Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2020

Mathematics

StemUp Model Solution

Unit M2
(With calculator)
Foundation Tier



[GMC21]

GMC21

MONDAY 13 JANUARY, 9.15am–11.00am

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 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-eight** 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.

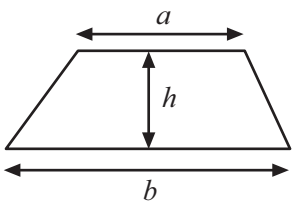
INFORMATION FOR CANDIDATES

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.

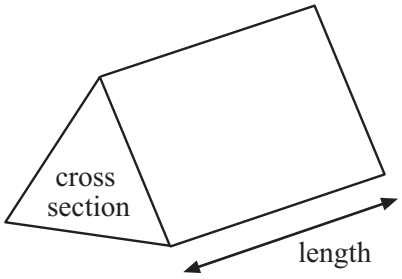
12506

Formula Sheet

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



Volume of prism = area of cross section × length



12506

1 The table shows information about eight different cameras.

Name of camera	Price (£)	Weight (g)	Battery life (shots)	Resolution (megapixels)	Touchscreen
Tinon 10	479	460	260	24	Yes
Tinon 20	605	510	400	28	No
Fiji F1	345	390	366	12	No
Fiji F2	380	360	450	18	Yes
Nika N400	750	625	300	20	No
Nika N500	879	775	365	24	No
Olympia OL	399	375	240	16	Yes
Olympia OM	549	390	275	20	No

Stan wants to buy a camera with

a resolution of at least 20 megapixels and

a weight under 500 g.

Write down the names of the two cameras that he could buy.

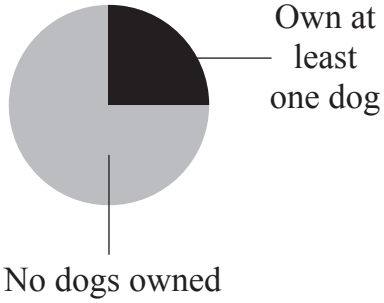
Answer Tinon 10 and Olympia OM [1]

[Turn over

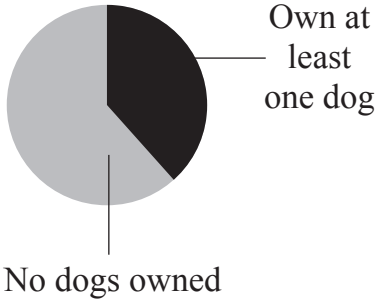
2 The pie charts show the proportion of households in the UK in 2017 that owned dogs.

The number of households in each country is also shown.

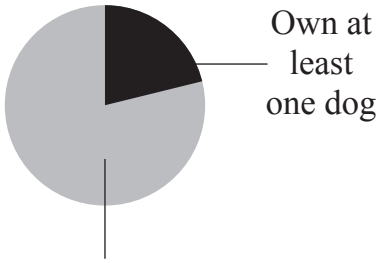
England
(22 million households)



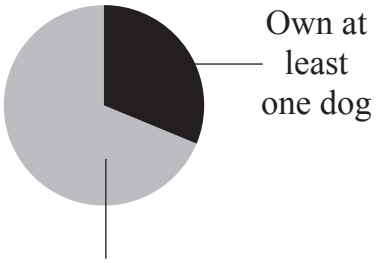
Northern Ireland
(800 000 households)



Scotland
(2.4 million households)



Wales
(1.3 million households)



(a) What percentage of households in England own at least one dog?

one quarter of the circle: 100 ÷ 4 = 25

Answer 25 % [1]

(b) About what fraction of households in Wales own at least one dog?

Answer $\frac{1}{3}$ [1]

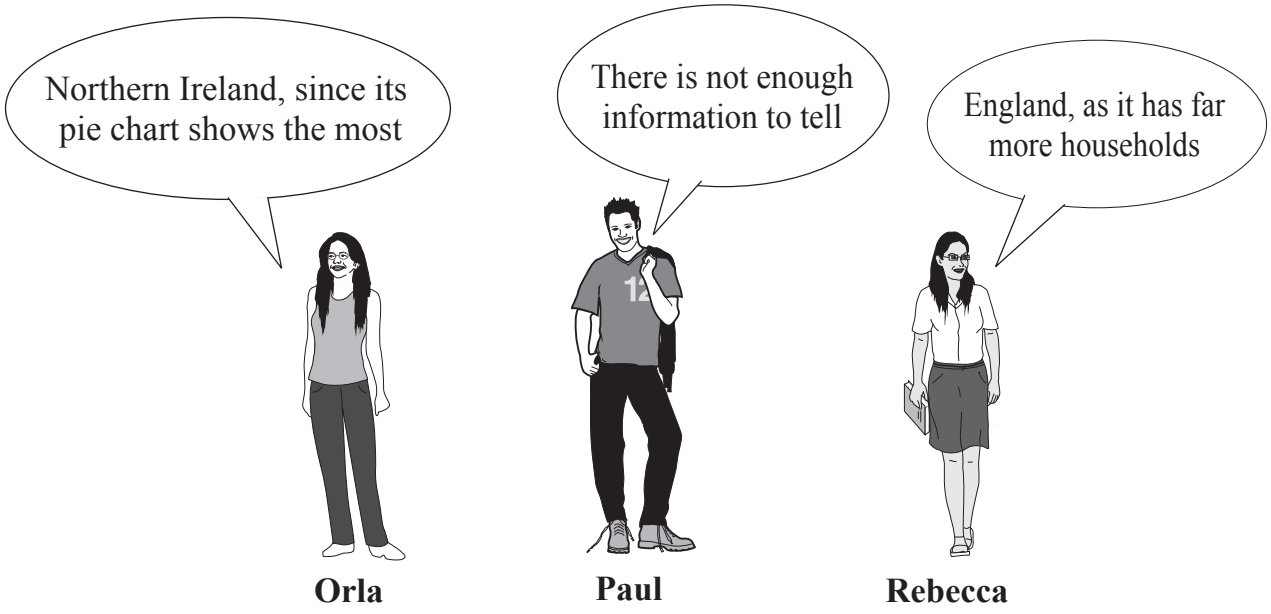
(c) $\frac{3}{8}$ of the households in Northern Ireland own at least one dog.

How many households is this?

800 000 ÷ 8 = 100 000
100 000 × 3 = 300 000

Answer 300 000 households [1]

(d) Three friends were asked which country in the UK has the most households owning dogs.



Circle the person you agree with.

Orla Paul (Rebecca)

[1]

[Turn over

3 Below are some of Denzel's school exam results.

English $\frac{13}{20}$

Maths $\frac{46}{50}$

Science $\frac{7}{10}$

LLW $\frac{21}{25}$

(a) Write Denzel's English result as a percentage.

13 ÷ 20 = 0.65
0.65 × 100 = 65%

Answer 65 % [1]

(b) Put his results in order, starting with his **highest** result.

You must show all your working.

English: 13 ÷ 20 = 0.65 = 65%
Maths: 46 ÷ 50 = 0.92 = 92%
Science: 7 ÷ 10 = 0.7 = 70%
LLW: 21 ÷ 25 = 0.84 = 84%
Order: 92%, 84%, 70%, 65%

Answer Maths , LLW , Science , English [3]

↑
highest

4 **(a)** What is the value of the digit 4 in the number 3.04?

Circle the correct answer.

$\frac{4}{10}$ 40 4 400 $\frac{4}{100}$

[1]

(b) Put these decimals in order of size, starting with the **smallest**.

3.024 3.1 3.24 3.124

Answer 3.024 , 3.1 , 3.124 , 3.24 [1]

↑
smallest

5 Ciara bought four burgers.

She paid with a £20 note and got £6 change.

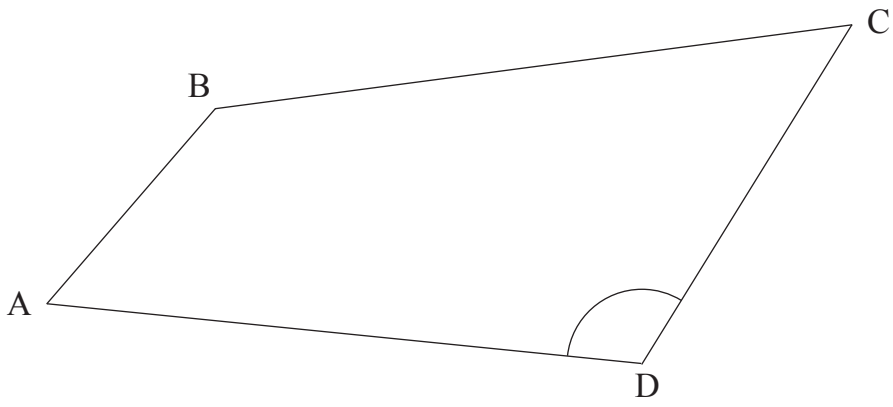
How much did each burger cost?

20 − 6 = £14 spent
14 ÷ 4 = 3.5

Answer £ 3.50 [2]

[Turn over

6



(a) Measure the length of the line BC in mm.

BC = 8.5 cm = 85 mm

Answer 85 mm [2]

(b) Measure the size of angle CDA.

Answer 116 ° [1]

7 Insert the correct symbol in each box below.

$<$ $>$ $=$

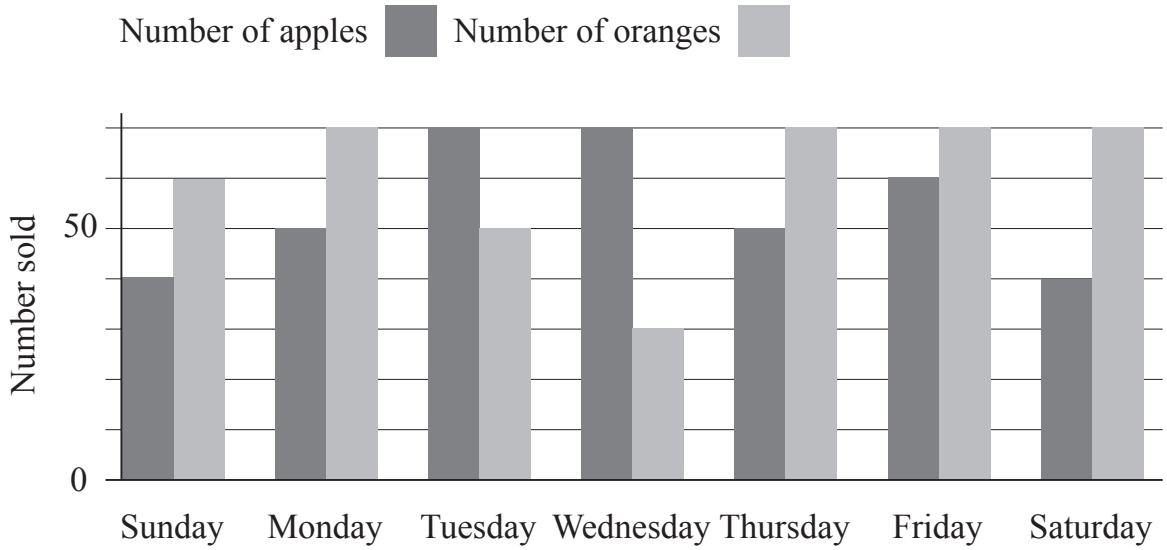
(a) 375 mm	=	37.5 cm	375 mm = 37.5 cm
(b) 600 g	<	6 kg	6 kg = 6000 g
(c) 27 litres	>	26 900 ml	27 litres = 27 000 ml
(d) 310 mins	>	5 hours	5 hours = 300 mins

[4]

[Turn over



8 The dual bar chart shows how many apples and oranges were sold in a fruit shop last week.



The owner says

"I sold 50 more oranges than apples last week."

Is he correct?

You must explain your answer.

Apples: 40 + 50 + 70 + 70 + 50 + 60 + 40 = 380

Oranges: 60 + 70 + 50 + 30 + 70 + 70 + 70 = 420

420 – 380 = 40 more oranges

Answer No because he sold 40 more oranges than apples, not 50 [3]

9 8500 tickets for a concert are sold.

The organisers think that 40% of the ticket holders will turn up more than an hour before the start.

How many ticket holders will this be?

40% = 0.4

0.4 × 8500 = 3400

Answer 3400 [2]

10

Silverside	costs	£4.90 per kg
Topside	costs	£5.75 per kg
Fillet	costs	£13.00 per kg

Martin buys 4.5 kg of Fillet.

He also buys some Silverside.

The total cost is £92.31

How much Silverside does he buy?

Fillet: 4.5 × 13.00 = £58.50

Silverside: 92.31 − 58.50 = £33.81

33.81 ÷ 4.90 = 6.9 kg

Answer 6.9 kg [4]

[Turn over

11 **(a)** Calculate the value of $\frac{2}{0.4^2}$

$0.4^2 = 0.4 \times 0.4 = 0.16$

$2 \div 0.16 = 12.5$

Answer 12.5 [2]

(b) Calculate the cube of 6

$6 \times 6 \times 6 = 216$

Answer 216 [1]

(c)

36	1	19	49	10	39	15	31

From the numbers in the list, write down all the

(i) prime numbers,

Answer 19, 31 [1]

(ii) square numbers.

Answer 1, 36, 49 [1]

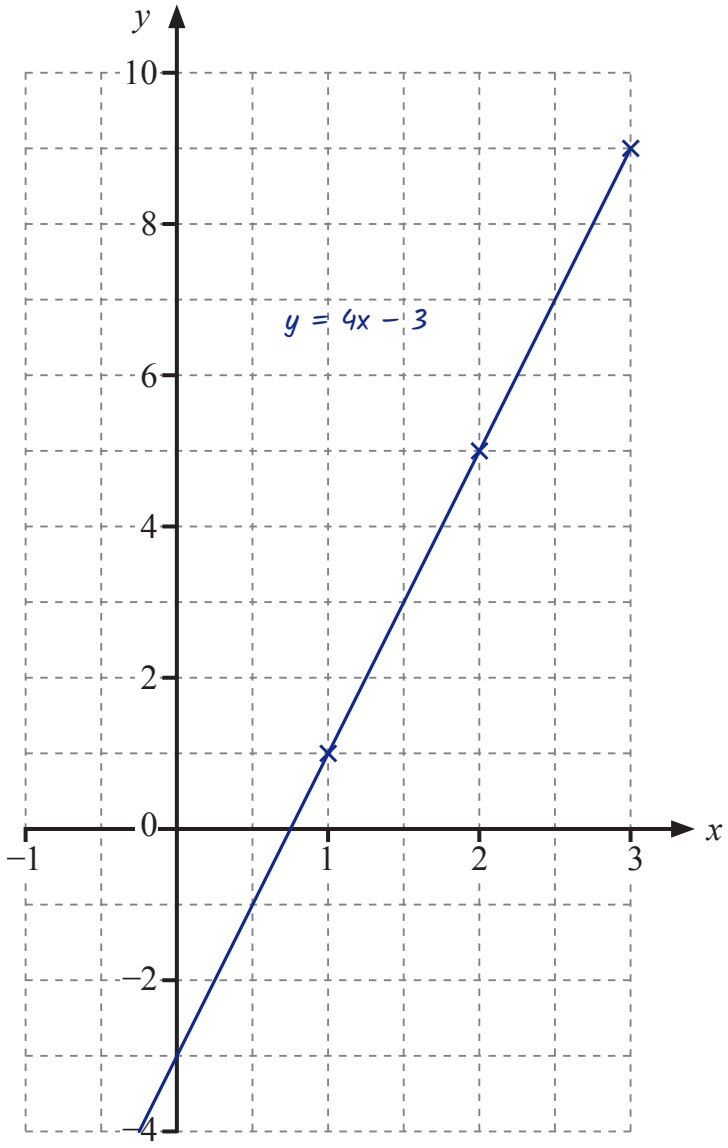
stemup.co.uk

12 **(a)** Complete the table below for $y = 4x - 3$

x	1	2	3
y	1	5	9

[1]

(b) Draw the line $y = 4x - 3$ on the grid below



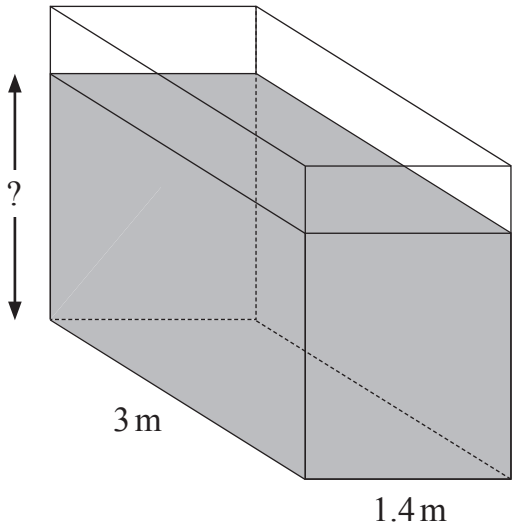
[2]

[Turn over

13 A tank is in the shape of a cuboid, as shown below.

The tank is used to store $11.13\,m^3$ of liquid.

How deep is the liquid in the tank?



Area of base = 3 × 1.4 = 4.2 m^2

Depth = 11.13 ÷ 4.2

= 2.65

Answer 2.65 m [3]

14 Work out the size of the angle marked x in the diagram below.

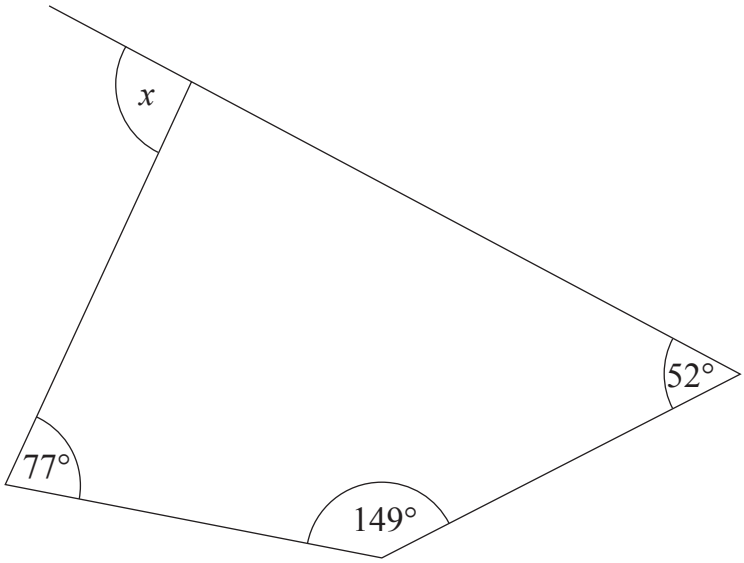


diagram not
drawn accurately

Angles in a quadrilateral add up to 360°
360 − (77 + 149 + 52) = 360 − 278 = 82°
Angles on a straight line add up to 180°
x = 180 − 82 = 98°

Answer 98 ° [3]

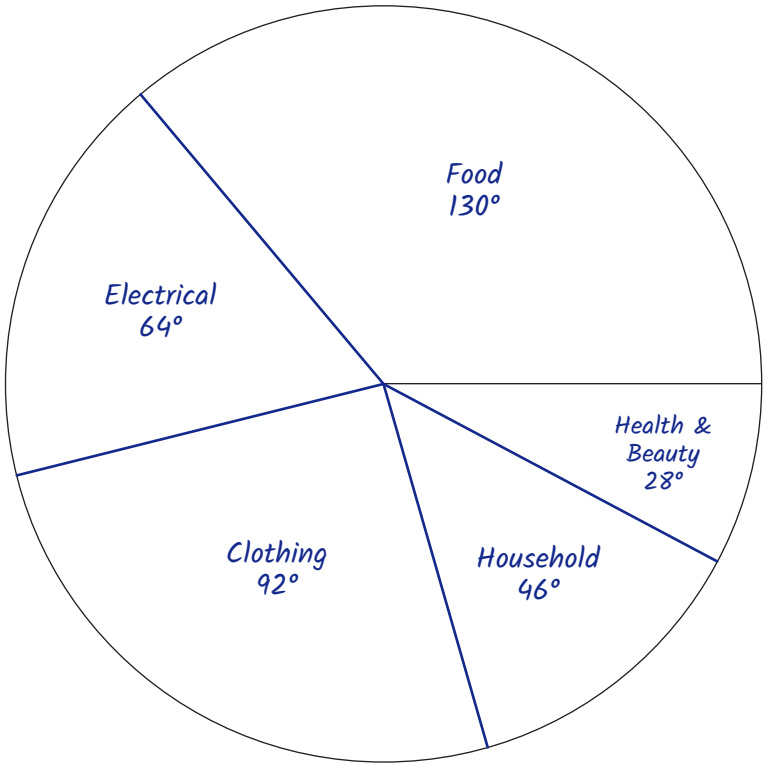
[Turn over

15 The total sales figures for a supermarket one month are shown below.

Department	Total Sales (£1000s)	Angle (× 2)
Food	65	65 × 2 = 130°
Electrical	32	32 × 2 = 64°
Clothing	46	46 × 2 = 92°
Household	23	23 × 2 = 46°
Health & Beauty	14	14 × 2 = 28°

Draw a pie chart to show this information.

Total = 180, 360 ÷ 180 = 2



[4]

16 A hotel has single, twin and family rooms.

It offers room only, bed and breakfast (B&B) or half board.

On Saturday night, all the rooms in the hotel were booked.

Some information is shown in this two-way table.

	Room only	**B&B**	**Half board**	
Single	2	1	*1*	4
Twin	*4*	4	3	*11*
Family	1	*3*	6	10
	7	*8*	*10*	*25*

How many rooms are in the hotel?

Twin total = 4 + 4 + 3 = 11

Total rooms = 4 + 11 + 10 = 25

Answer *25* [3]

[Turn over

17 Streetwise Youth Club has 86 members.

59 of the members attended last week.

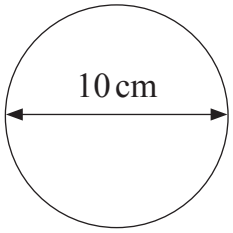
What percentage attended last week?

Give your answer to 1 decimal place.

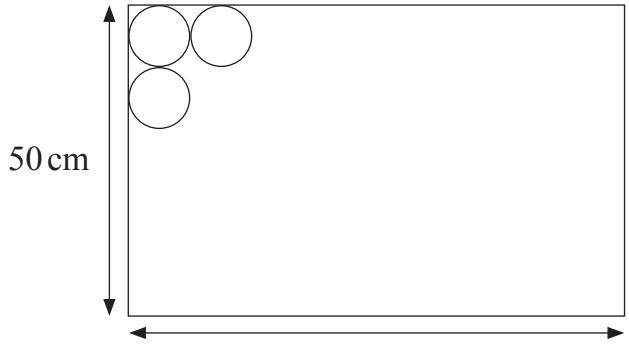
59 ÷ 86 × 100
= 68.6046...
= 68.6% (1 d.p.)

Answer 68.6 % [3]

18 Circles with diameter 10 cm are cut from a sheet of plastic as shown below.



diagrams not drawn accurately



(a) Calculate the area of each circle.

radius = 10 ÷ 2 = 5 cm

Area = π × 5^2 = 78.5398...

Answer 78.5 cm^2 [2]

(b) How many circles can be cut from the sheet of plastic?

1 m = 100 cm

100 ÷ 10 = 10 across, 50 ÷ 10 = 5 down

10 × 5 = 50

Answer 50 [2]

(c) What is the area of the plastic left over after the maximum number of circles have been cut out?

Sheet = 100 × 50 = 5000 cm^2

Circles = 50 × 78.5398... = 3926.99...

5000 − 3926.99... = 1073.009...

Answer 1073.0 cm^2 [3]

[Turn over

19 Julie works on a market stall.
One Saturday she has 42 boxes of candles to sell.
Each box cost her £2.40
There are 18 candles in each box.

During the day she sells 34 boxes at £3.60 each.
In the last hour she starts to sell the remaining candles individually at 35p each.

At the end of the day she has only 12 candles left.
Calculate the profit she made that day.

Cost: 42 × £2.40 = £100.80

Boxes sold: 34 × £3.60 = £122.40

Boxes left: 42 − 34 = 8

Candles left: 8 × 18 = 144

Candles sold: 144 − 12 = 132

132 × 35p = 4620p = £46.20

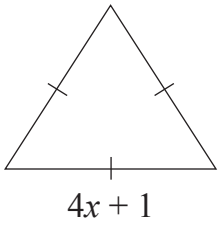
Takings: 122.40 + 46.20 = £168.60

Profit: 168.60 − 100.80 = £67.80

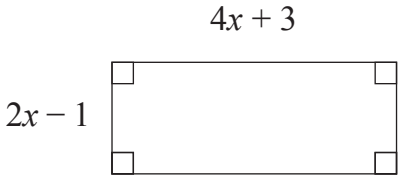
Answer £ 67.80 [6]

20 Which of these shapes has the greatest perimeter?

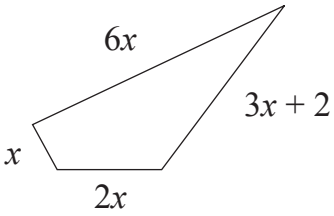
Show all your working.



Shape A



Shape B



Shape C

A: $3 \times (4x + 1) = 12x + 3$

B: $2(4x + 3) + 2(2x - 1) = 8x + 6 + 4x - 2 = 12x + 4$

C: $6x + (3x + 2) + 2x + x = 12x + 2$

$12x + 4$ is the greatest, so Shape B

Answer Shape _____B_____ [4]

[Turn over

21 A shop sells 80 gift vouchers valued at £5, £10, £20, £50 or £100
The table shows the number of each sold one weekend.

Price of gift voucher	Number of vouchers sold	Price × Number
£5	34	5 × 34 = 170
£10	26	10 × 26 = 260
£20	9	20 × 9 = 180
£50	7	50 × 7 = 350
£100	4	100 × 4 = 400

The shopkeeper states "on average people spend at least £15 on a gift voucher".

By finding all three averages (mode, median, mean), which average makes her statement correct?

Mode = £5 (most vouchers sold: 34)

Median: 80 values, so the 40th and 41st values

34 + 26 = 60, so both are £10. Median = £10

Mean = (170 + 260 + 180 + 350 + 400) ÷ 80

= 1360 ÷ 80 = £17

Mean £17 ≥ £15, mode £5 and median £10 < £15

Answer the mean because mean = £17, which is at least £15, but the mode (£5) and median (£10) are both less than £15 [5]

22 BMI (Body Mass Index) is calculated using the formula

$$\text{BMI} = \frac{w}{h^2}$$

where w = weight in kilograms and h = height in metres.

Mark has a BMI of 22
His height is 1.83 m.

Calculate his weight.

$22 = \frac{w}{1.83^2}$

$w = 22 \times 1.83^2$

$w = 22 \times 3.3489 = 73.6758$

Answer 73.7 kg [2]

23 Solve $5(3x - 2) = 7x + 4$

$15x - 10 = 7x + 4$

$15x - 7x = 4 + 10$

$8x = 14$

$x = 14 \div 8 = 1.75$

Answer $x =$ 1.75 [3]

[Turn over

24 **(a)** Find the highest common factor (HCF) of 24 and 40

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

Factors of 40: 1, 2, 4, 5, 8, 10, 20, 40

HCF = 8

Answer 8 [2]

(b) Write down two numbers, greater than 1, which have a lowest common multiple (LCM) of 48

Multiples of 16: 16, 32, 48

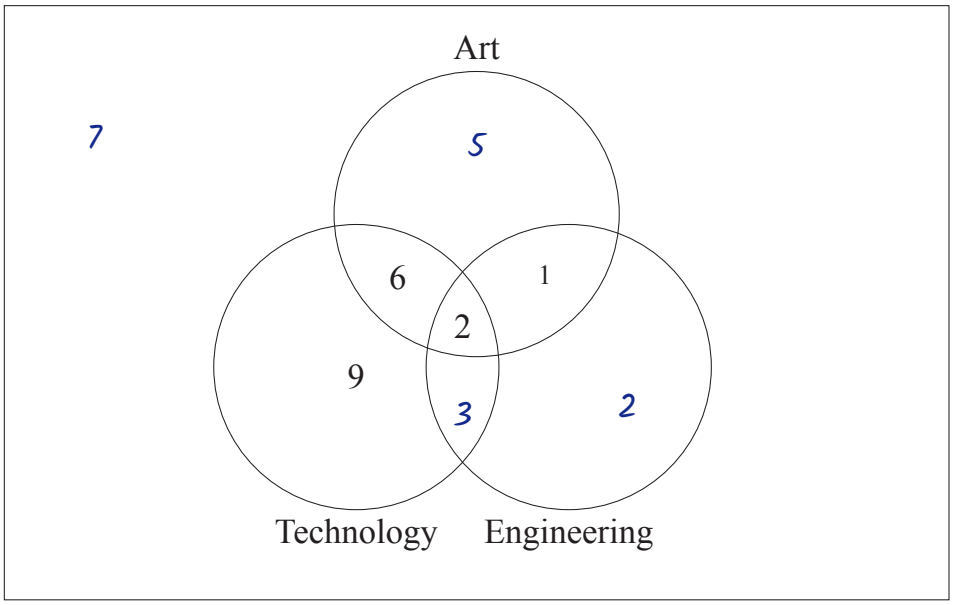
Multiples of 3: 3, 6, ..., 45, 48

LCM = 48

Answer 3 , 16 [2]

25 There are 35 students in a Form Class.
Some students study Art, some study Technology, some study Engineering and some study a combination of these subjects.
Some study none of these subjects.

The Venn diagram shows some information about the number of students studying the subjects.



5 students study Technology and Engineering.
14 students study Art.
8 students study Engineering.

T and E only: 5 − 2 = 3
Art only: 14 − 6 − 2 − 1 = 5
E only: 8 − 1 − 2 − 3 = 2
None: 35 − 28 = 7

(a) Use this information to complete the Venn diagram. [4]

(b) Use the Venn diagram to calculate what percentage of Technology students also study Art but not Engineering.

Technology = 6 + 2 + 9 + 3 = 20
6 ÷ 20 × 100 = 30

Answer 30 % [2]

[Turn over

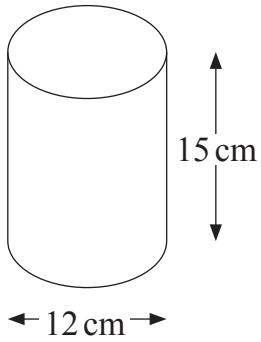
26 Work out the midpoint of the line PQ joining P(4, −6) and Q(8, 2).

x: (4 + 8) ÷ 2 = 6

y: (−6 + 2) ÷ 2 = −2

Answer (6 , −2) [2]

27 Calculate the volume of a cylinder with diameter 12 cm and height 15 cm.



radius = 12 ÷ 2 = 6 cm

$V = \pi \times 6^2 \times 15$

= 1696.460...

Answer 1696.46 cm^3 [2]

28 A badge is made from a triangle and three-quarters of a circle as shown.

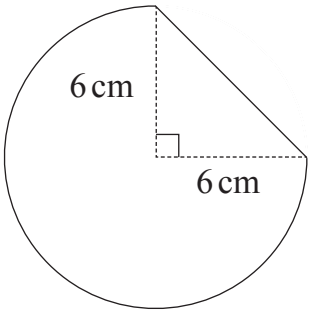


diagram not
drawn accurately

Work out the perimeter of the badge.

Circumference = $2 \times \pi \times 6 = 37.699...$

Arc = $\frac{3}{4} \times 37.699... = 28.274...$

Hypotenuse^2 = $6^2 + 6^2 = 72$

Hypotenuse = $\sqrt{72} = 8.485...$

Perimeter = $28.274... + 8.485... = 36.759...$

Answer 36.76 cm [6]

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Question Number	**Marks**
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Examiner Number

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