. **FE**		0.9 × 1.1 = 0.99	1% decrease	4	M3 $100 - 100 \times \frac{110}{100} \times \frac{90}{100}$ A1 cao **OR** M1 for new number of units candidate selected M1 for new cost per unit candidate selected M1 for correct method for % change A1 cao
					Total for Question: 4 marks
16.		$\frac{1428}{'4096'} \times 60$ = 20.91..	21	3	M1 $\frac{1428}{'4096'} \times 60$ A1 20.9 A1 rounded to 21
					Total for Question: 3 marks
17		$2000\left(\frac{100+r}{100}\right)^8 = 3800$ $\left(\frac{100+r}{100}\right)^8 = 1.9$ $\frac{100+r}{100} = \sqrt[8]{1.9}$ =1.0835	8.35%	4	M1 for $2000\left(1+\left(\frac{r}{100}\right)\right)^8$ = 3800, if r is the rate of interest M1 $2000\left(\frac{100+r}{100}\right)^8 = 3800$ M1 $\left(\frac{100+r}{100}\right)^8 = 1.9$ A1 cao **Alternative for trial and improvement** B1 for trial of 8 and 9 B1 for trial of 8.3 and 8.4 B1 for trial of 8.35 and 8.36 B1 for trial of 8.355.
					Total for Question: 4 marks

5AM1H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18		Alpha: $2A + B + 3C = 21$ Beta: $A + B + C = 11$ Gamma: $A + 2B + 2C = 16$ Diff. between Beta and Gamma $B + C = 5$ So, from Beta A = 6 Alpha becomes 12 + (5) + $2C$ = 21 So $2C$ = 4 $C = 2$ So from Beta $B = 3$ **OR** Alpha + Gamma gives $3A + 3B + 5C = 37$ 3 × Beta gives $3A + 3B + 3C = 33$ So Diff. is $2C = 4$ So $C = 2$ Alpha becomes $2A + B = 15$ Beta becomes $A + B = 9$ So $A = 6$ And $B = 3$	$A = 6$ $B = 3$ $C = 2$	7	M1 for setting up system of equations or equivalent B1 for eliminating 1 variable M1 for using subsequent relationship to find 1 answer B1 for attempt to use answer to find outstanding variables A1, A1, A1 cao **Trial and improvement method** M1 for substitution of feasible value (between 1 and 7) for 1 variable B1 for setting up subsequent relationships M1 for comparing relationships A1, A1, A1 cao
					Total for Question: 7 marks

5AM1H					
Question		Working	Answer	Mark	Additional Guidance
19	(a)	512 : 1000 8^3 : 10^3	25 cm	3	M1 for volume ratio = 512 : 1000 M1 for length ratio = 8 : 10 or 4 : 5 A1 cao
	(b)	512 ÷ 4^3 × 6^3 **OR** 1000 ÷ 5^3 × 6^3	1728 g	3	M1 for volume ratios are 4^3 : 5^3 : 6^3 M1 for 512 ÷ 4^3 × 6^3 or 1000 ÷ 5^3 × 6^3 A1 cao
	(c)	£2.50 ÷ 5^2 × 4^2 £2.50 ÷ 5^2 × 6^2	£1.60 £3.60	3	M1 for area ratios are 4^2 : 5^2 : 6^2 M1 for £2.50 ÷ 5^2 × 4^2 or £2.50 ÷ 5^2 × 6^2 A1 cao for both values
					Total for Question: 9 marks
20 **QWC** **ii** **FE**		Moving averages 4 pma = 430, 422, 409, 395, 387 3 pma = 435.3, 399.3, 420, 426.7, 388.7, 352.7 **OR** Time series graph 1. Points plotted at (1,522),(2,428),(3,356), ... and joined with straight line segments 2. Trend line drawn by eye	Analysis calculation and/or time series graph	5	M2 for an attempt to calculate a 4-point moving average (M1 for a 3-point moving average) A1 for 430, 422, 409, 395 and 387 (condone one error) or 435.3, 399.3, 420, 426.7, 388.7, 352.7 or better (condone one error) **OR** M1 for points plotted in a time series graph A1 for correct axes and labelled quarter, year, number of bulbs sold oe A1 for trend line within guidelines C1 ft for comment referring to trend of time series graph or to seasonal variations **QWC: Comments should be supported by working and all calculations attributable** C1 ft for correct recommendation for their analysis **QWC: Comments should be supported by working and all calculations attributable** (ft their calculations and/or time series graph)
					Total for Question: 5 marks

<table>
<tr><th colspan="6">5AM1H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>21.</td><td>(a)</td><td></td><td>Correct line</td><td>1</td><td>B1 cao</td></tr>
<tr><td></td><td>(b)</td><td></td><td>$x + y \leq 100$
$y \geq 2x$
$x \geq 20$</td><td>2</td><td>B2 all 3
(B1 any 2 or all 3 at least one sign wrong)</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Region</td><td>2</td><td>M1 all 3 of their lines drawn
A1 correct region identified</td></tr>
<tr><td></td><td>(d)</td><td>$C = 15x + 10y$
<table><tr><td>x</td><td>y</td><td>C</td></tr><tr><td>20</td><td>40</td><td>700</td></tr><tr><td>20</td><td>80</td><td>1100</td></tr><tr><td>33.33</td><td>66.66</td><td>1166.7</td></tr><tr><td></td><td></td><td></td></tr></table></td><td>£1166.7</td><td>2</td><td>M1 use of $C = 15x + 10y$
A1 1166.7 cao</td></tr>
<tr><td colspan="6">Total for Question: 7 marks</td></tr>
</table>

21.



Unit 2: Applications 2

Write your name here

Surname	Other names

Edexcel GCSE

Centre Number | Candidate Number

Applications of Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Foundation Tier

Sample Assessment Material
Time: 1 hour 45 minutes

Paper Reference
5AM2F/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

S38426A

S 3 8 4 2 6 A 0 1 2 5

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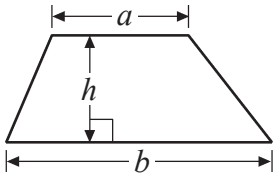
GCSE Mathematics 2AM01

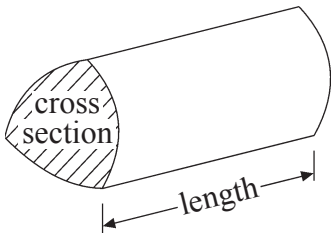
Formulae: Foundation Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

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



Volume of prism = area of cross section × length

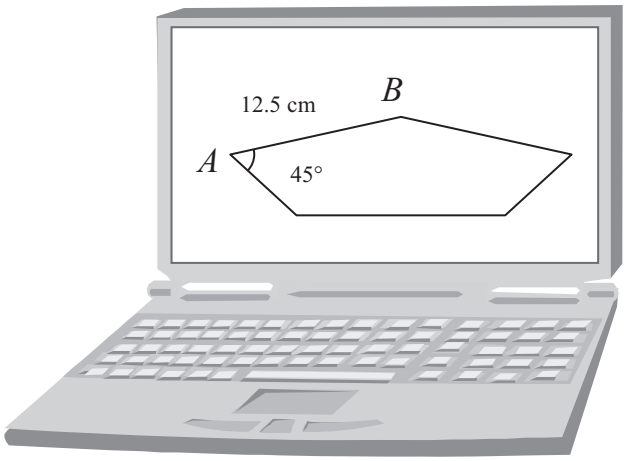


Answer ALL questions.

Write all your answers in the spaces provided.

You must write down all stages in your working.

1 Daniel has drawn a pentagon on his laptop.



On the laptop, the length of the line AB is 12.5 cm and the angle at A is 45°.
Daniel projects the pentagon onto a screen enlarging it by a scale factor of 10

(a) Find the length of AB on the screen.

(2)

.....

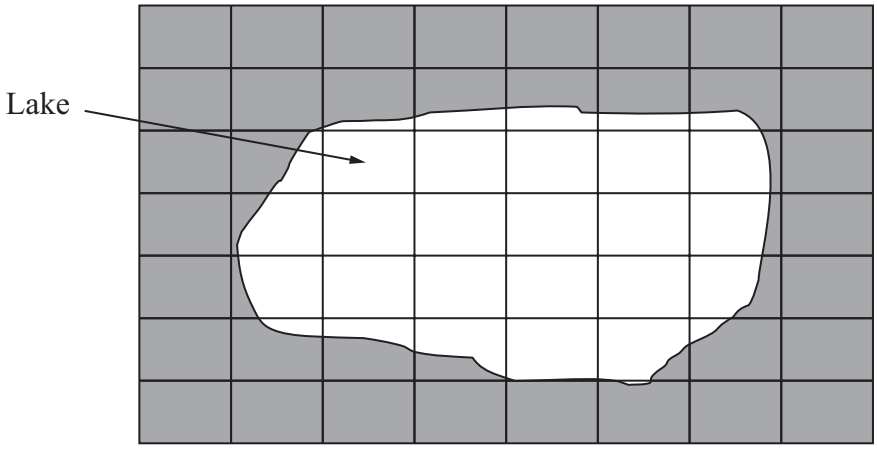
(b) Find the size of the angle at A on the screen.

(1)

.....

(Total for Question 1 = 3 marks)

2 In the plan below every square represents 100 m^2.
A lake is drawn on the plan.



Estimate the area of the lake.

..... m^2

(Total for Question 2 = 3 marks)

3 There are 100 tickets in a raffle.
Only one of these tickets will win a prize.

John has one of these raffle tickets.

(a) Draw a probability scale.
On your probability scale, mark with a cross (×) the probability that John will win the prize.

(2)

Mary buys a National Lottery ticket.

The probability that this ticket will win a prize is $\frac{1}{53}$

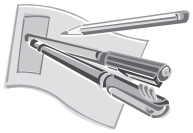
(b) Work out the probability that Mary will **not** win a prize.

(2)

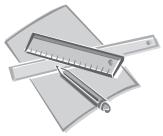
.....

(Total for Question 3 = 4 marks)

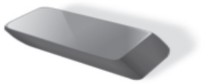
4



Pens 48p
and 85p



Rulers 26p
and 49p



Erasers 12p,
20p and 32p

Calculators
£3.95 and £4.45

Pencils 15p,
20p and 40p

Ring binders
£1.60 and £2.25

Pencil cases
£1.85 each

Christine has £8 to spend on equipment before starting her new school.
She needs to buy one calculator, one pencil case, one ruler, 2 pens and 2 pencils.

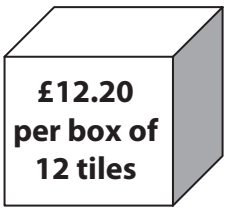
Where she can afford it, she buys the most expensive of each item.

What could Christine buy with her £8?

.....

(Total for Question 4 = 5 marks)

***5** Ali needs 165 tiles to tile a room.
Tiles are sold in boxes at £12.20 per box or a single tile can be bought for £1.40
There are 12 tiles in each box.



Ali bought the tiles for her room spending the least amount of money.
Show how Ali did this.

(Total for Question 5 = 5 marks)

6 A doctor does a blood test on three patients.
The blood test can either show a positive (+) outcome or a negative (−) outcome.
Each outcome is equally likely.

Work out the probability that all three blood tests show a positive (+) outcome.

(Total for Question 6 = 3 marks)

7 Here is part of a train timetable.

Manchester	07 53	09 17	10 35	11 17	13 30	14 36	16 26
Stockport	08 01	09 26	10 43	11 25	13 38	14 46	16 39
Macclesfield	08 23	09 38	10 58	11 38	13 52	14 58	17 03
Congleton	08 31	---	---	11 49	---	15 07	17 10
Kidsgrove	08 37	---	---	---	---	---	17 16
Stoke-on-Trent	08 49	10 00	11 23	12 03	14 12	15 19	17 33

A train leaves Manchester at 10 35

(a) At what time should this train arrive in Stoke-on-Trent?

(1)

.....

(b) Work out how many minutes it should take the 14 36 train from Manchester to get to Stoke-on-Trent.

(1)

..... minutes

The 14 36 train from Manchester to Stoke-on-Trent takes less time than the 16 26 train from Manchester to Stoke-on-Trent.

(c) How many minutes less?

(2)

..... minutes

Marvin has a meeting at Macclesfield station that will last from 10.30 am to 1pm.
He has to decide which train to catch from Manchester for his meeting in Macclesfield, and which train to catch back to Manchester after his meeting.

This is the return timetable to Manchester.

Stoke-on-Trent	11 45	12 15	01 30	02 10	02 50
Kidsgrove	---	12 27	---	---	03 02
Congleton	11 59	12 33	---	02 24	03 08
Macclesfield	12 07	12 41	01 52	02 32	03 16
Stockport	12 22	12 56	02 07	02 47	03 31
Manchester	12 31	13 05	02 16	02 56	03 40

He wants to spend as little time away from Manchester as he can.

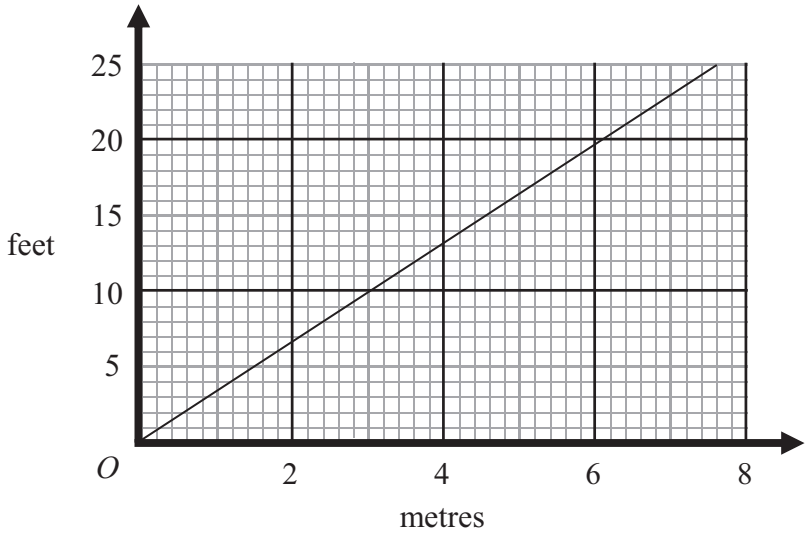
(d) What is the least amount of time between Marvin leaving Manchester and his arriving back?

(4)

.....

(Total for Question 7 = 8 marks)

8 This conversion graph can be used to change between metres and feet.



Robert represents the athletics team in his school in the long jump.
In training, Robert measured a jump of 13.5 feet.
In his next competition, at school, Robert jumped 3.8 metres.

(a) Which one of Robert's jumps was the furthest?
You must show all of your working.

(2)

At the 1948 Olympic Games, Micheline Ostermeyer won the shot putt gold medal with a throw of 45.125 feet.
At the 2008 Olympic Games, Valerie Vili won the shot putt gold medal with a throw of 20.56 metres.
During the 2008 Games, a female shot putter was heard to say, "Women are putting the shot twice as far as they did sixty years ago"

* (b) Is this statement true or false?
You must show all of your working.

(4)

(Total for Question 8 = 6 marks)

9 The cost, in pounds, of hiring a car can be worked out using this rule.

> Add 3 to the number of days' hire
>
> Multiply your answer by 10

(a) Work out the cost of hiring a car for 4 days.

(2)

£ .....

Bishen hired a car.
The total cost was £120

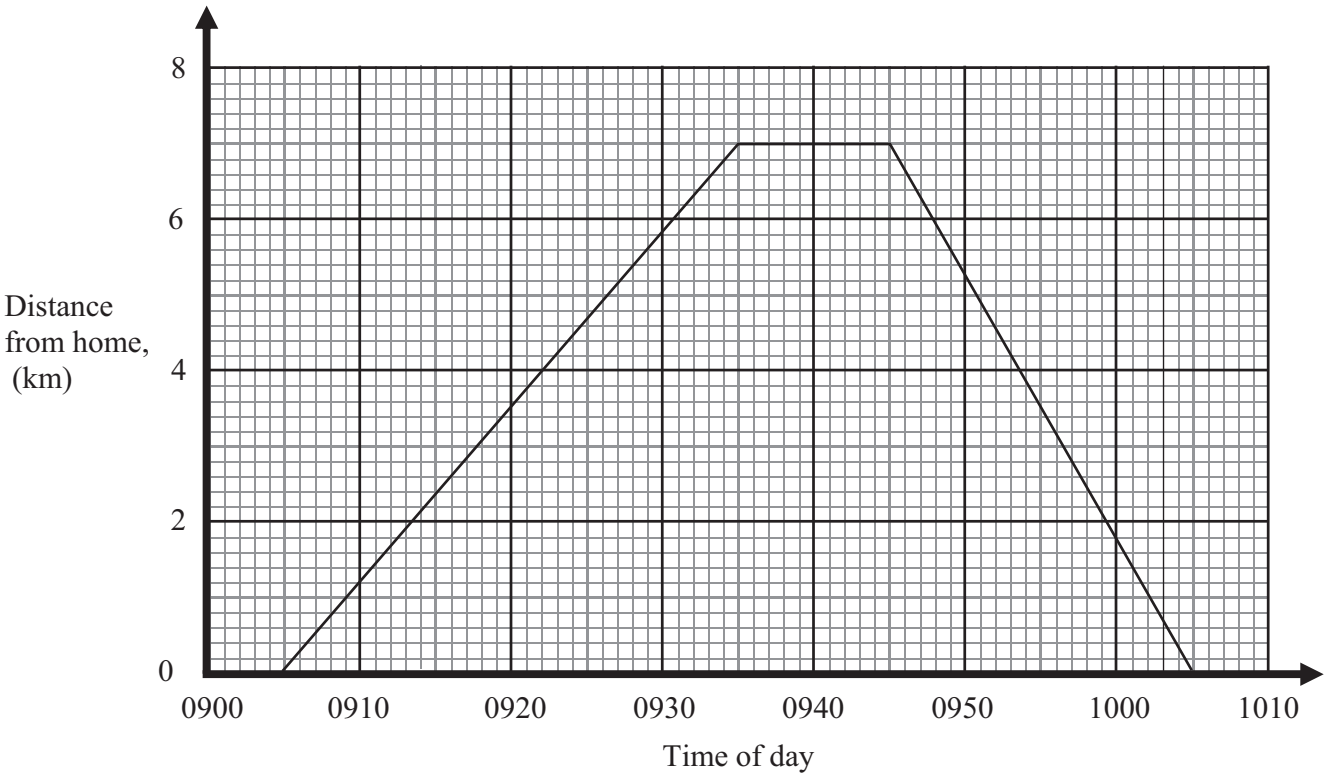
(b) Work out the number of days Bishen hired the car.

(2)

.....

(Total for Question 9 = 4 marks)

10 Samantha cycled from her home to the shops.
She did some shopping and then cycled back home.
Here is the distance-time graph for her complete journey.



(a) What is the distance from Samantha's home to the shops?

(1)

..... km

(b) How many minutes did Samantha spend at the shops?

(1)

..... minutes

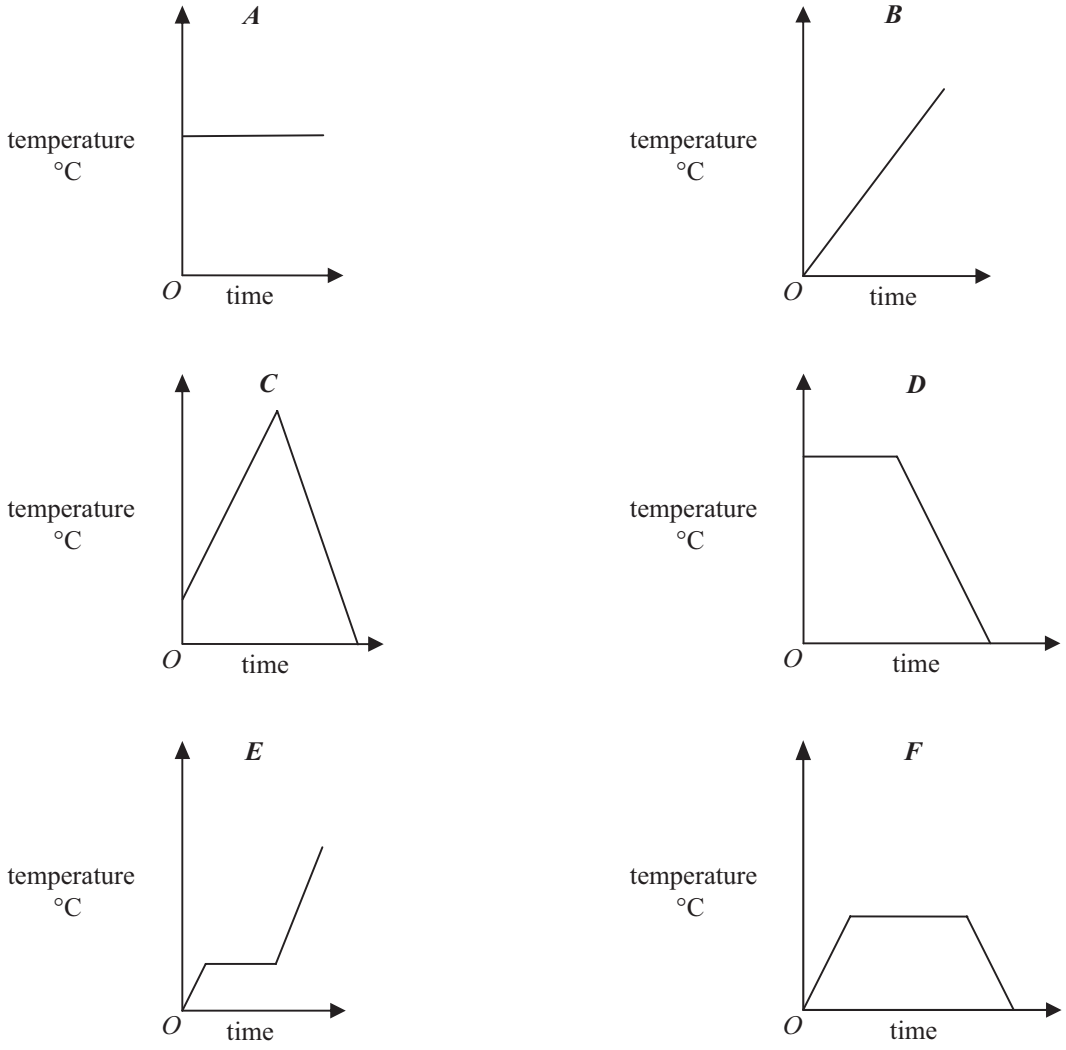
Samantha's mum was already at the shops and left to return home at 09 15
At 09 22, travelling at a constant speed, she passed Samantha going the other way.
When 2 km from home, Samantha's mum was held up in a traffic jam for 15 minutes.
It took her a further 12 minutes to reach home.

(c) How many minutes after her mum did Samantha arrive at home?

(4)

(Total for Question 10 = 6 marks)

11 Here are six temperature/time graphs.

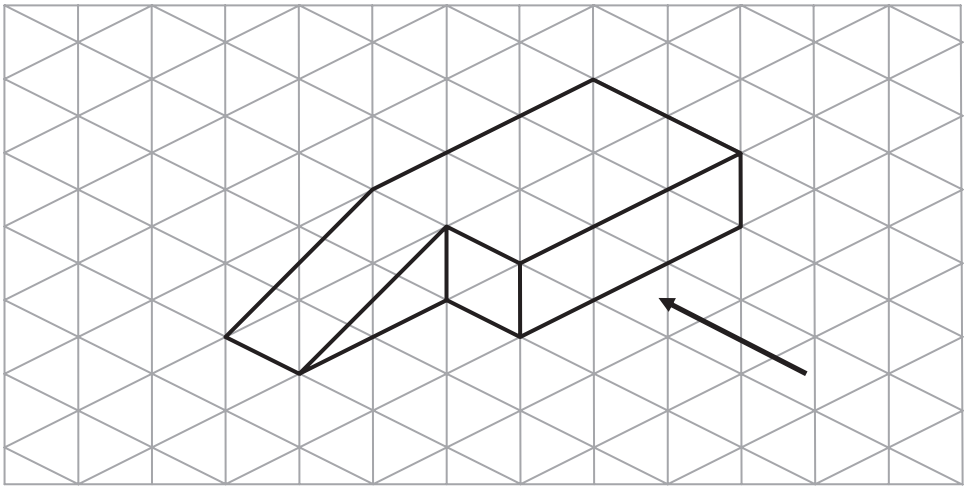


Each sentence in the table describes one of the graphs.
Write the letter of the correct graph next to each sentence.
The first one has been done for you.

The temperature starts at 0°C and keeps rising.	***B***
The temperature stays the same for a time and then falls.	
The temperature rises and then falls quickly.	
The temperature is always the same.	
The temperature rises, stays the same for a time and then falls.	
The temperature rises, stays the same for a time and then rises again.	

(Total for Question 11 = 3 marks)

12 The diagram shows a solid object that is to be made from metal.



(a) In the space below, sketch the front elevation of this object from the direction marked with an arrow.

(2)

(b) In the space below, sketch the plan of the object.

(2)

(Total for Question 12 = 4 marks)

13 Here are the ingredients needed to make 500 m*l* of custard.

CUSTARD	**makes 500 m*l***
400 m*l* of milk	
3 large egg yolks	
50 g sugar	
2 teaspoons of cornflower	

Work out the amount of each ingredient needed to make 1.5 litres of custard.

(Total for Question 13 = 3 marks)

14 Claire, David, Rachel and Steph are stylists in a hairdressing salon.
Billy, Oliver and Vicky have general duties working in the salon.

At the end of each week, all tips that have been received are shared between the four stylists and Billy, Oliver and Vicky.

Billy, Oliver and Vicky get half the amount that each of the stylists get.
Last week, a total of £308 was received in tips.

How much should Billy get?

£ .....

(Total for Question 14 = 3 marks)

15 The diagram represents the M6 motorway between Kendal and Preston
All distances are given in miles.

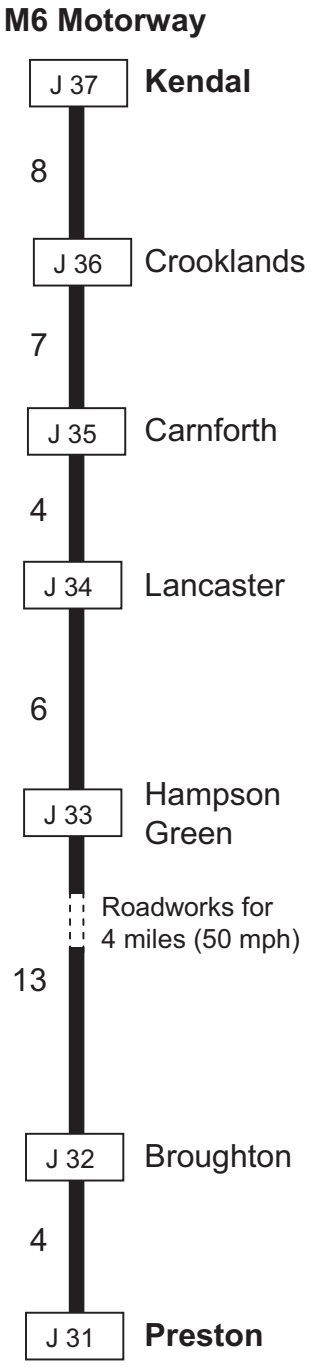


Diagram **NOT** accurately drawn.

Jo joins the M6 at Junction 33 and leaves at Junction 37
Stuart joins the M6 at Junction 35 and leaves at Junction 32

(a) Who travels the further distance on the M6?
You must show your working.

(2)

.....

Ken has to travel from Preston to Kendal.
He joins the M6 motorway at Junction 31 at 10 30

He maintains an average speed of 70 mph throughout his journey except for during the 4 miles of roadworks between Broughton and Hampson Green.

Speed cameras are positioned along the 4 miles of roadworks and this sign appears as a warning.

Roadworks for 4 miles
Maximum speed:
50 mph
Speed cameras measure your average speed

Ken leaves the motorway at Junction 37 at 11 08

* (b) Is Ken in danger of being caught for speeding?

(6)

(Total for Question 15 = 8 marks)

16 Eggs are sold in boxes.
A small box holds 6 eggs.
A large box holds 12 eggs.

Uzma buys x small boxes of eggs and y large boxes of eggs.

(a) Write down an expression, in terms of x and y, for the total number of eggs that Uzma buys.

(2)

.....

* (b) Hajra buys 4 fewer small boxes than Uzma and twice as many large boxes as Uzma.
Hajra has at least 10 more eggs in total than Uzma.

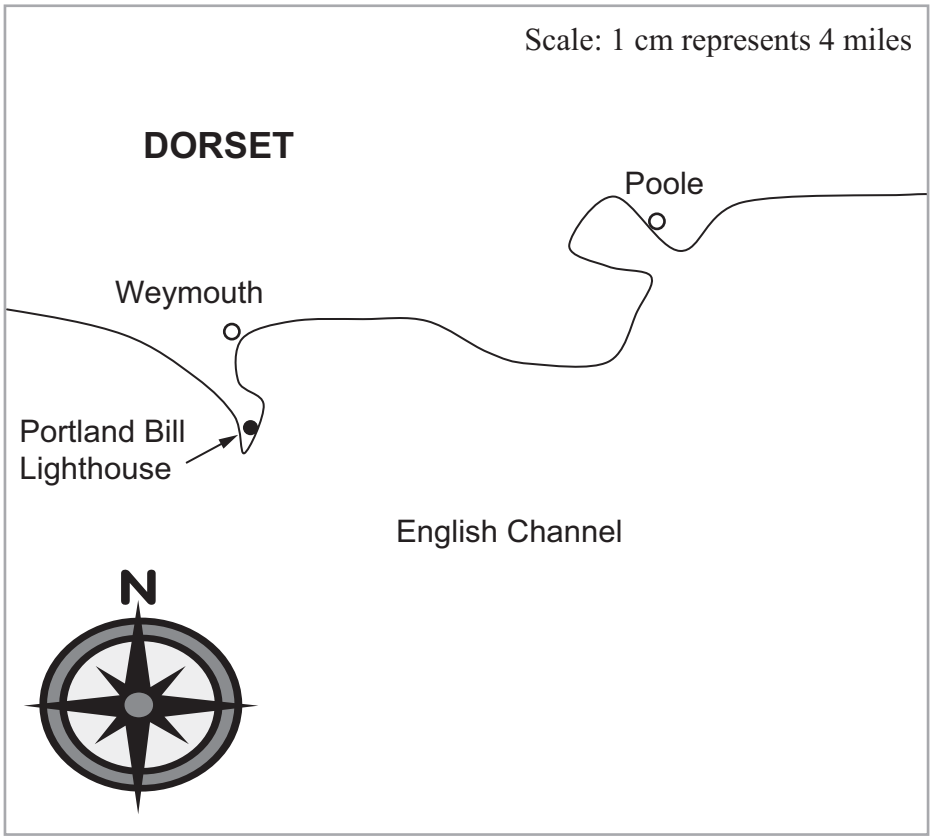
Show that $y > 3$

(4)

.....

(Total for Question 16 = 6 marks)

17 The diagram shows part of a map of Dorset.



A ferry leaves the port of Poole at 20 30 on a bearing of 155° heading for Guernsey.
After sailing 20 miles, the ferry alters course and sails on a bearing of 230° to Guernsey.

The light in Portland Bill Lighthouse has a range of 25 miles.

Can the light from Portland Bill Lighthouse be seen from the ferry on its way to Guernsey?
You must show all of your working.

(Total for Question 17 = 5 marks)

18 X-plas manufacture plastic wedges.
The diagram shows a wedge in the shape of a triangular prism.

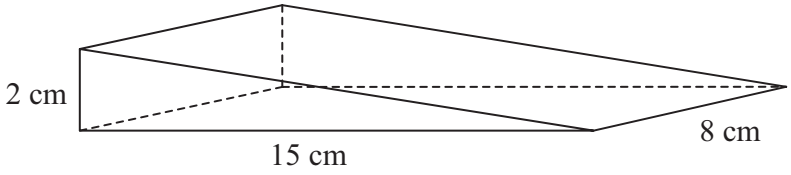


Diagram **NOT** accurately drawn.

Malcolm packs these wedges into cartons to sell on the internet.
Each carton must hold exactly 200 wedges when full.

Design a carton that Malcolm could use.
Explain clearly how you have developed your design.

(Total for Question 18 = 5 marks)

19 A circular tablecloth has a diameter of 240 cm.

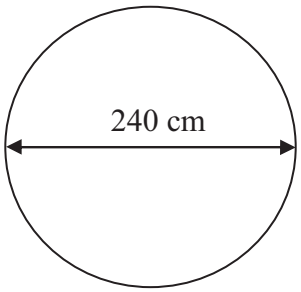


Diagram **NOT** accurately drawn.

(a) Work out the area of the tablecloth.
Give your answer correct to 3 significant figures.

(2)

..... cm^2

Some material is to be sewn around the edge of the tablecloth.

(b) Work out the length of the material needed to go completely around the edge of the tablecloth.
Give your answer correct to 3 significant figures.

(2)

..... cm

(Total for Question 19 = 4 marks)

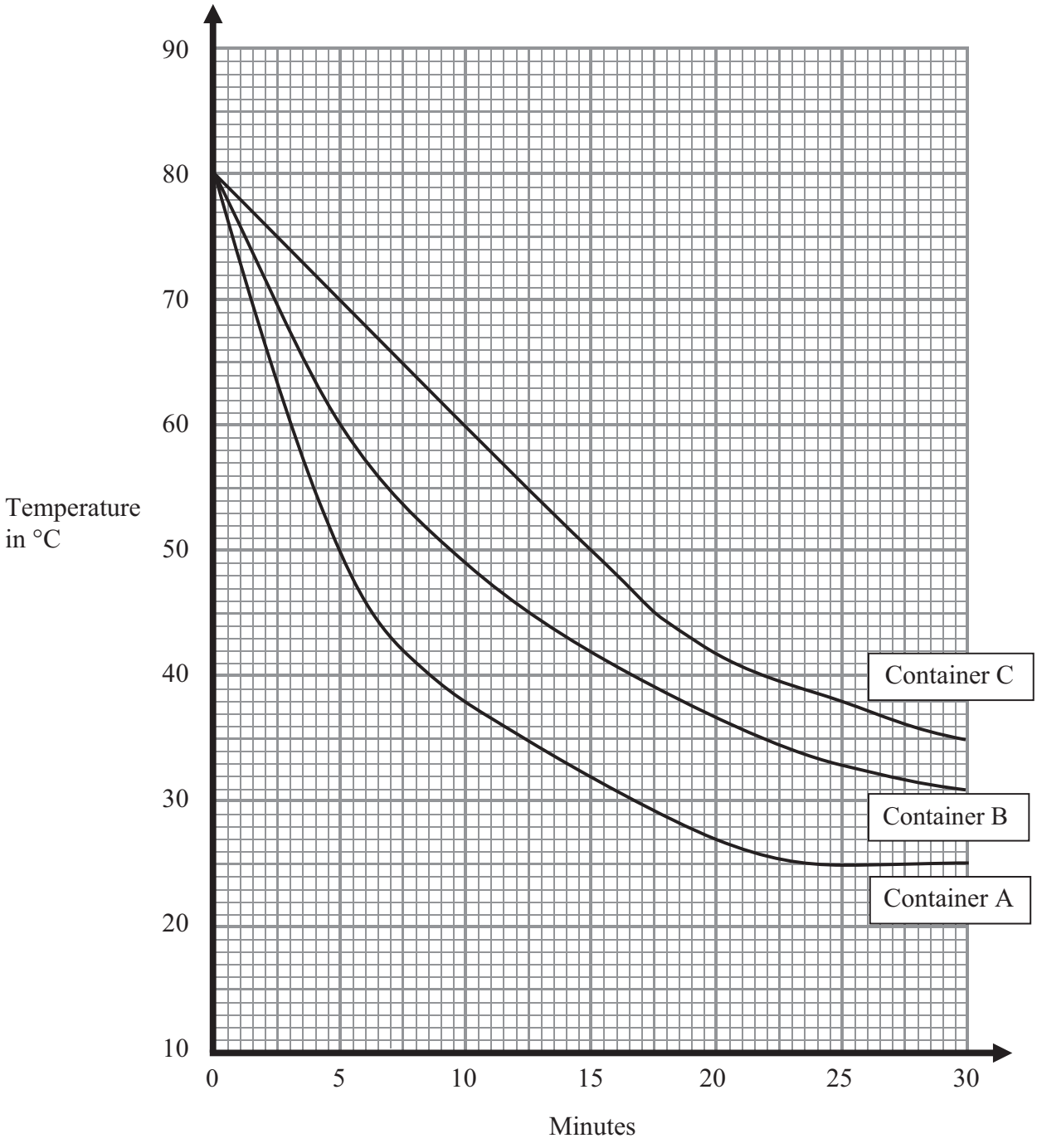
20 Heston is setting up a take away hot drinks stall.

He investigates the time a hot drink takes to cool in three different drinks containers.

Container A Plastic cup single wall
Container B Plastic cup double wall with air gap
Container C Cardboard cup single wall with lid

He decides to use the container that keeps the hot drinks hotter for longer.

He pours hot drinks into the three containers and records their temperatures for 30 minutes.
The graph below shows his results.



(a) What was the temperature at the start of the experiment?

(1)

..... °C

(b) Which container should Heston use?
You must explain clearly how you got your answer.

(2)

Container .....

(c) What was the temperature of the room in which Heston carried out his experiment?
You must explain clearly how you got your answer.

(2)

..... °C

(Total for Question 20 = 5 marks)

21 A doctor does three trials to test a new medicine.
The table below shows information about each of these trials.
It shows the number of people in each trial and the number of people cured by the medicine.

Number of people	100	1000	10 000
Number of people cured	61	798	7651

Which of these trials will give the best estimate of the probability that the medicine will cure the illness?
Give a reason for your answer.

.....

.....

(Total for Question 21 = 2 marks)

***22** Washing machines sometime break down and flood rooms.

Washing machines can be insured in case they break down.

In Applegate:

- There are 51 325 washing machines.
- Last year 124 washing machines broke down and flooded rooms.
- The probability that a washing machine is insured against causing a flood is $\frac{2}{5}$
- The average cost of cleaning up a flooded room is £1250

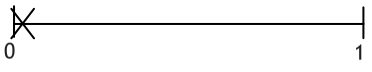
Insurance companies do not want to make a loss when insuring washing machines against causing a flood.

It costs £P to insure a washing machine.

Work out a suitable value for P.
Give a reason for your answer.

(Total for Question 22 = 5 marks)

TOTAL FOR PAPER = 100 MARKS

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
1.	(i) (ii)	12.5 × 10	125 cm or 1.25m	3	B1 for 125 or 1.25 B1 ft for correct units B1 cao
					Total for Question:3 marks
2.			1500-1800	3	B2 answer between 15 and 18 inclusive (or 1500,1800) (B1 answer between 13 and 20 inclusive; or 1300, 2000) B1 (indep) answer given inclusive of the 100
					Total for Question: 3 marks
3.	(a)		Probability scale	2	B1 for a probability scale with ends labelled 0 and 1 B1 for a cross marked within 0.5 cm of 0 (but not at 0)
	(b)	$1 - \frac{1}{53}$	$\frac{52}{53}$	2	M1 for $1 - \frac{1}{53}$ A1 for $\frac{52}{53}$ cao
					Total for Question: 4 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
4. **FE**		Best = 4.45 + 1.85 + 0.49 + 0.85 × 2 + 0.40 × 2 = 9.29 9.29 – 8 = 1.29 too much Savings: 4.45 – 3.95 = 0.50 on calculator 1.70 – 0.48 × 2 = 0.74 on pens (total saving = 1.24) Save another 23p on a ruler **OR** 1.85 + 4.45 = 6.30 6.30 + 0.49 = 6.79 6.79 + 0.85 × 2 = 8.49 too much 6.79 + 0.85 + 0.48 = 8.12 still too much 6.79 + 0.48 × 2 = 7.75 ok Only 25p left; not enough for 2 pencils so buy the cheaper ruler saving 0.49 – 0.26 = 23p leaving 25 + 23 = 48p for pencils (20 x 2 = 40p)	Calc = 3.95 Case = 1.85 Pens = 0.96 Pencils = 0.80 Ruler = 0.26 Total = 7.82	5	M1 for summing the most expensive of each item A1 for a saving of £1.29 needed M1 for finding savings of ≥ £1.29 keeping the greatest number of the best of each item A2 for a solution that keeps the greatest number of the best of each item [A1 for a viable solution, eg the cheapest of everything] **OR** M1 for a build up method A1 for say 8.49 which is too much M1 find an initial saving leaving some remainder A2 for a solution that keeps the greatest number of the best of each item [A1 for a viable solution, eg the cheapest of everything]
					Total for Question: 5 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
5. **QWC (ii)**		165 ÷ 12 = 13 boxes and 9 tiles or 14 boxes 13 boxes cost £12.20 × 13 = £158.60 9 tiles cost £1.40 × 9 = £12.60 Total = £171.20 **OR** 14 boxes cost £12.20 × 14 = £170.80	Cheaper to buy 14 boxes	5	M1 for 165 ÷ 12 M1 for attempting to cost 13 boxes = 9 tiles A1 for cao £171.20 M1 for considering the possibility of buying 14 boxes C1 for £170.80 and realising that this is the cheaper option **QWC: Correct statement supported by all calculations which are attributable**
					Total for Question: 5 marks
6.		Outcomes +++, ++-, +-+, -++, +--, -+-, --+, --- 8 possible outcomes (may be seen in tree diagram)	$\frac{1}{8}$	3	M1 for attempt to list possible outcomes (at least 2) may be seen in tree diagram M1 for 1/'total number of outcomes' A1 for $\frac{1}{8}$ oe **OR** M1 for P(+) = 0.5 oe M1 for 0.5 × 0.5 × 0.5 oe A1 for 0.125 oe
					Total for Question: 3 marks
7. **FE**	(a)		11 23	1	B1 cao
	(b)		43 mins	1	B1 cao
	(c)		24 mins	2	M1 for 67 – "43" A1 ft
	(d)	09 17 for train to Macc by 0938 01 52 for train to Man by 0216 09 17 to 02 16 =	4 h 59 min	4	M1 for 09 17 or 09 38 M1 for 0152 or 0216 A2 for time given sensible as 4 h 59 min (A1 for any equivalent time to 4 h 59 min)
					Total for Question: 8 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
8. FE	(a)	13.5 ft ≈ 4 metres > 3.8 metres **OR** 3.8 metres ≈ 12.5 feet < 13.5 feet **OR** 13.5 × 0.3 (30 cm = 1 ft) = 4.05 m > 3.8 m **OR** 3.8 ÷ 0.3 = 12.667 < 13.5 ft	13.5 ft jump	2	M1 for using the graph to read off 13.5 ft in metres or for reading 3.8 metres in feet or for using a separate conversion factor (say 1 foot = 30 cm = 0.3 m) C1 for correct conversions (±0.5) ft/m and identifying the further jump
	(b) **QWC (i, ii, iii)**	Using 20ft = 6 m from the graph, 45.125 ft ≈ $45.125 \times \frac{6}{20}$ = 13.5375 metres > 10.28 ($\frac{1}{2}$ of 20.56 m) OR $20.56 \times \frac{20}{6}$ = 68.533.. < 90 25 (twice 45.125 ft)	False	4	M1 for finding a conversion factor from the graph M1 for $45.125 \times \frac{6}{20}$ or $20.56 \times \frac{20}{6}$ = M1 for finding $\frac{1}{2}$ of 20.56 or doubling 45.125 accurately C1 for comparison and concluding that the statement was false **QWC: All calculations are attributable to the comparison and the final statement** .
					Total for Question: 6 marks
9.	(a)	(4 + 3) × 10	70	2	M1 for correct substitution of (4 + 3) × 10 A1 cao
	(b)	120 ÷ 10 = 12 12 – 3	9	2	M1 for "120 ÷ 10" – 3 A1 cao
					Total for Question: 4 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
10.	(a)		7	1	B1 cao
	(b)		10	1	B1 cao
	(c) **FE**	Samantha's mum's travel graph from (09 15, 7) to (09 27, 2) to (09 42, 2) to (09 54, 0) Time difference = 10 05 – 09 54 **OR** Samantha's speed = 14 km/h Distance to meeting = 14 × (17/60) Mum travels 7 – "4" in 7 minutes Travels 5 km in 7 × 5/3 = 11.7 mins (time is 09 15 + 11.7 = 09 27 approximately Time difference = 10 05 – 09 54	11 minutes	4	M1 for a line segment from (09 15, 7) passing through (09 22, 4) A1 for estimate of time of 09 27 when 2 km from home M1 for adding 27 minutes to this time and subtracting from 10 05 A1 for 11 (±1) minutes **OR** M1 for attempting to find mum's speed using Samantha's speed of 14 km/h A1 for an estimate of time of 09 27 when 2 km from home M1 for adding 27 minutes to this time and subtracting from 10 05 A1 for 11 (±1) minutes
					Total for Question: 6 marks
11.			(B) D C A F E	3	B3 All correct (B2 at least 3 correct) (B1 1 correct)
					Total for Question: 3 marks
12.	(a)		Elevations drawn	2	B2 correct front elevation (B1 for rectangle 3 × 1 or triangle)
	(b)		Plan drawn	2	B2 for correct plan (B1 for 3 × 2 or 2 × 1 rectangle)
					Total for Question: 4 marks
13.		1500÷500=3; 400 × 3 = 3 × 3 = 50 × 3 = 2 × 3 =	1200 ml of milk 9 egg yolks 150g of sugar 6 teaspoons of cornflour	3	B1 for 1.5 litres = 1500 m*l* M1 for using the scale factor 1500 ÷ 500 (= 3) A2 cao for all 4 answers [A1 for 2 or 3 correct answers]
					Total for Question: 3 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
14.		2 shares for each stylist = 8 shares + 1 share each for Billy, Oliver and Vicky = 11 shares altogether Billy = 1 share = 308 ÷ 11 **OR** 4 + 0.5 + 0.5 + 0.5 = 5.5 shares 308 ÷ 5.5 = £56 per share Billy gets 0.5 × 56 **OR** $4 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 5\frac{1}{2} = \frac{11}{2}$ $308 \div \frac{11}{2} = 308 \times \frac{2}{11}$ = 616 ÷ 11 = 56 Billy gets 0.5 × 56	£28	3	M1 for 2 + 2 + 2 + 2 + 1 + 1 + 1 or $4 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 5\frac{1}{2}$ shares M1 for 308 ÷ "5.5" or "11" or "$5\frac{1}{2}$" A1 cao
					Total for Question: 3 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
15.	(a)	Jo: 6 + 4 + 7 + 8 = 25 Stuart: 4 + 6 + 13 = 23	Jo by 2 miles	2	M1 for summing the 2 journeys and subtracting C1 for Jo by 2 miles
	(b) **QWC (ii, iii)** **FE**	Travels 38 miles at 70 mph Time = 38 ÷ 70 = 0.5428… hours = 32.6 minutes Roadworks: 4 ÷ 50 = 0.08 hours = 4.8 minutes Total time = 32.6 + 4.8 = 37.4 minutes. ETA = 11 07.4 **OR** Travels 38 miles at 70 mph Time = 38 ÷ 70 = 0.5428… hours = 32.6 minutes Time of whole journey = 11 06 – 10 30 = 36 minutes 37 – 32.6 = 4.4 mins for roadworks. Speed = 4 ÷ (4.4 ÷ 60) = 54.5 mph	Ken exceeded the speed limit at the roadworks	6	B1 for 38 miles travelled at 70 mph M1 for 38 ÷70 A1 for 32.6 minutes M1 for attempt to find length of time in the roadworks A1 for total time of journey of 37.4 mins C1 for comparing with total time of journey and correct conclusion. **QWC: Comparison and conclusion are supported by attributable working** **OR** B1 for 38 miles travelled at 70 mph M1 for 38 ÷ 70 A1 for 32.6 minutes M1 for attempt to find the average speed through the roadworks A1 for 54.54…. C1 for comparing speeds with the limit and correct conclusion. **QWC: Comparison and conclusion are supported by attributable working**
					Total for Question: 8 marks

5AM2F					
Question		Working	Answer	Mark	Additional Guidance
16.	(a)		$6x + 12y$	2	B2 for $6x + 12y$ [B1 for either $6x$ or $12y$]
	(b) QWC (iii)	Hajra buys $6(x-4) + 2 \times 12y$ = $6x - 24 + 24y$ $6x - 24 + 24y \geq 6x + 12y + 10$ $6x - 6x + 24y - 12y \geq 10 + 24$ $12y \geq 34$ $y > 3$ since y must be a whole number	Proof	4	B1 for $6(x-4) + 2 \times 12y$ M1 for $6x - 24 + 24y \geq 6x + 12y + 10$ or equivalent A1 for $12y \geq 34$ C1 for stating that y must be a whole number therefore $y > 3$ **QWC: statement supported by correct working**
					Total for Question: 6 marks
17. FE			Yes, the ferry does fall within the range of the light during its journey	5	M1 for attempting to draw the route of the ferry, applying two bearings B1 for either a line drawn from Poole on a bearing of 155° (±2°) or a line drawn from a point at sea on a bearing 230° (±2°) B1 for use of scale to indicate a point 5 cm (±2 mm) from Poole M1 for arc of radius 6.25 cm (±2 mm) drawn, centre the Lighthouse C1 for showing the intersection of the loci and concluding that the ferry is in range of the light
					Total for Question : 5 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18.		2 wedges together = a cuboid, 15 × 8 × 2 Volume = 15 × 8 × 2 = 240 cm^3 Volume of carton = 240 × 100 (200 wedges) = 24000 cm^3 Eg: 20 × 30 × 40 = 24000, etc **OR** 2 wedges together = a cuboid, 15 × 8 × 2 A layer of 4 cuboids by 5 cuboids = 60 (15 × 4) × 40 (8 × 5) = 40 (4 × 5 × 2) wedges in each layer 200 = 5 layers, 2cm × 5 = 10 cm Carton = 60 × 40 × 10, etc	The product of three numbers equating to 24000	5	B1 for 2 wedges together = a cuboid, 15 × 8 × 2 M1 for volume = 15 × 8 × 2 = 240 cm^3 M1 for 240 × 100 (200 wedges) = 24000 cm^3 M1 for attempting to find the product of three numbers equating to 24000 A1 for sensible dimensions **OR** B1 for 2 wedges together = a cuboid, 15 × 8 × 2 M1 for finding any correct layer giving a rectangular shape M1 a correct method that would lead to the correct number of wedges in a layer M1 for attempting to find the product of three numbers equating to 24000 A1 for sensible dimensions
					Total for Question: 5 marks

5AM2F					
Question		Working	Answer	Mark	Additional Guidance
19.	(a)	$\pi \times 120 \times 120=$	45200-45300	2	M1 for $\pi \times 120 \times 120$ A1 45200-45300
	(b)	$\pi \times 240 =$	750-760	2	M1 for $\pi \times 240$ A1 750-760
					Total for Question: 4 marks
20.	(a)		80	1	B1 cao
	(b)		Container C, with correct justification	2	C2 for Container C is always at a higher temperature than A or B [C1 for identifying C only without a reason]
	(c)		25	2	B1 for 25°C B1 for a reason such as 'the graph flattens out at this point'
					Total for Question : 5 marks
21			Trial with largest number of people The larger the sample the better the estimate	2	B1 for identifying the trial with the largest number of people, eg 7651/10 000 B1 for the larger the trial the better the estimate oe
					Total for Question : 2 marks

5AM2F					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
22 FE QWC (ii, iii)		Estimated cost = 1250 × 124 (=155000) Estimated number of washing machines insured = 2/5 × 51325 = 20530 To break even 20530 x P = 155000 So P = 155000/20530 = 7.5499... i.e. P = £7.55 (to break even)	Answer with reason	5	M1 for 1250 × 124 or 155000 seen M1 for 2/5 × 51325 or 20530 seen M1 for '15500'/'20530' A1 for £7.55 or for answer correctly justified using correct money notion with units C1 for correct reason, eg (this is the minimum value of P for which) estimated cost = estimated income **QWC: Justification is clear and correct, with all calculations attributable**
					Total for Question : 5 marks

Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Applications in Mathematics

Unit 2: Applications 2

For Approved Pilot Centres ONLY

Higher Tier

Sample Assessment Material
Time: 1 hour 45 minutes

Paper Reference
5AM2H/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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S 3 8 4 2 7 A 0 1 2 4

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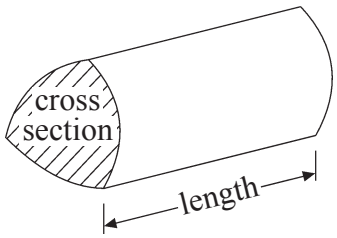
GCSE Mathematics 2AM01

Formulae: Higher Tier

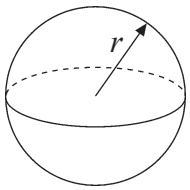
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length



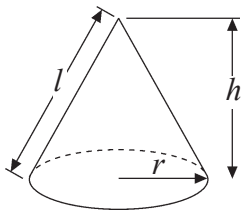
Volume of sphere $= \frac{4}{3}\pi r^3$

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

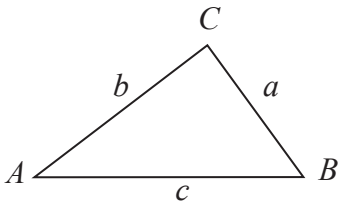


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



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 $= \frac{1}{2}ab\sin C$

The Quadratic Equation

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

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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 $T = 2\pi\sqrt{\frac{l}{g}}$ is a formula used to work out the time period of a simple pendulum.

(a) Use your calculator to work out the value of T, when $l = 15.38$ and $g = 9.81$
Write down all the figures on your calculator display.

(2)

.....

(b) Give your answer to part (a) correct to 3 significant figures.

(1)

.....

(Total for Question 1 = 3 marks)

2 Claire, David, Rachel and Steph are stylists in a hairdressing salon.
Billy, Oliver and Vicky have general duties working in the salon.

At the end of each week, all tips that have been received are shared between the four stylists and Billy, Oliver and Vicky.

Billy, Oliver and Vicky get half the amount that each of the stylists get.
Last week, a total of £308 was received in tips.

How much should Billy get?

£ .....

(Total for Question 2 = 3 marks)

3 Here is a diagram of a storage container for a garden.

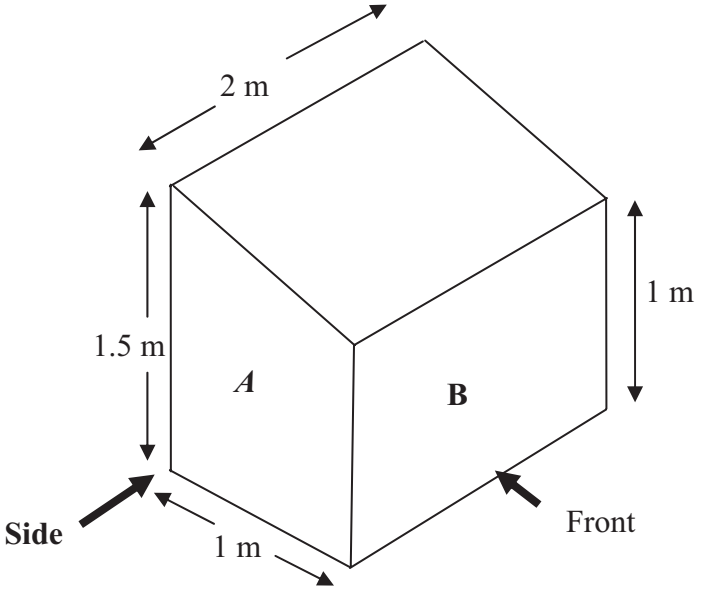


Diagram **NOT** accurately drawn

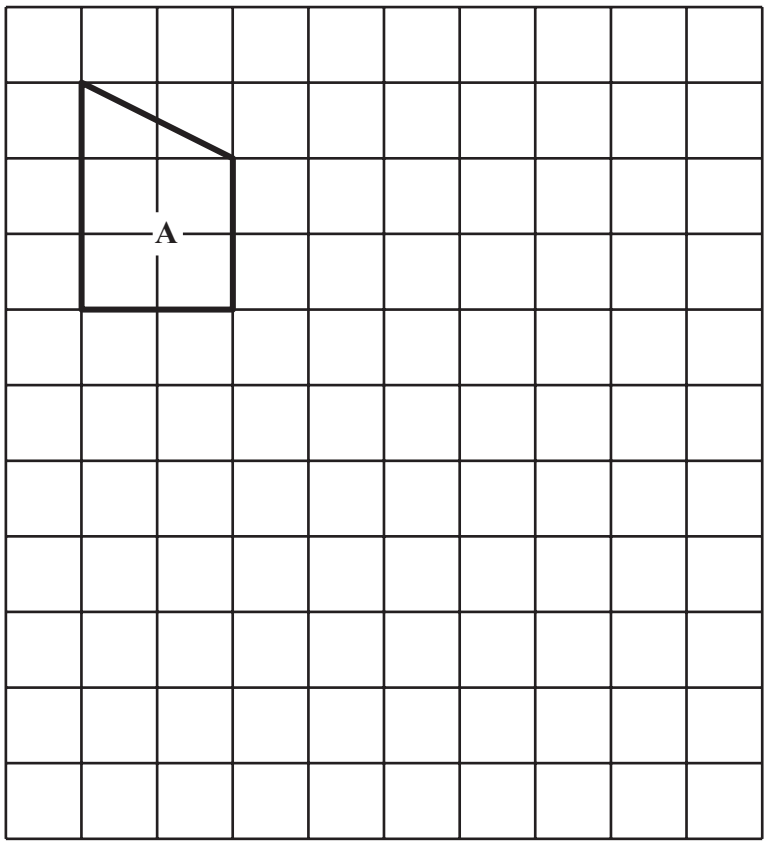
The storage container is in the shape of a prism.
The face labelled A is a cross-section of the prism.

(a) On the diagram above, draw all the hidden edges of the storage container.

(1)

The **side** elevation of the storage container, face **A,** has been drawn accurately on the grid below.

Scale 1 cm represents 50 cm



(b) On the grid accurately draw the **front** elevation of the storage container.
Label the front elevation **B**.

(2)

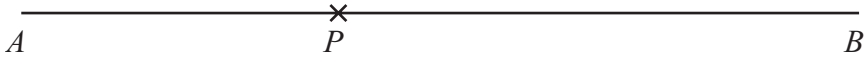
(c) On the grid accurately draw the plan of the storage container.
Label the plan **C.**

(2)

(Total for Question 3 = 5 marks)

4 *A*, *P* and *B* are three locations on a map.
APB is a straight line.
Construct the perpendicular to the line *AB* at the point *P*
You must leave **all** your construction lines.

Diagram **NOT** accurately drawn



(Total for Question 4 = 2 marks)

***5** The diagram represents the M6 motorway between Kendal and Preston.
All distances are given in miles.

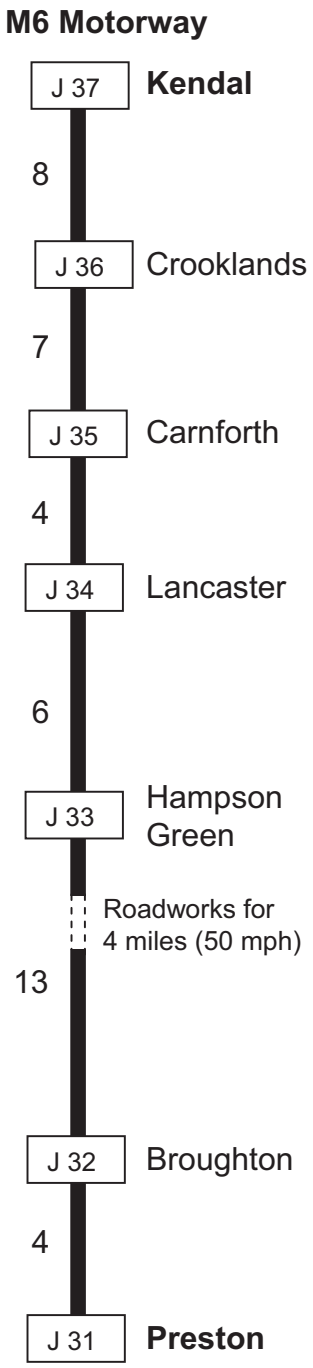


Diagram **NOT** accurately drawn.

Ken has to travel from Preston to Kendal.
He joins the M6 motorway at Junction 31 at 10 30

He maintains an average speed of 70 mph throughout his journey except for during the four miles of roadworks between Broughton and Hampson Green.

Speed cameras are positioned along the four miles of roadworks and this sign appears as a warning.

Roadworks for 4 miles
Maximum speed:
50 mph
Speed cameras measure your average speed

Ken leaves the motorway at Junction 37 at 11 08

Is Ken in danger of being caught for speeding?

(Total for Question 5 = 6 marks)

6 X-plas manufacture plastic wedges.
The diagram shows a wedge in the shape of a triangular prism.

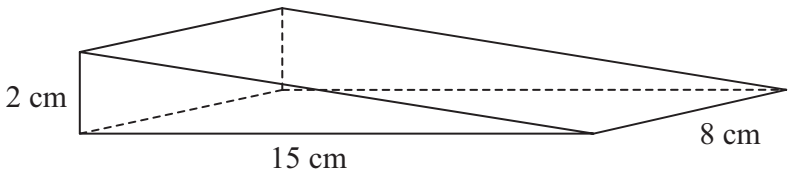


Diagram **NOT** accurately drawn.

Malcolm packs these wedges into cartons to sell on the internet.
Each carton must hold exactly 200 wedges when full.

Design a carton that Malcolm could use.
Explain clearly how you have developed your design.

(Total for Question 6 = 5 marks)

7 A company uses newspapers, local radio, the internet and cold calling to advertise itself.

In January, it spent a quarter of its budget on newspapers and 36 % of its budget on local radio.
The remainder of the budget was spent on the internet and cold calling in the ratio 8 : 5

What percentage of the January budget was spent on cold calling?

(Total for Question 7 = 4 marks)

8 A doctor carries out three trials to test a new medicine.
The table below shows information about each of these trials.
It shows the number of people in each trial and the number of people cured by the medicine.

Number of people	100	1000	10 000
Number of people cured	61	798	7651

Which of these trials will give the best estimate of the probability that the medicine will cure the illness?
Give a reason for your answer.

.....

.....

(Total for Question 8 = 2 marks)

9 The table below shows temperatures in °F and their equivalent temperatures in °C.

°F	0	10	20	30	40		
°C	32	50	68	86	104		

(a) What would 100°F be equivalent to in °C?

(1)

.....

(b) Find a formula for C in terms of F.

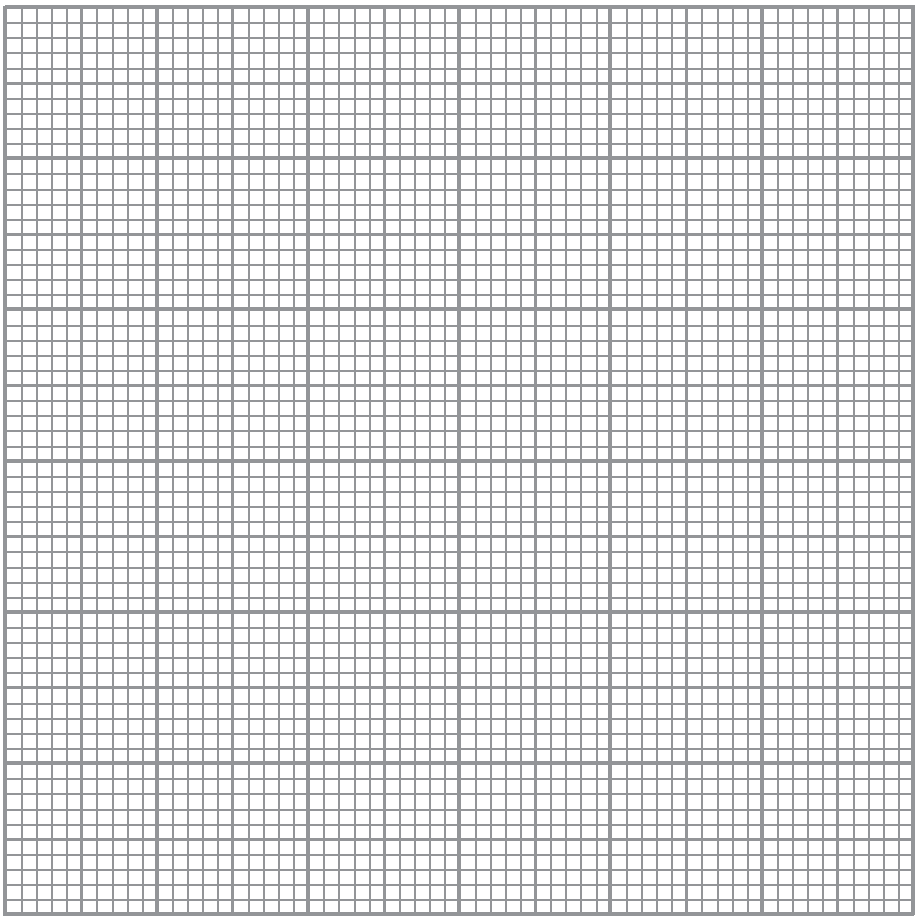
(2)

.....

(c) What temperature has the same value in °C as in °F?

You can use the graph paper to help you find your answer.

(2)



.....

(Total for Question 9 = 5 marks)

10 A circular tablecloth has a diameter of 240 cm.

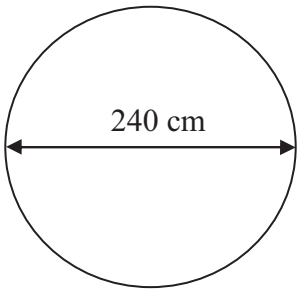


Diagram **NOT** accurately drawn.

(a) Work out the area of the tablecloth.
Give your answer correct to 3 significant figures.

(2)

..... cm^2

Some material is to be sewn around the edge of the tablecloth.

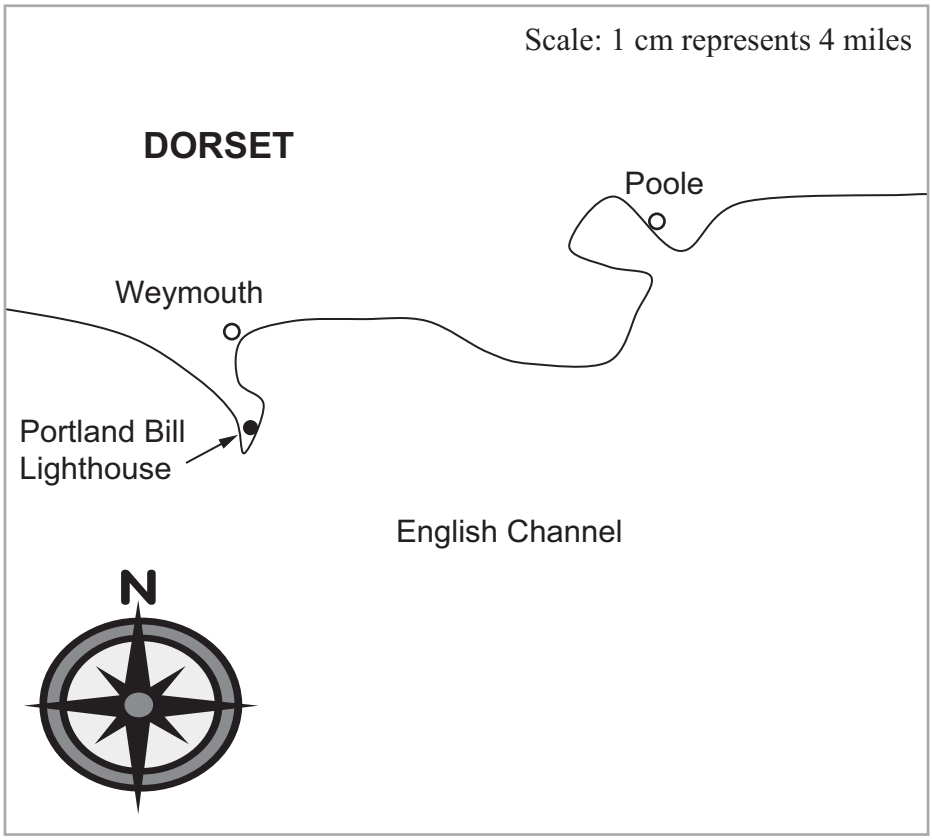
(b) Work out the length of the material needed to go completely around the edge of the tablecloth.
Give your answer correct to 3 significant figures.

(2)

..... cm

(Total for Question 10 = 4 marks)

11 The diagram shows part of a map of Dorset.



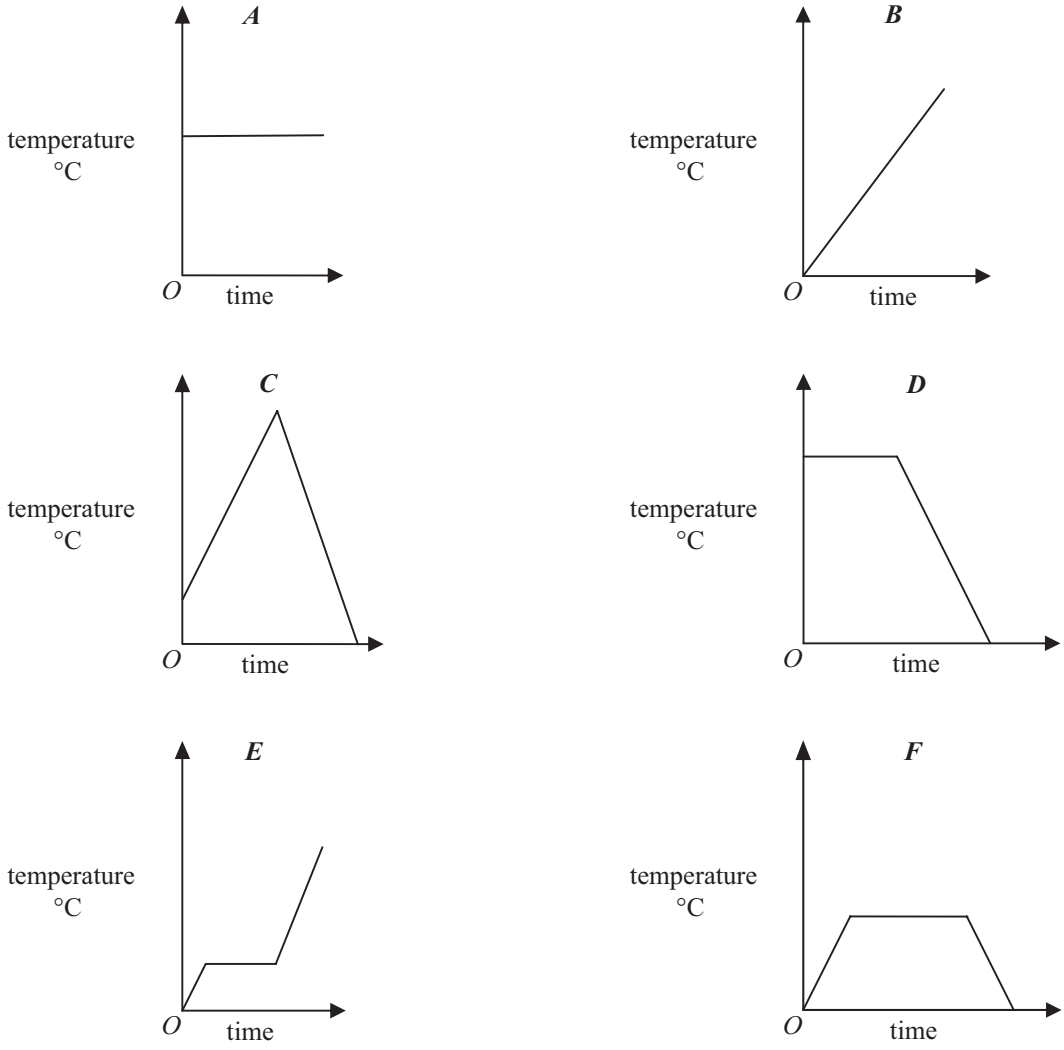
A ferry leaves the port of Poole at 20 30 on a bearing of 155° heading for Guernsey.
After sailing 20 miles, the ferry alters course and sails on a bearing of 230° to Guernsey.

The light in Portland Bill Lighthouse has a range of 25 miles.

Can the light from Portland Bill Lighthouse be seen from the ferry on its way to Guernsey?
You must show all of your working.

(Total for Question 11 = 5 marks)

12 Here are six temperature/time graphs.



Each sentence in the table below describes one of the graphs.
Write the letter of the correct graph next to each sentence.
The first one has been done for you.

The temperature starts at 0°C and keeps rising.	***B***
The temperature stays the same for a time and then falls.	
The temperature rises and then falls quickly.	
The temperature is always the same.	
The temperature rises, stays the same for a time and then falls.	
The temperature rises, stays the same for a time and then rises again.	

(Total for Question 12 = 3 marks)

***13** Washing machines sometimes break down and flood rooms.

Washing machines can be insured in case they break down.

In Applegate:

- There are 51 325 washing machines.
- Last year 124 washing machines broke down and flooded rooms.
- The probability that a washing machine is insured against causing a flood is $\frac{2}{5}$
- The average cost of cleaning up a flooded room is £1250

Insurance companies do not want to make a loss when insuring washing machines against causing a flood.

It costs £P to insure a washing machine.

Work out a suitable value for P.
Give a reason for your answer.

(Total for Question 13 = 5 marks)

14 Ronnie is having a new 3-part snooker cue made for him.

Diagram **NOT** accurately drawn

The diagram shows the snooker cue in 3 parts.

The length of part A is 2 cm greater than the length of part C.
The length of part C is to be twice the length of part B.

The total length of all 3 parts must be greater than 182 cm and less than 197 cm.

Work out the **range** of possible lengths of part B.

.....

(Total for Question 14 = 5 marks)

15 The probability of winning a prize in the National Lottery is p.

Harry buys two National Lottery tickets.

(a) Write down an expression, in terms of p, for the probability that Harry will win a prize with both tickets.

(1)

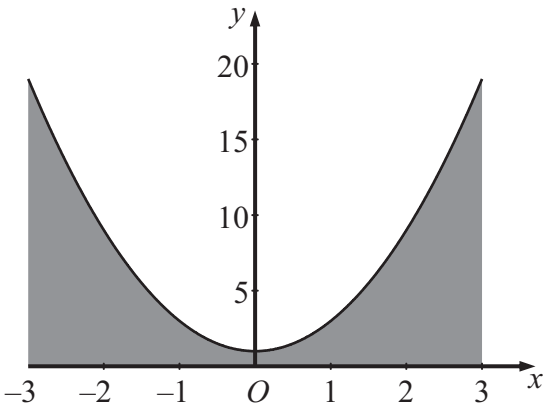
(b) Show that the probability that Harry will **not** win a prize with either ticket is $1 - 2p + p^2$

(3)

(Total for Question 15 = 4 marks)

16 Here is a sketch of the graph of $y = 2x^2 + 1$

Diagram **NOT** accurately drawn



Calculate an estimate of the area of the shaded region.

.....

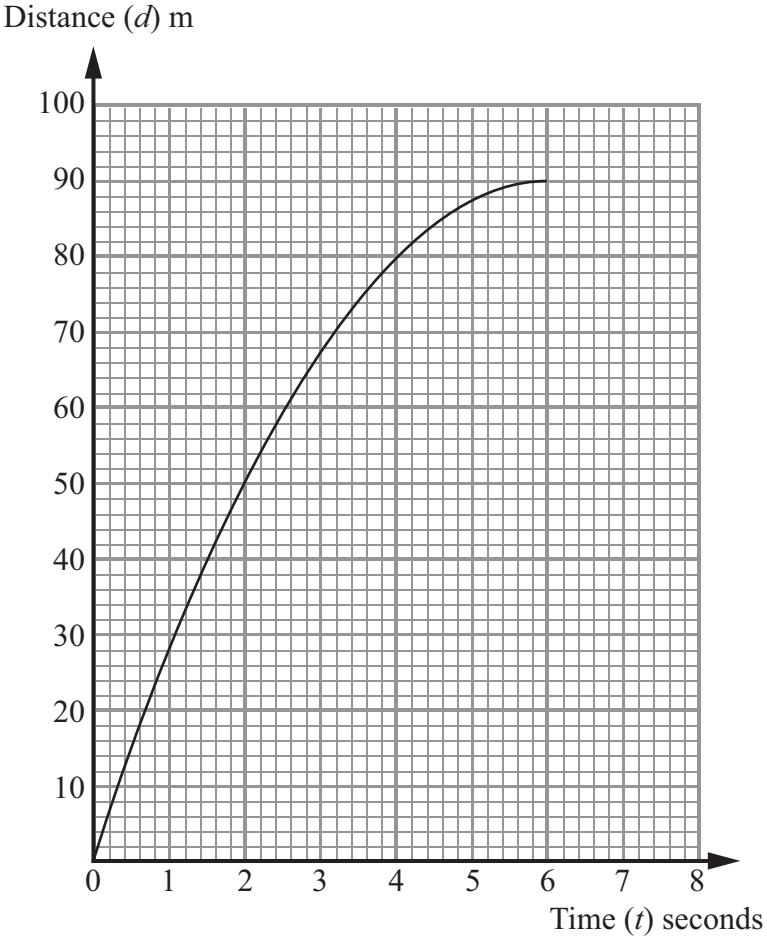
(Total for Question 16 = 4 marks)

17 A transport engineer is investigating the motion of a car when it slows down.

The transport engineer applies the brakes to the car so that the car comes to a stop in 6 seconds.

He then waits another second to switch off the engine.

The graph gives information about the distance, d metres, travelled by the car in t seconds after the brakes had been applied.



(a) Complete the graph for $6 < t \leqslant 7$

(1)

(b) Work out the average speed of the car, in km/h, during the first 6 seconds.

(3)

..... km/h

*(c) Find and compare the speeds of the car after 2 seconds, 4 seconds and 6 seconds.
You must show all of your working.

(4)

(Total for Question 17 = 8 marks)

18 As part of its production process a company boils water in spherical tanks, all made from the same type of metal.

The time, T minutes, taken to boil the water filling a spherical tank is proportional to the cube of the radius, r cm, of the tank.

For a tank with a radius of 50 cm, the time taken is 20 minutes.

Another spherical tank has a radius of 70 cm.

(a) Work out the time taken to boil the water filling this spherical tank.

(4)

..... minutes

The company wants a spherical tank which when filled with water will take 2 hours to boil.

(b) Calculate the radius of this spherical tank.

(3)

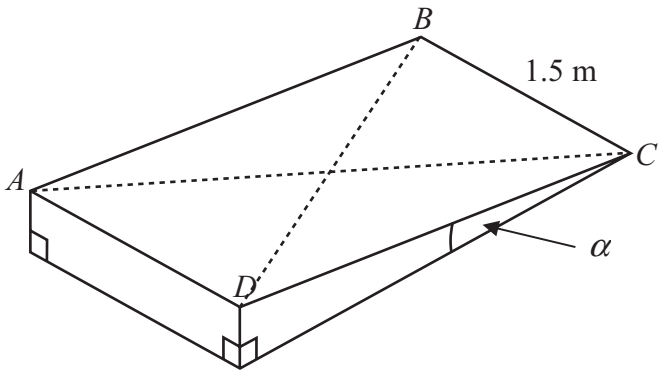
$r =$ ..... cm

(Total for Question 18 = 7 marks)

19 Colin is the caretaker of a local community centre.
He wants to make a ramp to enable wheelchair access into the centre.

Colin makes this sketch of a ramp in the shape of a prism.

Diagram **NOT** accurately drawn



The health and safety regulations say that the width of the ramp must be 1.5 m and the angle α, of the slope, must satisfy $\tan^{1} \alpha \leqslant \frac{1}{15}$

AC and *BD* are metal struts to strengthen the ramp.
The step into the community centre is 16 cm high.

Work out the minimum length, *CD*, of the ramp and the length of each of the metal struts *AC* and *BD*.

(Total for Question 19 = 5 marks)

20 The edge of a solid cube is 20 cm correct to the nearest centimetre.
The mass of the cube is 64.8 kg correct to 1 decimal place.

(a) Write down the upper bound of the mass of the cube.

(1)

..... kg

(b) Work out the upper bound of the density of the cube.
Give your answer correct to 3 significant figures in kilograms per m^3.

(4)

..... kg/m^3

(Total for Question 20 = 5 marks)

21 A rare species of spider was found to be affected by disease. A population of 1000 of these spiders was reduced to 800 in two days.

Assuming that the population decreases exponentially, how many spiders will there be 7 days after the initial count of 1000?

.....

(Total for Question 21 = 5 marks)

***22** Talil works for an insurance company.
The insurance company insures both male drivers and female drivers.
Talil wants to assess the risk presented to the company by the male and by the female drivers.

He estimates the probabilities that a male driver and a female driver will claim on their insurance policies in the next year as 0.25 and 0.35 respectively.

He further estimates that 60 % of the claims made by the male drivers and 70 % of the claims made by the female drivers will be for less than £1000.

The insurance company insures about the same number of male drivers as female drivers.

The table below gives information about the mean claims made by male drivers and by the female drivers last year.

Mean claim	**Male drivers**	**Female drivers**
Less than £1000	£289	£518
£1000 or more	£1753	£1189

What can Talil conclude about the risk presented to the company by the male drivers and by the female drivers?

(Total for Question 22 = 5 marks)

TOTAL FOR PAPER = 100 MARKS

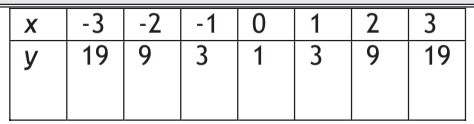
5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
1	(a)	$2 \times \pi \times \sqrt{\frac{15.38}{9.81}} = 2 \times \pi \times \sqrt{1.567787971}$	9.850702347	2	B2 for 9.8507(02347) [B1 for 1.567787971..]
	(b)		9.85	1	B1 ft their answer to part (a)
					Total for Question: 3 marks
2		2 shares for each stylist = 8 shares + 1 share each for Billy, Oliver and Vicky = 11 shares altogether Billy = 1 share = 308 ÷ 11 **OR** 4 + 0.5 + 0.5 + 0.5 = 5.5 shares 308 ÷ 5.5 = £56 per share Billy gets 0.5 × 56 **OR** $4 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 5\frac{1}{2} = \frac{11}{2}$ $308 \div \frac{11}{2} = 308 \times \frac{2}{11}$ = 616÷ 11 = 56 Billy gets 0.5 × 56	£28	3	M1 for 2 + 2 + 2 + 2 + 1 + 1 + 1 or $4 + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 5\frac{1}{2}$ shares M1 for 308 ÷ "5.5" or "11" or "$5\frac{1}{2}$" A1 cao
					Total for Question: 3 marks
3	(a)		Hidden lines shown	1	B1 within tolerance of diagram
	(b)		Front view	2	M1 a correct looking front view with two joined rectangles A1 fully correct
	(c)		Plan	2	M1 a correct plan with two joined rectangles A1 fully correct
					Total for Question: 5 marks
4			Correct construction	2	M1 correct construction with arcs shown A1 within guidelines
					Total for Question: 2 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
5 **QWC (ii, iii)** **FE**		Travels 38 miles at 70 mph Time = 38 ÷ 70 = 0.5428… hours = 32.6 minutes Roadworks: 4 ÷ 50 = 0.08 hours = 4.8 minutes Total time = 32.6 + 4.8 = 37.4 minutes. ETA = 11 07.4 **OR** Travels 38 miles at 70 mph Time = 38 ÷70 = 0.5428… hours = 32.6 minutes Time of whole journey = 11 06 – 10 30 = 36 minutes 37 – 32.6 = 4.4 mins for roadworks. Speed = 4 ÷ (4.4 ÷ 60) = 54.5 mph	Ken exceeded the speed limit at the roadworks	6	B1 for 38 miles travelled at 70 mph M1 for 38 ÷70 A1 for 32.6 minutes M1 for attempt to find length of time in the roadworks A1 for total time of journey of 37.4 mins C1 for comparing with total time of journey and correct conclusion **QWC: Conclusion supported by attributable working** **OR** B1 for 38 miles travelled at 70 mph M1 for 38 ÷ 70 A1 for 32.6 minutes M1 for attempt to find the average speed through the roadworks A1 for 54.54…. C1 for comparing speeds with the limit and correct conclusion. **QWC: Conclusion supported by attributable working**
					Total for Question: 6 marks
6 **FE**		2 wedges together = a cuboid, 15 × 8 × 2 Volume = 15 × 8 × 2 = 240 cm^3 Volume of carton = 240 × 100 (200 wedges) = 24000 cm^3 Eg: 20 × 30 × 40 = 24000 **OR** 2 wedges together = a cuboid, 15 × 8 × 2 A layer of 4 cuboids by 5 cuboids = 60 (15 × 4) × 40 (8 × 5) = 40 (4 × 5 × 2) wedges in each layer 200 = 5 layers, 2 cm × 5 = 10 cm Carton = 60 × 40 × 10, etc	The product of three numbers equating to 24000	5	B1 for 2 wedges together = a cuboid, 15 × 8 × 2 M1 for volume = 15 × 8 × 2 = 240 cm^3 M1 for 240 × 100 (200 wedges) = 24000 cm^3 M1 for attempting to find the product of three numbers equating to 24000 A1 for sensible dimensions **OR** B1 for 2 wedges together = a cuboid, 15 × 8 × 2 M1 for finding any correct layer giving a rectangular shape M1 a correct method that would lead to the correct number of wedges in a layer M1 for attempting to find the product of three numbers equating to 24000 A1 for sensible dimensions
					Total for Question: 5 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
7		$\frac{1}{4}$ = 25 % + 36% = 61% 100 – 61 = 39% divided in the ratio 8 : 5 39 ÷ (5 + 8) = 3 5 × 3 **OR** Say budget is £1000 Newspapers = $\frac{1}{4}$ of 1000 = 250 Local radio = 36% of 1000 = 360 Leaving 1000 – 250 – 360 = 390 $\frac{5}{13} \times 390$	15%	4	M1 for converting $\frac{1}{4}$ to a % and adding to 36 A1 for 39% for the remainder M1 for 39 ÷ "13" A1 cao **OR** M1 finding ($\frac{1}{4}$ + 36%) of any value A1 for a correct remainder M1 for $\frac{5}{13} \times 390$ A1 cao
					Total for Question: 4 marks
8			Trial with largest number of people. The larger the sample the better the estimate	2	B1 for identifying the trial with the largest number of people, eg 7651/10 000 B1 for the larger the trial the better the estimate oe
					Total for Question: 2 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
9	(a)	This could be found using the table and adding 18 6 times **OR** Drawing a graph from information given	212 C	1	B1 cao
	(b)		$C = \frac{18F + 320}{10}$	2	B2 for $C = \frac{18F + 320}{10}$ or equivalent [B1 for $C = 9F/5 + k$]
	(c)	When $C=F$, $10C = 18C + 320$ $8C = -320$ **OR** Drawing a graph of $C = F$ to intersect a conversion graph	−40	2	M1 for $10C = 18C + 320$ A1 cao **OR** M1 for graphs of $C = F$ and $C = \frac{18F + 320}{10}$ A1 cao
					Total for Question: 5 marks
10	(a)	$\pi \times 120 \times 120 =$	45200-45300	2	M1 for $\pi \times 120 \times 120$ A1 45200-45300
	(b)	$\pi \times 240 =$	750-760	2	M1 for $\pi \times 240$ A1 750-760
					Total for Question: 4 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
11 FE			Yes, the ferry does fall within the range of the light during its journey	5	M1 for attempting to draw the route of the ferry, applying 2 bearings B1 for either a line drawn from Poole on a bearing of 155° (± 2°) or a line drawn from a point at sea on a bearing 230° (± 2°) B1 for use of scale to indicate a point 5 cm (±2 mm) from Poole M1 for arc of radius 6.25 cm (±2 mm) drawn, centre the Lighthouse C1 for showing the intersection of the loci and concluding that the ferry is in range of the light
					Total for Question: 5 marks
12			(B) D C A F E	3	B3 All correct (B2 at least 3 correct) (B1 1 correct)
					Total for Question: 3 marks
13 **QWC (ii, iii) FE**		Estimated cost = 1250 × 124 (=155000) Estimated number of washing machines insured = $\frac{2}{5}$ × 51325 = 20530 To break even 20530 × P = 155000 So P = 155000/20530 = 7.5499... i.e. P = £7.55 (to break even)	Answer with reason	5	M1 for 1250 × 124 or 155000 seen M1 for 2/5 × 51325 or 20530 seen M1 for '15500'/'20530' A1 for £7.55 or for answer correctly justified using correct money notion with units C1 for correct reason, eg (this is the minimum value of P for which) estimated cost = estimated income **QWC: Justification is clear for C1 and supported by attributable working**
					Total for Question: 5 marks
14		Let x be the length of B, so C = 2 x, A = 2 x + 2 Length of cue = 5 x + 2 182 ≤ 5 x + 2 ≤ 197 180 ≤ 5 x and 5 x ≤ 195	36 ≤ Length of B ≤ 39	5	M1 for defining an algebraic representation of one of the parts A1 for B = x, C = 2 x, A = 2 x + 2 or equivalent M1 for 182 ≤ 5 x + 2 or 5 x + 2 ≤ 197 M1 for a correct rearrangement of 182 ≤ 5x + 2 ≤ 197 A1 for 36 ≤ Length of B ≤ 39 .
					Total for Question: 5 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
15	(a)	(a) $p \times p$	P^2	1	M1 for $p \times p$ B1 $(1-p)$
	(b)	(b) $(1-p) \times (1-p) = 1-p-p-p \times -p$ $= 1-2p+p^2$ **OR** draw a tree diagram	Proof	3	M1 for $(1-p) \times (1-p)$ A1 for correct working leading to $1-2p+p^2$
					Total for Question:4 marks
16		 Area = (19 + 2 × 9 + 2 × 3 +2 × 1 + 2 × 3 + 2 × 9 + 19)/2	44	4	B1 at least 4 values correct M1 correct use of trapezium rule A1 88 A1 44 .
					Total for Question: 4 marks
17	(a)		Line segment from (6,90) to (7,90)	1	B1 cao
	(b)	90 ÷ 6 = 15 15 × 3600 ÷ 1000	54	3	M1 90÷ 6 M1 for "15" × 3600 ÷ 1000 A1 cao
QWC ii	(c)	Tangent drawn at t = 2 Gradient = height ÷ base	22 m/s	4	M1 tangent drawn at t = 2, 4 and 6 M1 for any gradient = height ÷ base A1 for 20 ± 5 and 0 or 10 ± 5 and 0 C1 for decrease of 10 m/s each 2 second interval **QWC: For C1, answer is supported by clear and attributable working**
					Total for Question: 8 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
18	(a)	$T = kr^3$ $20 = k \times 50^3$ $T = \frac{20}{125000} \times 70^3$ **OR** $\frac{T_2}{T_1} = \frac{r_2^3}{r_1^3}$ $T_2 = \frac{70^3}{50^3} \times 20$	54.88	4	M1 $T = kr^3$ M1 $20 = k \times 50^3$ A1 $T = \frac{20}{125000} r^3$ oe A1 cao **OR** M2 $\frac{T_2}{T_1} = \frac{r_2^3}{r_1^3}$ A1 $T_2 = \frac{70^3}{50^3} \times 20$ A1 cao
	(b)	$120 = \frac{20}{125000} r^3$ $r = \sqrt[3]{\left(\frac{120 \times 125000}{20}\right)}$	90.9	3	M1 $'120' = \frac{20}{125000} r^3$ M1 $r = \sqrt[3]{\left(\frac{'120' \times 125000}{20}\right)}$ A1 90.85 - 90.9
					Total for Question : 7 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
19		Using 1:15, y = 16 × 15 = 240 cm Ramp length = $\sqrt{16^2 + 240^2}$ = 240.53.... Strut = $\sqrt{16^2 + 240^2 + 150^2}$ = 283.47... **OR** Angle of slope = $\tan^{-1}$ (1÷15) = 3.814° Ramp length = $\frac{16}{\sin 3.814}$ = 240.53... Strut = $\sqrt{150^2 + 240.537..^2}$ = 283.47... **OR** Scale drawings	2.405m by 1.5m Struts = 2.835 m	5	M1 for 16 × 15 (= 240) M1 for $\sqrt{16^2 + 240^2}$ A1 for 240.5 cm (2.405 m) or better M1 for $\sqrt{16^2 + 240^2 + 150^2}$ A1 for 2.83 m or better **OR** B1 for $\tan^{-1}$ (1 ÷ 15) = 3.184° M1 for $\frac{16}{\sin 3.814}$ A1 for 240.5 cm (2.405m) or better M1 for $\sqrt{150^2 + 240.537..^2}$ A1 for 2.83 m or better **OR** Scale drawings: B1 for ramp length > 240 cm B1 for 2.83 or better
					Total for Question: 5 marks
20	(a)		64.85	1	B1 accept $64.84\dot{9}$
	(b)	$D = \frac{64.85}{0.195^3}$ = 8746	8750 kg/m^3	4	M1 Volume = '19.5'^{3} M1 Density $D = \frac{'64.85'}{'0.195'^3}$ A1 correct values A1 8750 or better
					Total for Question: 5 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
21		Let the population be reduced by n% each day Decay factor = $\frac{100 - n}{100}$ 1000 × $\frac{100 - n}{100} \times \frac{100 - n}{100}$ = 800 $(100 - n)^2$ = 8000 $100 - n$ = 89.4427… n = 10.5573.. After 7 days, 1000 × (0.894427…)^7 **OR** Trial and Improvement: 1000 × 0.9 × 0.9 = 810 too high 1000 × 0.8 × 0.8 = 640 too low 1000 × 0.85 × 0.85 = 722.5 too low 1000 × 0.88 × 0.88 = 774.4 too low 1000 × 0.89 × 0.89 = 792.1 too low 1000 × 0.895 × 0.895 = 801.025 too high 1000 × 0.894 × 0.894 = 799.236 too low 1000 × 0.8945 × 0.8945 = 800.13 After 7 days, 1000 × (0.8945)^7 **OR** $l_n \frac{800}{1000} = 2k$ $2k$ = −0.223 so k = −0.1115 After 7 days, population = 1000$e^{-0.1115\times7}$	458	5	M1 for introducing a fully defined decay factor M1 for 1000 × $\frac{100 - n}{100} \times \frac{100 - n}{100}$ = 800 A1 for n = 10.5573.. or equivalent, eg 89.44…% M1 for 1000 × (0.894427…)^7 A1 for 457 or 458 **OR** M1 for any trial evaluated and compared with 800 M1 for trials above and below (too high and too low) A1 for 0.8945 or better M1 for 1000 × (0.8945)^7 A1 for 457 or 458 **OR** M1 for introducing a fully defined decay factor (k) M1 for $l_n \frac{800}{1000} = 2k$ A1 for k = −0.1115 M1 for 1000$e^{-0.1115\times7}$ A1 for 457 or 458
					Total for Question: 5 marks

5AM2H					
Question		**Working**	**Answer**	**Mark**	**Additional Guidance**
22 **QWC (ii, iii)** **FE**		Male risk 0.25 × 60/100 × 289 + 0.25 × 40/100 × 1753 = 218.65 Female risk 0.35 × 70/100 × 518 + 0.35 × 30/100 × 1189 = 251.755	Male R = £218.65 Female R = £251.76 Females are the greater risk	5	M1 for 0.25 × 60/100 × 289 + 0.25 × 40/100 × 1753 OR 0.35 × 70/100 × 518 + 0.35 × 30/100 × 1189 M1 for 0.25 × 60/100 × 289 + 0.25 × 40/100 × 1753 OR 0.35 × 70/100 × 518 + 0.35 × 30/100 × 1189 A1 for 218.65 and 251.76 (accept 251.755) B1 for units, ie £ associated with each risk C1 ft for '251.76' > '218.65', so females are the greater risk oe **QWC: For C1, Decision should be supported by working, and calculations should be clear and attributable.**
					Total for Question: 5 marks

March 2010