OCR
RECOGNISING ACHIEVEMENT

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Friday 8 November 2013 – 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

J567040

J517180313

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

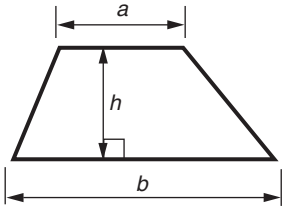
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your quality of written communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

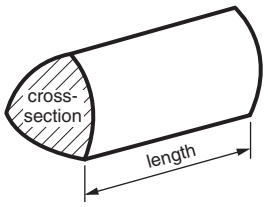
OCR is an exempt Charity

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

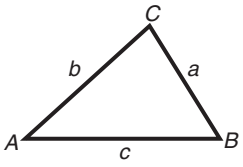


In any triangle *ABC*

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

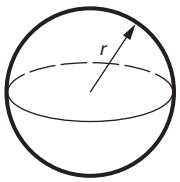
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



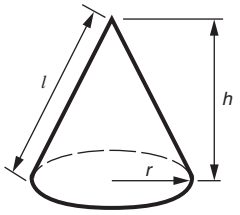
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

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

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

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Answer **all** the questions.

1 **(a)** Calculate.

$$\frac{6.3^2 - 3.7}{5.8}$$

Write your answer correct to 2 decimal places.

(a) _____ **[2]**

(b) Calculate.

$$\sqrt{4.5 \times 6.7 + 1.8 \times 2.4}$$

Write your answer correct to 2 significant figures.

(b) _____ **[2]**

2 Samuel has six types of coin in a bag.
The table shows the probability of each type of coin being picked.

Coin	1p	2p	5p	10p	20p	50p
Probability	0.07	0.23	0.18	0.28	0.19	x

(a) Work out x.

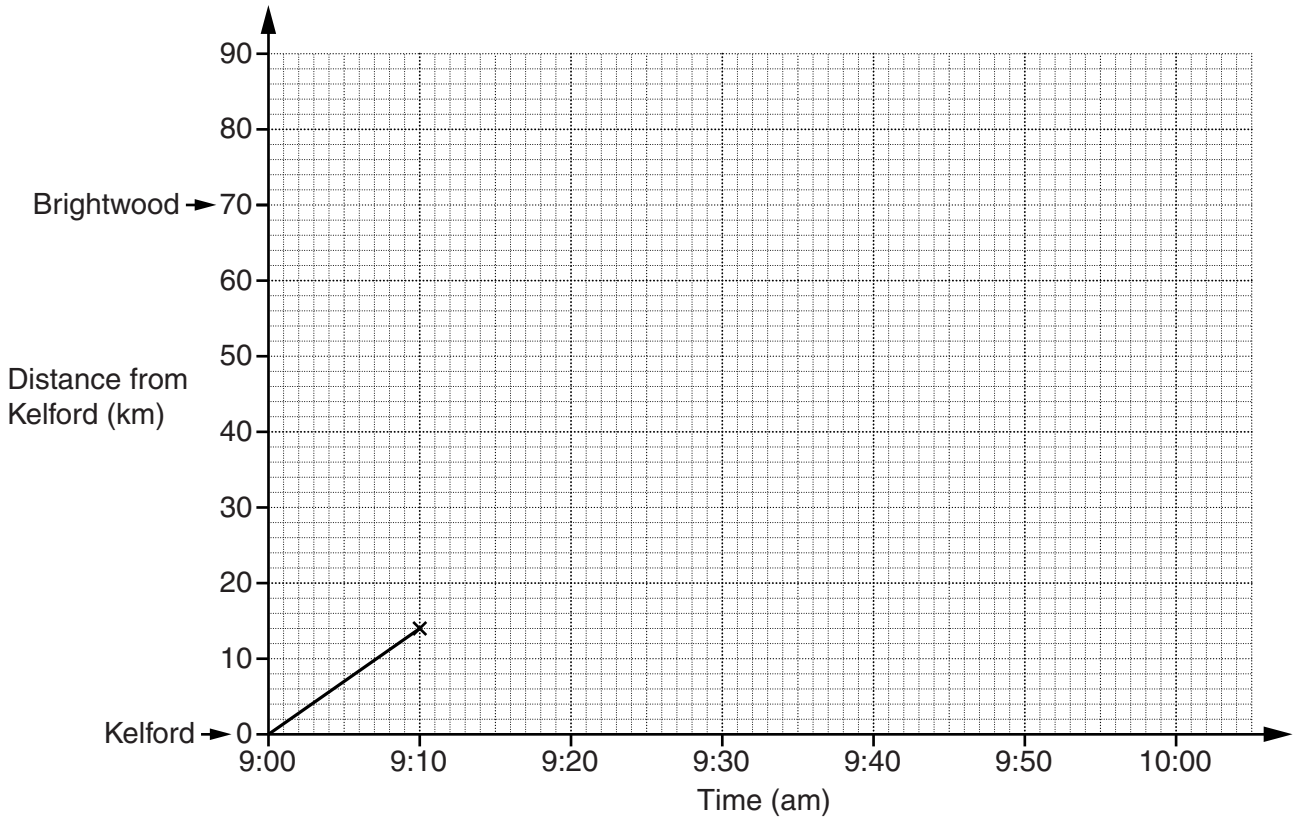
(a) _____ **[2]**

(b) Samuel picks one coin out of the bag at random.

Work out the probability that he picks a coin worth 5p or less.

(b) _____ **[2]**

3 A train travels from Kelford to Brightwood.
The graph shows the first ten minutes of the train's journey.



The two stations are 70 kilometres apart.
The train is due to arrive at Brightwood at 10:00 am.

Will it arrive on time if it continues to travel at the same speed?
Show clearly how you decide.

_____

_____ **[3]**

4 **(a)** Here are the first four terms of a sequence.

7 12 17 22

Write an expression for the nth term of this sequence.

(a) _____ **[2]**

(b) The nth term of another sequence is given by the expression $100 - 8n$.

Write down the first three terms of this sequence.

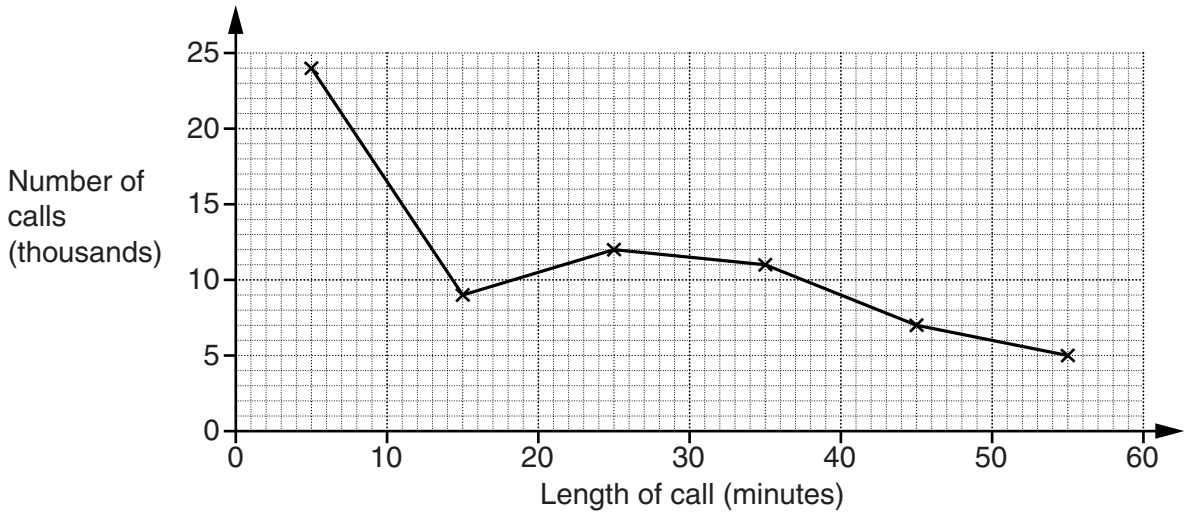
(b) _____ , _____ , _____ **[2]**

5 Solve.

$$6(2x - 3) = 24$$

$x =$ _____ **[3]**

6 **(a)** The Bilberry Telephone Company records the lengths of telephone calls in one day. The information is summarised in the frequency polygon below.



(i) Estimate how many calls lasted less than 20 minutes.

(a)(i) _____ thousand **[2]**

(ii) Write down the modal class.

(ii) _____minutes **[1]**

(b) The lengths of Desmond's telephone calls, in minutes, are summarised in the table below.

Length of call (t minutes)	Number of calls		
$0 < t \leqslant 10$	0		
$10 < t \leqslant 20$	3		
$20 < t \leqslant 30$	3		
$30 < t \leqslant 40$	6		
$40 < t \leqslant 50$	8		
$50 < t \leqslant 60$	5		

Calculate an estimate of the mean length of Desmond's calls.

(b) _____minutes **[4]**

(c) The table below summarises the lengths, in minutes, of Harriet's calls in November and December.

	Mean	Range
November	34.2	67.4
December	39.7	43.8

(i) In which month were Harriet's calls longer on average?
Explain how you decide.

_____

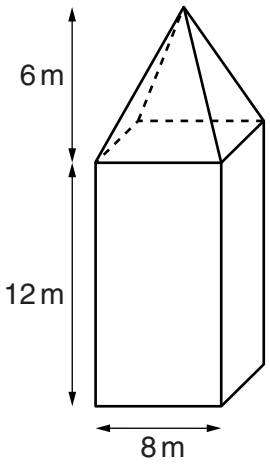
_____ **[1]**

(ii) In which month were the lengths of Harriet's calls more spread out?
Explain how you decide.

_____

_____ **[1]**

7 A tower is in the shape of a cuboid with a pyramid on top.
The base of the tower is a square of side 8 m and it has a **total** height of 18 m.



On the grids below draw accurately the plan and the front elevation of the tower.
Use a scale of 1 cm to 2 m.

Plan

Front Elevation

[4]

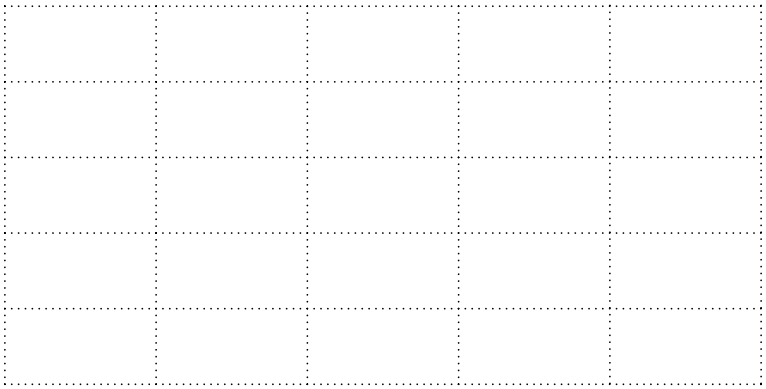
8 **(a)** Riverside Tennis Club has 24 members.
They have four types of membership.

SM	Senior Male	JM	Junior Male
SF	Senior Female	JF	Junior Female

The membership information is recorded below.

SM	JM	SM	JM	SF	JM	SM	JF
JM	SF	JF	SM	SM	JF	SF	SM
SF	SM	JM	JM	JF	SM	JM	SF

(i) On the grid below, design and draw a two-way table to show this information.



[3]

(ii) One member is selected at random.

Write down the probability that the member is a Junior.

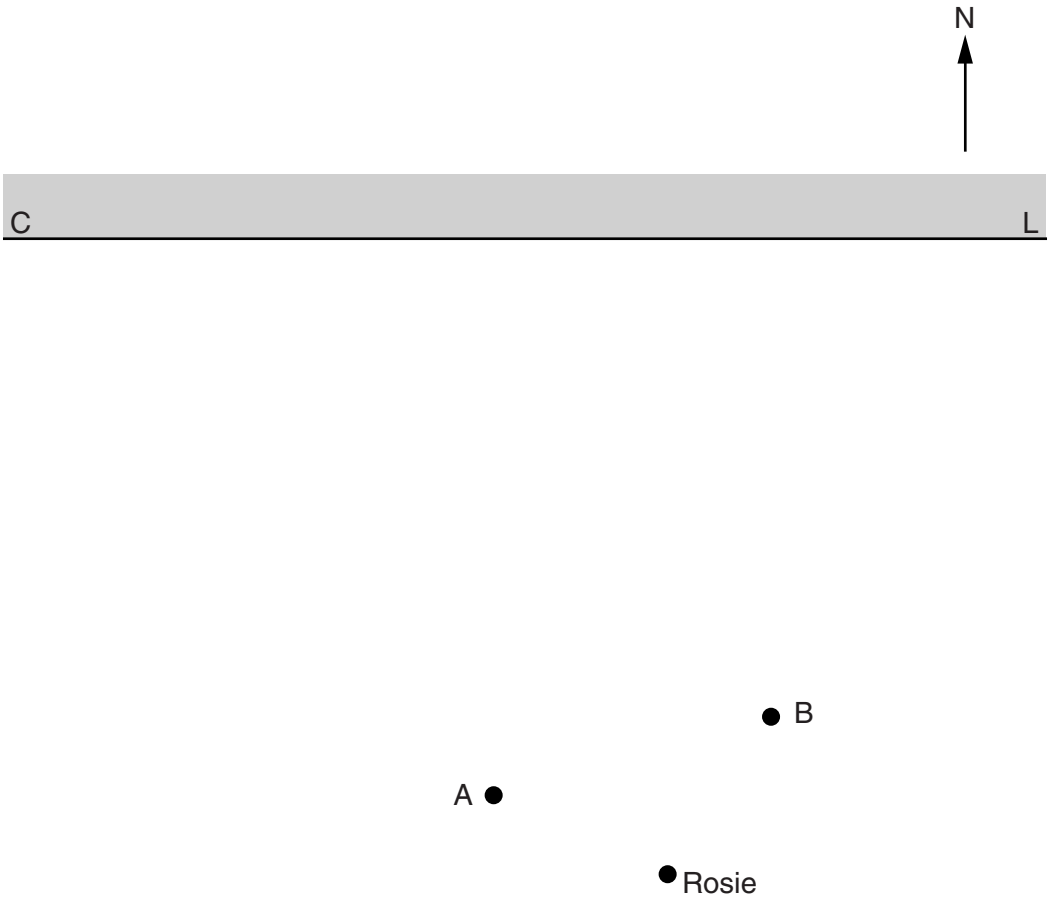
(a)(ii) _____ **[1]**

(b) In 2011, Greenmeadows Tennis Club had 25 members and in 2012 it had 31 members.

Calculate the percentage increase in the number of members.

(b) _____% **[3]**

9 The diagram shows a coastline, CL.
A and B are two rocks in the sea.



Scale: 1 cm represents 500 m

Rosie is sailing her boat.
She sails on a course towards the coast so that she is an equal distance from the rocks, A and B.

When she is less than 1 km from the coast she turns and sails due West.
She now sails so that she is between 500 m and 1 km from the coast.

Construct a route that Rosie could take.
You must leave in all your construction lines. **[4]**

10 Gwen is taking her class of 28 pupils to a pantomime.
The total cost of the trip is £575.

Use estimation to find an approximate cost of this trip for each pupil.
Show your working clearly.

_____ ÷ _____ = _____ **[2]**

11 Here are six equations of straight lines, each labelled with a letter.

A	**B**	**C**
$y = 4x - 7$	$y = 3x + 14$	$y = 2x + 5$

D	**E**	**F**
$y = -3x + 1$	$y = 14x - 7$	$y = 4x + 3$

Choose the correct letters to make each statement true.

Line _____ is the steepest line.

Lines _____ and _____ are parallel.

Lines _____ and _____ meet on the *y*-axis. **[3]**

12 In Westercote, house prices rose by 6% from 2010 to 2011.

(a) On 1 January 2010 a house was priced at £180 000.

Calculate its price on 1 January 2011.

(a) £ _____ **[3]**

(b) On 1 January 2011 another house was priced at £371 000.

Calculate its price on 1 January 2010.

(b) £ _____ **[3]**

13 **(a)** Multiply out and simplify.

$$(x + 7)(x - 3)$$

(a) _____ **[2]**

(b) Factorise fully.

$$6xy - 12x^2$$

(b) _____ **[2]**

(c) Rearrange this formula to make x the subject.

$$A = x^2 - 4y$$

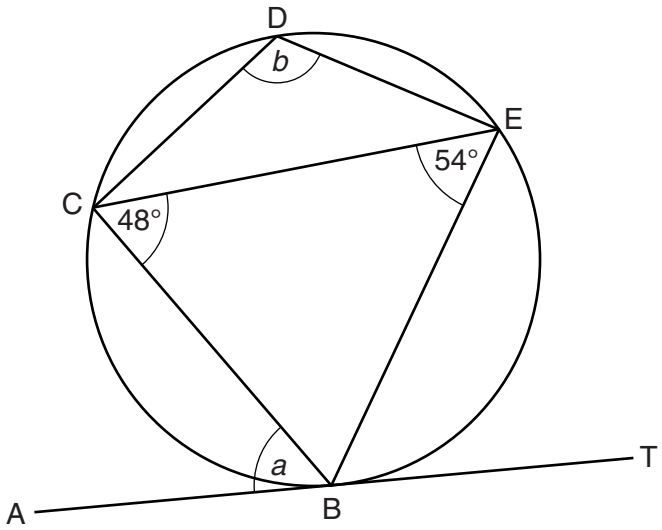
(c) _____ **[2]**

(d) y is inversely proportional to x and $y = 30$ when $x = 4$.

Write an equation linking x and y.

(d) _____ **[3]**

14 In the diagram B, C, D and E are points on the circumference of a circle.
AT is the tangent to the circle at B.
Angle BCE = 48° and angle BEC = 54°.



Not to scale

(a) Find angle *a*.
Give a reason for your answer.

(a) Angle *a* = _____ °

_____

_____ **[2]**

(b) Calculate angle *b*.
Give a reason for each step of your working.

(b) Angle *b* = _____ ° **[3]**

15 A town has a population of 120 000, correct to the nearest ten thousand, and an area of 54 km^2, correct to the nearest whole number.

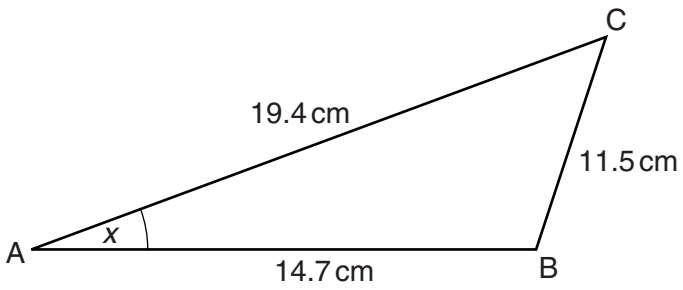
(a) Write down the upper bound of the population.

(a) _____ **[1]**

(b) Calculate the upper bound of the population density.

(b) _____ people / km^2 **[3]**

16 **(a)** The diagram shows a triangle ABC.
AB = 14.7 cm, BC = 11.5 cm and AC = 19.4 cm.



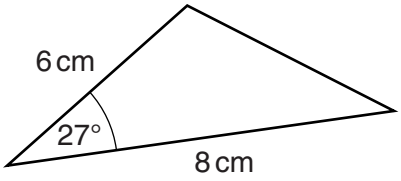
Not to scale

(i) Show that triangle ABC is **not** a right-angled triangle. **[3]**

(ii) Calculate angle *x*.

(a)(ii) _____ ° **[3]**

(b) Calculate the area of this triangle.



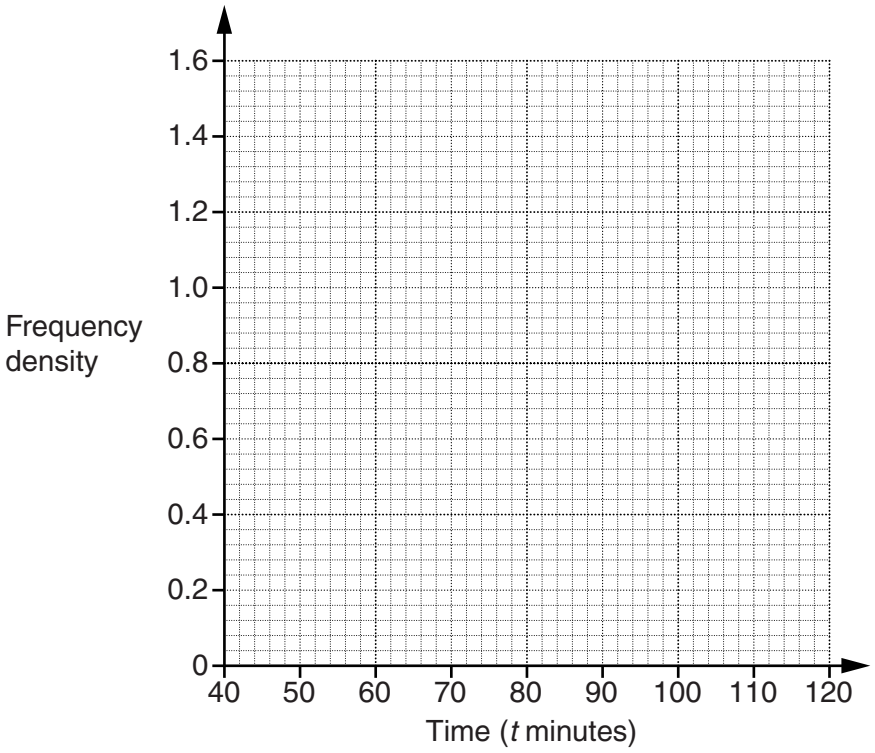
Not to scale

(b) _____ cm^2 **[2]**

17 A teacher records the times taken for pupils to complete a cross-country course.
The results are summarised in the table below.

Time (t minutes)	Number of pupils
$40 < t \leqslant 50$	8
$50 < t \leqslant 60$	15
$60 < t \leqslant 80$	6
$80 < t \leqslant 120$	4

Draw a histogram on the grid below to show this data.



[3]

18 **(a)** Solve algebraically.

$$5x - 2y = 22$$
$$2x + 3y = 5$$

(a) $x =$ _____

$y =$ _____ **[4]**

(b) **(i)** Write $x^2 - 6x + 4$ in the form $(x + a)^2 + b$.

(b)(i) _____ **[3]**

(ii) Using your answer to **(b)(i)**, or otherwise, solve $x^2 - 6x + 4 = 0$.
Write your answers correct to 1 decimal place.

(ii) $x =$ _____ or $x =$ _____ **[2]**

19 On Finch Island there are bullfinches and chaffinches.
In the spring of 2013:

- the population of bullfinches was 6700 and was **decreasing** by 3% each year
- the population of chaffinches was 4800 and was **increasing** by 4% each year.

In the spring of which year will the population of chaffinches first be greater than that of the bullfinches?
Show your working clearly.

_____ **[4]**

20* Assume that the Earth is a sphere with radius 6371 km.
The land area on the surface of the Earth is 148 940 000 km^2.

Use this information to show that the ratio of land area to water area is approximately 3 : 7. **[5]**

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