NCFE Level 2 Functional Skills Qualification in Mathematics (603/5060/X)

Paper number:	SAM
Section B:	Calculator Test

Time allowed: 1 hour 30 minutes

Learner instructions

- Answer **all** questions.
- Read each question carefully.
- Write your answers in the spaces provided.
- Show your working, as marks may be awarded for working.
- State units in your answers, where appropriate.
- Check your work.
- Use $\pi = 3.14$

Learner information

- Section B contains **Activities 2, 3** and **4**.
- The maximum mark for this section is **45**.
- The marks available for **each** question are shown in brackets.

Resources

You will need a:

- pen, with black or blue ink
- pencil and eraser
- 30 cm ruler
- protractor
- calculator.

If extra pages are used, please make sure your name and centre name are on them and they are securely fastened to this booklet.

Please complete the details below clearly and in BLOCK CAPITALS.

Learner name ______________________________

Centre name ______________________________

Learner number [   ]   Centre number [   ]

Do not turn over until the invigilator tells you to do so.

Last updated 27 November 2019.

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Activity 2: Pollution

Ali sees an article about the health risk from pollution caused by cars and other vehicles.


COLLEGE *NEWS*

Air pollution: Toxic school run poses health risk to thousands…

2 (a) The article states that, every year, nine hundred and seventy thousand, two hundred and fifteen working days are lost due to air pollution-related illness.

Write nine hundred and seventy thousand, two hundred and fifteen as a number.

[1 mark]

2 (b) 84% of the days lost due to air pollution related illnesses are due to breathing related problems.

Calculate the number of days lost due to breathing related problems.
Give your answer to the **nearest thousand.**

[2 marks]

Your answer: ______________ **days**

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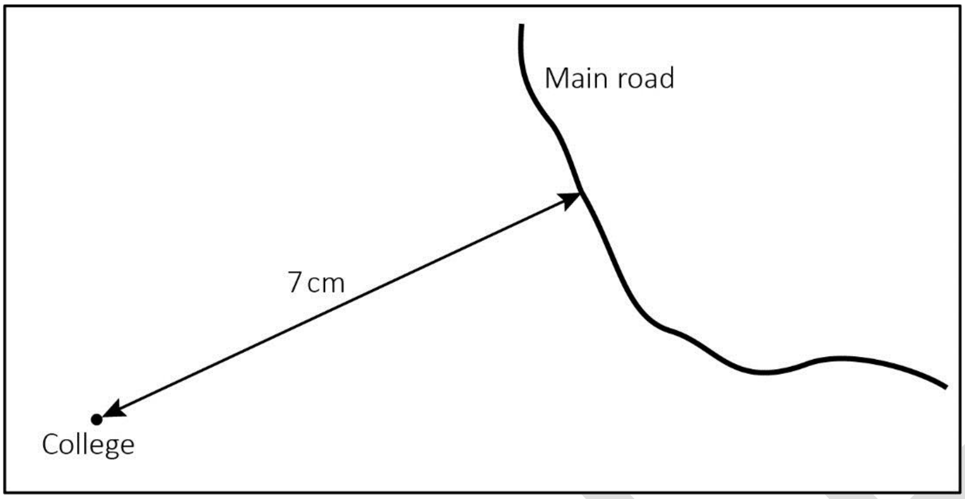
2 (c) Schools and colleges can have very high levels of air pollution if they are close to a main road.

This is a map of the area around Ali's college:



At its closest point, the main road is 0.35 km from the college.

What scale has been used for this map? Give your answer in the form 1 : N

[2 marks]

Your answer:

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2 (d) Some students drive or get a lift by car to and from college.

Ali wants to encourage students to travel to college by other methods of transport.

He conducts a survey to find out how students travel to college.

This table shows his results:

Method of transport to college	Number of students
Walk	52
Car	36
Bus	28
Cycle	4

What fraction of students travel to college by car?
Give your answer in its **simplest form**.

[1 mark]

Your answer:

Please turn over

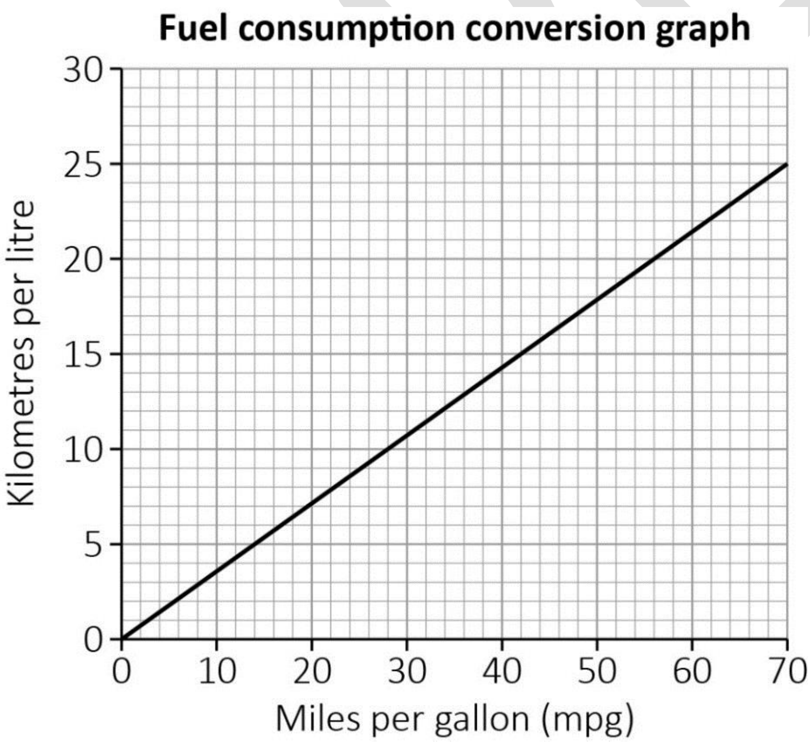
2 (e) Ali wants to find out how much pollution is produced by students travelling between home and college by car.

He asks the students that travel to college by car how far they live from the college. The students attend college on 164 days per year.

This table shows his results:

Distance from home to college in kilometres (km)	Number of students
0 km < distance ≤ 1 km	13
1 km < distance ≤ 2 km	11
2 km < distance ≤ 3 km	7
3 km < distance ≤ 4 km	5

Ali finds this conversion graph:



The average fuel consumption of a car is 38 miles per gallon (mpg).

A typical car produces 2.44 g of nitrogen dioxide (NO_2) per litre of petrol used.

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Ali uses the estimated mean distance to calculate the average amount of NO_2 produced.

Calculate the average amount of NO_2 produced by a student who travels by car **to and from** college for 164 days.

[6 marks]

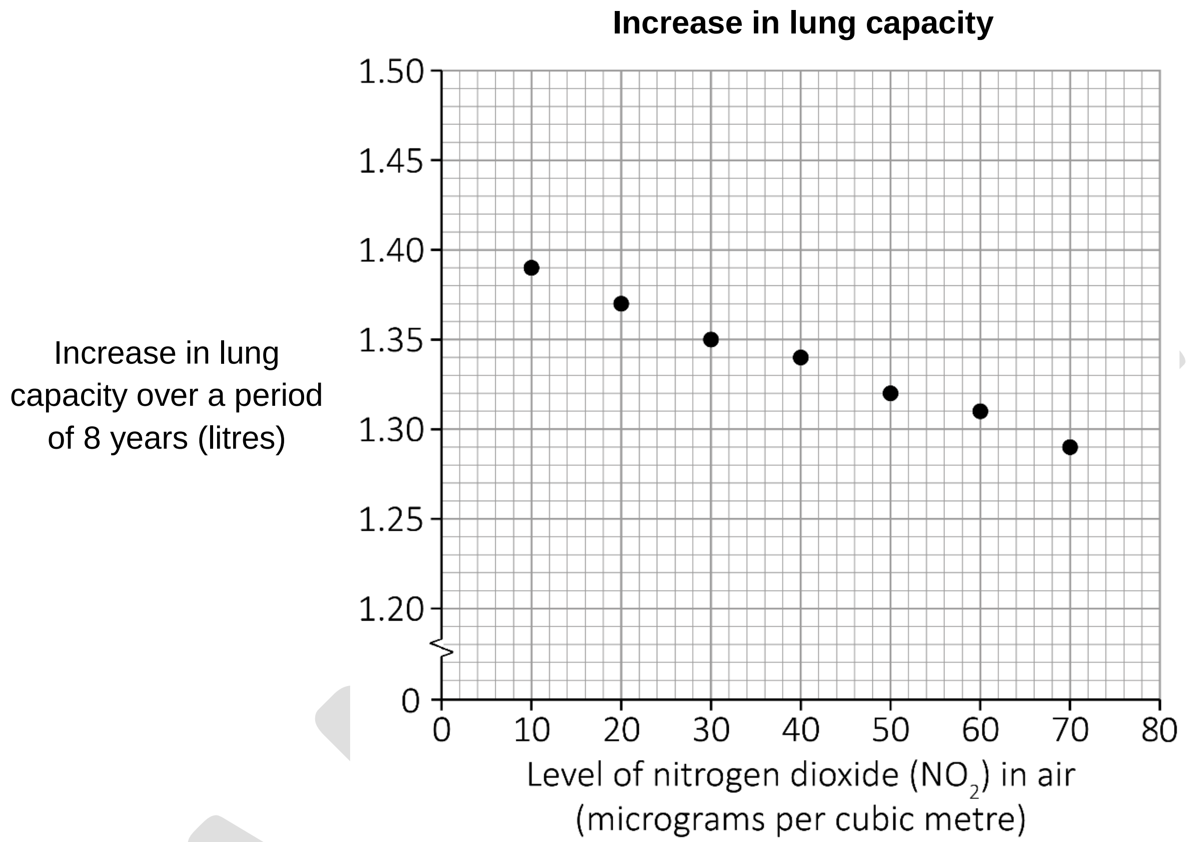
Your answer: g

Please turn over

2 (f) Air pollution can affect the lungs.

Research has shown that, for school-aged children, exposure to nitrogen dioxide (NO_2) is associated with reduced growth in lung volume.

This scatter diagram shows the results of a study into lung capacity.



The level of NO_2 around Ali's college is typically 55 micrograms per cubic metre.

Estimate the additional lung capacity that children would gain over a period of eight years if the pollution level were to be reduced from 55 to 35 micrograms of NO_2 per cubic metre.

Give your answer as a **fraction** of a litre.

[3 marks]

Your answer:

[Total marks: 15]

Activity 3: Boxes of chocolates

3 (a) Kate works for a chocolate company.
Her job is to supervise the packing chocolates into boxes.

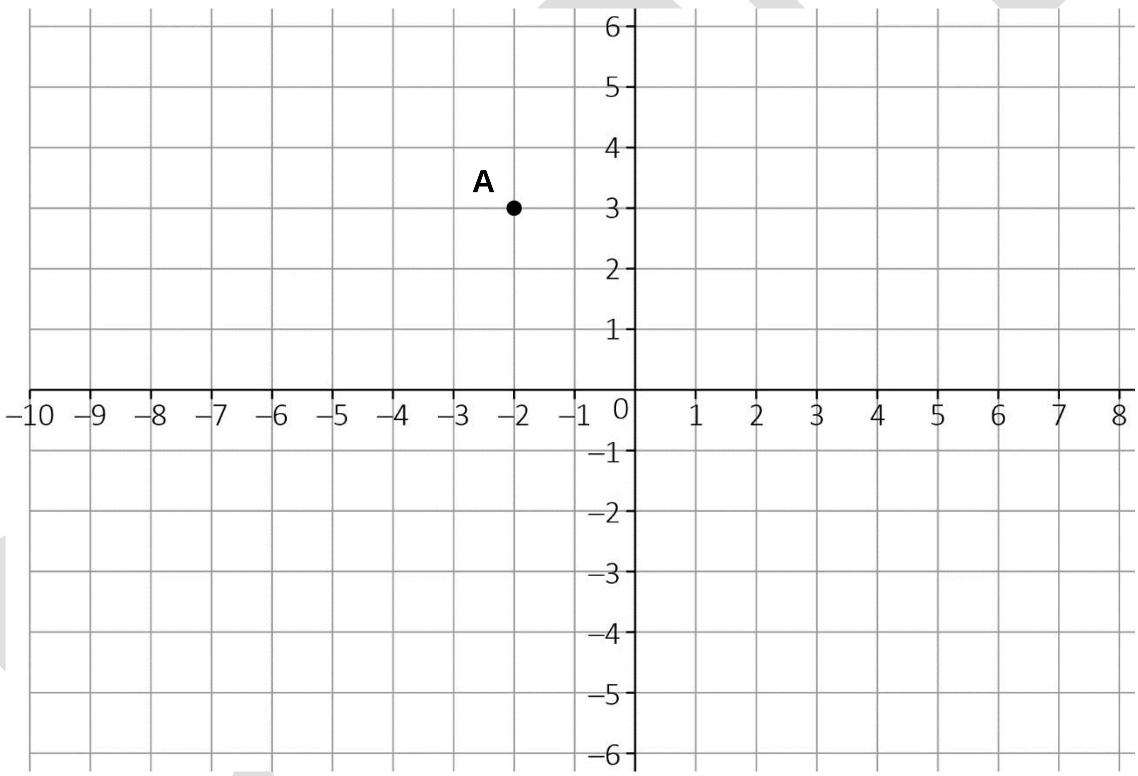
She sets up the computer to print the labels for the boxes.

The label needs to be a 6 cm by 5 cm rectangle.
She needs to program the computer with the co-ordinates of the corners of the label.

A is one corner of the label. Each square represents 1 cm^2

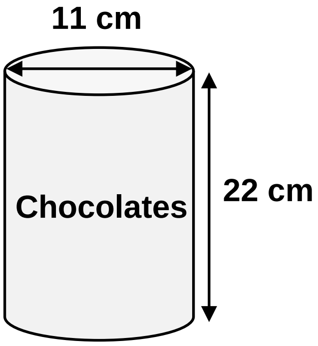
Draw one possible position for the label on the grid and write the co-ordinates of each corner.

[2 marks]



3 (b) This is a diagram of a box to be filled with chocolates. The box is a cylinder.

The diameter of the box is 11 cm, and the height is 22 cm.



Not drawn accurately

Calculate the volume of the box.
Use π = 3.14

[2 marks]

Your answer: ______ **cm^3**

Please turn over

3 (c) The boxes are filled with chocolates and weighed.

The target weight of each full box is **294 g**

A box is automatically rejected if it is less than **98%** of the target weight.

Kate looks at the weights of ten boxes of chocolates:

Weight in grams (g)				
295.60	286.14	284.02	298.31	294.15
294.06	303.28	285.66	299.50	300.53

Use this data to estimate the probability that the next two boxes will be rejected.
Show your answer as a **percentage**.

[4 marks]

Your answer: %

Please turn over

3 (d) Kate monitors the performance of the chocolate packing machine.

Using **+** and – complete the table showing the difference between the target weight of **294 g** and the next three box weights.

[1 mark]

Weight of box (g)	+ / – Difference (g)
294.04	
293.71	
292.59	

3 (e) Kate must check that chocolates are distributed in the boxes in the correct proportions.

There are four types of chocolate: Mint, Caramel, Fudge and Toffee

The types of chocolates are produced in the ratio of 2:3:3:1

She opens a box that contains 27 chocolates in total.
Eight of them are fudge chocolates.

Kate thinks that the box contains the correct number of fudge chocolates.

Is she right? **Explain your answer.**

[2 marks]

3 (f) Kate checks the number of boxes of chocolates produced each hour.

The table shows the number of boxes produced over the last 24 hours:

1494	1522	1513	1498	1521	1522
1498	1473	1502	1494	1518	1494
1512	1501	1517	1493	1494	1500
1500	1494	1498	1518	1494	1473

What is the mode of the number of boxes of chocolates produced per hour?

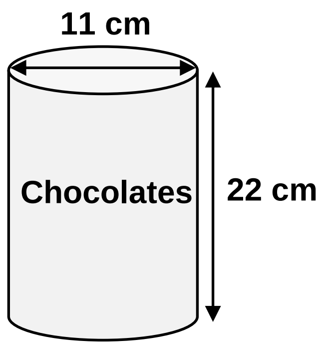
[1 mark]

Your answer: **boxes of chocolates**

Please turn over

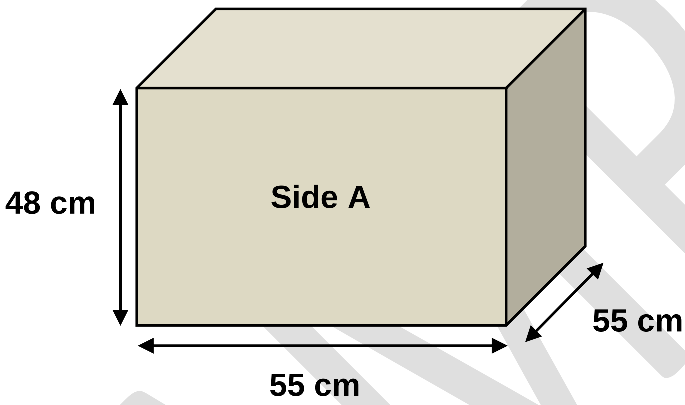
3 (g) Kate needs to show how the boxes of chocolates will be packed.

She needs to fit as many boxes of chocolates as possible into the delivery box.



Not drawn accurately

This is the delivery box:



(i) What is the maximum number of boxes of chocolates that can be packed into the delivery box?

[1 mark]

Your answer: **boxes of chocolates**

(ii) Explain your answer by drawing a sketch of the:

- plan view **and**
- elevation of Side A

to show how the boxes of chocolate will be packed into the delivery box.

[2 marks]

Plan view:

Elevation of Side A:

[Total marks: 15]

Please turn over

Activity 4: Training for a race

4 (a) Kyle is training to run a half marathon.

On his next training run, Kyle wants to run 5 km. He plans a route in the park.

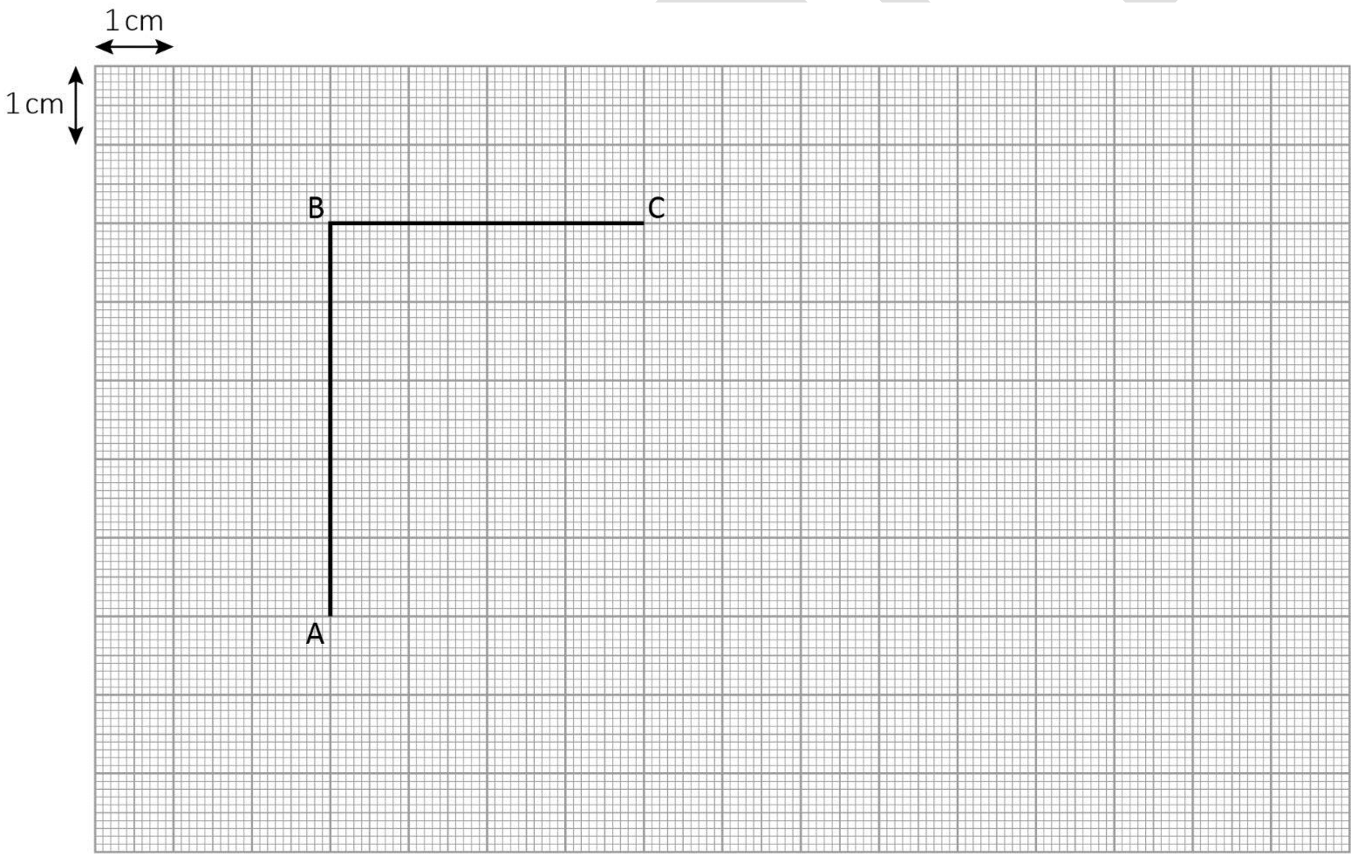
He starts at point **A**, then takes a right turn at point **B**.
When he reaches point **C**, he stops for a rest.

At point **C** he continues to run in a straight line, in the same direction, until he has completed the full 5 km.

The scale of this plan is 1 : 40 000

Show where Kyle finishes his run by accurately placing point **D** on the plan.

[3 marks]



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4 (b) It took Kyle 45 minutes to complete the 5 km run.
This time was 5% longer than his previous time.

How long did Kyle take to run his previous 5 km run?
Show your answer to **2 decimal places.**

[2 marks]

Your answer: ______ **minutes**

Please turn over

4 (c) Kyle thinks that the outside temperature affects his running speed.

He collects some information on the days he has completed a 5 km run.

Outside temperature	Time taken to run 5 km
17°C	46 minutes
12°C	38 minutes
25°C	52 minutes
9°C	36 minutes
10°C	37 minutes
22°C	50 minutes
6°C	35 minutes

Produce a scatter diagram to show Kyle's data.

[2 marks]

Time taken to run 5 km at different temperatures (°C)

4 (d) Use your scatter diagram in **4 (c)**.

Kyle wants to calculate his likely time to run the half marathon.

The half marathon is 13.1 miles long.

1 mile = 1.6 km

The forecast temperature for the race day is **15°C**.

This is a formula used to predict the time (in minutes) it will take to run a race, based on the times achieved for a 5 km run:

$$\frac{D}{5} \times 1.12 \times t$$

Where:

D = distance (in km)
t = time to run 5 km (in minutes)

Calculate the predicted time for Kyle's half marathon.
Show your working.

[4 marks]

Your answer: **minutes**

Please turn over

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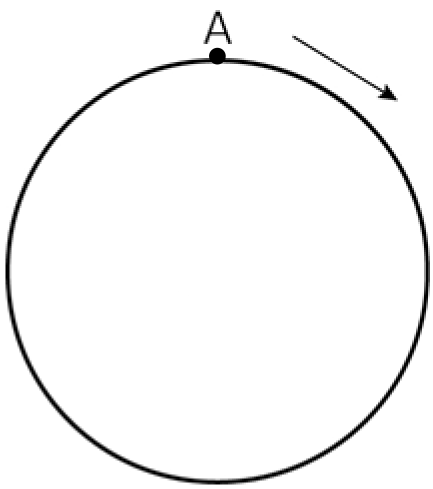
4 (e) Kyle goes to a circular athletics track for a 15 km training run.
One lap of the track is 320 m

He runs in a clockwise direction, starting at point **A**.



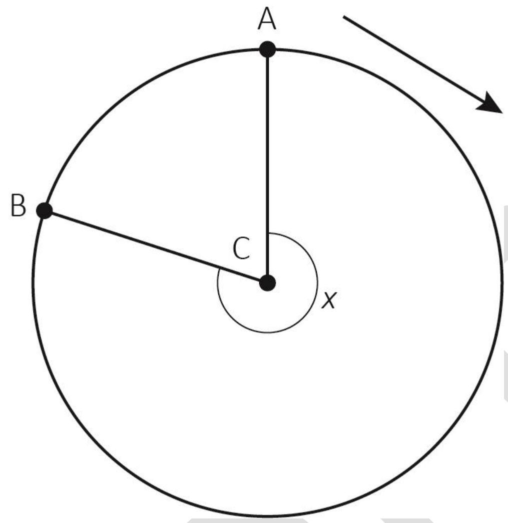
How far along the track from point **A** will Kyle be when he has run exactly 15 km?
Show your working.

[2 marks]

Your answer: **m**

4 (f) A different runner starts at point **A** and stops at point **B** when he has run exactly 0.8 of a lap.

C marks the centre of the circular track.



Calculate the angle marked *x*

[2 marks]

Your answer: **degrees**

[Total marks: 15]

This is the end of the assessment.