

**Friday 13 June 2014 – Morning**

**GCSE MATHEMATICS B**

**J567/04** Paper 4 (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**

None

**Other materials required:**

- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

**Duration:** 1 hour 45 minutes



Candidate forename		Candidate surname	
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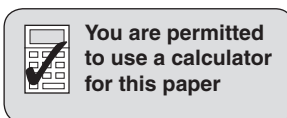
Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

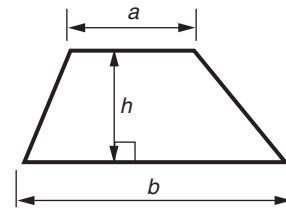
**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- The quality of written communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

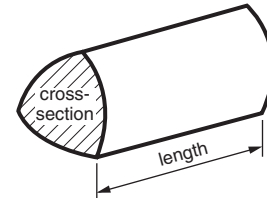


## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

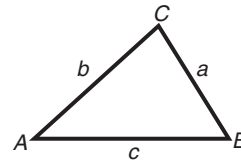


**In any triangle ABC**

**Sine rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

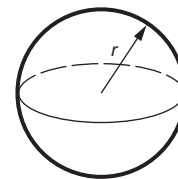
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** =  $\frac{1}{2}ab \sin C$



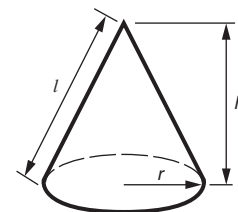
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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



**The Quadratic Equation**

The solutions of  $ax^2 + bx + c = 0$ ,  
where  $a \neq 0$ , are given by

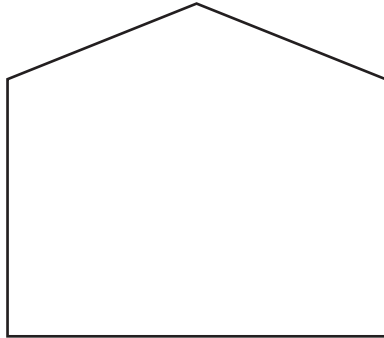
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**PLEASE DO NOT WRITE ON THIS PAGE**

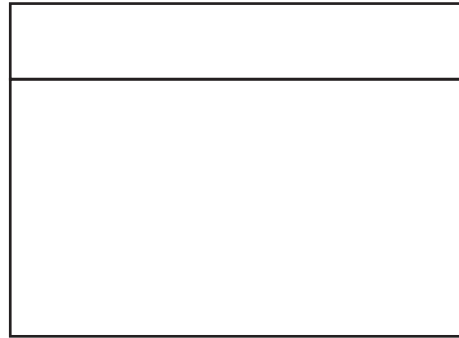
Answer **all** the questions.

- 1 The scale drawing shows the front and side elevations of a shed.

**Scale: 2 cm represents 1 m**



Front elevation

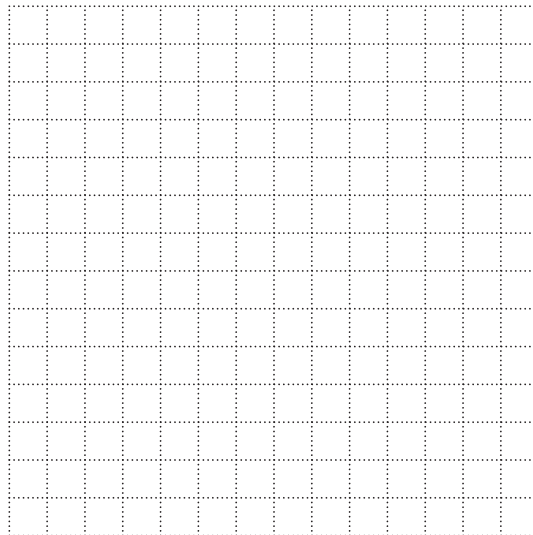


Side elevation

- (a) Work out the real height of the shed.

(a) ..... m [2]

- (b) On the grid below, draw an accurate plan view of the shed.  
Use the scale 2 cm represents 1 m.



[2]

- 2 (a) Work out.

$$\sqrt{4.7 \times 2.5 - 1.8^2}$$

Give your answer correct to three significant figures.

(a) ..... [2]

- (b) Here is part of Tara's homework.

Question 10

X

The time taken for a journey is 2.25 hours.  
This time in hours and minutes is 2 hours 25 minutes.

Question 11

X

$3570 \div 0.93 = 3391.5$

- (i) Explain what is wrong with Tara's answer to Question 10.

.....  
..... [1]

- (ii) Without working out the exact answer, explain how you can tell her answer to Question 11 is wrong.

.....  
..... [1]

- 3 Jayden makes a 5-sided spinner, numbered from 1 to 5.  
He records the number of times he scores a 3 from different numbers of spins.

Number of spins	10	50	200
Number of times 3 scored	4	18	76
Relative frequency			

(a) Complete the table to show the relative frequencies of scoring 3. [2]

(b) Which of the relative frequencies gives the best estimate of the probability of scoring 3?  
Give a reason for your answer.

..... because .....

..... [1]

(c) Estimate the number of times Jayden would expect to score a 3 if he spins the spinner 500 times.

(c) ..... [1]

(d) Is Jayden's spinner fair?  
Give a reason for your answer.

..... because .....

..... [1]

- 4 Northland School records the number of times students are late for morning and afternoon sessions of school.

(a) The table summarises this information for the 30 students of class 11R in one week.

Number of times late	Frequency	
0	11	
1	8	
2	6	
3	0	
4	3	
5	2	

Work out the mean number of times late.

(a) ..... [3]

- (b) Each term, a letter is sent home if students are late for more than 15% of sessions. Here is Karl's record for when he was in Year 10.

Autumn term	140 sessions	24 late
Spring term	116 sessions	19 late
Summer term	128 sessions	15 late

During which terms did Karl have a letter sent home about lateness?  
Show all your working.

(b) ..... [3]

5 (a) The  $n$ th term of a sequence is given by  $8n - 5$ .

(i) Write down the first three terms of this sequence.

(a)(i) ..... [2]

(ii) Is 96 a term in this sequence?  
Give a reason for your answer.

..... because ..... [1]

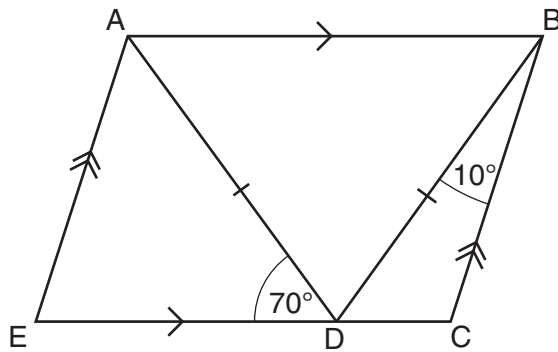
(b) Here are the first four terms of a different sequence.

16      9      2      -5

Write an expression for the  $n$ th term of this sequence.

(b) ..... [2]

- 6 (a) The diagram shows parallelogram ABCE.  
 D is a point on EC.  
 $AD = BD$ , angle  $ADE = 70^\circ$  and angle  $CBD = 10^\circ$ .



Not to scale

Work out angle BCD.  
 Give a reason for each angle you work out.

(a) Angle BCD = ..... $^\circ$  [4]

- (b) The interior angle of a regular polygon is  $156^\circ$ .

How many sides does the polygon have?

(b) ..... [2]



7 (a) Factorise fully.

$$6xy + 8y^2$$

(a) ..... [2]

(b) Expand and simplify.

$$(x - 5)(x - 3)$$

(b) ..... [2]

(c) Solve the inequality.

$$5x - 2 < 3x + 18$$

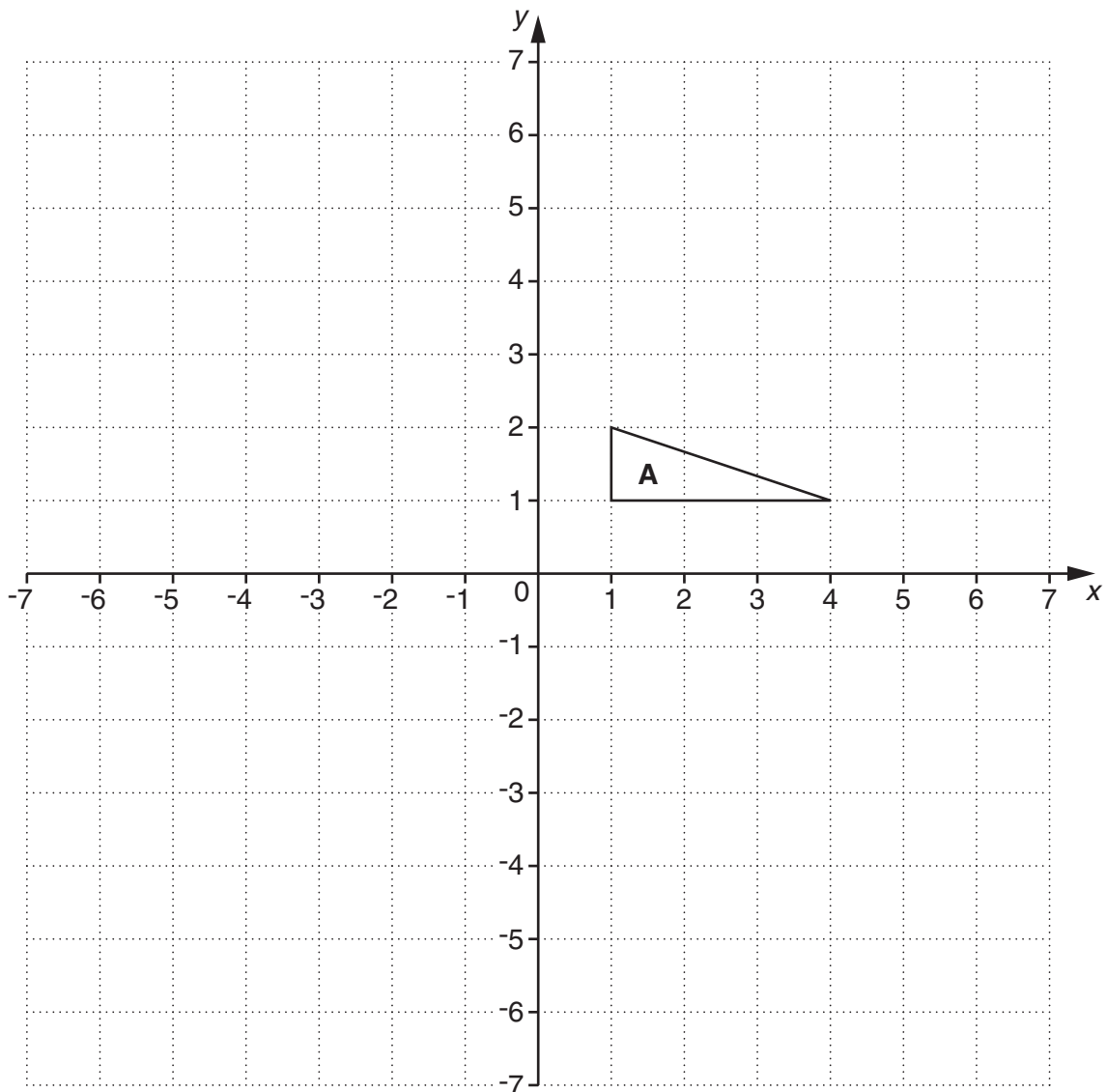
(c) ..... [3]

(d) Solve.

$$\frac{x}{4} = 2 - x$$

(d)  $x =$  ..... [3]

8 Triangle **A** is drawn on the grid below.



Describe fully the **single** transformation that is equivalent to:

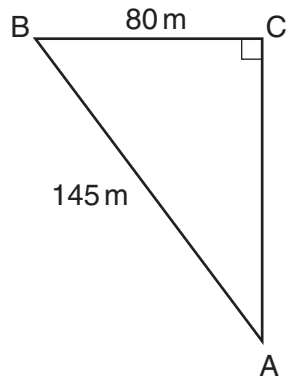
- a rotation of  $90^\circ$  anticlockwise about  $(0, 0)$ , followed by
- a reflection in the  $x$ -axis.

You may use the grid to help you.

.....

..... [3]

9 The diagram shows a swimming course set out on a lake. Angle  $BCA = 90^\circ$ .



Not to scale

Swimmers go from A to B to C and then directly back to A.

(a) Calculate the total length of the swimming course.

(a) ..... m [4]

(b) C is due north of A.

Calculate the bearing of B from A.

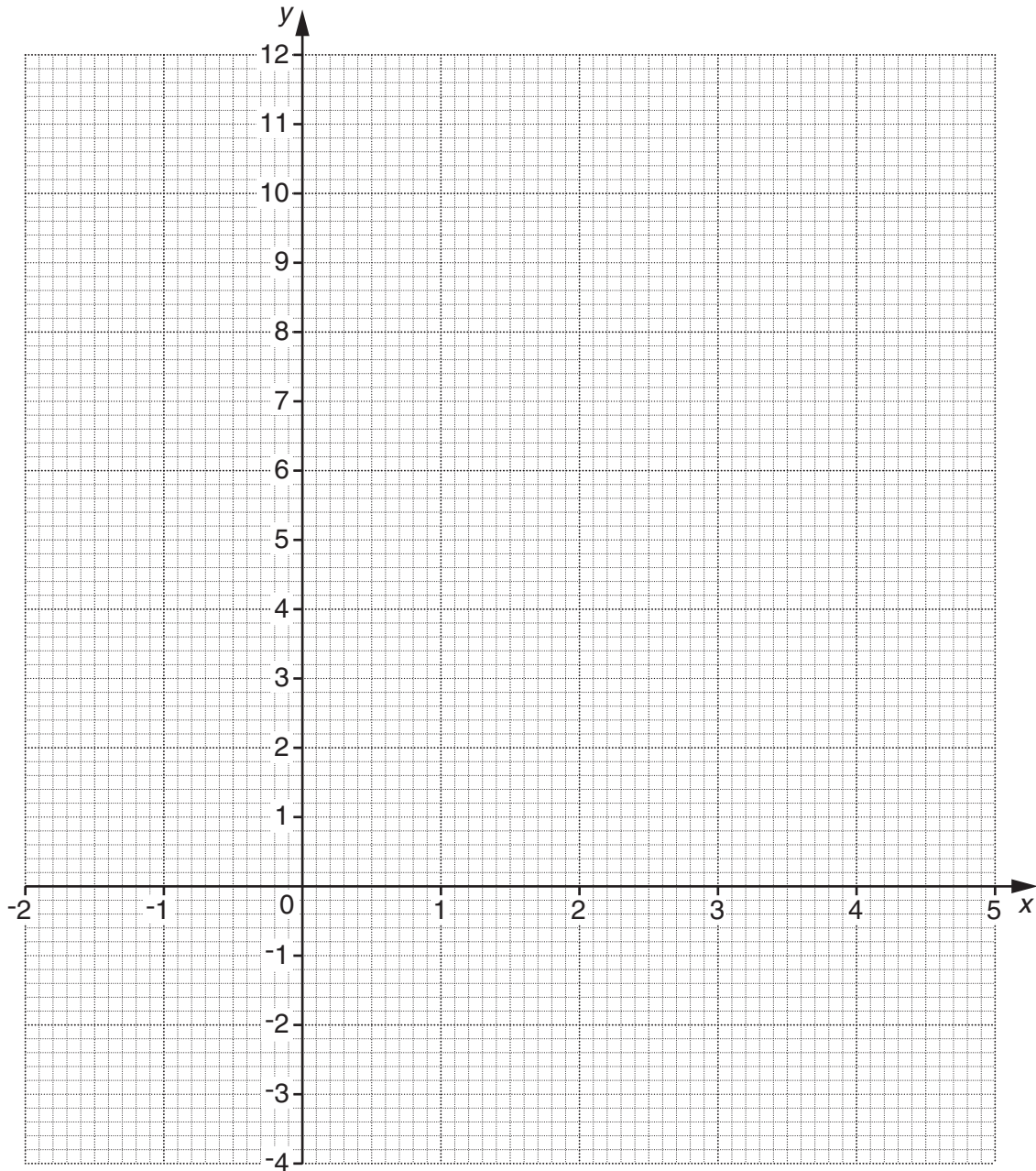
(b) ..... $^\circ$  [4]

10 (a) (i) Complete the table for  $y = x^2 - 3x$ .

x	-2	-1	0	1	2	3	4
y		4	0	-2	-2	0	4

[1]

(ii) Draw the graph of  $y = x^2 - 3x$  for values of  $x$  from -2 to 4.



[2]

(b) On the same set of axes, plot the graph of  $x + y = 5$ . [3]

(c) Use your graphs to find the solutions to these simultaneous equations.

$$y = x^2 - 3x$$

$$x + y = 5$$

(c)  $x = \dots\dots\dots y = \dots\dots\dots$

$x = \dots\dots\dots y = \dots\dots\dots$

[2]

11 The table shows the quarterly visitor numbers at a museum. It also shows some four-quarter moving averages.

Year	2012				2013				2014	
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	
Visitors (thousands)	6	8	12	5	4	9	15	7	7	
Moving average (thousands)			7.75	7.25						

(a) Calculate the next three moving averages.

(a)..... [3]

(b) Describe the trend in the visitor numbers.

..... [1]

12\* Chris has £2500 to invest for 3 years.  
He finds this information about two savings accounts paying compound interest.

BONUS ACCOUNT  
3.5% interest for first year  
then 3% interest per year

FIXED RATE ACCOUNT  
3.25% interest per year  
fixed rate for 3 years

Advise Chris which account he should choose, and find how much money he will have at the end of the 3 years.

..... account  
£ ..... [5]

13 For each of the graphs below, select the correct equation from this list.

$$y = 2x + 2$$

$$y = x^2 + 2x$$

$$y = 2x - x^2$$

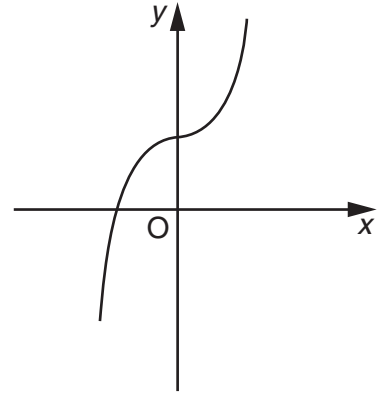
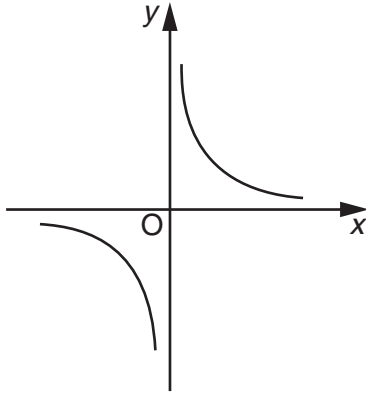
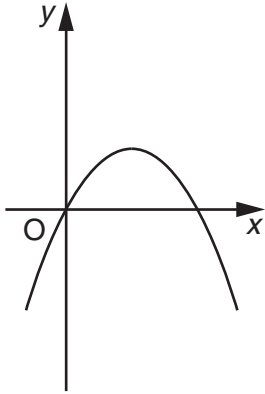
$$y = 2x$$

$$y = \frac{1}{x}$$

$$y = x^3 + 2x$$

$$y = x^3 + 2$$

$$y = 2 - x^3$$



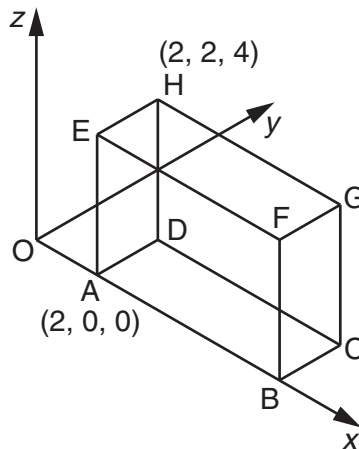
$y = \dots\dots\dots$

$y = \dots\dots\dots$

$y = \dots\dots\dots$

[3]

14 This cuboid has sides of length 6 units, 2 units and 4 units.  
The coordinates of A are (2, 0, 0) and the coordinates of H are (2, 2, 4).



(a) Find the coordinates of F.

(a) (....., ....., .....) [1]

(b) Calculate the length AG.

(b) ..... [2]

15 (a) Maryam is doing a survey asking girls their opinion about becoming a mother.

(i) Here is one of her questions.

At what age will you have your first baby?

Do you think this is a good question?  
Explain your answer.

..... because .....

..... [1]

(ii) The table summarises the number of girls in each year in the school.

Year	7	8	9	10	11
Frequency	140	145	180	165	170

Maryam decides to interview a representative stratified sample of 50 girls.

How many girls from Year 9 should she interview?

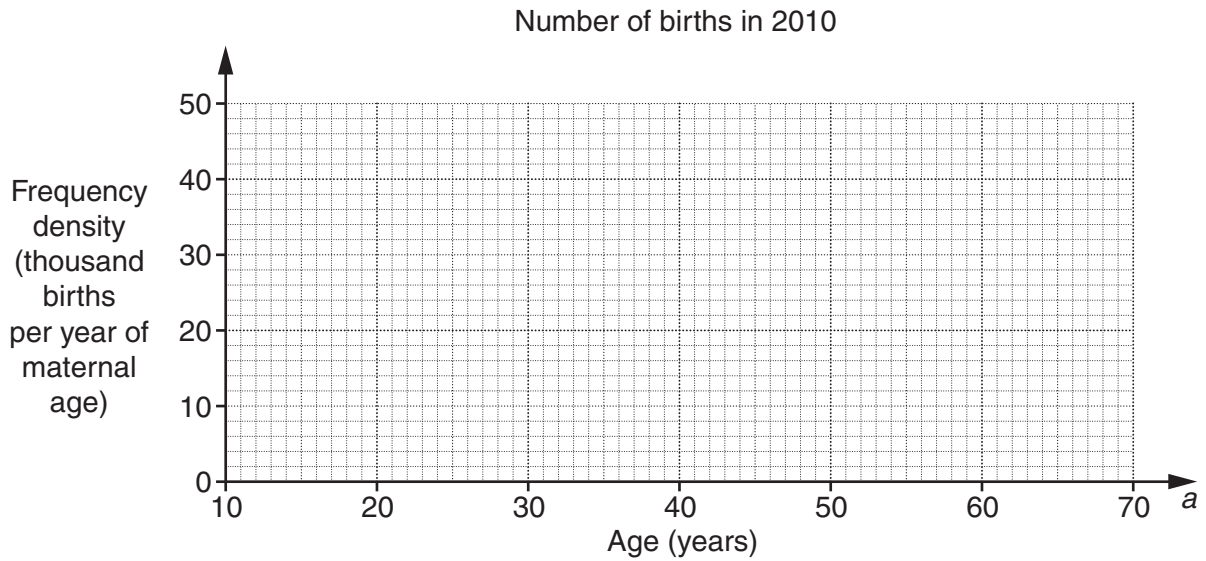
(a)(ii) ..... [2]

(b) The table summarises the number of births to women of different ages in England and Wales in 2010.

Age ( $a$ years)	Number of births (thousands)
$10 \leq a < 20$	41
$20 \leq a < 25$	137
$25 \leq a < 30$	199
$30 \leq a < 35$	202
$35 \leq a < 40$	116
$40 \leq a < 45$	26
$45 \leq a < 65$	2

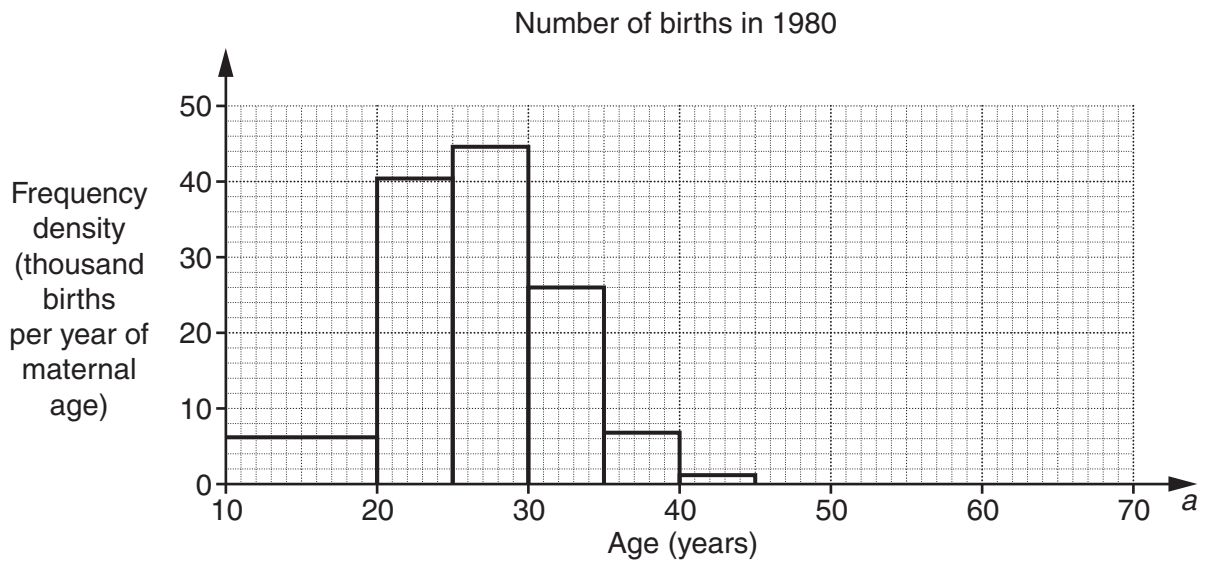


(i) Draw a histogram to represent this distribution.



[3]

(ii) The histogram below represents the distribution of the number of births to women of different ages in England and Wales in 1980.



Make two comparisons between the distributions for 2010 and 1980.

- 1 .....
- .....
- 2 .....
- .....

[2]

16 The current,  $I$  amps, in a wire is inversely proportional to the resistance,  $R$  ohms. When the resistance is 10ohms, the current is 1.2 amps.

(a) Find an equation connecting  $I$  and  $R$ .

(a) ..... [2]

(b) Find the resistance when the current is 0.5 amps.

(b) ..... ohms [1]

17 (a) Write as a single power of  $x$ .

(i)  $x^6 \times x^2$

(a)(i) ..... [1]

(ii)  $x^9 \div x^3$

(ii) ..... [1]

(b) Simplify.

$$\frac{9x^2 - 16}{3x^2 + 7x + 4}$$

(b) ..... [4]

18 The population,  $P$ , of an island  $t$  years after the start of 2010 is given by  $P = 9200 \times 0.96^t$ .

(a) Write down the population of the island at the start of 2010.

(a) ..... [1]

(b) Work out the population of the island at the start of 2013.

(b) ..... [2]

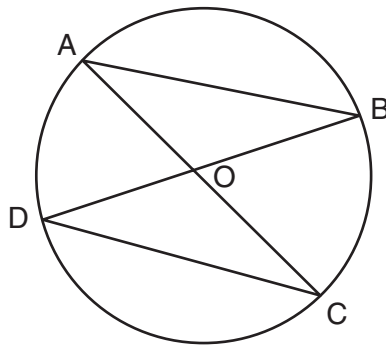
(c) The population continues to decrease at the same rate.

At the start of which year is the population first below half of its level at the start of 2010?

(c) ..... [3]

**TURN OVER FOR QUESTION 19**

19 In the diagram AC and BD are diameters of the circle, centre O.



Not to scale

Prove that triangles OAB and ODC are congruent.

.....

.....

.....

.....

.....

..... [3]

**END OF QUESTION PAPER**



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