Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U60-1

S24-3310U60-1

MONDAY, 3 JUNE 2024 – MORNING

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for the work written on the additional page.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

In question **2**(a), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**10**	
3.	**12**	
4.	**13**	
5.	**7**	
6.	**8**	
7.	**17**	
8.	**6**	
Total	**80**	

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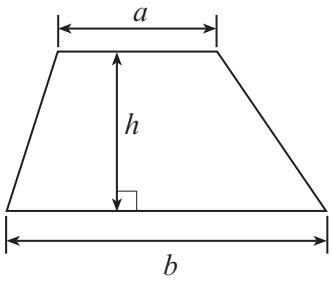
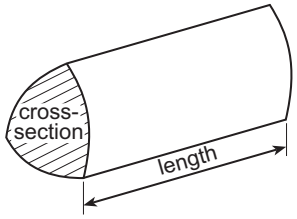
Formula List – Higher Tier

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

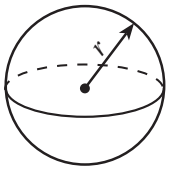


Volume of prism = area of cross-section × length



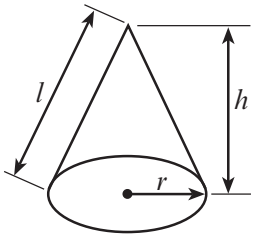
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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

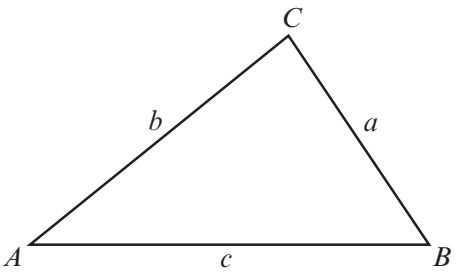


In any triangle ABC

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

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

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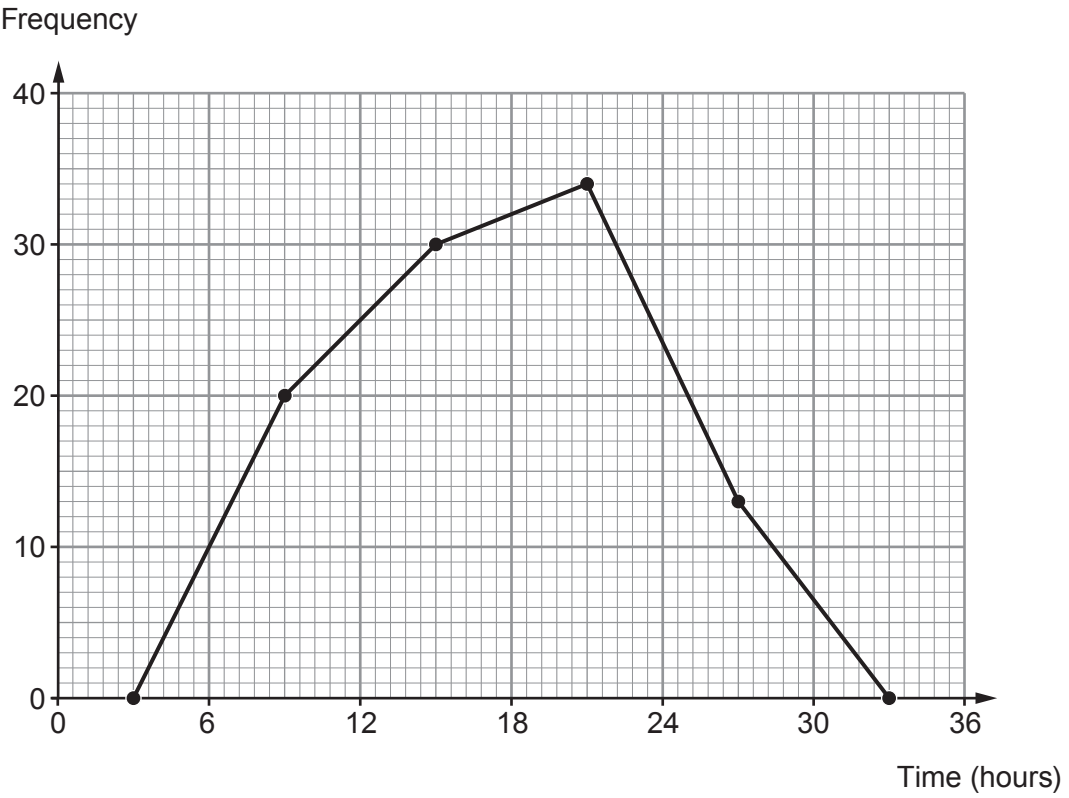
Examiner only

1. (a) A survey was carried out to find the total time people took to read the book 'Wales is a Celtic Country'.
The results are shown in the frequency polygon below.



(i) Which is the modal group?
Circle your answer. [1]

18 to 24 hours 21 hours 12 to 18 hours 34 hours 30 to 36 hours

(ii) How many people took part in the survey?
Circle your answer. [1]

34 30 33 97 108

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Examiner only

(iii) How many of the people in the survey took 24 hours or more to read this book? Circle your answer. [1]

13 34 47 24 84

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(iv) Did any of the people in the survey take less than 6 hours to read this book?

Yes ☐ No ☐ Can't tell ☐

You must give a reason for your answer. [1]

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(b) Four books are placed in a stack.

The thickness of each of the books is as follows:

22 mm 25 mm 29 mm 31 mm

The thickness of each book is measured **correct to the nearest mm**.

Show that the total height of the stack of these four books cannot be more than 109 mm. [3]

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2. (a) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Remember:

1 kilowatt (kW) = 1000 watts (W)

There are 8 street lights in Ffordd Alwyn.
Each light is fitted with an 80 watt light bulb.

Each of the 8 street lights is usually on from 6 p.m. to 6 a.m.

It costs 32.4p per hour for each **kilowatt** of electricity used.

How much would be saved **per week** if the 8 street lights were only on from 7 p.m. to 5 a.m.?
Give your answer in pounds, correct to the nearest penny.
You must show all your working. [5 + 2 OCW]

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(b) A lamp post is vertical and stands on horizontal ground.
The angle of elevation of the top of the lamp post is 68° when measured from a point 3·3 m from the centre of the base of the lamp post.

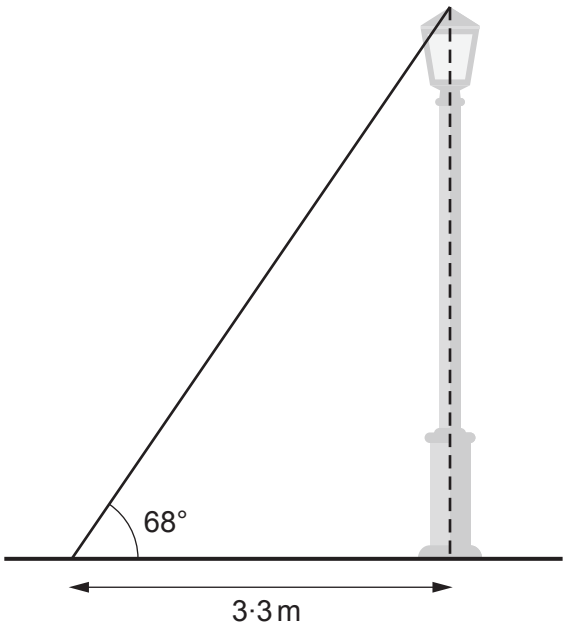

Diagram not drawn to scale

Calculate the height of the lamp post. [3]

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3. (a) 50 people living by the sea were asked how often they went for a walk along the sea wall each week.

The results were as follows:

Number of walks each week	Frequency
0 to 2	8
3 to 5	12
6 to 8	20
9 to 13	4
14 to 18	6

Calculate an estimate of the mean number of walks per person each week. [4]

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(b) High tide in the morning is, on average, 35 minutes later each day.
The morning high tide on 3rd March was at 08:03.
At what time was the morning high tide on 1st March? [1]

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Examiner only

(c) A new concrete sea-defence wall is to be built.
The sea-defence wall will have a uniform cross-section.
A sketch of the new wall is shown below.

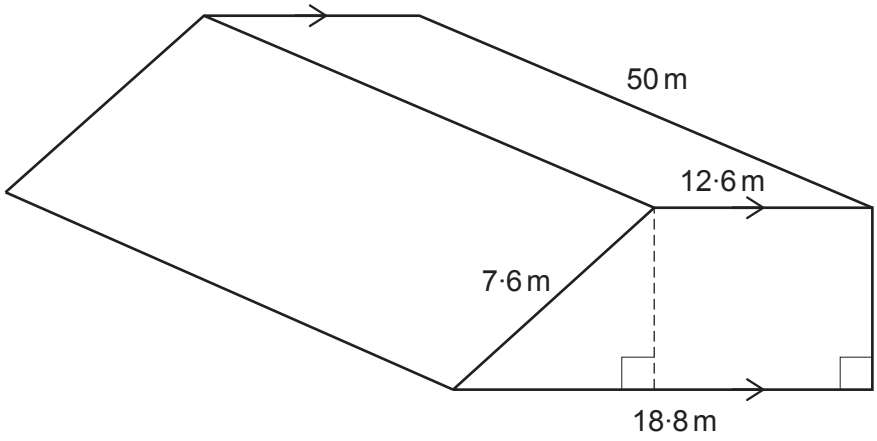

Diagram not drawn to scale

Calculate the volume of concrete needed to make this new sea-defence wall.
You must show all your working. [7]

Turn over.

Examiner only

4. (a) A volcano is an opening in the Earth's crust, through which molten lava, hot ash and gases escape into the air.

(i) An estimated 500 000 000 people live near active volcanoes.
What is 500 000 000 written in standard form? [1]

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(ii) The teragram is a unit of mass.
1 teragram = 10^9 kg

Last year, a volcano released a total of 140 teragrams of carbon dioxide in 300 days.

Calculate the average number of kilograms of carbon dioxide that were released by this volcano **per hour**.
Give your answer correct to 3 significant figures.
You must show all your working. [5]

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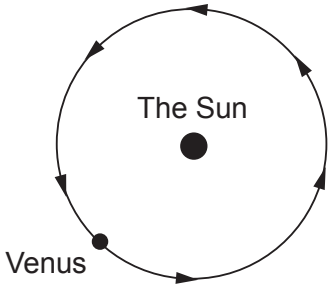
Examiner only

(b) (i) The planet Venus orbits the Sun.
Its orbit can be considered to be circular.



The distance between Venus and the Sun is $1{\cdot}08 \times 10^8$ km.

Venus orbits the Sun once every 224·7 days.

Calculate the distance Venus travels in 1 day.
Give your answer in standard form. [4]

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(ii) The surface area of Venus is 460 234 320 km^2.
The surface of Venus is wrinkled-volcanic, smooth-volcanic or **non**-volcanic.
The areas of these three different types of surface are in the ratio 7 : 1 : 2.

Wrinkled-volcanic : Smooth-volcanic : Non-volcanic = 7 : 1 : 2

Calculate the total surface area of Venus that **is** volcanic.
You must show all your working. [3]

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Examiner only

5. Caryl needs to calculate the cost of the petrol she used for a recent car journey.

She knows the following information about her journey:

- For part of her journey, she travelled a distance of 36 miles at a steady speed of 25 mph.
- For the rest of her journey, she travelled at a steady speed of 65 mph for 1 hour 24 minutes.

Some fuel economy information for her car is given in the following table:

Speed	**Number of miles travelled per gallon**
60 mph or less	48
Greater than 60 mph	35

(a) Calculate how many gallons of petrol Caryl used during her journey. [4]

(b) Caryl paid £1.49 for each **litre** of petrol.
Calculate the cost of the petrol used for the journey. [3]

Remember:
1 gallon = 8 pints

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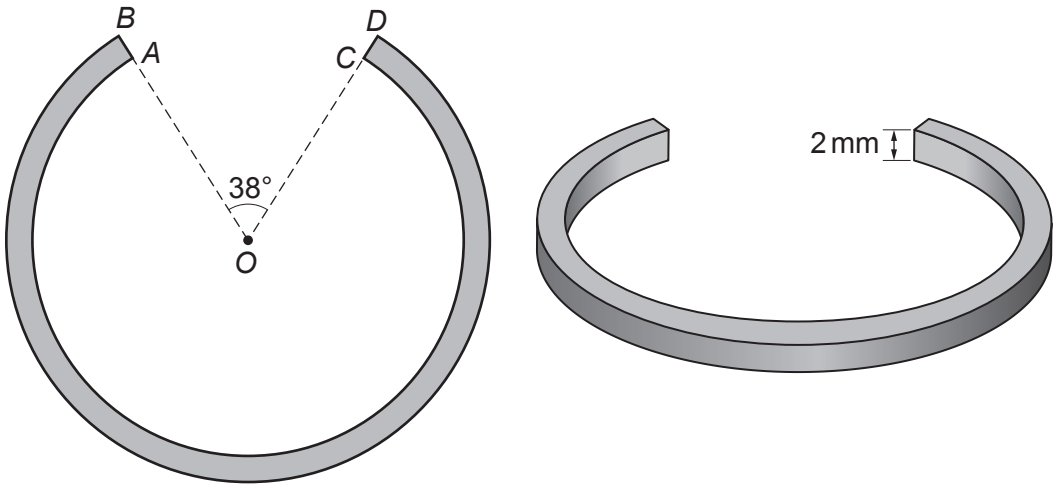
Examiner only

6. (a) C-clips are used in motors and turbines as a type of fastener.
Clip Zone makes metal C-clips.
They have a uniform cross-section, as shown below.



Diagrams not drawn to scale

O is the centre of the circular arcs *AC* and *BD*.
OAB and *OCD* are straight lines.
OA = *OC* = 50 mm.
AB = *CD* = 4 mm.
The C-clips have a uniform thickness of 2 mm.

C-clips are made by melting down metal bars and re-casting them.
Calculate the number of C-clips that can be made from a metal bar with a volume of 1 500 000 mm^3.
You must show all your working. [5]

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(b) Clip Zone makes four types of fastener.
The table below shows the number of each type produced each week.

Type of fastener	C-clips	Jubilee clips	Screws	Bolts
Number made each week	23 000	11 000	70 000	45 000

Clip Zone takes a sample of these 149 000 fasteners to check the quality of its products.
A stratified sample of 1500 fasteners is taken, based on the type of fastener.

Calculate the number of each type of fastener that should be included in the sample.
You must show all your working. [3]

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Type of fastener	C-clips	Jubilee clips	Screws	Bolts
Number in the sample	.....	.....	.....	.....

Examiner only

7. Sara and Tanvi are taking part in an orienteering race.
The start and finish points of the race are the same.
They will take different routes from the start point to get to the same last marker point.
They then head directly back to the start/finish point.

(a) Here is a diagram showing some information about Sara's route.

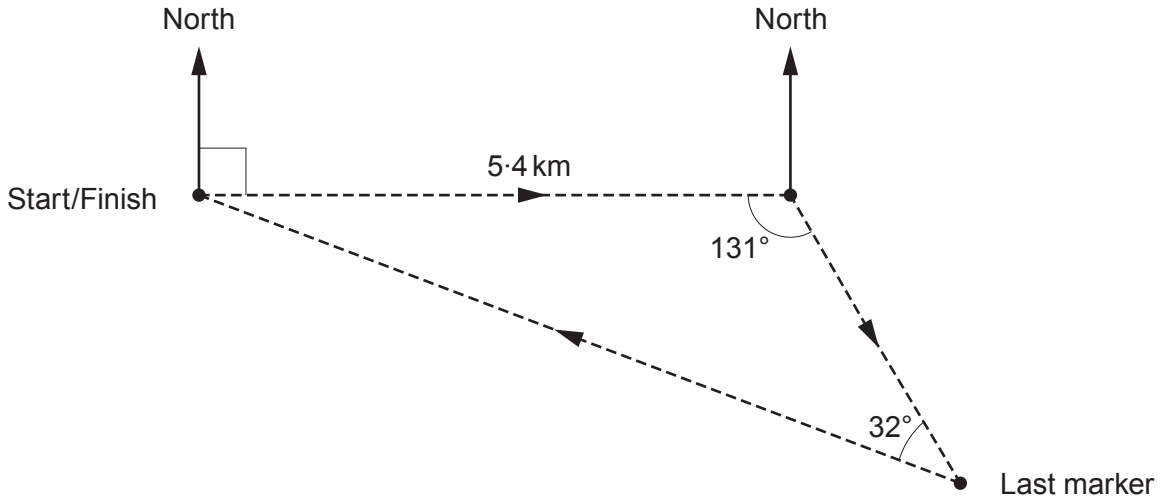

Diagram not drawn to scale

Show that the distance Sara travels from the last marker back to the finish point is 7·7 km, correct to 1 decimal place. [3]

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(b) The diagram below shows some information about Tanvi's route.

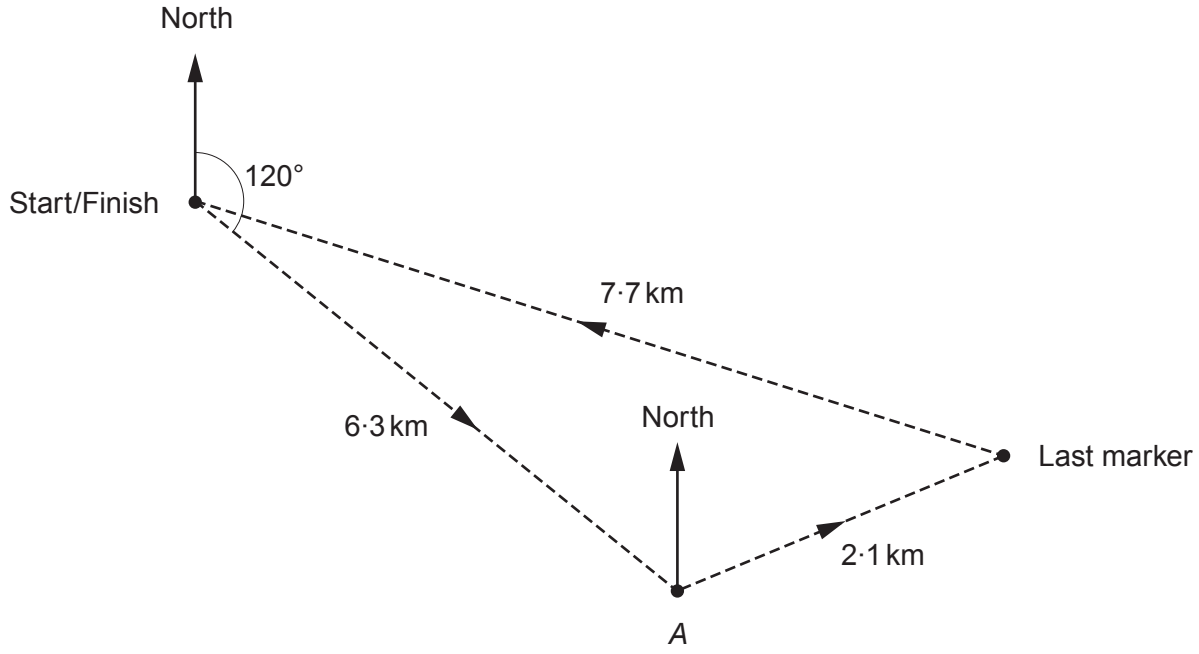

Diagram not drawn to scale

Tanvi started her race by running 6·3 km on a bearing of 120° to point *A*.
She then ran 2·1 km to reach the last marker.
Calculate the bearing of the last marker from point *A*. [5]

Bearing is ..... °

Examiner only

(c) The map that Sara and Tanvi were each given before the start of the race was 33 cm long.
Tanvi decided to reduce the size of her map to a mathematically similar size.

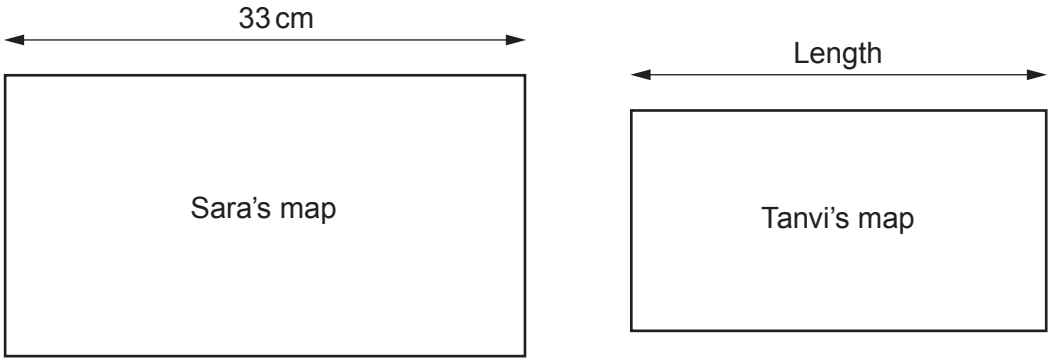

Diagram not drawn to scale

The area of Tanvi's map is now 19% less than the area of Sara's map.

Calculate the length of Tanvi's map. [4]

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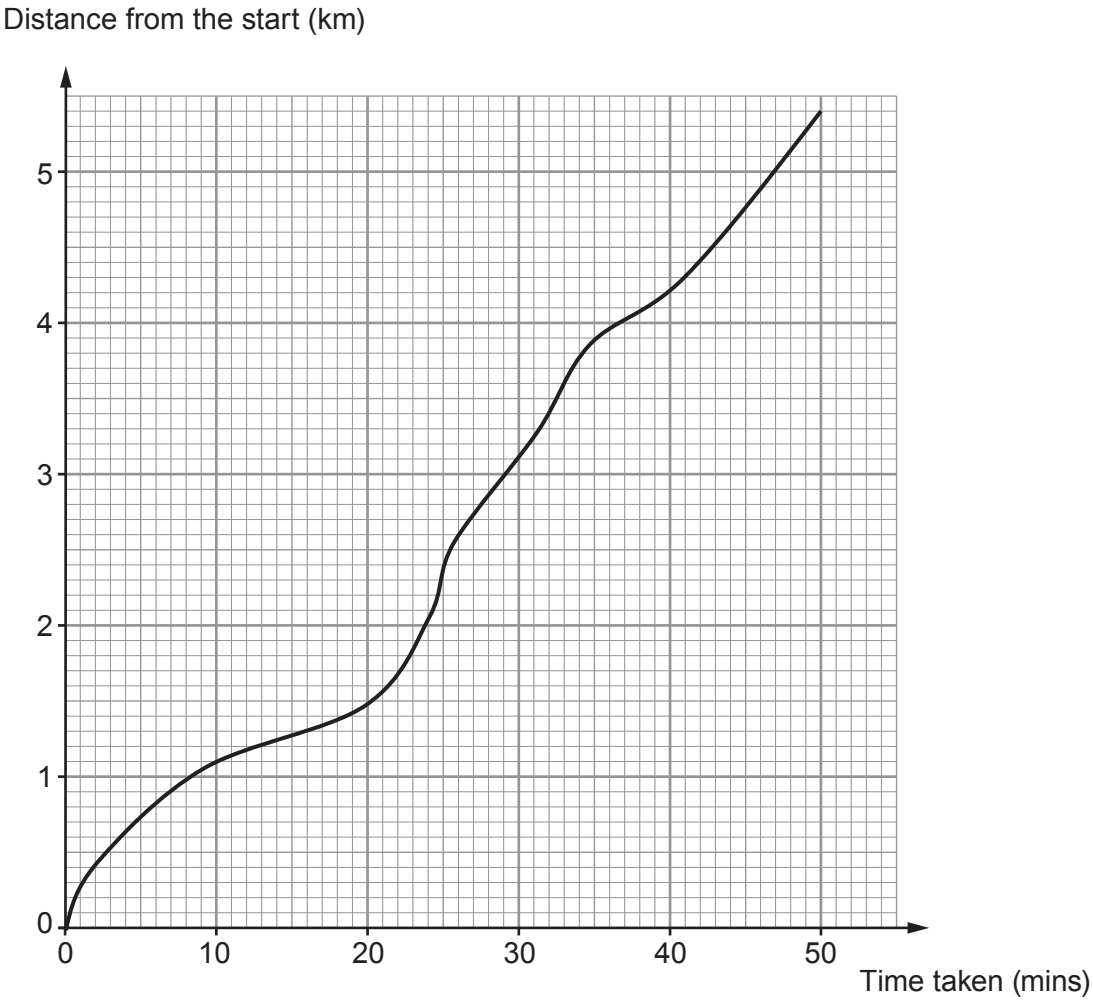
(d) Sara's distance from the start, for the first part of her race, is shown in the graph below.



Estimate Sara's speed 20 minutes after the start of the race.
Give your answer in **miles per hour**. [5]

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8. (a) The Cardiff Saver account pays interest at a rate of 0.6% every 3 months.
Evan invests £5000 in this account.

Evan does not make any further deposits or withdrawals after opening the account.

Calculate how much money is in the account after $4\frac{1}{2}$ years. [2]

(b) The Pontypridd Saver account has an AER of 4%.
The account pays interest every 6 months.
Myles invests money in this account.

Calculate the interest rate that is applied to the account every 6 months.
Give your answer as a percentage correct to 2 decimal places.
You must show all your working. [4]

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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