New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018

Mathematics

StemUp Model Solution

Unit M2 **(With calculator)**
Foundation Tier



[GMC21]

GMC21

THURSDAY 24 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.**
All working should be clearly shown since marks may be awarded for partially correct solutions.
When rounding is necessary give answers to **2 decimal places** unless stated otherwise.
Answer **all twenty-seven** questions.

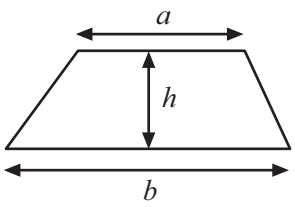
INFORMATION FOR CANDIDATES

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 may use a calculator.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

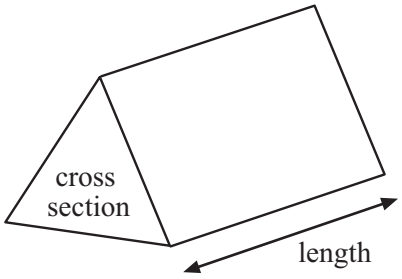
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Formula Sheet

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

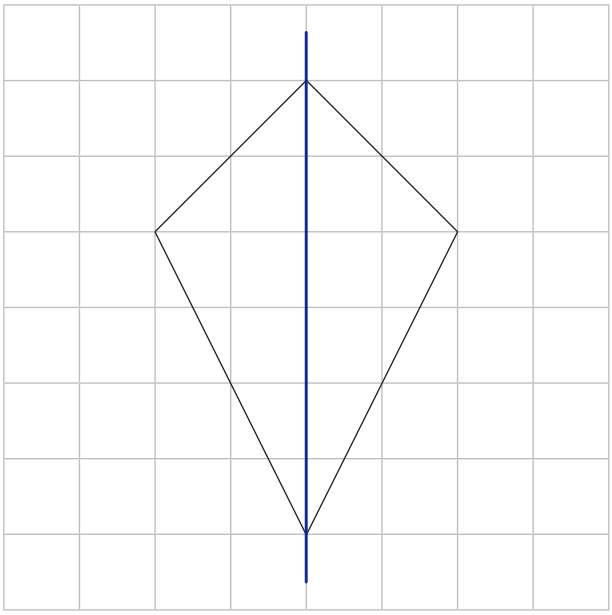


Volume of prism = area of cross section × length



stemup.co.uk

1 The diagram below shows a kite, drawn on a centimetre squared grid.



(a) Work out the area of the kite.

Diagonals are 4 cm and 6 cm
Area = (4 × 6) ÷ 2 = 12

Answer 12 cm^2 [1]

(b) Draw a line of symmetry on the kite. [1]

[Turn over

2 The temperature in some cities is shown in the table below.

Riga	–3°C
Helsinki	–11°C
Toronto	–6°C
Moscow	–8°C
Stockholm	–1°C

(a) List the temperatures in **ascending** order.

Answer −11 , −8 , −6 , −3 , −1 [2]

(b) How much warmer is Moscow than Helsinki?

−8 − (−11) = −8 + 11 = 3

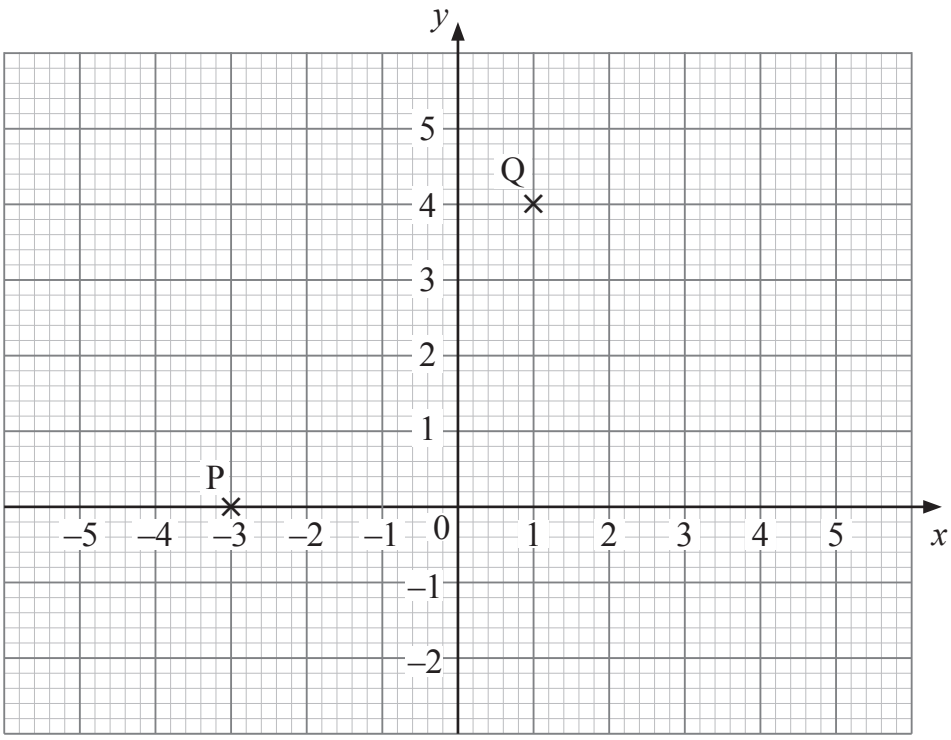
Answer 3 °C [1]

(c) What is the difference in temperature between Helsinki and Stockholm?

−1 − (−11) = −1 + 11 = 10

Answer 10 °C [1]

3



What are the co-ordinates of the midpoint of PQ?

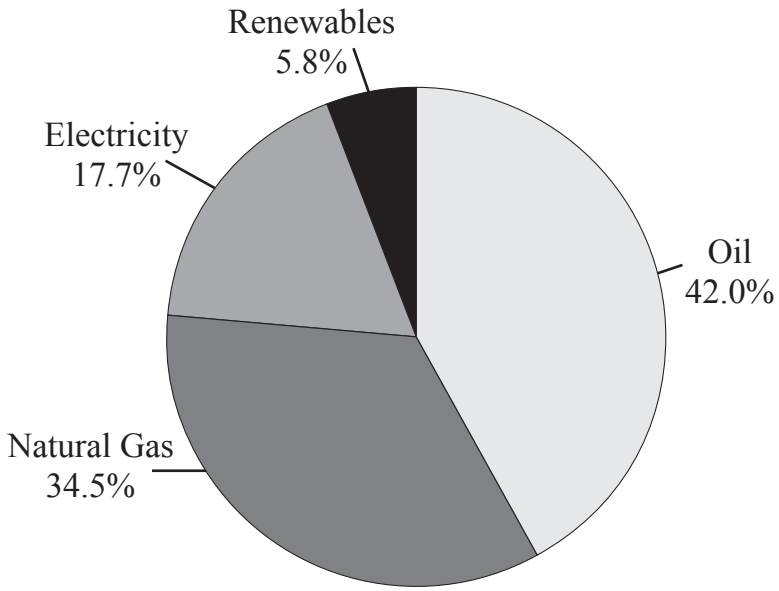
x: $(-3 + 1) \div 2 = -2 \div 2 = -1$

y: $(0 + 4) \div 2 = 4 \div 2 = 2$

Answer (-1 , 2) [2]

[Turn over

4 This pie chart shows energy use by type of fuel.



(a) Which type of fuel is used most?

Answer Oil [1]

(b) **Measure** the angle for electricity.

Answer 64 ° [1]

(c) Sean thinks about $\frac{3}{4}$ of energy use comes from oil and natural gas.

Explain why Sean is correct.

Answer 42 + 34.5 = 76.5%, which is about 75%

and 75% = ¾, so about ¾ comes from oil and natural gas [1]

(d) Complete the statement below with a suitable number in the box.

The fraction $\frac{\text{renewables}}{\text{electricity}}$ is about $\frac{1}{\boxed{3}}$. [1]

5 The total population of Great Britain and Ireland is 70 million.

Information about this population is given in the table.

England	54.9 million
Northern Ireland	1.9 million
Republic of Ireland	4.6 million
Scotland	5.5 million
Wales	3.1 million

(a) What is the population of Wales?

54.9 + 1.9 + 4.6 + 5.5 = 66.9
70 − 66.9 = 3.1

Answer 3.1 million [2]

(b) Sue thinks the population of Northern Ireland and Republic of Ireland makes up more than 10% of the total population of Great Britain and Ireland.

Do you agree?

Explain your answer.

10% of 70 = 7 million
1.9 + 4.6 = 6.5 million 6.5 < 7

Answer No because 10% of 70 million is 7 million, but 1.9 + 4.6 = 6.5 million, which is less than 7 million (only 9.29%) [2]

[Turn over

6 **(a)** Work out the size of the angle marked x.

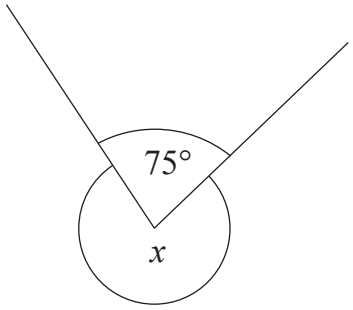


diagram not
drawn accurately

360 − 75 = 285

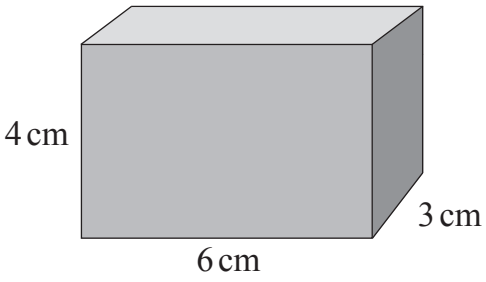
Answer 285 ° [1]

(b) Circle the name of the quadrilateral with rotational symmetry of order 2

square kite parallelogram trapezium [1]

Look at the box below.

(c) **(i)** How many 1 cm cubes are needed to fill this box?



6 × 3 × 4 = 72

Answer 72 cubes [1]

(ii) What is the perimeter of the top face of the box?

6 + 3 + 6 + 3 = 18

Answer 18 cm [1]

7 **(a)** Seven factory workers and their manager earn these weekly wages:

£294, £245, £300, £288, £300, £259, £290 and £850

What is the **median** weekly wage?

245, 259, 288, 290, 294, 300, 300, 850
(290 + 294) ÷ 2 = 292

Answer £ 292 [2]

(b) The manager's weekly wage is increased to £900 from £850

Which of these is not affected by the change?

range median mean mode

Answer median and mode [1]

8 **(a)** I think of a number, multiply it by 3 and then add 1

The answer is 28

What was the number?

28 − 1 = 27
27 ÷ 3 = 9

Answer 9 [2]

(b) I think of a number, subtract 1 from it and then divide by 4

The answer is 3

What was the number?

3 × 4 = 12
12 + 1 = 13

Answer 13 [2]

[Turn over

9 **(a)** Write 2 **prime** numbers between 60 and 70

Answer 61 and 67 [2]

(b) Which of these is both a **square** number and a **cube** number?

8 16 36 64 100

Answer 64 [1]

(c) Write $\frac{3}{8}$ as a decimal.

$3 \div 8 = 0.375$

Answer 0.375 [1]

(d) What percentage is £9 of £16?

$\frac{9}{16} \times 100 = 56.25$

Answer 56.25 % [2]

10 **(a)** Bikes normally cost £b each.

In a sale they are each reduced by £30

Write an expression for the cost of a bike in the sale.

Answer $b - 30$ [1]

(b) Cycling helmets normally cost £h each.

In a sale they are each reduced to half-price.

Write an expression for the cost of a cycling helmet in the sale.

Answer $\frac{h}{2}$ [1]

(c) Write an expression for the total cost of 4 bikes and 4 cycling helmets in the sale.

$4(b - 30) + 4 \times \frac{h}{2}$

$= 4b - 120 + 2h$

Answer $4b - 120 + 2h$ [2]

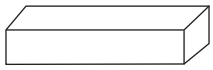
11 Solve the equation $5y + 4 = 24$

$5y = 24 - 4$
$5y = 20$
$y = 20 \div 5 = 4$

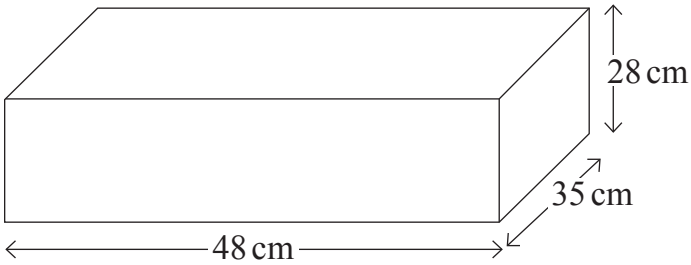
Answer $y = 4$ [2]

[Turn over

12 The packaging for a tube of toothpaste is a cuboid measuring 16 cm × 5 cm × 4 cm.



The manufacturer wants to be able to pack 150 of these tubes into a cardboard box.
The box is a cuboid.
The box measures 48 cm × 35 cm × 28 cm.



Will the box be big enough to hold 150 tubes of toothpaste in their packaging?
You must show working to explain your answer.

Number of tubes along each edge:

48 ÷ 16 = 3

35 ÷ 5 = 7

28 ÷ 4 = 7

3 × 7 × 7 = 147 tubes

147 < 150, so the box is not big enough

Answer *No* [3]

13 Male and female care assistants work in a nursing home.

Some can work weekdays only, some can work weekends only and some can work both.

(a) Complete the two-way table below.

	Weekdays only	Weekends only	Both	Total
Male	1	5	2	8
Female	2	3	8	13
Total	3	8	10	21

[2]

(b) How many male care assistants can work on weekends?

5 + 2 = 7

Answer 7 [1]

[Turn over

14 John has a telephone with the following costs.

Line rental: £18.99 per month
Call charge: 5.8p per minute

Last month John made calls lasting 385 minutes.

Work out his telephone bill for last month.

385 × 5.8 = 2233p = £22.33
22.33 + 18.99 = 41.32

Answer £ 41.32 [3]

15

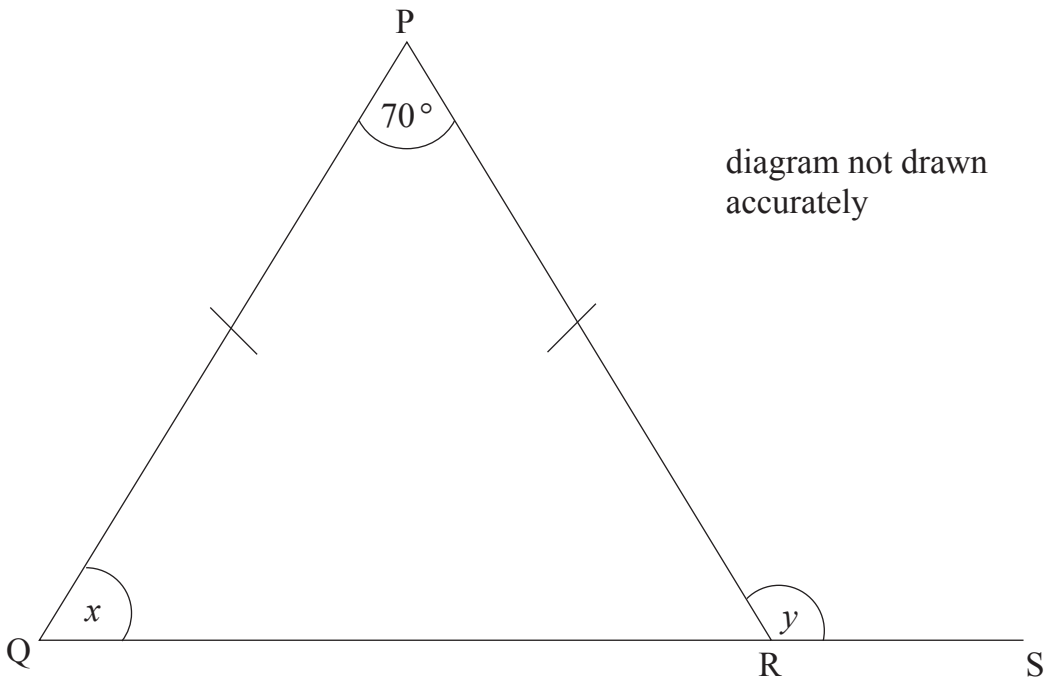


diagram not drawn accurately

PQR is an isosceles triangle with PQ = PR.
QRS is a straight line.

(a) Work out the size of the angle marked x.

(180 − 70) ÷ 2
= 110 ÷ 2 = 55

Answer 55 ° [2]

(b) Work out the size of the angle marked y.

180 − 55 = 125

Answer 125 ° [1]

[Turn over

16 The life expectancy for males in 12 countries in Africa for 2015 is shown in the following stem and leaf diagram.

4	9						
5	0	5	5	6	8	8	
6	0	2	4				
7	1	3					

Key: 5 | 3 means 53 years

(a) How many of these countries had a life expectancy for males of less than 58 years?

49, 50, 55, 55, 56

Answer 5 [1]

(b) For the above data work out

(i) the median,

12 values, so median is between the 6th and 7th
(58 + 58) ÷ 2 = 58

Answer 58 years [1]

(ii) the range.

73 – 49 = 24

Answer 24 years [1]

(c) In **1975** the life expectancy for males in the same 12 countries had a median of 49 years and a range of 30 years.

Compare the life expectancy for males in these 12 countries in **2015** with the life expectancy for males in **1975**

The median is higher in 2015 (58 years compared to 49 years),

so on average males lived longer in 2015.

The range is smaller in 2015 (24 compared to 30), so less spread. [2]

[Turn over

17

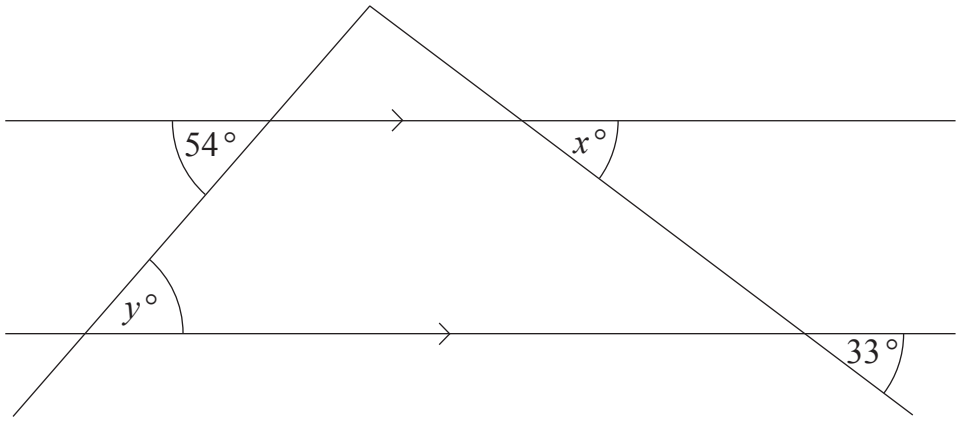


diagram not drawn accurately

Write down the values of x and y.

Answer x = 33 [1]

Answer y = 54 [1]

18 Calculate $\dfrac{\sqrt{1.1 \times 4.4}}{(3.2 - 2.65)}$

$\sqrt{(1.1 \times 4.4)} = \sqrt{4.84} = 2.2$

$3.2 - 2.65 = 0.55$

$\dfrac{2.2}{0.55} = 4$

Answer 4 [2]

19 **(a)** Pat buys 30 boxes of crisps.

Each **box** contains 48 **packets** of crisps.

He sells 80% of the crisps at 60p a packet.

(i) How many packets does he sell at this price?

30 × 48 = 1440 packets
0.8 × 1440 = 1152

Answer 1152 [2]

(ii) How much in total does he sell them for?

1152 × 60p = 69 120p = £691.20

Answer £ 691.20 [1]

(b) He sells the rest at 20p a packet.
Pat paid £25 for each box of crisps.

Does Pat make a profit or loss, and how much is this profit or loss?

1440 − 1152 = 288 packets
288 × 20p = 5760p = £57.60
Money taken = 691.20 + 57.60 = £748.80
Cost = 30 × 25 = £750
750 − 748.80 = 1.20, so a loss

Answer Pat makes a loss of £ 1.20 [3]

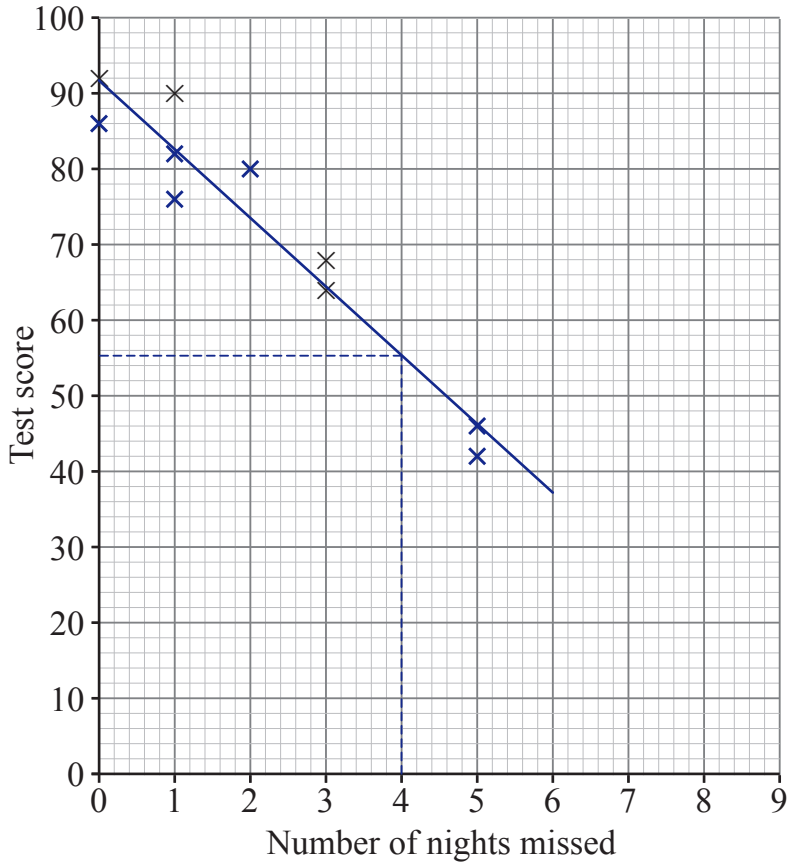
[Turn over

20 A group of pupils do a first aid course over 8 nights.
There is a test at the end of the course.

The table shows the number of nights each pupil misses and their test score.

Pupil	A	B	C	D	E	F	G	H	I	J
Number of nights missed	**0**	**3**	**1**	**3**	2	1	0	5	1	5
Test score	**92**	**64**	**90**	**68**	80	82	86	42	76	46

(a) The first 4 points are plotted on the scatter graph.
Plot the last 6 points.



[2]

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

(c) Another pupil missed 4 nights of the course.
Use the graph to estimate their test score.

Answer 55 [1]

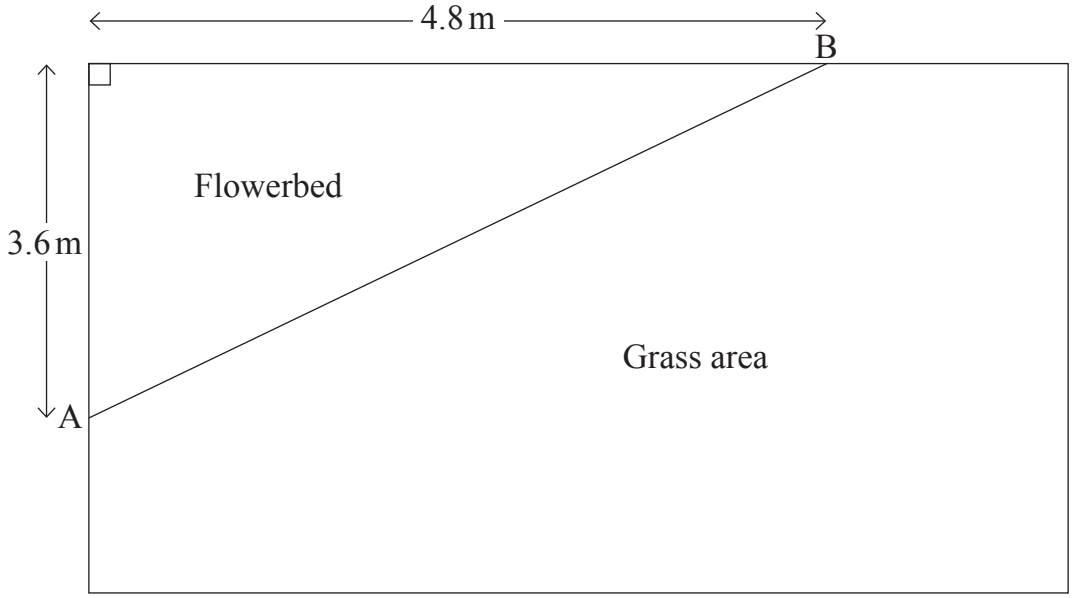
(d) What type of correlation does your graph show?

Answer negative [1]

[Turn over

21 A garden has a flowerbed in the corner.

A diagram of the garden is shown below.



(a) Calculate the area of the flowerbed.

$(3.6 \times 4.8) \div 2$
$= 17.28 \div 2 = 8.64$

Answer 8.64 m^2 [2]

(b) There is a fence along the line AB separating the flowerbed from the grass area.

How long is the fence?

$AB^2 = 3.6^2 + 4.8^2$
$AB^2 = 12.96 + 23.04 = 36$
$AB = \sqrt{36} = 6$

Answer 6 m [3]

22 Last year a company spent a total of £2400 on advertising.

This year they spent £2796

What was the percentage increase in their spending on advertising?

$2796 - 2400 = 396$

$\frac{396}{2400} \times 100 = 16.5$

Answer 16.5 % [3]

[Turn over

23 Best Bank offers a 3 year investment account with a fixed compound interest rate of 1.75 % per annum.

Mr Lucas invests £8000 in this account.

What is the value of his investment at the end of the 3 year period?

Multiplier = 1 + 0.0175 = 1.0175

8000×1.0175^3

= 8427.3928...

= £8427.39 (to 2 d.p.)

Answer £ 8427.39 [4]

24 Sue is training to compete in a 10 km walk.

A diagram of her local athletics track is shown below.

The track consists of a rectangle and two semicircles.

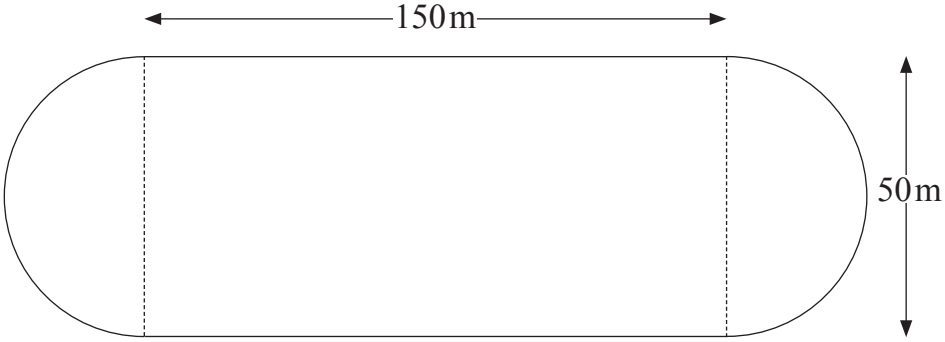


diagram not drawn accurately

How many complete laps are needed to ensure she walks 10 km?

You must show all your working.

Two semicircles make one circle of diameter 50 m

Circumference = π × 50 = 157.0796... m

One lap = 157.0796... + 150 + 150 = 457.0796... m

10 km = 10 000 m

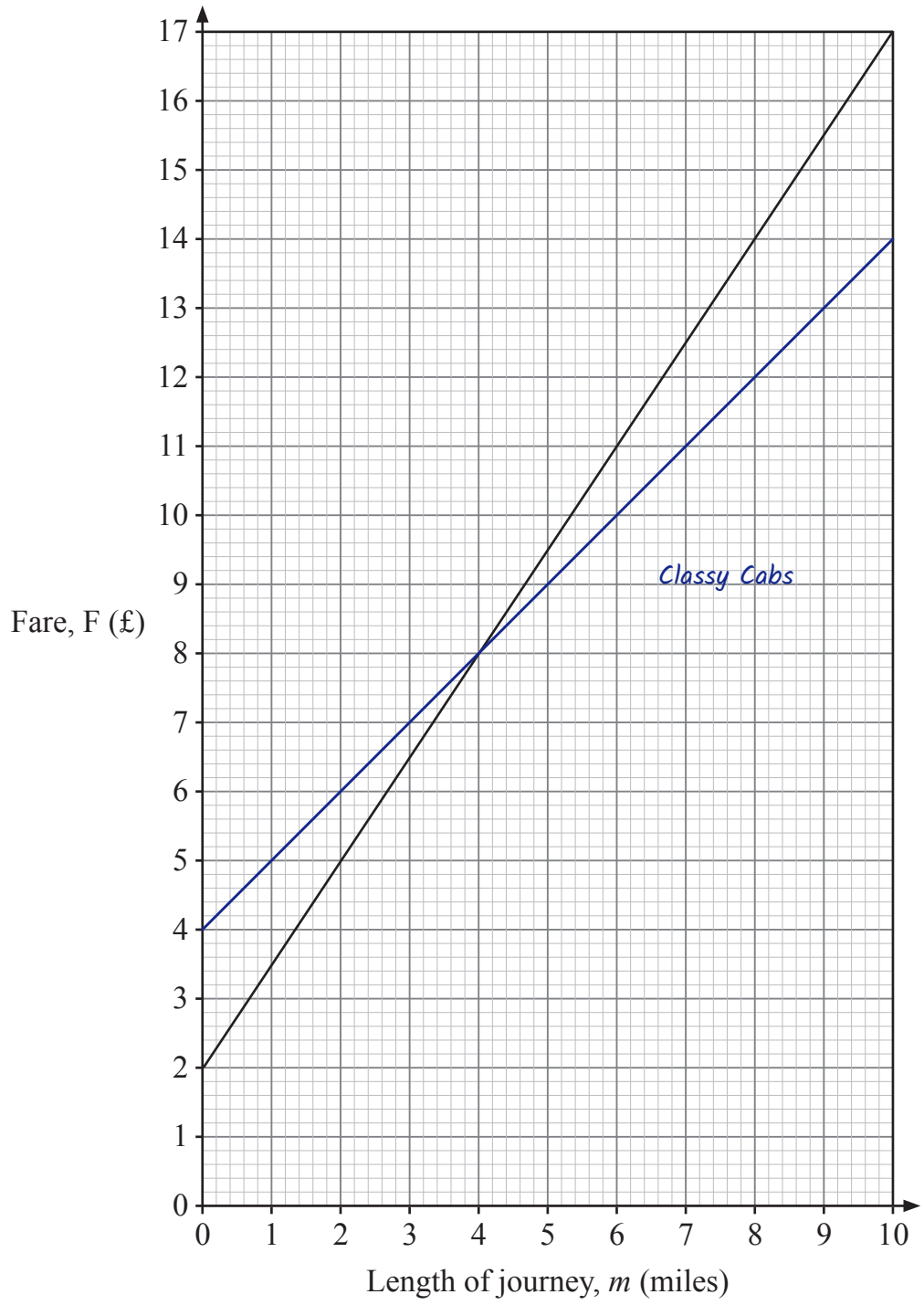
10 000 ÷ 457.0796... = 21.878...

21 laps is not enough, so she needs 22 laps

Answer 22 [4]

[Turn over

25 The graph shows the fare, F (£), for a taxi journey of m miles with Trusty Taxis.



(a) Calculate the gradient of the straight line.

Using (2, 5) and (8, 14):

$\frac{14 - 5}{8 - 2} = \frac{9}{6} = 1.5$

Answer 1.5 [2]

(b) Give a real life meaning to the value you found in part **(a)**.

Answer Each mile travelled costs £1.50 [1]

(c) Classy Cabs charge a minimum fare of £4 plus £1 for each mile travelled.

Draw a graph for the cost of a taxi journey with Classy Cabs on the same grid as Trusty Taxis. [1]

(d) Use your graphs to work out the length of the journey that will cost the same with both companies.

The lines cross at (4, 8)

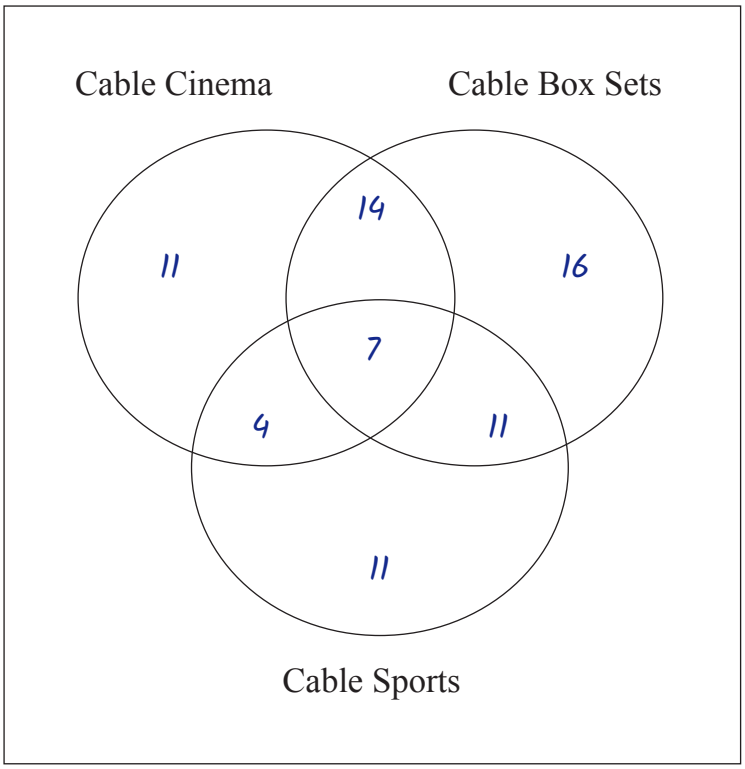
Answer 4 miles [1]

[Turn over

26 **(a)** 80 Cable TV customers were asked whether they had a subscription for Cable Cinema, Cable Box Sets or Cable Sports.

7 had subscriptions to all 3
11 had Cable Box Sets and Cable Sports, but not Cable Cinema
14 had Cable Box Sets and Cable Cinema, but not Cable Sports
11 had Cable Cinema and Cable Sports

Show this information on the Venn diagram. [2]



(b) 36 had a subscription for Cable Cinema
48 had a subscription for Cable Box Sets
33 had a subscription for Cable Sports

Show this information on the Venn diagram. [1]

(c) How many of the customers asked did not have any subscriptions?

$11 + 14 + 16 + 4 + 7 + 11 + 11 = 74$

$80 - 74 = 6$

Answer 6 [2]

27 Each player in a group of 15 players scored either 2 or x goals.

Number of goals	Frequency
2	10
x	5

The mean number of goals per player was 3

Calculate x.

Total goals $= 15 \times 3 = 45$

$10 \times 2 + 5 \times x = 45$

$20 + 5x = 45$

$5x = 25$

$x = 5$

Answer $x =$ 5 [3]

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