A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE
MATHEMATICS

H

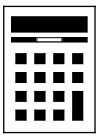
Higher Tier Paper 2 Calculator

8300/2H

Thursday 8 November 2018 Morning

Time allowed: 1 hour 30 minutes

For this paper you must have:
- **a calculator**
- **mathematical instruments.**



At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

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INSTRUCTIONS

- **Use black ink or black ball-point pen. Draw diagrams in pencil.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 80.**
- **You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.**

ADVICE

In all calculations, show clearly how you work out your answer.

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

1 **What does (A ∩ B) represent in P(A ∩ B) ?**

Circle your answer. [1 mark]

A or B or both **A but not B**

not A and not B **A and B**

2 ***P* is (4, 9) and *Q* is (–2, 1)**

Circle the midpoint of *PQ*. [1 mark]

(1, 5) **(3, 4)** **(3, 5)** **(6, 8)**

3 **Which of these is a geometric progression?**

Circle your answer. [1 mark]

1 3 5 7 9 **1 3 6 10 15**

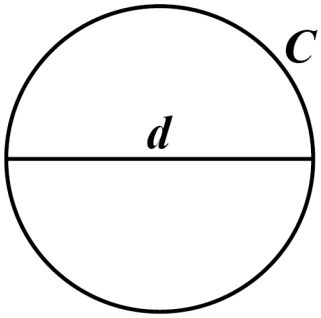
1 4 9 16 25 **1 3 9 27 81**

4 The bearing of *A* from *B* is 310º

Circle the bearing of *B* from *A*. [1 mark]

050º 110º 130º 220º

5 A circle has circumference C and diameter d.



$C = kd$

What VALUE does the constant k represent?
[1 mark]

Answer _____

5

6 Here is some information about 20 trains leaving a station.

Number of minutes late, t	Number of trains	Midpoint	
$0 \leqslant t < 5$	12		
$5 \leqslant t < 10$	7		
$10 \leqslant t < 15$	1		
$t \geqslant 15$	0		

6 (a) Work out an estimate of the mean number of minutes late. [3 marks]

Answer _____ minutes

6 (b) The station manager looks at the information in more detail.

Number of minutes late, t	Number of trains
$0 \leqslant t < 2$	12
$2 \leqslant t < 4$	0
$4 \leqslant t < 6$	7
$6 \leqslant t < 8$	0
$8 \leqslant t < 10$	0
$10 \leqslant t < 12$	1

He works out an estimate of the mean using this information.

How does his estimate compare with the answer to part (a)?

Tick ONE box. [1 mark]

☐ Higher than part (a)

☐ Same as part (a)

☐ Lower than part (a)

☐ Not possible to tell

4

7 **Work out the values of a and b in the identity**

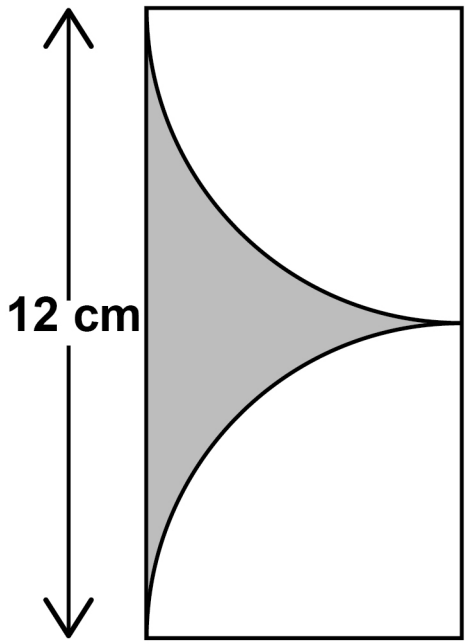
$5(7x + 8) + 3(2x + b) \equiv ax + 13$ [4 marks]

a = _____ b = _____

[Turn over]

8 **Two identical quarter circles are cut from a rectangle as shown.**

The diagram is not drawn accurately.



Work out the shaded area. [4 marks]

Answer _____ **cm²**

[Turn over]

8

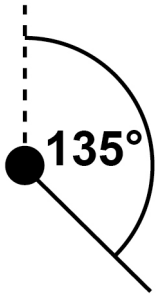
9 **The diagrams show the position of a tap when off and fully on.**

The tap is fully on when the angle of turn is 180º

When fully on, water flows out of the tap at 14 litres per minute.

The rate at which water flows out is in direct proportion to the angle of turn.

The tap is turned 135º



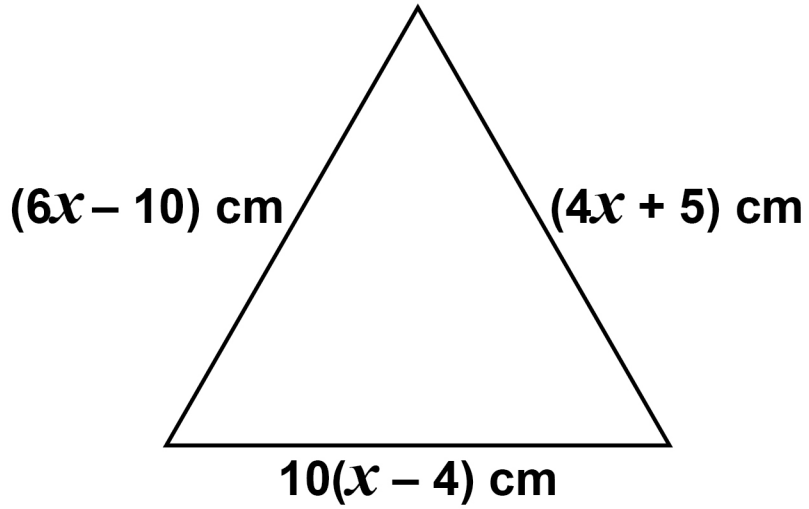
The water flows into a tank with a capacity of 79.8 litres.

Will it take less than $7\frac{1}{2}$ minutes to fill the tank?

You MUST show your working. [4 marks]

10 **This triangle is equilateral.**

The diagram is not drawn accurately.



Is the perimeter of the triangle greater than one metre?

You MUST show your working. [5 marks]

9

[Turn over]

11 **An approximation for the value of π is given by**

$$4\left(1-\frac{22}{57}+\frac{22}{85}-\frac{22}{105}+\frac{22}{117}-\frac{22}{242}\right)$$

Use your calculator to show that this approximation is within 0.1 of 3.14 [2 marks]

12 Work out $\frac{9.12 \times 10^{10}}{3.2 \times 10^{4}}$

Give your answer in standard form. [2 marks]

Answer _____

[Turn over]

13 **Ashraf is going to put boxes into a crate.**

The crate is a cuboid measuring
2.5 m by 2 m by 1.2 m

Each box is a cube of length 50 cm

He does these calculations.

volume of crate = 2.5 × 2 × 1.2

= 6 m^3

volume of one box = 0.5 × 0.5 × 0.5

= 0.125 m^3

number of boxes = 6 ÷ 0.125

= 48

He claims,

“I can put 48 boxes in the crate.”

Evaluate Ashraf’s method AND claim. [2 marks]

14 **The cross section of a prism has n sides.**

Circle the expression for the number of edges of the prism. [1 mark]

$2n$ **$3n$** **$n + 2$** **$2n + 3$**

[Turn over]

7

15 The volume of a medal is 45 cm^3

The medal is made from copper and tin.

volume of copper : volume of tin = 22 : 3

The density of copper is 8.96 g/cm^3

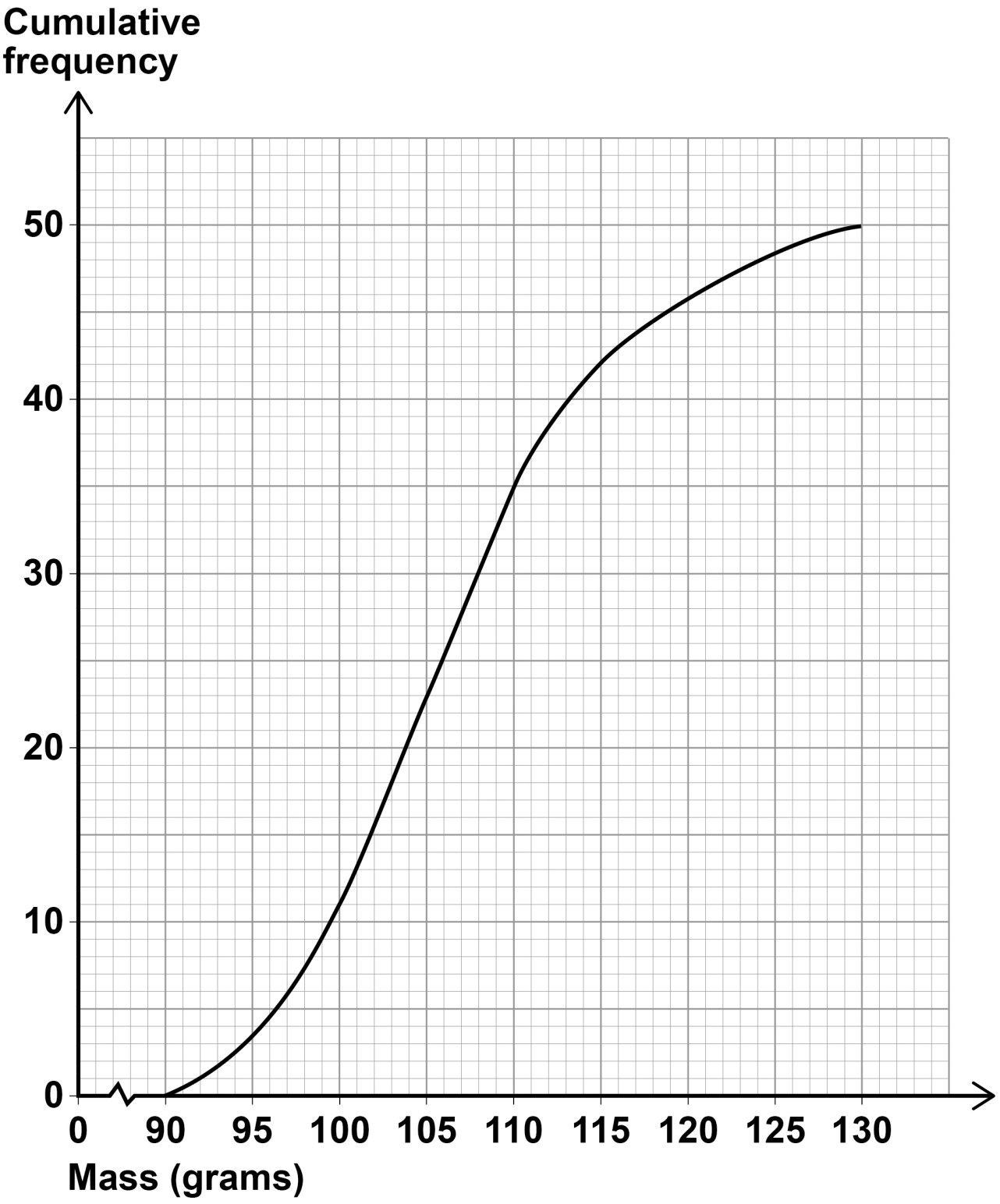
The density of tin is 7.31 g/cm^3

Work out the mass of the medal. [4 marks]

Answer _____ grams

[Turn over]

16 **The cumulative frequency graph shows information about the masses of 50 apples.**



16 (a) Use the graph to estimate the median mass of the apples. [1 mark]

Answer _____ **grams**

16 (b) Estimate the proportion of the apples that have a mass greater than 115 grams. [2 marks]

_____

_____

_____

Answer _____

7

[Turn over]

17 a **is a prime number.**

b **is an even number.**

$N = a^2 + ab$

Circle the correct statement about N**.** **[1 mark]**

could be even or odd

always even

always prime

always odd

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[Turn over]

18 **A bag contains 20 discs.**

10 are red, 7 are blue and 3 are green.

18 (a) **Marnie takes a disc at random before putting it back in the bag.**

Nick then takes a disc at random before putting it back in the bag.

Olly then takes a disc at random.

Work out the probability that they all take a red disc. [2 marks]

Answer _____

18 (b) **All 20 discs are in the bag.**

Reggie takes three discs at random, one after the other.

After he takes a disc he does NOT put it back in the bag.

Reggie's first disc is blue.

Work out the probability that all three discs are different colours. [3 marks]

Answer _____

[Turn over]

6

19

LUNCH

Choose one starter and one main course

There are four starters and ten main courses to choose from.

Two of the starters and three of the main courses are suitable for vegans.

What percentage of the possible lunches have BOTH courses suitable for vegans? [3 marks]

Answer _____ **%**

20 n **is a positive integer.**

Prove algebraically that

$$2n^2\left(\frac{3}{n}+n\right)+6n\left(n^2-1\right)$$

is a cube number. [3 marks]

21 y **is inversely proportional to** $\sqrt{x}$

$y = 4$ **when** $x = 9$

21 (a) Work out an equation connecting y **and** x**.**
[3 marks]

Answer _____

21 (b) **Work out the value of y when $x = 25$ [2 marks]**

Answer _____

11

[Turn over]

22 **Simplify fully** $\dfrac{x^5 - 4x^3}{3x - 6}$ **[3 marks]**

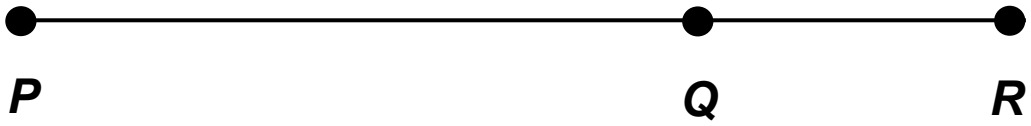
Answer _____

23 ***PQR*** **is a straight line.**

$PQ : QR = 3 : 1$

$\overrightarrow{PQ} = \mathbf{a}$

The diagram is not drawn accurately.



Circle the vector $\overrightarrow{RQ}$

[1 mark]

$\frac{1}{3}\mathbf{a}$ $\quad$ $\frac{1}{4}\mathbf{a}$ $\quad$ $-\frac{1}{3}\mathbf{a}$ $\quad$ $-\frac{1}{4}\mathbf{a}$

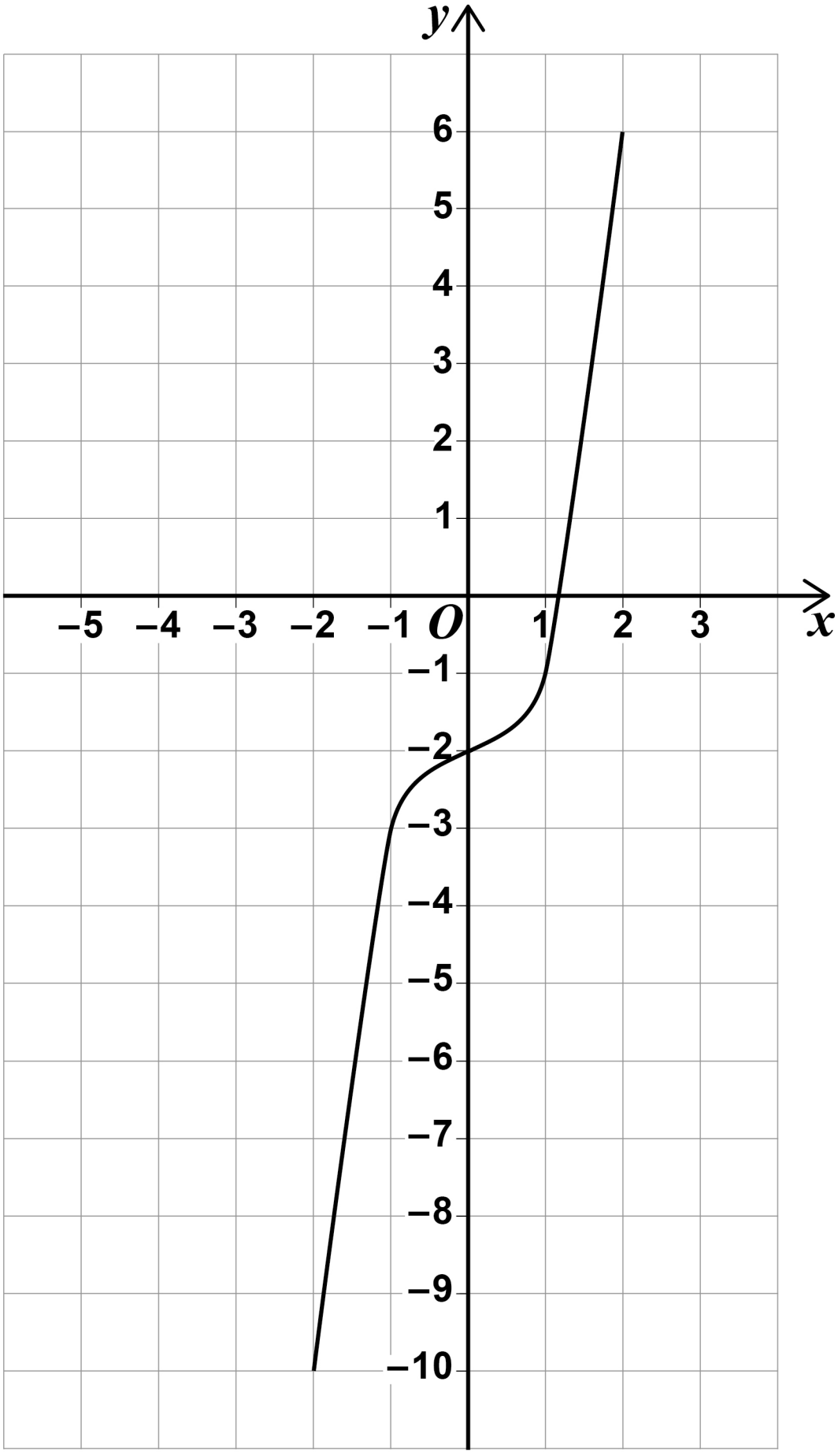
[Turn over]

24 Here is a sketch of $y = f(x)$

The curve passes through the points

(–2, –10) (–1, –3) (0, –2) (1, –1) (2, 6)

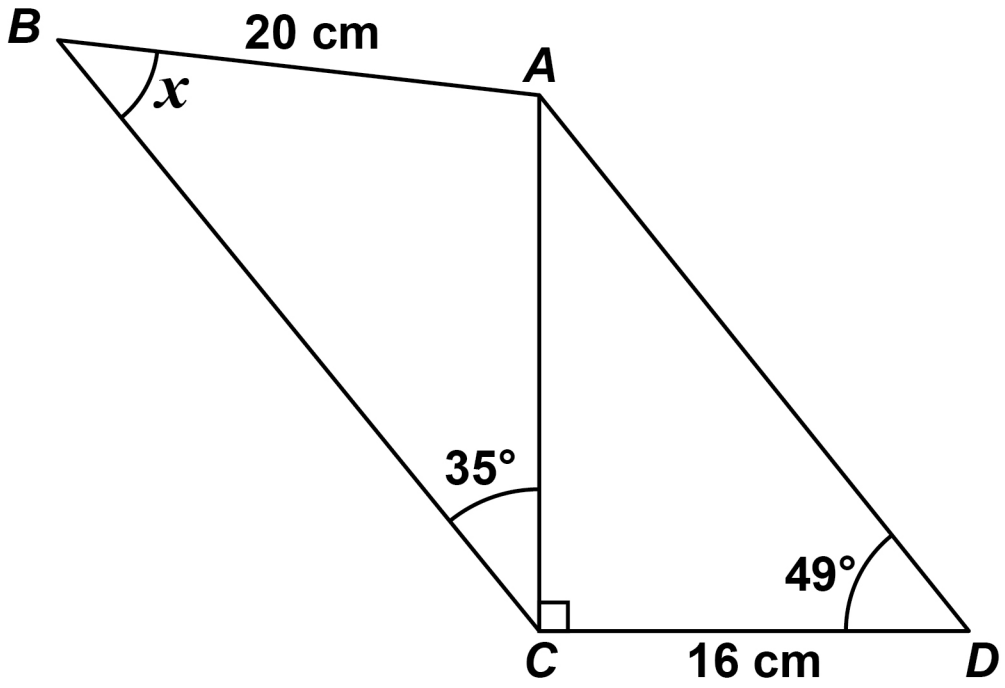
On the grid, on the opposite page, sketch the curve $y = f(x + 2)$ [2 marks]



6

25 ***ABC*** **and** ***ACD*** **are triangles.**

The diagram is not drawn accurately.



Work out the size of angle x. [5 marks]

Answer _____ **degrees**

[Turn over]

26 $f(x) = \frac{x}{x+2}$ $g(x) = x^2 - 2$

Work out $fg(x)$

Give your answer in the form $a + bx^n$ **where** a, b **and** n **are integers. [3 marks]**

Answer _____

27 The point $\left(3, \frac{1}{64}\right)$ lies on the curve $y = k^x$ where k is a constant.

Show that the point $\left(\frac{1}{2}, \frac{1}{2}\right)$ lies on the curve.
[3 marks]

11

28 Izzy runs an 80-metre race in 14 seconds.

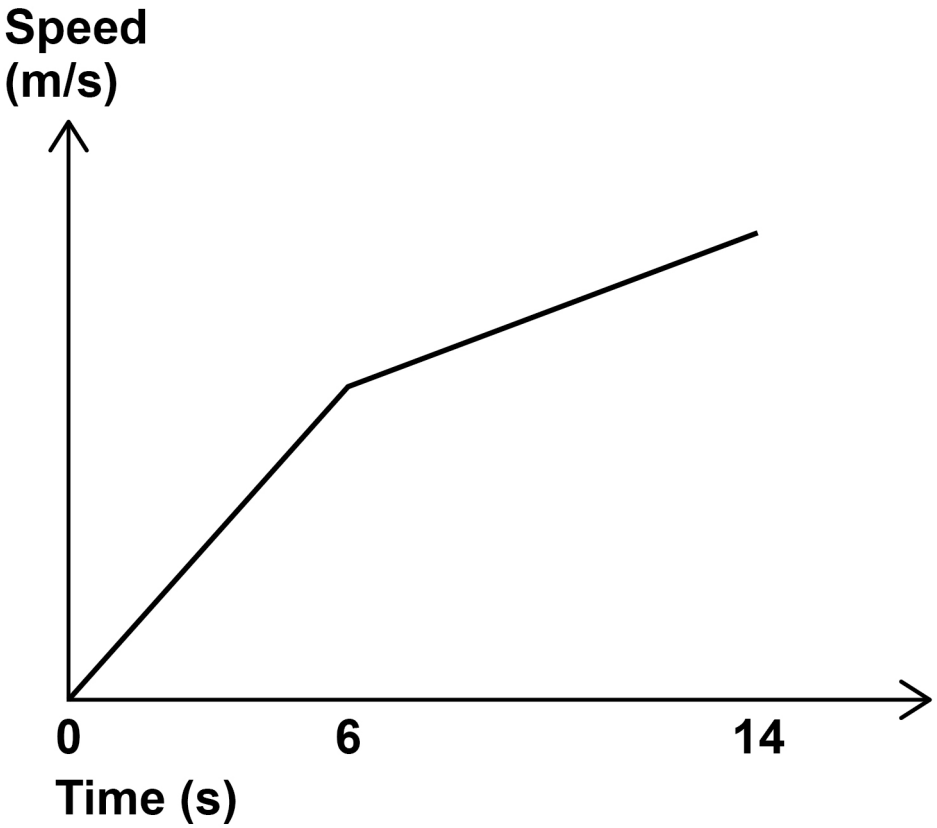
During the first 6 seconds her speed increases at a constant rate.

During the last 8 seconds her speed increases at a different constant rate.

Her speed at 14 seconds is 2 m/s more than her speed at 6 seconds.

Here is a sketch of her speed-time graph.

The diagram is not drawn accurately.



28 (a) **Work out her acceleration during the last 8 seconds.**

State the units of your answer. [2 marks]

_____

_____

_____

Answer _____

[Turn over]

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28 (b) **When Izzy finishes the 80-metre race, her speed is v m/s**

Work out the value of v. [4 marks]

Answer _____

END OF QUESTIONS

6

There are no questions printed on this page

For Examiner's Use	
Pages	Mark
4–5	
6–7	
8–11	
12–15	
16–19	
20–23	
24–27	
28–31	
32–35	
36–39	
40–43	
TOTAL	