Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Mathematics

StemUp Model Solution

Unit M2
(With calculator)
Foundation Tier



[GMC21]

GMC21

TUESDAY 21 MAY, 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-five** 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.

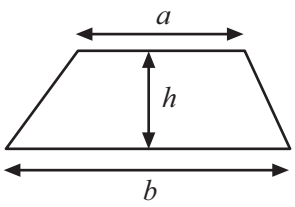
INFORMATION FOR CANDIDATES

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.

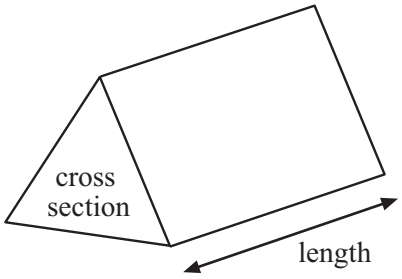
11936

Formula Sheet

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



Volume of prism = area of cross section × length



1 **(a)** Four fifths of 2900 bus journeys left on time.

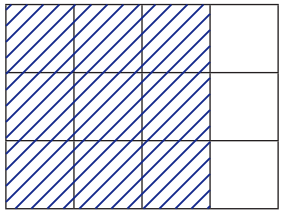
How many journeys left on time?

2900 ÷ 5 = 580
580 × 4 = 2320

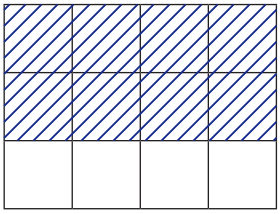
Answer 2320 journeys [2]

(b) Which fraction, $\frac{3}{4}$ or $\frac{2}{3}$, is larger?

The grids can be used to explain your answer.



3/4 = 9/12



2/3 = 8/12

Answer $\frac{3}{4}$ is larger because 3/4 = 9/12 (9 squares) but 2/3 = 8/12 (8 squares), and 9/12 is more than 8/12 [2]

(c) Sara says $\frac{3}{4} + \frac{2}{3} = \frac{5}{7}$

Tanya says $\frac{3}{4} + \frac{2}{3} = \frac{17}{24}$

Una says $\frac{3}{4} + \frac{2}{3} = \frac{17}{12}$

Which girl is correct? $\frac{3}{4} + \frac{2}{3} = \frac{9}{12} + \frac{8}{12} = \frac{17}{12}$

Answer Una [1]

[Turn over

2 Tickets for a show are priced as shown:

Adult £14	Senior Citizen £8	Child £5

Mrs Evans spent £57 on 6 tickets.

She bought 1 Child ticket.

How many Adult and Senior Citizen tickets did she buy?

£57 − £5 (child) = £52 for the other 5 tickets
Try 2 adult and 3 senior citizen:
2 × £14 = £28
3 × £8 = £24
£28 + £24 = £52 ✓

Answer Adult 2

Senior Citizen 3 [3]

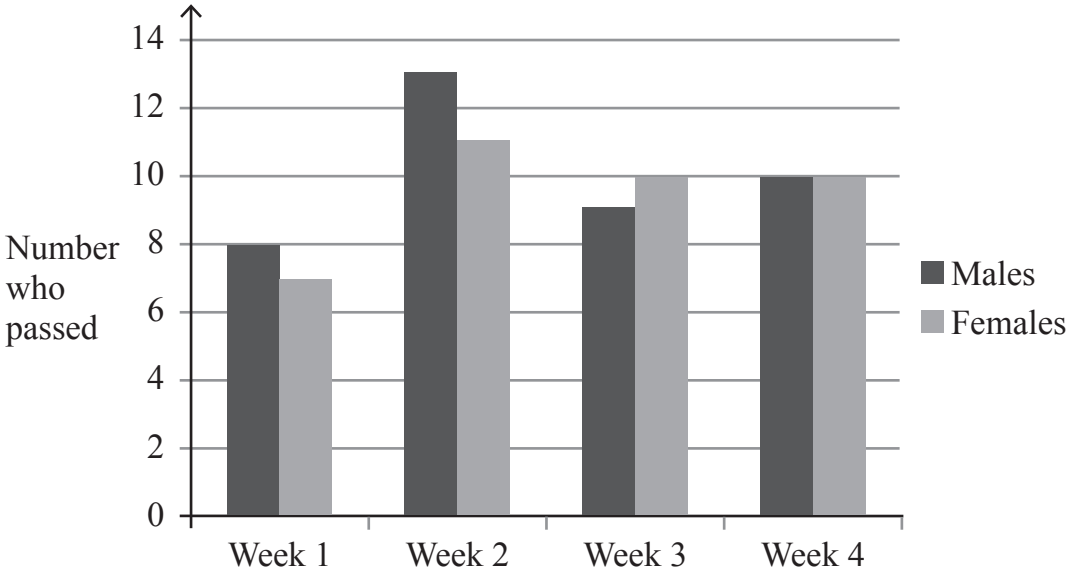
3 Insert < or > or = in the boxes to make each statement correct.

20% $\frac{1}{5}$ [<] 25%

30% 0.3 [>] 3%

[2]

4 A driving instructor recorded the number of males and females who passed their driving test.



(a) How many more males than females passed their driving test in Week 2?

13 − 11 = 2

Answer 2 [1]

(b) The driving instructor says "Those who pass their test are more likely to be female than male."

Does the data in the bar chart support this statement?

Give a reason for your answer.

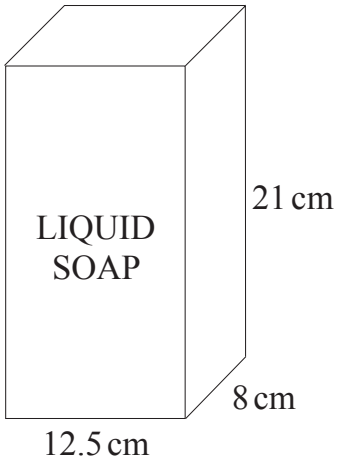
Males: 8 + 13 + 9 + 10 = 40
Females: 7 + 11 + 10 + 10 = 38

Answer No because 40 males passed but only 38 females passed, so more males than females passed [2]

[Turn over

5 Each soap dispenser in a restaurant is in the shape of a cuboid.

The measurements are shown in the diagram below.



(a) Work out the volume of the soap dispenser.

State the units of your answer.

Volume = 21 × 8 × 12.5
= 2100

Answer 2100 cm^3 [3]

(b) The manager of the restaurant buys 15 litres of liquid soap.

How many soap dispensers will he be able to fill?

15 litres = 15 000 cm^3
15 000 ÷ 2100 = 7.142857...
so 7 full dispensers

Answer 7 [2]

6 **(a)** Simplify $2c + 5e + 8c - 2e$

$2c + 8c = 10c, \quad 5e - 2e = 3e$

Answer $10c + 3e$ [2]

(b) Solve $w + 13 = 27$

$w = 27 - 13$

Answer $w =$ 14 [1]

(c) Solve $\frac{m}{3} = 15$

$m = 15 \times 3$

Answer $m =$ 45 [1]

(d) Given that $t = 4$ and $r = 7$

find the value of $5t - 2r$

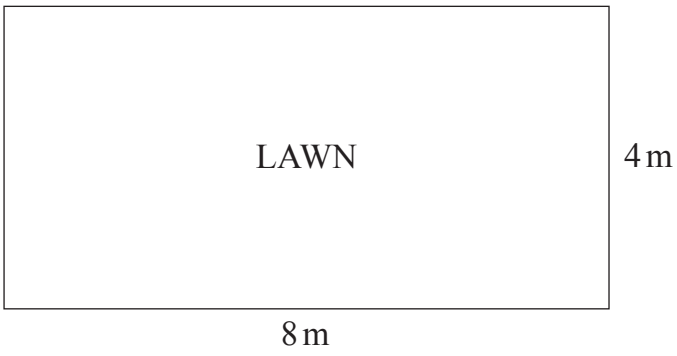
$5 \times 4 - 2 \times 7$
$= 20 - 14$

Answer 6 [2]

[Turn over

7 Jim, who runs a gardening business, cuts the grass on lawns.

The measurements of one lawn are shown in the diagram below.



Jim charges £2 per square metre for cutting grass.

How much does he charge to cut the grass on the lawn?

Area = 8 × 4 = 32 m^2
Cost = 32 × £2 = £64

Answer £ 64 [2]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

8 Gary asked some people how many times they went to the cinema last month.

Number of times	Number of people
Less than 3	0
3	5
4	11
5	8
6	6
More than 6	0

(a) How many people did he ask?

$5 + 11 + 8 + 6 = 30$

Answer 30 [1]

(b) Draw a fully labelled pie chart to show the information in the table.

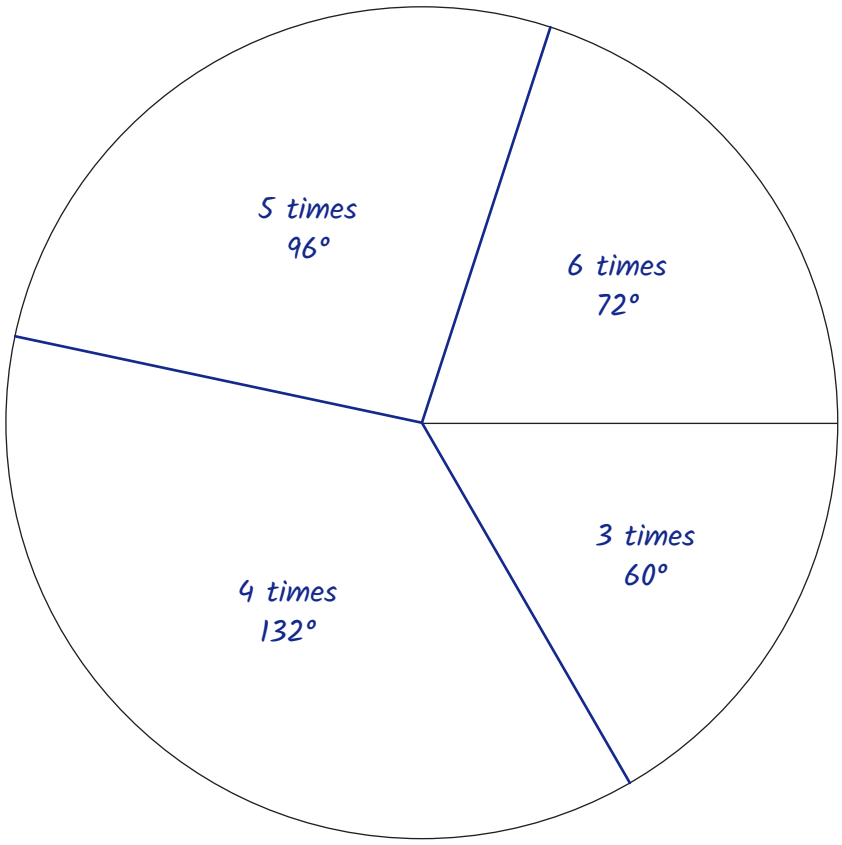
$360 \div 30 = 12°$ each

3: $5 \times 12 = 60°$

4: $11 \times 12 = 132°$

5: $8 \times 12 = 96°$

6: $6 \times 12 = 72°$



[4]

stemup.co.uk

(c) What was the modal number of times for these people?

4 times has the most people (11)

Answer 4 [1]

(d) How many times did these people go in total?

(3 × 5) + (4 × 11) + (5 × 8) + (6 × 6)
= 15 + 44 + 40 + 36
= 135

Answer 135 [2]

[Turn over

9 Steven wants to get a T-shirt printed for each member of his running club.

The printer charges a fee of £25 to set up the machine.

He then charges £1.20 per T-shirt for the printing.

The total bill from the printer was £67

How many people are in the running club?

£67 − £25 = £42
£42 ÷ £1.20 = 35

Answer 35 [3]

10 Jenny opens a "Charity Bank Account". Any interest gained goes to a local charity.

It pays 2% per annum simple interest.

She puts £1500 into the account.

She does not make any deposits or withdrawals.

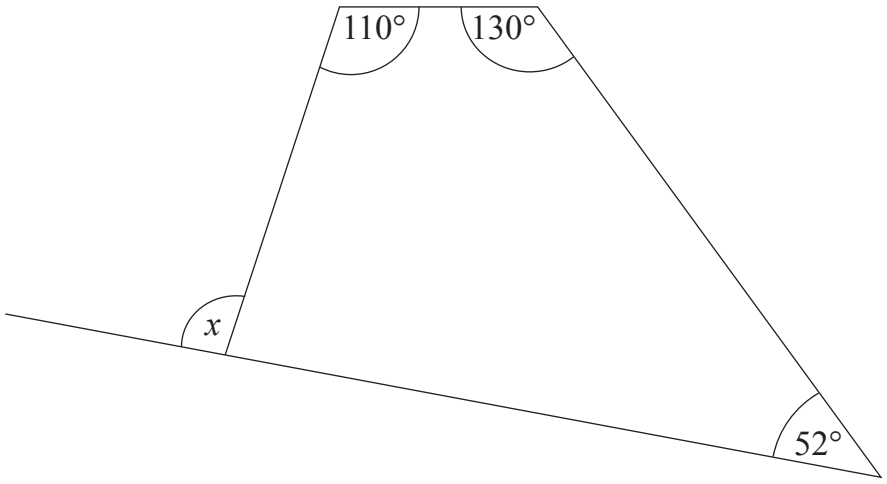
How much interest will the charity have received after 3 years?

2% of £1500 = 0.02 × 1500 = £30 per year
3 × £30 = £90

Answer £ 90 [3]

[Turn over

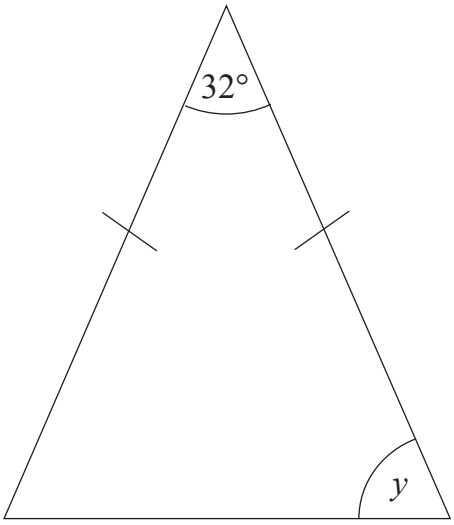
11 (a) Work out the size of the angle x in the diagram below.



Angles in a quadrilateral add up to 360°
360 − (110 + 130 + 52) = 360 − 292 = 68°
Angles on a straight line add up to 180°
x = 180 − 68 = 112°

Answer 112 ° [3]

(b) Work out the size of the angle y in the diagram below.



Isosceles triangle, so the base angles are equal
$y = (180 - 32) \div 2$
$= 148 \div 2 = 74°$

Answer 74 ° [2]

[Turn over

12 Peter buys mince and potatoes.

Mince costs £6 per kg.

Peter buys 3.2 kg of mince and 1.8 kg of potatoes.

The total cost is £20.46

How much does it cost for 1kg of potatoes?

Mince: 3.2 × £6 = £19.20
Potatoes: £20.46 − £19.20 = £1.26
1 kg potatoes: £1.26 ÷ 1.8 = £0.70

Answer 70 p [4]

13 Holly did three exams.

Her results were:

Geography	28 out of 40
Music	16 out of 25
English	34 out of 50

Her Mum says "English was your best subject."

Is her Mum right?

You must show your working and explain your answer.

Geography: 28 ÷ 40 × 100 = 70%

Music: 16 ÷ 25 × 100 = 64%

English: 34 ÷ 50 × 100 = 68%

Answer No because Geography 70% is higher than English 68%

so Geography was her best subject, not English [3]

[Turn over

14 The price of a sofa was £880

It is reduced by 35%.

Joanna says "The sofa now costs only £570"

Is she correct? Explain your answer.

35% of £880 = 35/100 × 880 = £308

£880 − £308 = £572

No, she is not correct. The sofa now costs £572,

not £570.

[3]

15 Mr Jackson's car insurance is £840

He can either:

pay the full amount within seven days and receive 5% discount
or
pay by direct debit, which will cost 8% more.

The direct debit is paid in 12 equal monthly amounts.

(a) If he chooses direct debit, how much will his monthly payment be?

8% of £840 = 0.08 × 840 = £67.20
£840 + £67.20 = £907.20
£907.20 ÷ 12 = £75.60

Answer £ 75.60 [3]

(b) How much extra will he pay if he chooses the direct debit instead of paying in full within seven days?

5% of £840 = 0.05 × 840 = £42
Pay in full: £840 − £42 = £798
Extra: £907.20 − £798 = £109.20

Answer £ 109.20 [2]

[Turn over

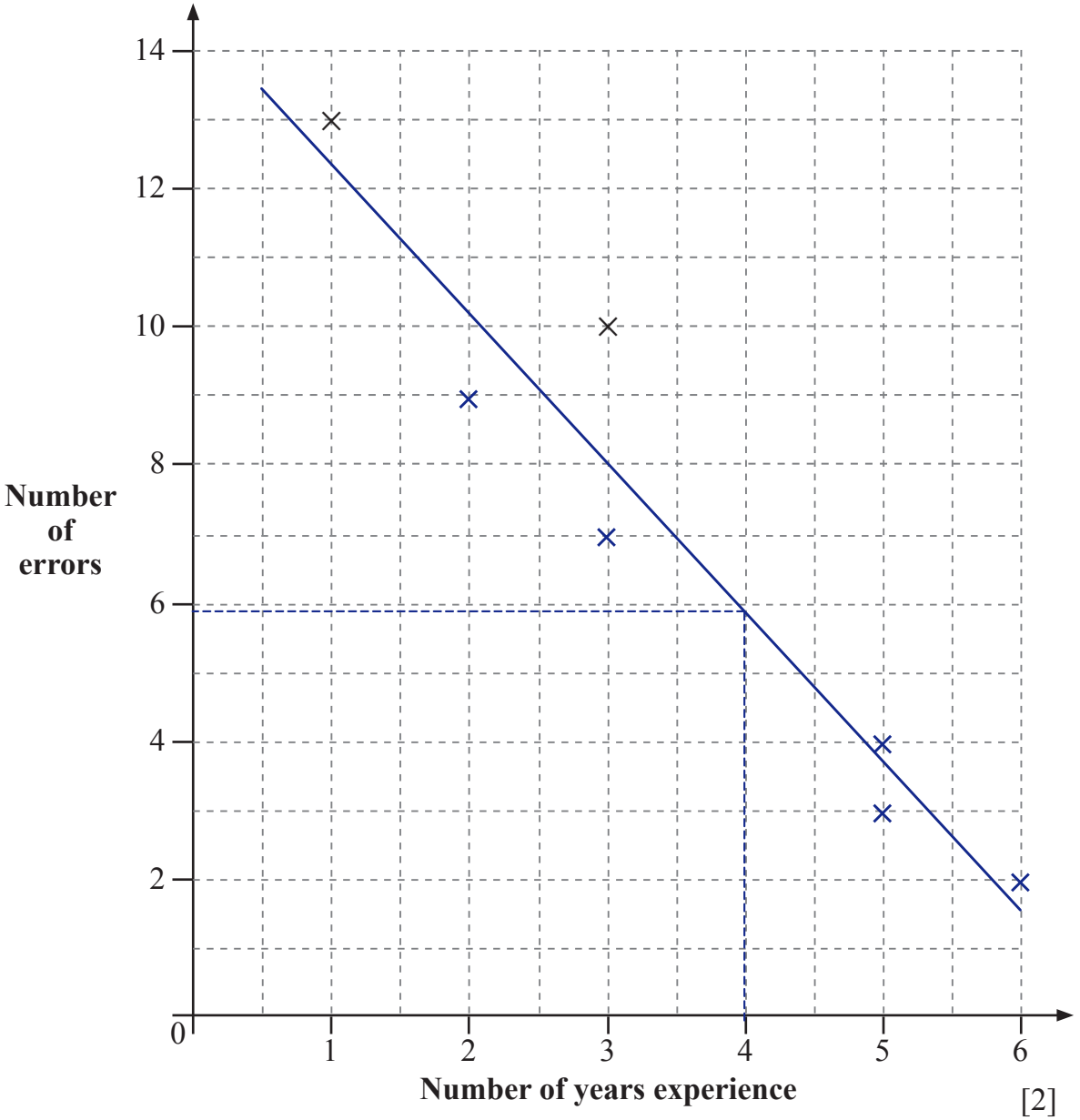
16 Seven rugby matches were watched to see how many errors the referee made.

The number of years experience for each referee is also shown.

Referee	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Number of years experience	**3**	**1**	5	2	6	5	3
Number of errors made	**10**	**13**	4	9	2	3	7

(a) Plot this information on the scatter graph below.

The first two points have been done for you.



[2]

(b) Draw a line of best fit. [1]

(c) Use your line of best fit to estimate the number of errors made by a referee with four years experience.

Answer 6 [1]

[Turn over

17 Alice has five cards each with a number on them. Three of the numbers are shown.

3	8	5	5	9

The mode of the five numbers on the cards is 5

The mean of the five numbers on the cards is 6

Work out the range of the five numbers on the cards.

You must show your working.

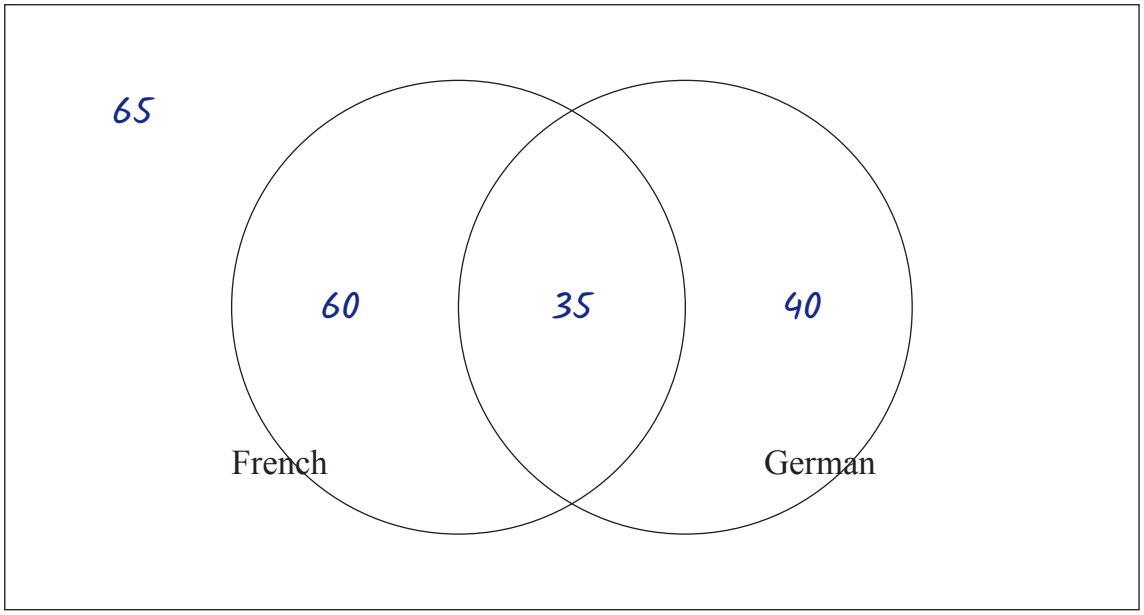
Mode is 5, so one missing card must be 5
Mean 6, so total = 5 × 6 = 30
Last card = 30 − (3 + 8 + 5 + 5) = 30 − 21 = 9
Numbers: 3, 5, 5, 8, 9
Range = 9 − 3 = 6

Answer 6 [4]

18 In Year 11 there are 200 students.
Students can choose to study French, German, both languages or no language.

95 students study French.
75 students study German.
35 students study both languages.

By completing the Venn diagram below, calculate how many students in Year 11 study no languages.



Both = 35
French only = 95 − 35 = 60
German only = 75 − 35 = 40
No language = 200 − (60 + 35 + 40)
= 200 − 135 = 65

Answer 65 [4]

[Turn over

19

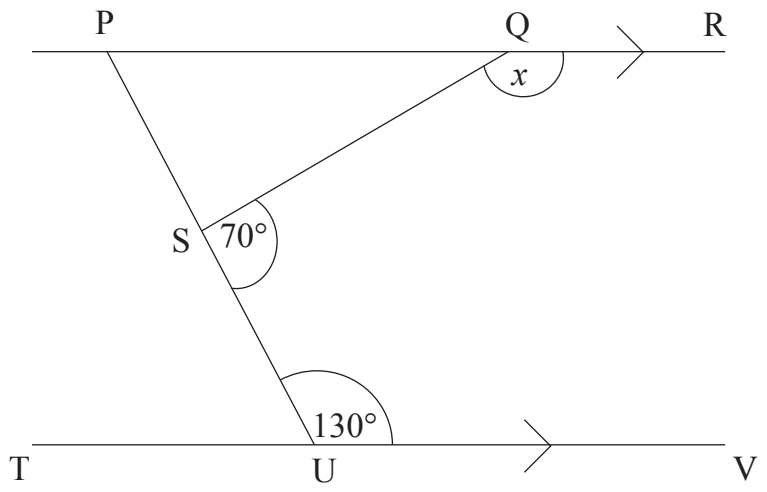


diagram not drawn accurately

PR and TV are parallel lines.

Calculate the size of angle x.

Angle QSP = 180 – 70 = 110° (angles on a straight line)
Angle TUP = 180 – 130 = 50° (angles on a straight line)
Angle QPU = angle TUP = 50° (alternate angles)
Angle PQS = 180 – (50 + 110) = 20° (angles in a triangle)
x = 180 – 20 = 160° (angles on a straight line)

Answer 160 ° [3]

20 The waiting times for patients at a surgery are recorded in the table.

Waiting time t (minutes)	Number of patients	Mid-point	$f \times$ mid
$0 < t \leq 5$	7	2.5	17.5
$5 < t \leq 10$	8	7.5	60
$10 < t \leq 15$	5	12.5	62.5
$15 < t \leq 20$	5	17.5	87.5
$20 < t \leq 25$	4	22.5	90
$25 < t \leq 30$	1	27.5	27.5

Total patients = 30

Total f × mid = 345

Calculate an estimate of the mean waiting time.

$$\text{Mean} = \frac{345}{30} = 11.5$$

Answer 11.5 minutes [4]

21 Expand and simplify

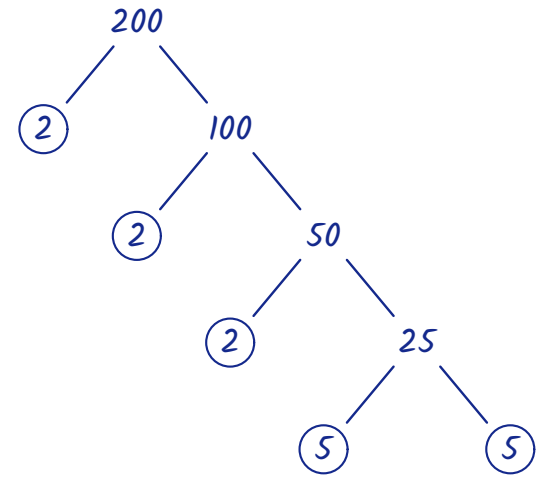
$$4(2x - 3) - 2(x - 5)$$

$$8x - 12 - 2x + 10$$
$$= 6x - 2$$

Answer $6x - 2$ [2]

[Turn over

22 Write 200 as a product of prime factors, using index notation.



$200 = 2 \times 2 \times 2 \times 5 \times 5$

Answer $2^3 \times 5^2$ [3]

23

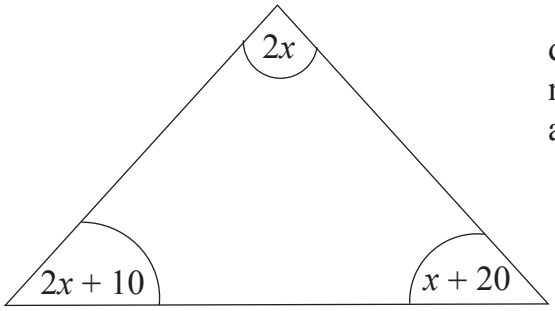


diagram
not drawn
accurately

Form and solve an equation to work out the size of the smallest angle in the triangle above.

Equation $2x + 2x + 10 + x + 20 = 180$ [1]

$5x + 30 = 180$

$5x = 150$

$x = 30$

Angles: $2x = 60°$, $2x + 10 = 70°$, $x + 20 = 50°$

Answer smallest angle = 50 ° [3]

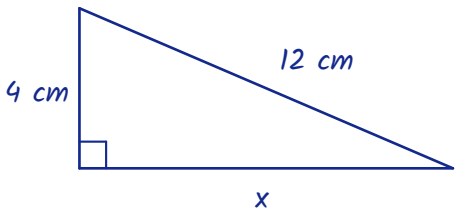
[Turn over

24 The longest side in a right-angled triangle is 12 cm.

One of the shorter sides is 4 cm.

Calculate the perimeter of the triangle.

Give your answer correct to 1 decimal place.



$4^2 + x^2 = 12^2$

$16 + x^2 = 144$

$x^2 = 144 - 16 = 128$

$x = \sqrt{128} = 11.3137...$

Perimeter $= 4 + 12 + 11.3137...$

$= 27.3137...$

$= 27.3$ (1 d.p.)

Answer 27.3 cm [5]

25 **(a)** The price of a TV is increased by 20%.

In a sale this price is decreased by 20%.

By choosing any starting price for the TV, show that the final sale price is lower than the starting price.

Starting price £100
20% increase: 100 × 1.2 = £120
20% decrease: 120 × 0.8 = £96
£96 is lower than £100, so the final sale price is lower

[3]

(b) Calculate the overall percentage decrease.

100 − 96 = 4
4 ÷ 100 × 100 = 4%

Answer 4 % [2]

(c) Would the outcome be the same if the 20% decrease was applied first, followed by the 20% increase? Justify your answer.

Yes, the outcome is the same.
Decrease first: 100 × 0.8 = £80
then increase: 80 × 1.2 = £96
0.8 × 1.2 = 1.2 × 0.8 = 0.96, so it is still a 4% decrease

[2]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.