

Please write clearly in block capitals.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

Surname

\_\_\_\_\_

Forename(s)

\_\_\_\_\_

Candidate signature

\_\_\_\_\_

I declare this is my own work.

# GCSE MATHEMATICS

# H

Higher Tier Paper 2 Calculator

Wednesday 7 June 2023

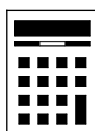
Morning

Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26	
<b>TOTAL</b>	



J U N 2 3 8 3 0 0 2 H 0 1

IB/M/Jun23/E8

8300/2H

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

Do not write  
outside the  
box

**1** Write  $30 : 12$  in the form  $n : 1$

**[1 mark]**

---

---

Answer \_\_\_\_\_ : 1

**2** Four consecutive triangular numbers are 6 10 15 21

Write down the next triangular number.

**[1 mark]**

---

---

Answer \_\_\_\_\_



- 3 Write down the reciprocal of  $\frac{4}{7}$  [1 mark]

Answer \_\_\_\_\_

- 4 The price of a toy increases by 12.5% to £19.53  
Work out the **original** price of the toy. [2 marks]

---

---

---

---

Answer £ \_\_\_\_\_

Turn over for the next question



She has

- [4 marks]**

Answer \_\_\_\_\_ :



- 6 (a) Part of a regular polygon is shown.



Not drawn  
accurately

Assume that the polygon is an octagon.

Work out the size of an **exterior** angle.

[2 marks]

---



---



---

Answer \_\_\_\_\_ °

- 6 (b) In fact, the polygon has **more** sides than an octagon.

What does this mean about the size of an exterior angle?

Tick **one** box.

[1 mark]

☐

It is more than the answer to part (a)

☐

It is the same as the answer to part (a)

☐

It is less than the answer to part (a)

☐

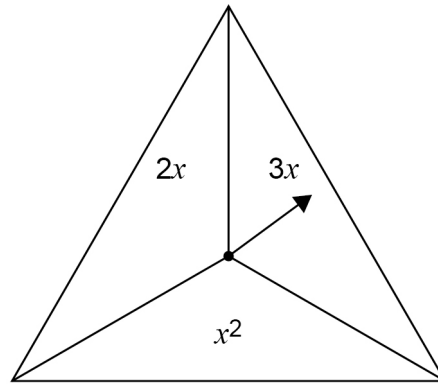
It could be any of the above



7

In a game,

- an ordinary fair six-sided dice is rolled
- the fair spinner shown is spun.



The score is the dice number **substituted** into the spinner expression.

7 (a) Complete the table to show all of the possible scores.

[2 marks]

	1	2	3	4	5	6
$2x$				8		
$3x$		6				
$x^2$					25	

---



---



---



- 7 (b)** A player wins the game if their score is 10 or more.

Work out the probability that they win the game.

**[1 mark]**

---



---



---

Answer \_\_\_\_\_

- 7 (c)** The game is played 711 times.

Estimate the number of games that are won.

**[2 marks]**

---



---



---

Answer \_\_\_\_\_

**8**  $(a - 3)x^2 + 2b \equiv 5x^2 + 12$

Work out the values of  $a$  and  $b$ .

**[2 marks]**

---



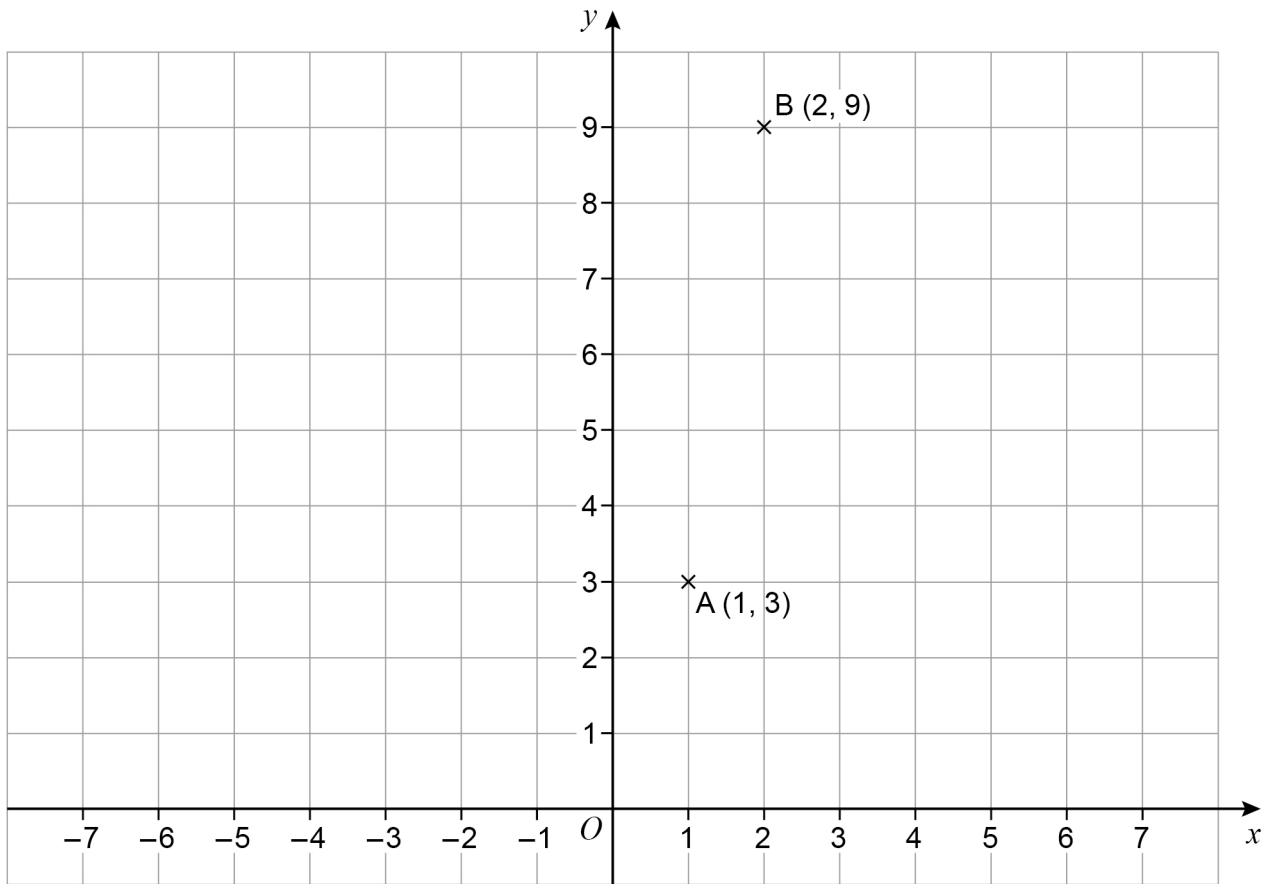
---

$a =$  \_\_\_\_\_  $b =$  \_\_\_\_\_



9

A (1, 3) and B (2, 9) are points on a centimetre grid.



ABCD is a parallelogram.

AD and BC are **horizontal** and each has length 5 cm

The diagonals of ABCD cross at E.

Work out the **two** possible pairs of coordinates of E.**[4 marks]**


---



---



---

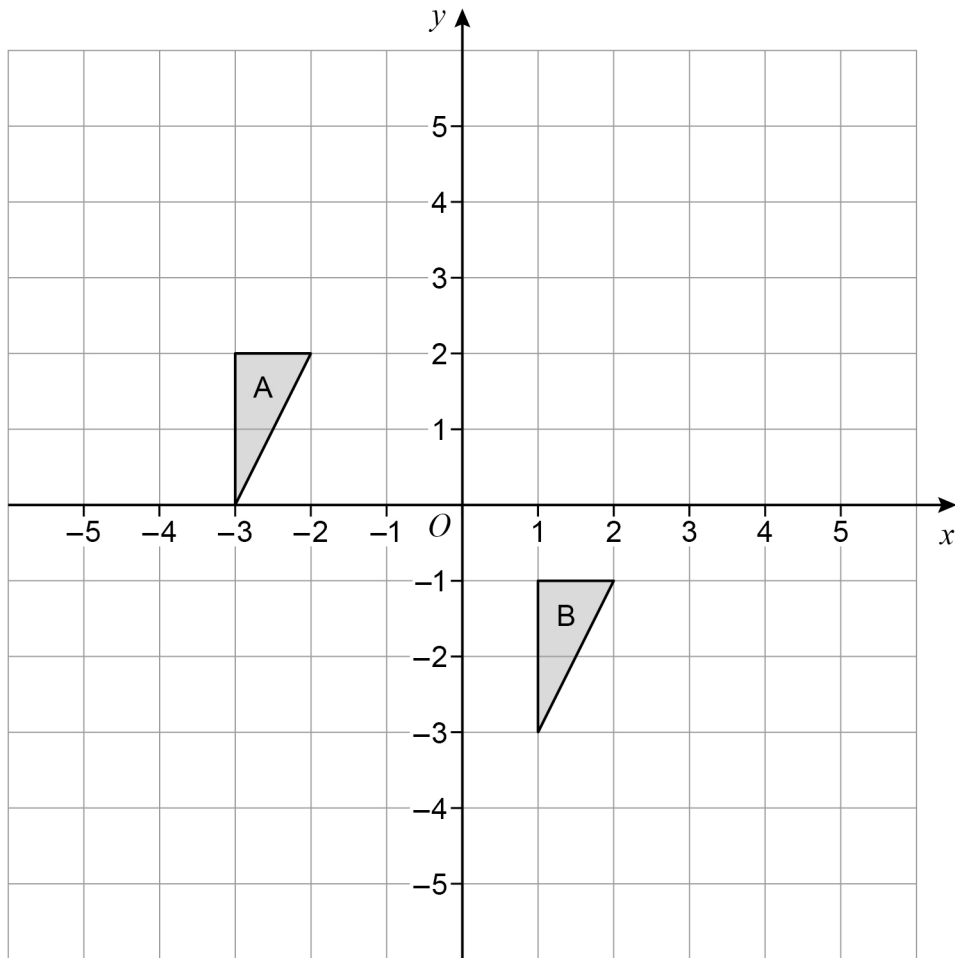
Answer ( \_\_\_\_\_ , \_\_\_\_\_ ) and ( \_\_\_\_\_ , \_\_\_\_\_ )





10

Write down the translation vector that maps shape A onto shape B.

**[2 marks]**

Answer \_\_\_\_\_

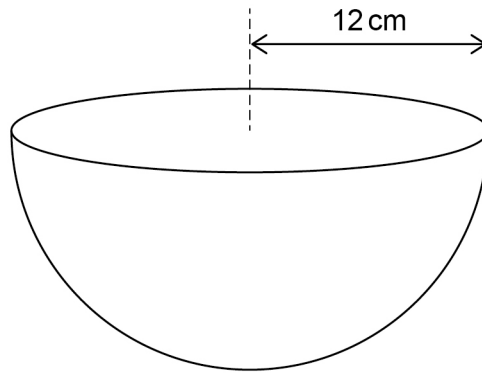
Turn over ►



11

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

A bowl is a hemisphere with radius 12 cm



Water is poured into the bowl  
at a rate of  $325 \text{ cm}^3$  per second  
for 8 seconds.

Does the water fill **more than** 70% of the bowl?

You **must** show your working.

[4 marks]

---

---

---

---

---

---

---

---

---

---

---

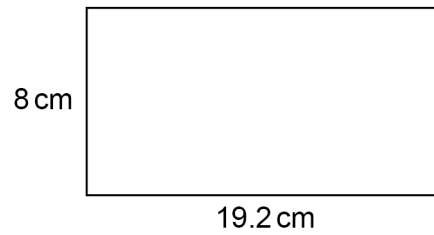
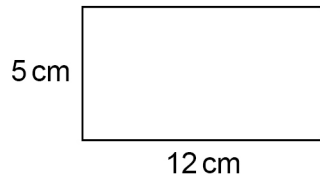
---



- 12** Show that these two rectangles are similar.

**[2 marks]**

Not drawn  
accurately




---

---

---

- 13** A factory packs  $x$  boxes of teabags per hour.  
Each box contains 80 teabags.

Show that the factory packs  $\frac{4x}{3}$  teabags per minute.

**[2 marks]**

---

---

---

---

Turn over for the next question

Turn over ►



14

A company has 123 employees.

Information about their hourly rates of pay is shown in the table.

Hourly rate, £ $p$	Number of employees
$10 \leq p < 14$	66
$14 \leq p < 20$	32
$20 \leq p < 40$	15
$40 \leq p < 100$	10
	Total = 123

The owner of the company uses the data to make two statements.

**Statement A**

“Over 30% of employees have an hourly rate that is more than £17”

**Statement B**

“The average hourly rate of pay is more than £20”

14 (a) Show working that supports **Statement A**.

[3 marks]

---

---

---

---

---

---

---



**14 (b)** Why might **Statement A** not be true?

[1 mark]

---



---



---

**14 (c)** Work out an estimate of the mean to support **Statement B**.

[3 marks]

---



---



---



---



---



---



---



---

**14 (d)** Why is the mean **not** the best average to represent the data?

[1 mark]

---



---



---



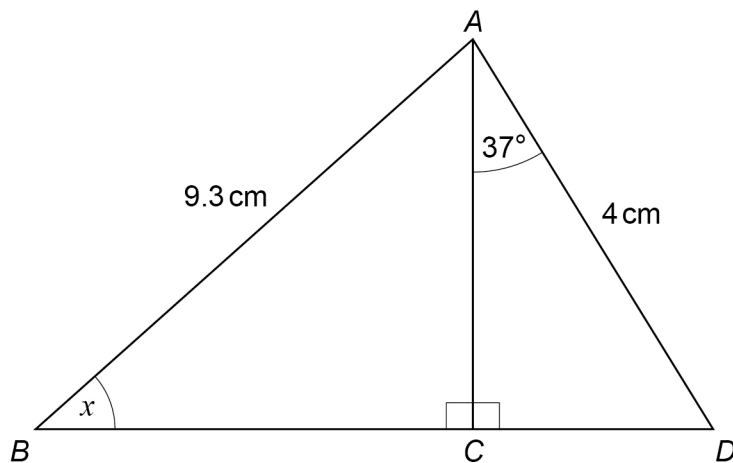
**[2 marks]**

16

**[3 marks]**



Not drawn accurately



**[4 marks]**

$x =$







Here are the first four terms of a quadratic sequence.

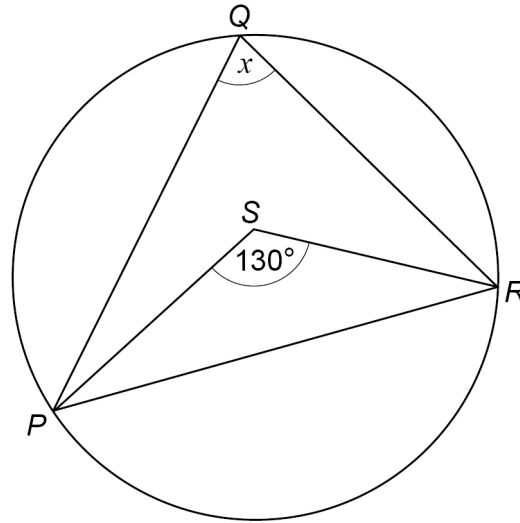
Work out an expression for the  $n$ th term of the sequence.

Find Personal Tutor from [www.wisepspout.co.uk](http://www.wisepspout.co.uk) 找名校导师，用小草线上辅导（微信小程序同名）

7

- 20 (a)**  $P$ ,  $Q$  and  $R$  are points on a circle.  
 $S$  is a point inside triangle  $PQR$ .

Not drawn  
accurately



Assume that  $S$  is the centre of the circle.

Work out the size of angle  $x$ .

[1 mark]

$x =$  \_\_\_\_\_  $^{\circ}$

- 20 (b)** In fact, the centre of the circle is on  $PS$  but **not** at  $S$ .

What does this mean about the size of angle  $x$ ?

Tick **one** box.

[1 mark]

☐

It is the same as the answer to part (a)

☐

It is greater than the answer to part (a)

☐

It is smaller than the answer to part (a)

☐

It is impossible to tell



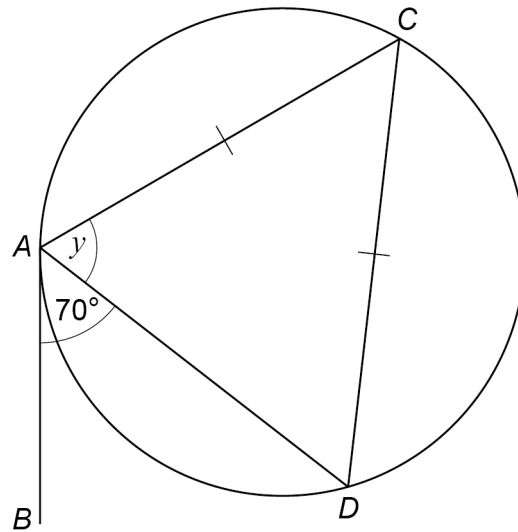
20 (c) For a different circle,

$AB$  is a tangent at  $A$

$C$  and  $D$  are on the circumference of the circle

$AC = CD$

Not drawn  
accurately



Here is Simon's method to work out the size of angle  $y$ .

Angle  $ADC = 70^\circ$  (alternate segment theorem)  
Therefore  $y = 70^\circ$  (angles in an isosceles triangle)

Is he correct?

Give a reason for your answer.

[1 mark]

---



---



---



---



Magana decides to put £500 into an account that pays compound interest. She wants to have **at least** £560 in the account after 3 years.

**[3 marks]**

Answer	%
1	100



- 22** An approximate value of a root of an equation,  $x$ , can be found using the iterative formula

$$x_{n+1} = \sqrt[3]{5(x_n)^2 - 2x_n - 3}$$

The starting value is  $x_1 = 4$

- 22 (a)** Work out the values of  $x_2$  and  $x_3$

**[2 marks]**

---



---



---

$$x_2 = \underline{\hspace{10cm}}$$

$$x_3 = \underline{\hspace{10cm}}$$

- 22 (b)** By continuing the iteration, show that the value of  $x$  is more than 4.25

**[1 mark]**

---



---



---



23

Here are three sets of cards.

<b>Set A</b>	1	1	3	5	5	5	6	8
<b>Set B</b>	1	2	4	6	8	8	9	
<b>Set C</b>	3	4	5	6				

In a game, a player has two options.

**Option 1**

Pick two cards from Set A

**Option 2**Pick one card from Set B  
and  
pick one card from Set C

The cards are picked at random.

The player wins if the total of their two cards is exactly 10



Option 1

11

### Option 2

10

**[4 marks]**

4

**Turn over ►**



24

 $a = 65$  to the nearest integer $b = 30$  to 1 significant figureWork out the **upper bound** for  $2a^2 - b^2$ You **must** show your working.**[3 marks]**

---

---

---

---

---

---

---

---

---

---

Answer \_\_\_\_\_





Show that  $\frac{x-5}{x-2} + \frac{x+5}{x+2}$

simplifies to  $\frac{ax^2-b}{x^2-4}$  where  $a$  and  $b$  are integers.

Find Personal Tutor from [www.wisesprout.co.uk](http://www.wisesprout.co.uk)

找名校导师，用小草线上辅导（微信小程序同名）

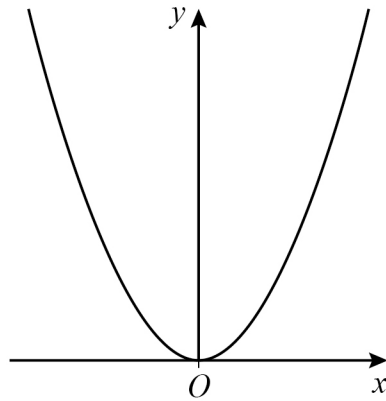
**Turn over for the next question**

6

**Turn over ►**



26 Here is a sketch of  $y = x^2$



26 (a) The minimum point of  $y = x^2$  is at  $(0, 0)$

Write down the coordinates of the minimum point of  $y = x^2 + 2$

[1 mark]

Answer ( \_\_\_\_\_ , \_\_\_\_\_ )

26 (b) The graph  $y = x^2$  is reflected in the  $x$  axis.

Write down the equation of the graph after this transformation.

[1 mark]

Answer \_\_\_\_\_

26 (c)  $y = x^2$  is now transformed to give  $y = (x + 3)^2$

Describe fully this single transformation.

[2 marks]

---



---

END OF QUESTIONS



**There are no questions printed on this page**

*Do not write  
outside the  
box*

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

Find Personal Tutor from [www.wisesprout.co.uk](http://www.wisesprout.co.uk)

找名校导师，用小草线上辅导（微信小程序同名）



[illegible]

[illegible]

[illegible]

[illegible]

**There are no questions printed on this page**

*Do not write  
outside the  
box*

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

**Copyright information**

For confidentiality purposes, all acknowledgements of third-party copyright material are published in a separate booklet. This booklet is published after each live examination series and is available for free download from [www.aqa.org.uk](http://www.aqa.org.uk).

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team.

Copyright © 2023 AQA and its licensors. All rights reserved.

Find Personal Tutor from [www.wisesprout.co.uk](http://www.wisesprout.co.uk)

找名校导师，用小章线上辅导（微信小程序同名）

