



Rewarding Learning

General Certificate of Secondary Education
2022

Centre Number

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Candidate Number

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Mathematics

Unit M2
(With calculator)
Foundation Tier



[GMC21]
TUESDAY 24 MAY, 9.15am–11.00am

GMC21

TIME

1 hour 45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page. **You are provided with Foundation Tier Additional Support Materials for use with this paper.**

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all twenty-seven** questions.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

Functional Mathematics is assessed in this unit.

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

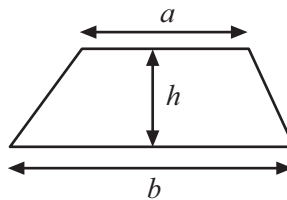
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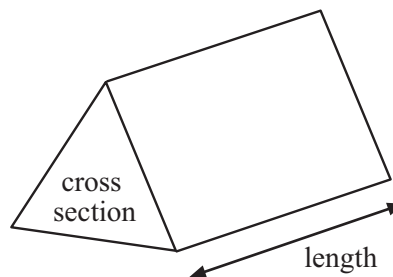
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Formula Sheet

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



Volume of prism = area of cross section \times length



- 1 (a) The warmest place in the world is in Ethiopia.

It has an average temperature of 34°C .



Source: © Getty Images

The coldest place in the world is in Antarctica.

It has an average temperature of -58°C .



Source: © Getty Images

What is the difference between these temperatures?

Answer _____ $^{\circ}\text{C}$ [1]

- (b) The formula below can be used to convert between temperatures in Celsius and Fahrenheit.

$$F = 1.8C + 32$$

where F is the temperature in Fahrenheit and C is the temperature in Celsius.

The average temperature in Northern Ireland is 8°C .

- (i) Convert this temperature into Fahrenheit.

Answer _____ $^{\circ}\text{F}$ [2]

- (ii) Water freezes at 32°F .

What temperature is this in Celsius?

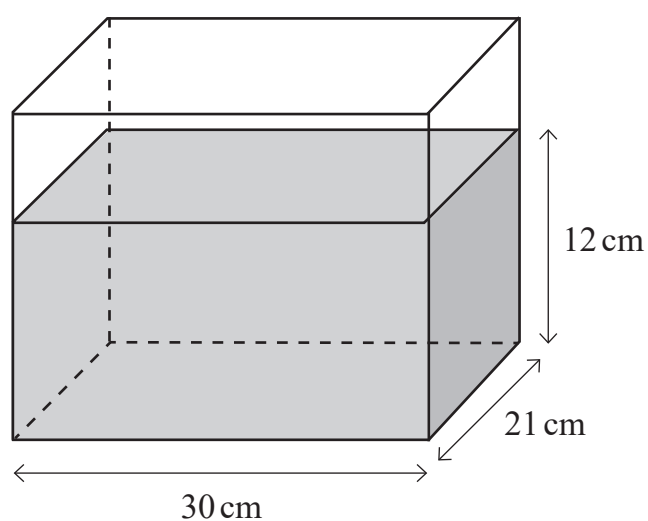
Answer _____ $^{\circ}\text{C}$ [1]

[Turn over]



- 2 A chip shop keeps gravy in a tin.

The tin is a cuboid.



- (a) What is the volume of gravy in the tin?

Include units with your answer.

Answer _____ [3]

- (b) The gravy is sold in 120 ml tubs.

How many tubs can be filled using the gravy in the tin?

Answer _____ [2]



- 3 (a) Priya earns £11.158 per hour.

Write this amount in pounds (£) correct to the nearest penny.

Answer £ _____ [1]

- (b) Diesel costs 131.9p per litre.

Write this amount in pounds (£) correct to the nearest penny.

Answer £ _____ [1]

- (c) Priya drove 11 760 miles last year.

$\frac{5}{7}$ of the miles driven were for work.

How many miles were for work?

Answer _____ miles [2]

- (d) Priya's firm pays 70% of her car service.

Last year it cost £260 for her car service.

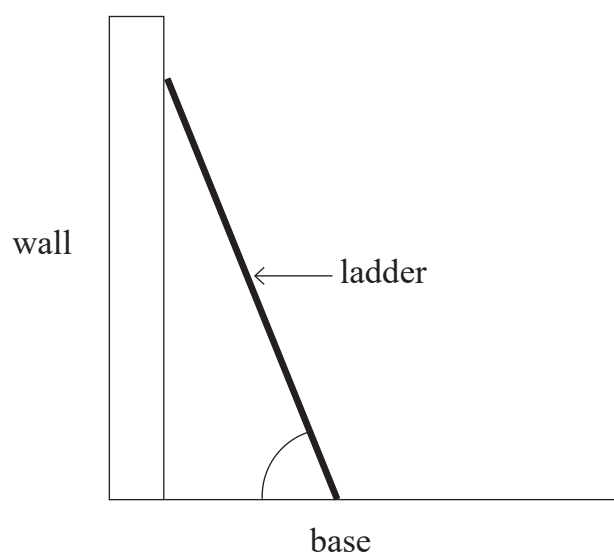
How much did Priya's firm pay?

Answer £ _____ [2]

[Turn over]



- 4 The diagram shows a ladder leaning against a wall.



In order to be safe, the angle at the base of a ladder should be between 72° and 78°

Is this ladder safe?

Explain your answer.

Answer _____ because _____ [2]

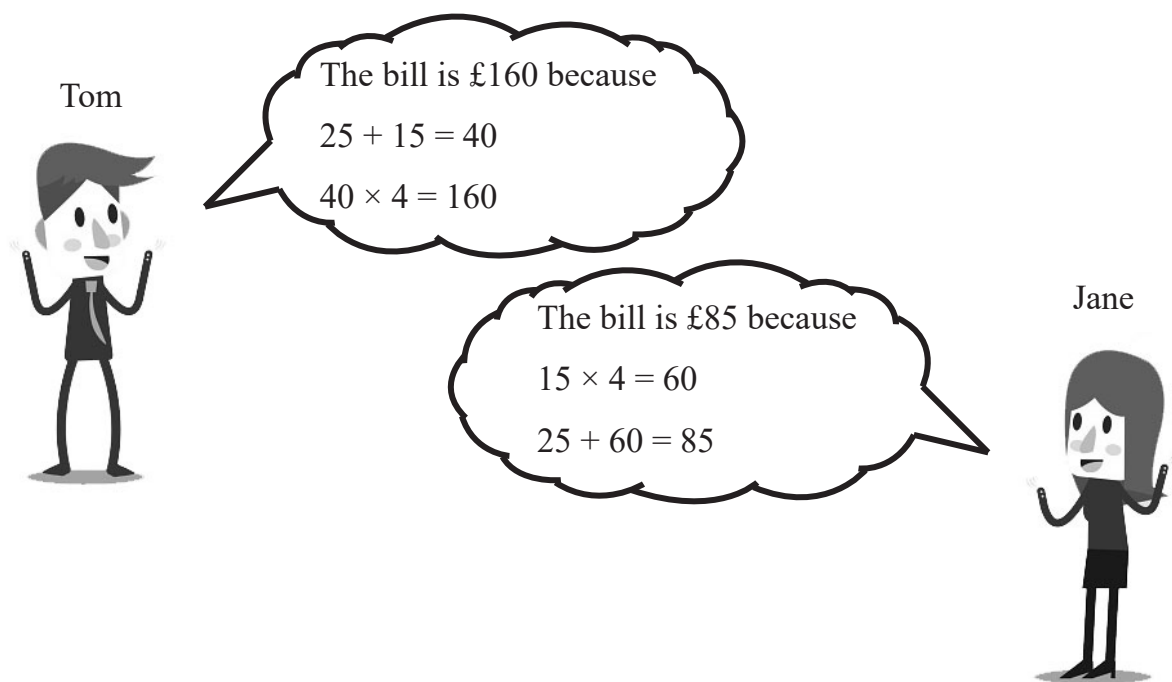


- 5 A plumber charges a callout fee of £25 and an hourly rate of £15

His bill for a 4 hour job is found by working out

$$25 + 15 \times 4$$

Tom thinks the bill is £160 and Jane thinks it is £85



Source: © Getty Images

- (a) Who is correct and why?

Answer _____ because _____
[2]

- (b) The plumber has taps for sale with 10% off.

How much would be saved on a tap costing £12.50?

Answer £ _____ [1]

[Turn over]



6 The weights, in kg, of members of a rowing crew are

92.4

91.7

93.5

96.2

88.9

94.1

(a) Calculate the mean weight of the members.

Answer _____ kg [3]

(b) Work out the range of the weights.

Answer _____ kg [1]

(c) The manager of the rowing crew says

“I cannot find the median weight of my crew because there are 6 of them, so none of their weights can be the middle value.”

Is the manager correct?

Answer _____ because _____

_____ [1]





Source: © Getty Images

Belfast Zoo has 120 different species of animals.

One quarter of the species are birds.

40% of the species are mammals.

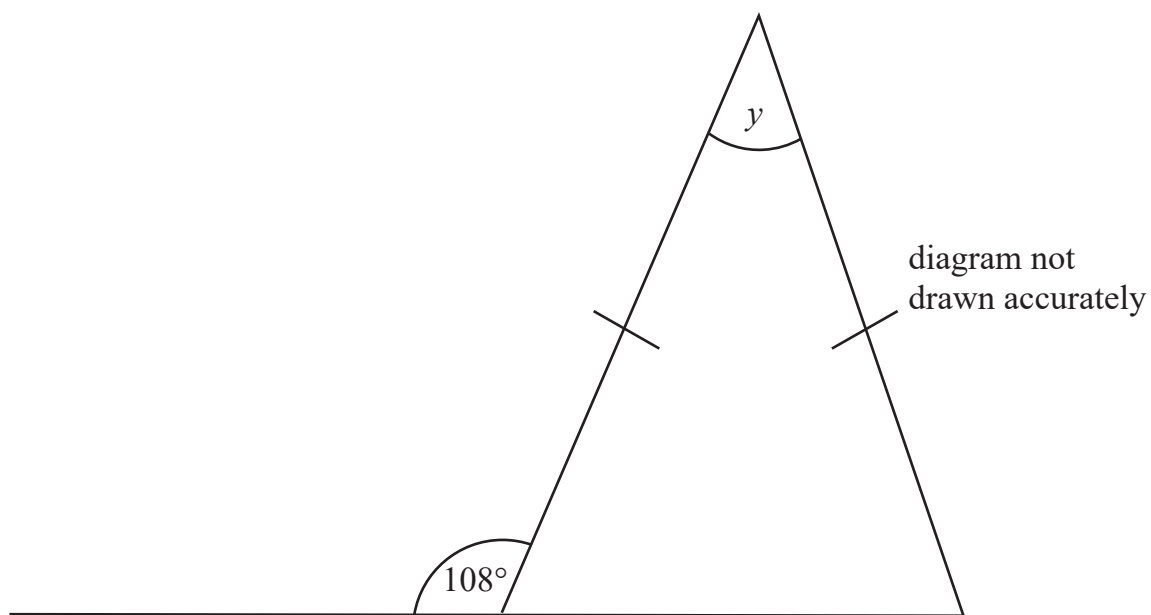
What **fraction** of the species are neither birds nor mammals?

Answer _____ [4]

[Turn over]



- 8 Work out the size of angle y in the diagram below.



Answer $y =$ _____ $^{\circ}$ [3]



9 (a) Which of these is correct?

Circle the answer.

$$2^3 = 6$$

$$3^3 = 81$$

$$5^3 = 125$$

[1]

(b) (i) Calculate 8.5^3

Answer _____ [1]

(ii) Round this answer to 1 significant figure.

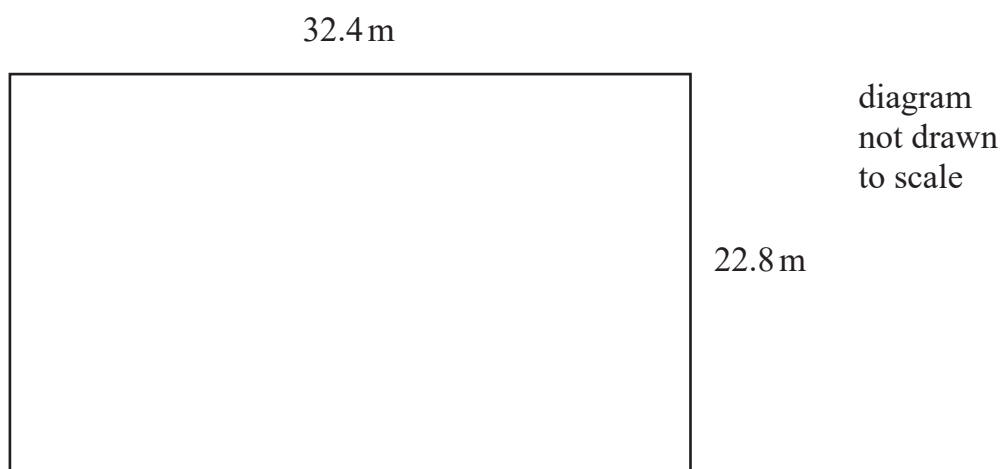
Answer _____ [1]

[Turn over]



- 10 A building firm needs to put fencing around the perimeter of a rectangular site.

The dimensions of the site are shown in the diagram.



- (a) Calculate the total perimeter of the site.

Answer _____ m [1]

- (b) Each section of fencing is 180 cm wide.

How many sections are needed to go around the perimeter of the site?

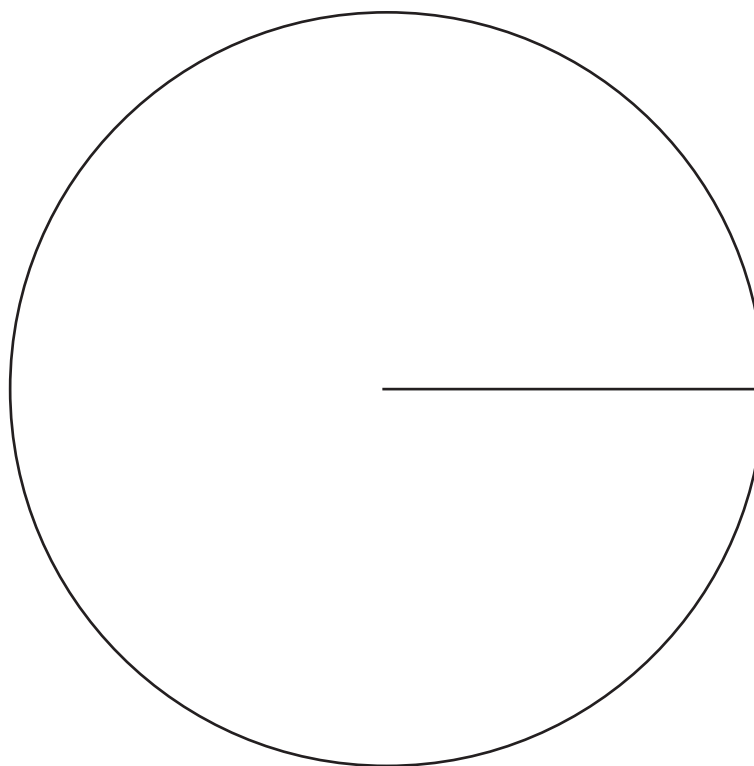
Answer _____ [2]



11 The table below shows how an organisation spent its annual budget.

Spending area	£ (millions)	
Health	21	
Education	12	
Welfare	11	
Pensions	28	

Draw a labelled pie chart to show this information.



[4]

[Turn over



12 Debbie earns £9.50 an hour.

She is paid **double time** for overtime.

Robbie earns £12 an hour.

He is paid overtime at a rate of **time and a half**.

They both worked 6 hours on Saturday at their normal rate and 2 hours overtime.

Who earned more and how much more?

Answer _____ earned £ _____ more [3]



13 A club shop sold T-shirts and polo shirts in sizes small, medium and large.

They sold

- 4 small T-shirts
- 9 large polo shirts
- 8 medium T-shirts
- a total of 21 polo shirts
- a total of 11 small items
- a total of 15 large items

Use this information to complete the two-way table below.

	T-shirt	Polo shirt	Total
Small			
Medium			
Large			
Total			

[3]

[Turn over



14 Clare buys some buns and a gift box for them.

The buns cost 55p each.

The gift box costs 80p.

She pays with a £10 note and receives £2.60 change.

How many buns did Clare buy?

Show all your working.

Answer _____ [3]



15 Jenny has p paintbrushes and c crayons.

- (a) Kev has twice as many paintbrushes and three times as many crayons as Jenny.

Write an expression for Kev's total, in terms of p and c .

Answer _____ [1]

- (b) Lily has the same number of paintbrushes and three-quarters of the number of crayons that Jenny has.

Write an expression for Lily's total, in terms of p and c .

Answer _____ [1]

- (c) Dan has 3 fewer paintbrushes and 4 more crayons than Jenny.

Write an expression for Dan's total, in terms of p and c .

Give your answer in its simplest form.

Answer _____ [1]

[Turn over]



- 16 20 patients were asked how many weeks they had been waiting for an appointment to see a consultant.

Their answers were

38	15	4	3	56
42	28	21	39	12
8	17	47	58	43
30	16	34	29	39

Display these results in a stem and leaf diagram.

[3]



17 In a class, 3 of the 10 girls wear glasses.

In the same class, 3 of the 18 boys wear glasses.

What percentage of the class wear glasses?

Give your answer correct to 2 decimal places.

Answer _____ % [3]



18 Gail wants to do some research into people's spending on food.

(a) She decides to use the following question in her survey.

How much money do you spend on food?

£0–10 ☐ £20–30 ☐ £40–50 ☐ over £50 ☐

Give two possible reasons why people may be confused by this question.

Reason 1 _____

Reason 2 _____
_____ [2]

(b) Gail decides to survey 10 people.

Why might this lead her to make unreliable conclusions?

Answer _____ [1]



19 I spent $2\frac{1}{2}$ hours on my homework last night.

One third of that time was spent on Geography and half of the time spent on Geography was on map work.

What **fraction** of my homework time was spent on map work?

Answer _____ [3]

20 Solve $5(p - 3) = 20$

Answer $p =$ _____ [3]

[Turn over]

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- 21 The diagram shows a “figure of 8” shaped race track, which has a semi-circular section at either end.

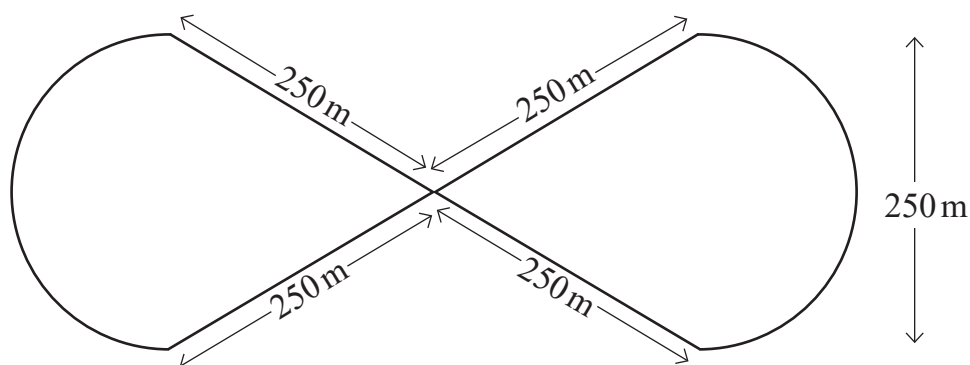


diagram
not drawn
accurately

- (a) Calculate the total distance travelled during one complete lap of the track.

Answer _____ m [3]



(b) A horse runs 2000 metres at an average speed of 14.5 m/s.

How long does this take?

Give your answer in minutes and seconds, to the nearest second.

Answer _____ minutes _____ seconds [3]



22 Shares were bought with an original value of £1600

The value increased by 5% each year.

Calculate the value after three years.

Answer £ _____ [3]



23 P is the smallest number which has prime factors of 2, 3 and 5

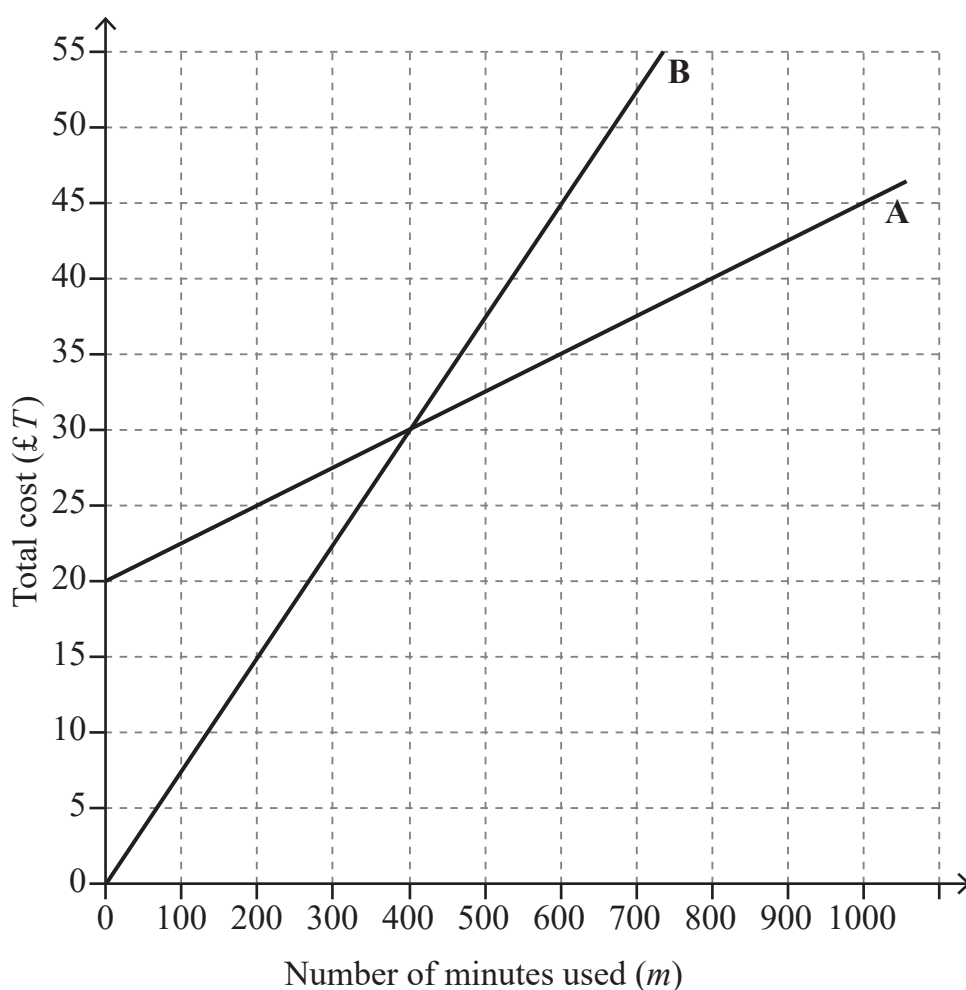
Q is the number 24

Work out the LCM (lowest common multiple) of P and Q.

Answer _____ [3]



24 The graph below illustrates two different monthly tariffs, A and B, for a mobile phone.



(a) Max uses 200 minutes per month.

Which tariff is cheaper for him and by how much?

Answer Tariff _____ is cheaper by £ _____ [1]



(b) Tariff A has a fixed charge per month plus a charge per minute for phone calls.

(i) What is the fixed charge per month?

Answer £ _____ [1]

(ii) What is the charge per minute?

Answer _____ p [2]

(iii) Hence write a formula for the total cost T of tariff A for m minutes.

Answer _____ [2]

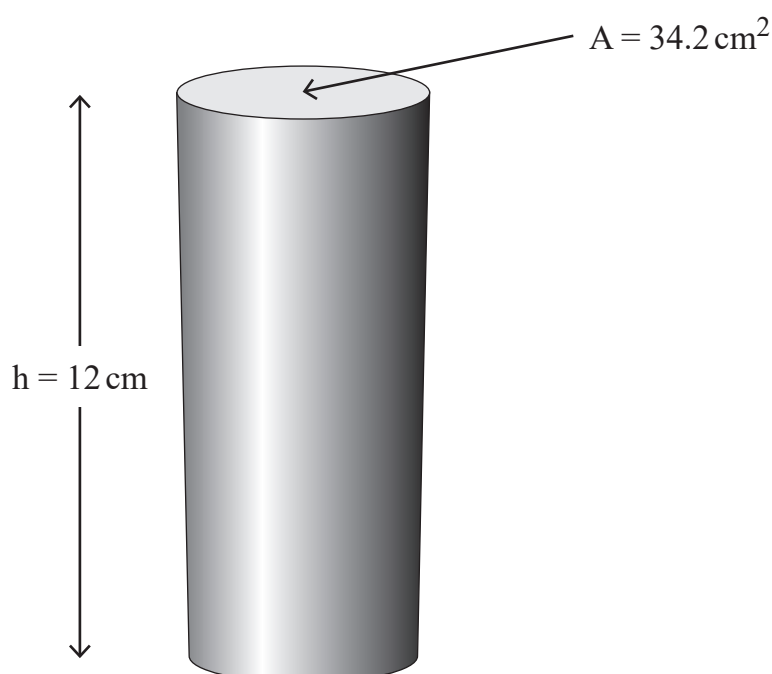
[Turn over]



25 A solid cylinder has a height of 12 cm and a circular cross-sectional area of 34.2 cm^2

The density is 0.83 g/cm^3

Find the mass of the cylinder.



Answer _____ g [3]



26 The number of flights delayed at an airport were recorded over a 24-hour period.

The number of minutes they were delayed is shown in the table below.

Minutes delayed (t)	Number of flights		
$0 < t \leq 20$	31		
$20 < t \leq 40$	19		
$40 < t \leq 60$	10		
$60 < t \leq 80$	14		
$80 < t \leq 100$	12		
$100 < t \leq 120$	6		

(a) Calculate an estimate for the mean number of minutes the flights were delayed.

Answer _____ minutes [4]

(b) Write down the modal class interval.

Answer _____ [1]

(c) Write down the class interval in which the median lies.

Answer _____ [1]

[Turn over]



27 Two cyclists start from the same location.

One cyclist travels due North at an average speed of 22 km/h and the other travels due East at an average speed of 26 km/h.

How far apart are the cyclists after 2 hours?

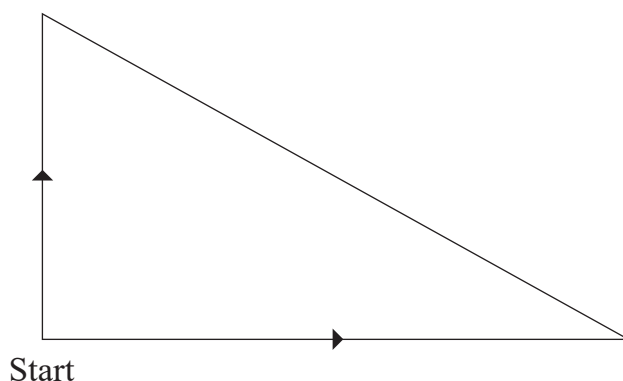


diagram
not drawn
accurately

Answer _____ km [4]

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Question Number	Marks
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Examiner Number

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Rewarding Learning

**General Certificate of Secondary Education
Summer 2022**

GCSE Mathematics

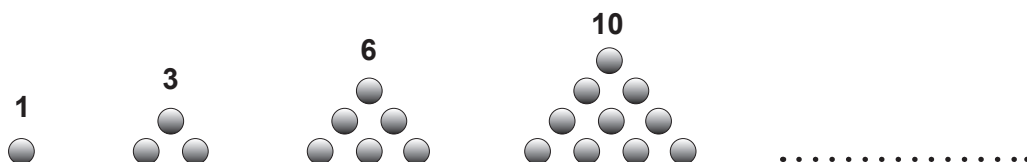
FOUNDATION TIER ADDITIONAL SUPPORT MATERIALS (For use in Summer 2022)

FOUNDATION TIER ADDITIONAL SUPPORT MATERIALS (Summer 2022)

Numbers

Lowest common multiple (LCM): The lowest common multiple is the lowest multiple shared by 2 or more numbers.

Triangular numbers – are a pattern of numbers which form triangles. Each number in the sequence adds a new row of dots to the triangle.



Trial and Improvement

This is a method of trying different values in an equation until you get a suitable solution (e.g to 1 decimal place).

Measures

Conversion from metric to imperial units

$$1 \text{ kg} = 2.2 \text{ pounds (lb)}$$

Metric units

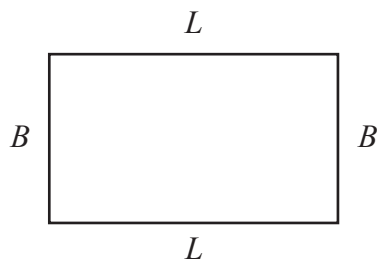
$$1 \text{ ml} = 1 \text{ cm}^3$$

Compound Measures

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Average Speed} = \frac{\text{Distance}}{\text{Time}}$$

Perimeter and Volume



The perimeter of a rectangle is the distance around the outside of the rectangle. It is found by adding the lengths of the 4 sides of the rectangle.

$P = 2L + 2B$ where P is perimeter, L is length and B is breadth.

The volume of a cuboid is found by multiplying the length by the breadth by the height of the cuboid.

$V = L \times B \times H$ where V is volume, L is length, B is breadth and H is height.

The circumference (perimeter) of a circle is $C = 2\pi r$ where r is the radius of the circle. An alternative formula is $C = \pi d$ where d is the diameter of the circle.

Geometry and Angles

There are 180° on a straight line.

There are 180° inside a triangle.

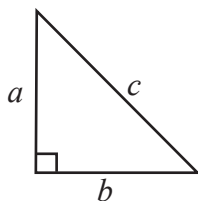
An isosceles triangle is a triangle with 2 equal sides and 2 equal angles.

The sum of all the angles inside a polygon is given by $180(n - 2)$ where n is the number of sides in the polygon.

Pythagoras' Theorem

If a , b and c are the sides of a right angled triangle shown below, then

$$a^2 + b^2 = c^2$$



Range

The range of a set of data is the difference between the largest value and the smallest value in the data set.

Mean

The mean of a set of data is the sum of all the data values divided by the number of data values.

Estimate for the mean of a grouped frequency distribution

Estimated mean = sum of (mid interval values multiplied by their frequency) divided by the sum of all the frequencies.

Pie Chart

In a pie chart, the total angle that corresponds to the entire data set is 360°

Probability

The sum of the probabilities of all outcomes equals 1