For **AQA**

Name	Class

GCSE
Mathematics
Specification

H

Paper 1 Higher Tier

Churchill Paper 1B

1 hour 30 minutes

Materials

For this paper you must have: • mathematical instruments You must **not** use a calculator	

Instructions

- Use black ink or black ball-point pen.
- Draw diagrams in pencil.
- Write your name and class in the box at the top of the page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.

Churchill Maths

Written by Shaun Armstrong

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

1 In a sale, the price of jackets is reduced by 30%.

Work out the price in the sale of a jacket that normally costs £82.

Circle your answer.

[1 mark]

£24.60 £54.33 £57.40 £65.40

2 Which of these could be a Fibonacci sequence?

Circle your answer.

[1 mark]

2, 3, 6, 18, 108 1, 4, 5, 9, 10

2, 7, 9, 16, 25 1, 2, 4, 8, 16

3 Circle the calculation with an answer of 0.012

[1 mark]

0.3 × 0.4 0.03 × 0.04

30 × 0.0004 0.03 × 4

4 Circle the expression that is equivalent to $\frac{6ab + 3a^3}{3a}$

[1 mark]

$6ab + a^2$ $\quad$ $2b + a^2$ $\quad$ $2b + 3a^2$ $\quad$ $3b + a^2$

5 A sports hall is only used for playing badminton or basketball.

When it is used for badminton, the hall receives £15 per hour.
When it is used for basketball, the hall receives £18 per hour.

One week the hall is used for 55 hours.
The ratio of the time it is used for badminton to the time it is used for basketball is 7 : 4

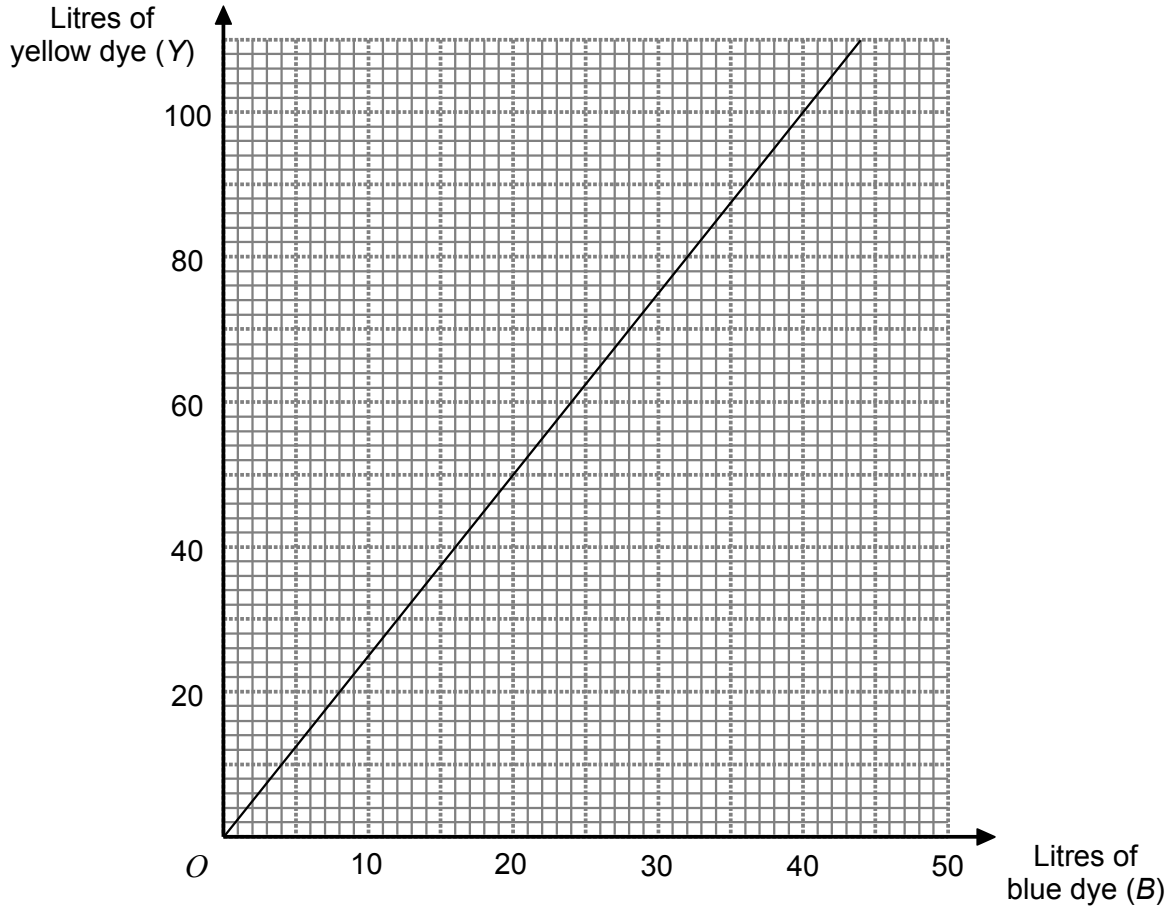
Work out how much the hall receives in total for this week.

[3 marks]

Answer £ _____

6 Yellow and blue dye are mixed to make a green dye.

This graph is used to determine how much of each dye is used when mixing them.



6 (a) Using the graph, estimate how much green dye is made when 60 litres of yellow dye is mixed with the correct amount of blue dye.

[1 mark]

Answer _____ litres

6 (b) The number of litres of yellow dye is Y and the number of litres of blue dye is B.

Use the graph to write down a formula connecting Y and B.

[2 marks]

_____

_____

_____

_____

Answer _____

6 (c) Hence, or otherwise, write down the ratio

volume of yellow dye : volume of blue dye

used when making the green dye.

Give your answer in the form $p : q$, where p and q are integers.

[1 mark]

Answer _____

7 (a) Find a fraction with a value between 0.21 and 0.22

Give your answer in its simplest form.

[2 marks]

Answer _____

7 (b) Find the mean of these three fractions

$\frac{1}{4}$ $\frac{5}{6}$ $\frac{3}{8}$

[3 marks]

Answer _____

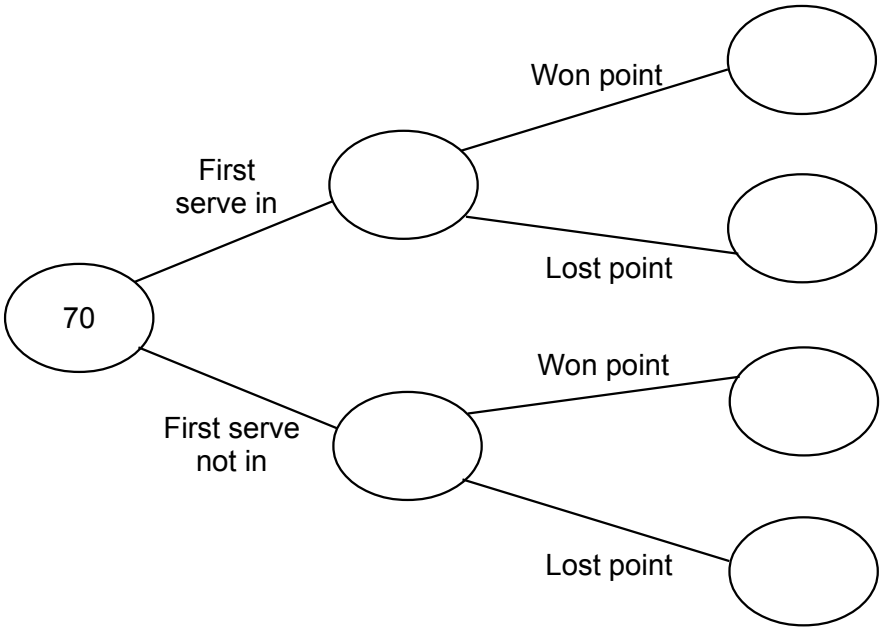
8 Abi served on 70 points during a tennis match.

Her first serve was in on 28 of these points.

She won 18 of the points on which her first serve was in.

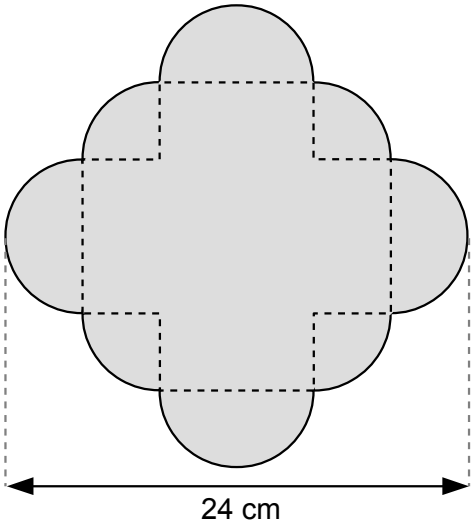
Altogether she won 40 of the 70 points on which she served.

Complete this frequency diagram.



[2 marks]

9



Not drawn accurately

The edge of a design consists of 4 identical semicircles and 4 identical quarter-circles.

The radius of the quarter-circles is the same as the radius of the semicircles.

The total width of the design is 24 cm as shown.

9 (a) Show that the perimeter of the design is 24π cm.

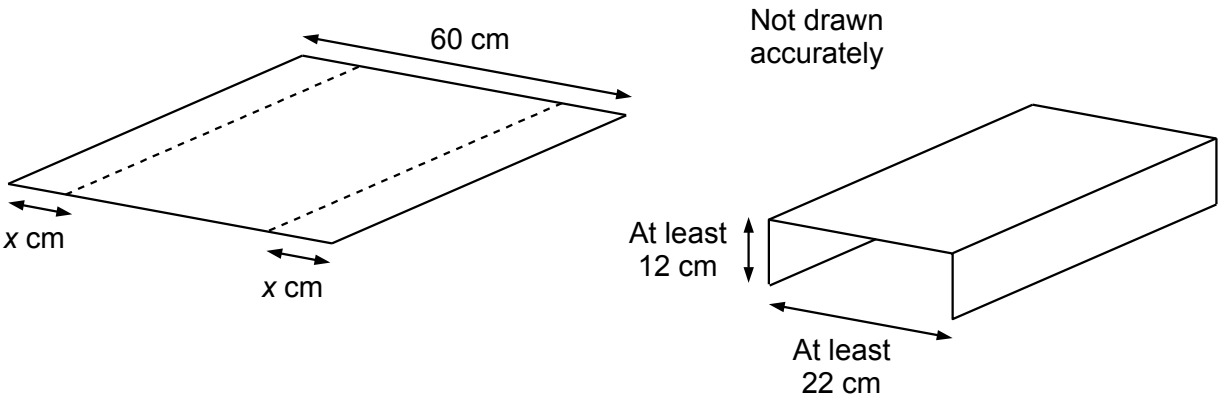
[3 marks]

9 (b) Find the area of the design in square centimetres, giving your answer in the form $a + b\pi$, where a and b are integers.

[3 marks]

Answer _____ cm^2

10



Martin is making cloches to protect young plants.

He uses square sheets of side 60 cm made from plastic.
He uses heat to fold the sheets along two lines parallel to the edges as shown.
The folds are each x cm from the nearest edge.

The cloches must be at least 12 cm tall and at least 22 cm wide.

Use algebra to find the set of possible values of x.

[3 marks]

Answer _____

11 Simplify $\sqrt{27} + \sqrt{48}$

Circle the answer.

[1 mark]

$7\sqrt{3}$ $5\sqrt{3}$ $4\sqrt{3}$ $\sqrt{3}$

12 Each part of this question gives a student's estimate for the value of a numerical expression.

Decide whether each estimate is too low or too high and explain your answer.

12 (a) Dave estimates the value of $(11.1)^2$ to be 135.

[1 mark]

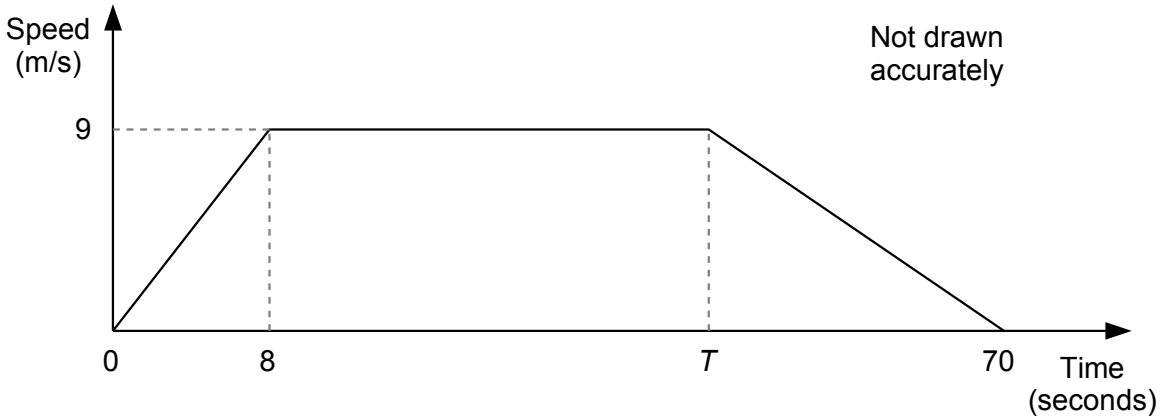
12 (b) Ruksana estimates the value of $\sqrt[3]{980}$ to be 9.5.

[1 mark]

12 (c) Tim estimates the value of $(2.5)^4$ to be 46.

[2 marks]

13



The speed-time graph shows the journey of a tram between two stops.

The distance between the stops is 513 metres.

Work out the value of T.

[3 marks]

Answer _____

14 Circle the fraction that is nearest in value to $0.2\dot{5}$

[1 mark]

$\frac{1}{4}$ $\frac{6}{25}$ $\frac{11}{40}$ $\frac{13}{50}$

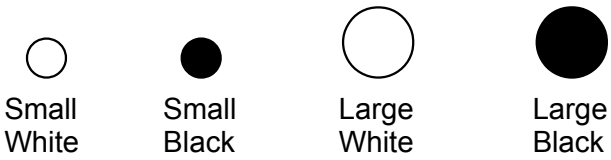
15 (a) Describe fully a transformation under which the points (3, 3) and (3, 6) are invariant.

[1 mark]

15 (b) Describe fully a transformation under which the points (–1, 6) and (2, 0) are invariant.

[3 marks]

16



A bucket contains the 4 types of balls shown above.
Each ball can be small or large in size.
Each ball can be white or black in colour.

The ratio of small to large balls in the bucket is 3 : 7

The ratio of white to black balls in the bucket is 5 : 7

16 (a) Jaime says

"There must be at least 60 balls in the bucket."

Is Jaime correct?

Show working to justify your answer.

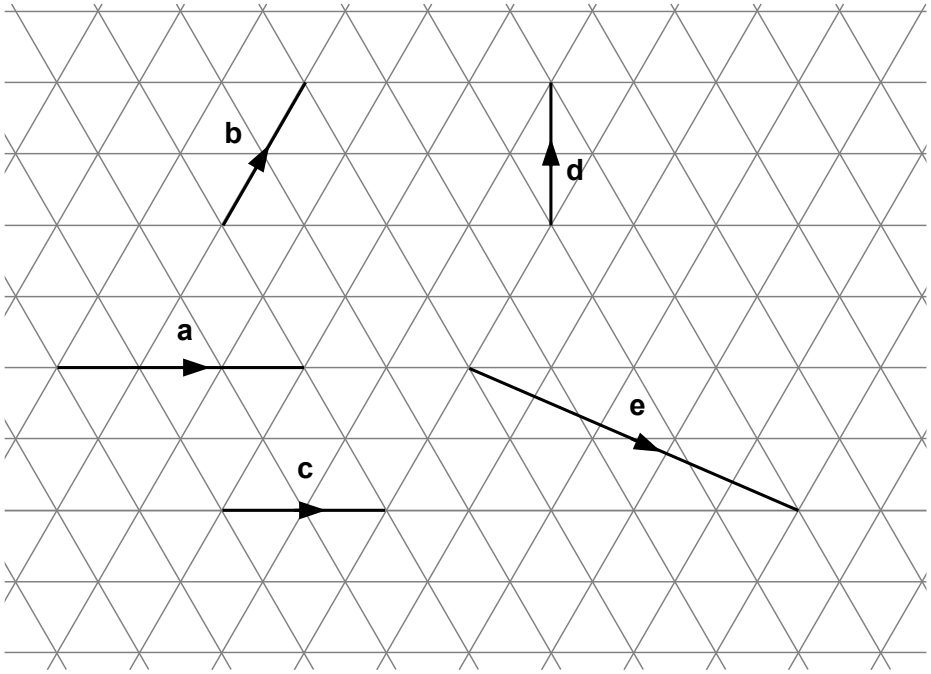
[3 marks]

16 (b) Find one possible value for the number of small white balls when there are 62 large black balls in the bucket.

[3 marks]

Answer _____

17



The vectors **a**, **b**, **c**, **d** and **e** are shown on the grid.

17 (a) Express **c** in terms of **a**.

[1 mark]

Answer _____

17 (b) Express **d** in terms of **a** and **b**.

[2 marks]

Answer _____

17 **(c)** Express **e** in terms of **a** and **b**.

[2 marks]

Answer _____

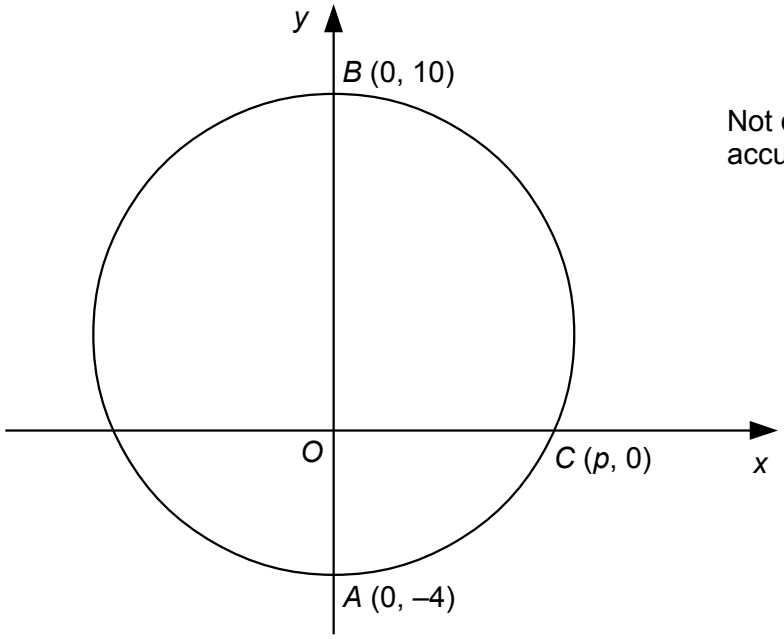
18 For all values of x, $f(x) = 3x + k$, where k is a constant.

Given that $ff(3) = 7$, find the value of k.

[3 marks]

Answer _____

19



Not drawn accurately

A is the point (0, –4) and B is the point (0, 10).

AB is a diameter of a circle which passes through the point C (p, 0) where p is positive.

Find the exact value of p.

Give your answer in its simplest form.

[4 marks]

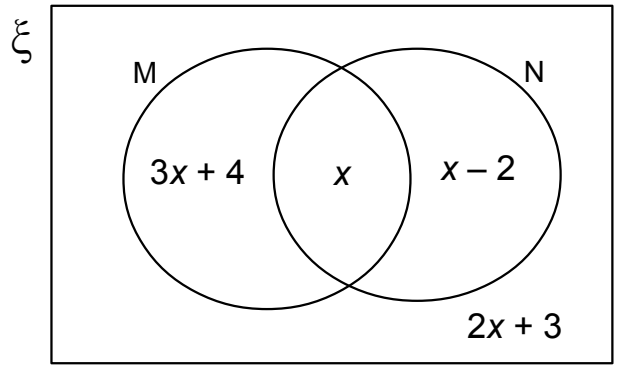
Answer _____

20 The Venn diagram shows information about a box of chocolates.

ξ = chocolates in the box

M = milk chocolates

N = chocolates with nuts in



When a chocolate is picked at random from the box, the probability that it is a milk chocolate is 3 times the probability that it contains nuts.

20 (a) Find out how many chocolates are in the box.

[4 marks]

Answer _____

A chocolate is picked at random from the box.

The chocolate has nuts in.

20 (b) What is the probability that it is not a milk chocolate?

Circle your answer.

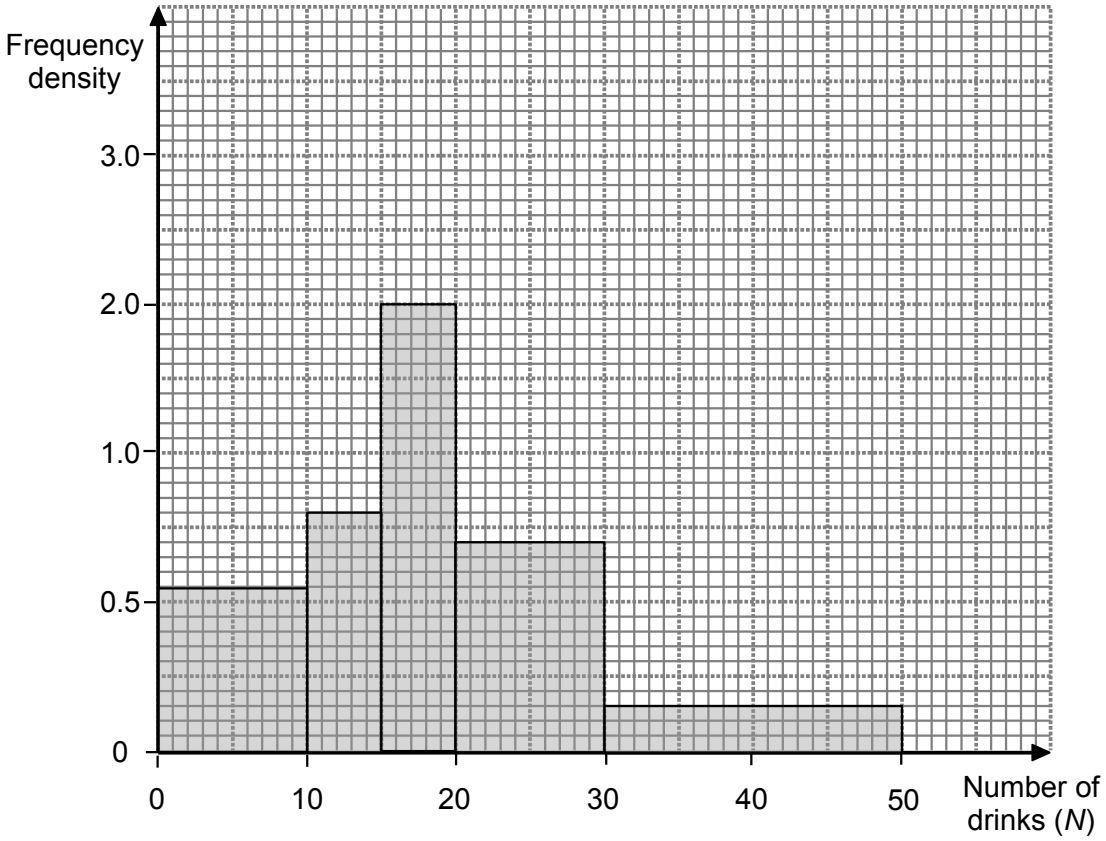
[1 mark]

$\frac{3}{8}$ $\frac{2}{5}$ $\frac{3}{5}$ $\frac{3}{40}$

21 Seb asks 30 people in a coffee shop how many hot drinks they have on average per week. The table shows his results.

Number of drinks (N)	Frequency
$0 \leq N < 10$	6
$10 \leq N < 15$	4
$15 \leq N < 20$	10
$20 \leq N < 30$	7
$30 \leq N < 50$	3

Seb used these results to draw this histogram.



21 (a) Write down two mistakes that Seb made.

[2 marks]

Mistake 1 _____

Mistake 2 _____

Seb assumes that his data will be representative of the whole UK population.

21 (b) The UK population is approximately 65 million.

Using Seb's assumption, calculate an estimate for the number of people in the UK who drink less than 10 hot drinks on average per week.

[2 marks]

Answer _____

21 (c) Comment on Seb's assumption and how it affected the value you calculated in part **(b)**.

[2 marks]

22 **(a)** What is the value of $36^{-\frac{1}{2}}$

Circle your answer.

[1 mark]

-6 $\quad \frac{1}{18}$ $\quad \frac{1}{6}$ $\quad \frac{1}{\sqrt{6}}$

22 **(b)** Work out the value of $2^{23} \times 3^{21} \times 6^{-19}$

[2 marks]

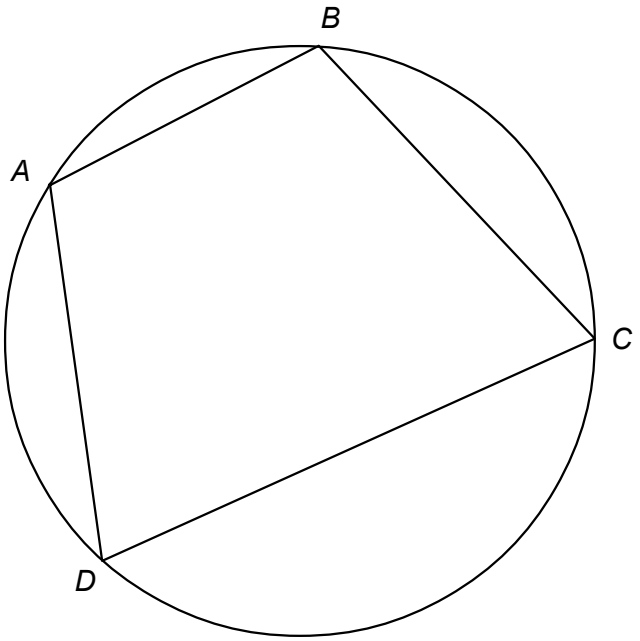
Answer _____

23 Show that

$$\frac{3}{x-3} - \frac{4}{x+1} = \frac{15-x}{(x-3)(x+1)}$$

[2 marks]

24



Not drawn accurately

The points *A*, *B*, *C* and *D* lie on the circumference of a circle.

Prove that

angle *ABC* + angle *ADC* = 180º

[3 marks]

25 Solve the equation

$$x^2 - 8x - 3 = 0$$

giving your answers in the form $a + b\sqrt{c}$, where a, b and c are integers.

[3 marks]

Answer _____

END OF QUESTIONS