Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

0258908058

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/62**

Paper 6 (Extended) **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.
You may use an HB pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer both parts **A** (Questions 1 to 6) and **B** (Questions 7 to 11).
You must show all relevant working to gain full marks for correct methods, including sketches.
In this paper you will also be assessed on your ability to provide full reasons and to communicate your mathematics clearly and precisely.
At the end of the examination, fasten all your work securely together.
The total number of marks for this paper is 40.

This document consists of **15** printed pages and **1** blank page.

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Answer **both** parts **A** and **B**.

A INVESTIGATION (QUESTIONS 1 to 6)

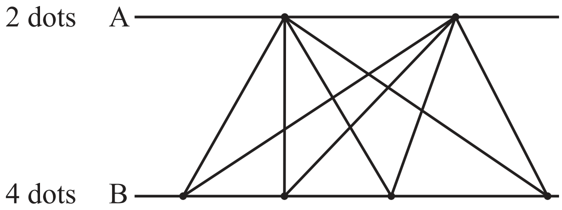
CROSSING POINTS (20 marks)

You are advised to spend no more than 45 minutes on this part.

This investigation is about how many times lines cross when you join two rows of dots.

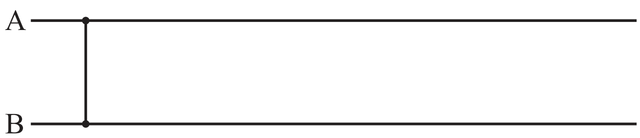
Dots are arranged along two parallel lines, A and B.
Straight lines join each dot on A to each dot on B.
A crossing point is where **exactly two** straight lines cross.

<u>Example</u>
When there are 2 dots on A and 4 dots on B there are 6 crossing points.



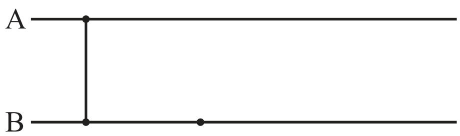
You must complete all diagrams accurately using a ruler and a sharp pencil.

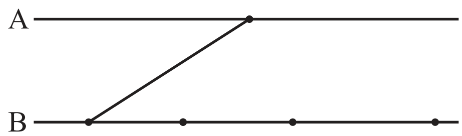
1 When there is 1 dot on A and 1 dot on B, there is no crossing point.



(a) Each of these diagrams has 1 dot on A.

Complete the diagrams by joining the dot on A to each dot on B.



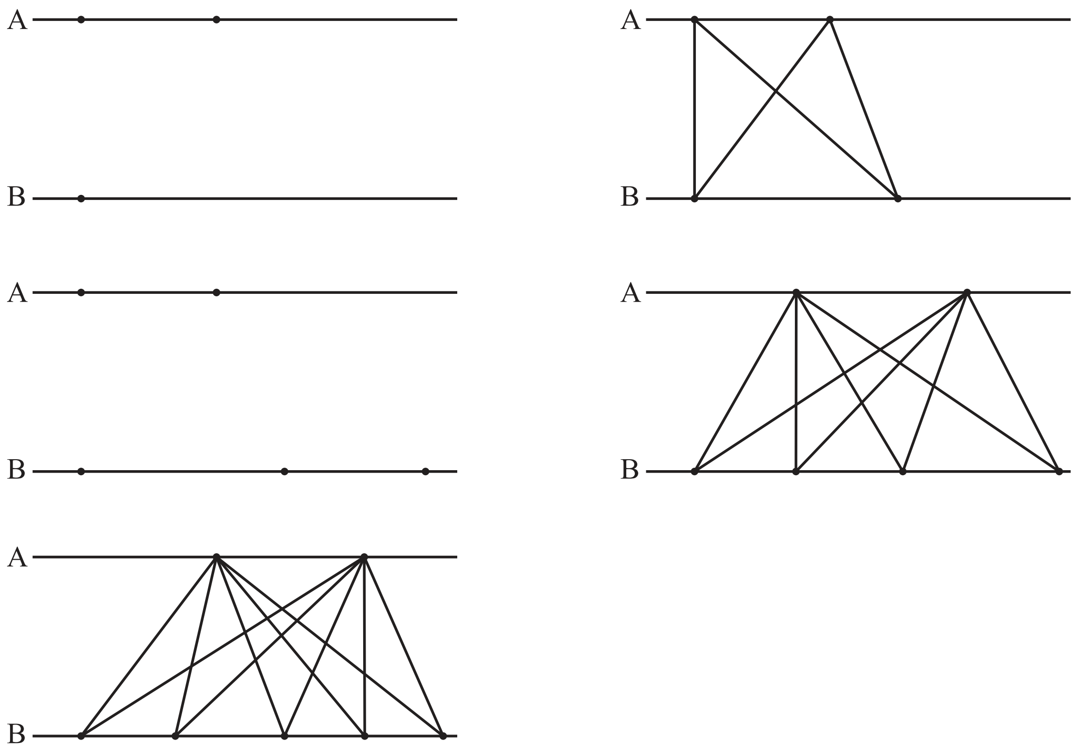


(b) The number of dots on B is b.
The number of crossing points is p.
Complete this statement.

When there is 1 dot on A and b dots on B, then the value of p is ....

2 There are now 2 dots on A.

(a) Complete the diagrams for 1 dot on B and 3 dots on B, and use your results to complete the table.



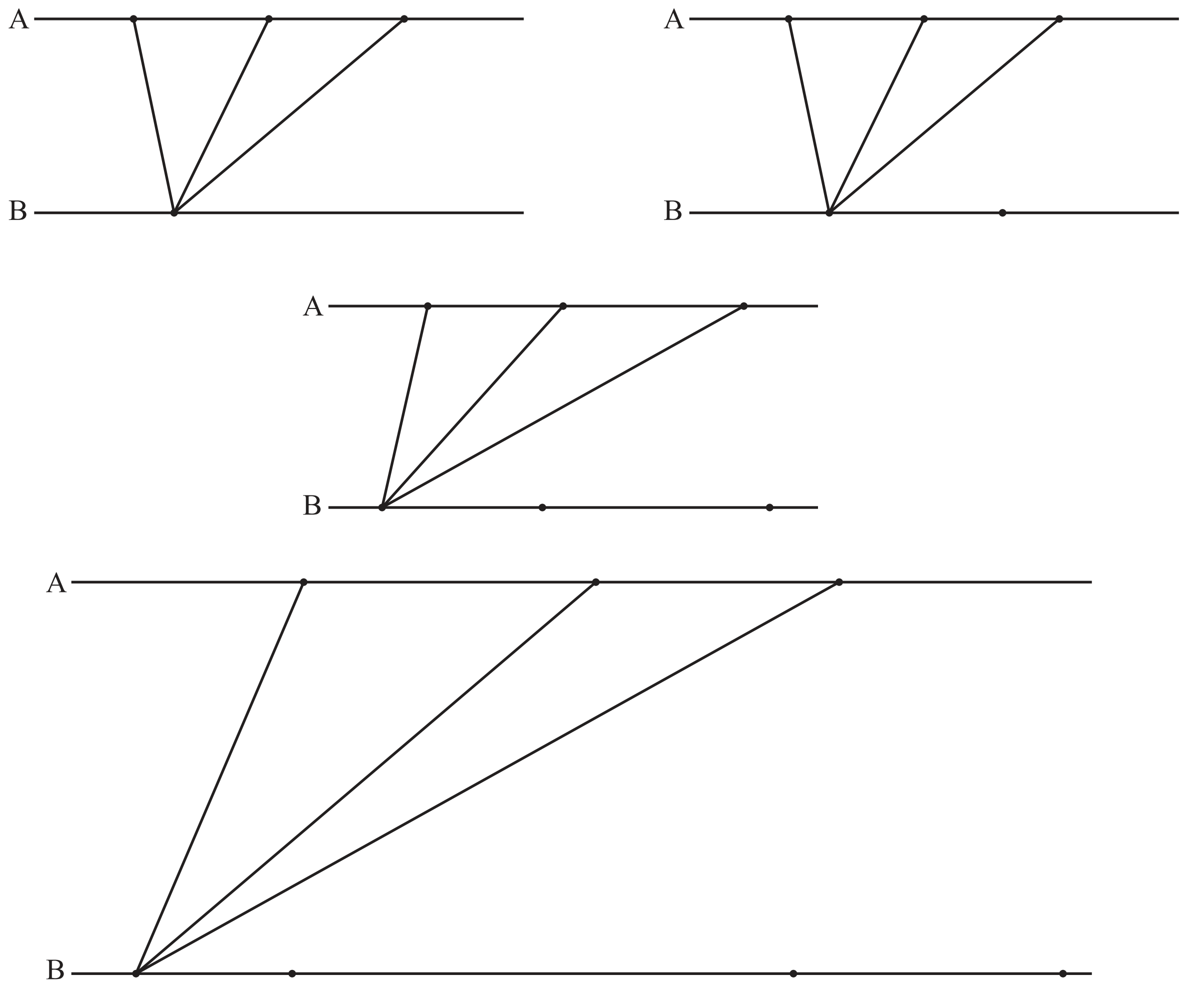
Number of dots on B (b)	Number of crossing points (p)
1	
2	1
3	
4	6
5	10

(b) Find a formula for p in terms of b when there are 2 dots on A.

....

3 There are now 3 dots on A.

(a) Complete each diagram and use your results to complete the table.
The first diagram has been completed for you.



Number of dots on B (b)	Number of crossing points (p)
1	
2	
3	9
4	
5	30

(b) Find a formula for p in terms of b when there are 3 dots on A.

....

4 There are now 4 dots on A.
This table shows the number of crossing points.

Number of dots on B (b)	Number of crossing points (p)
1	0
2	6
3	18
4	36
5	60

Find a formula for p in terms of b when there are 4 dots on A.

....

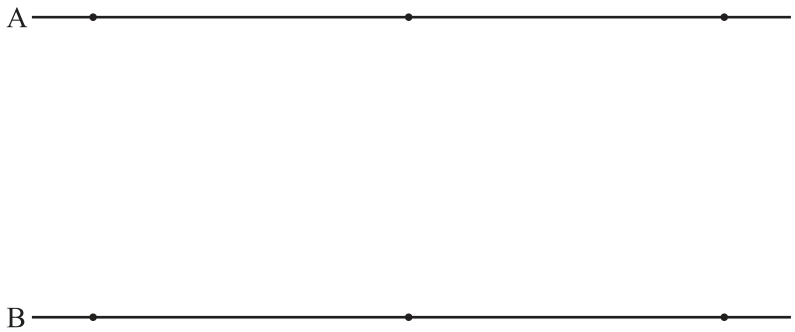
5 Use your answers to **question 2(b)**, **question 3(b)** and **question 4** to help you complete the table when there are b dots on B.

Number of dots on A	Number of crossing points (p)	Factorised form for number of crossing points (p)
1	0	0
2	$\frac{\quad}{2}b^2 - \frac{\quad}{2}b$	$\frac{b(b- \quad)}{2}$
3	$\frac{\quad}{2}b^2 - \frac{\quad}{2}b$	$\frac{b(b- \quad)}{2}$
4	$\frac{\quad}{2}b^2 - \frac{\quad}{2}b$	$\frac{b(b- \quad)}{2}$
5	$\frac{10}{2}b^2 - \frac{10}{2}b$	$\frac{10b(b-1)}{2}$
a	$\frac{\qquad}{2}b^2 - \frac{\qquad}{2}b$	$\frac{a(a- \quad)}{2} \times \frac{b(b- \quad)}{2}$

6 **(a)** There are now a dots on A.
When the number of dots on B is the same as the number of dots on A, show that your factorised form from **question 5** becomes

$$\frac{a^2(a-1)^2}{4}.$$

(b) **(i)** Show that the expression in **part (a)** does **not** give the correct number of crossing points for the dots in this diagram.



(ii) Give a reason why this happens.

....

....

(c) Equal numbers of dots are marked on A and B so that the expression in **part (a)** will give the correct number of crossing points.

(i) Explain why there cannot be 50 crossing points.

....

....

(ii) There are 29 241 crossing points.

Find the number of dots on A.

....

The modelling task starts on the next page.

B MODELLING (QUESTIONS 7 to 11)

VALUE OF A CAR (20 marks)

You are advised to spend no more than 45 minutes on this part.

This task is about how the value of a car changes with time.

The value of any car changes continuously.

7 Anna says that this is a model for the value of a car as it gets older.

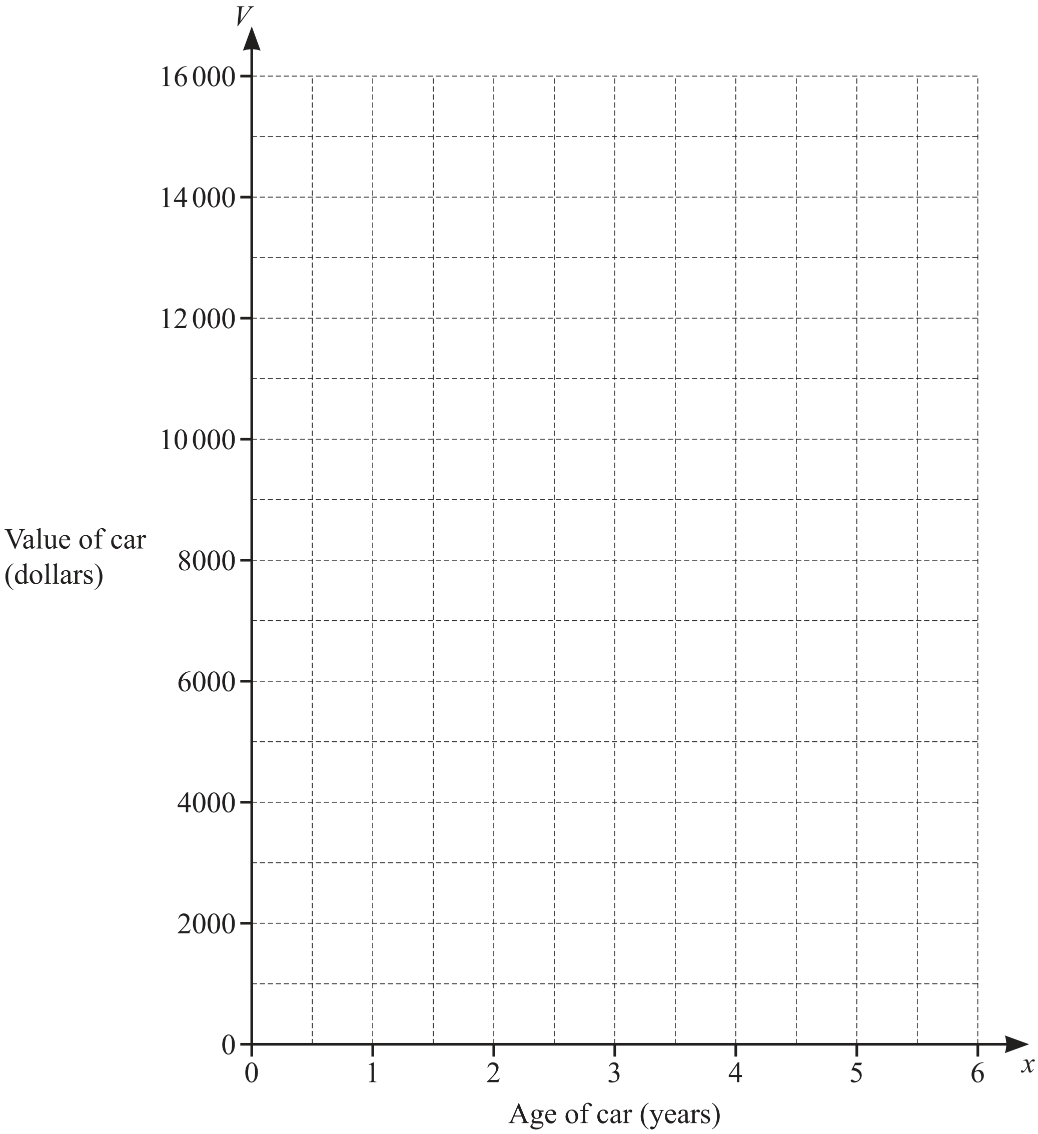
> At the end of each year, the value of the car will be half of its value at the start of the year.

Eddie pays $16 000 for a new car.

(a) Use Anna's model to complete the table.

Age of car (x years)	0	1	2	3	4	5	6
Value (V dollars)	16 000	8000					

(b) Use these values to draw a graph of V against x.



(c) Complete this model for V in terms of x.

$V = 16\,000 \times$ ....

(d) Using Anna's model, find the value of Eddie's car when it is 10 years old.

....

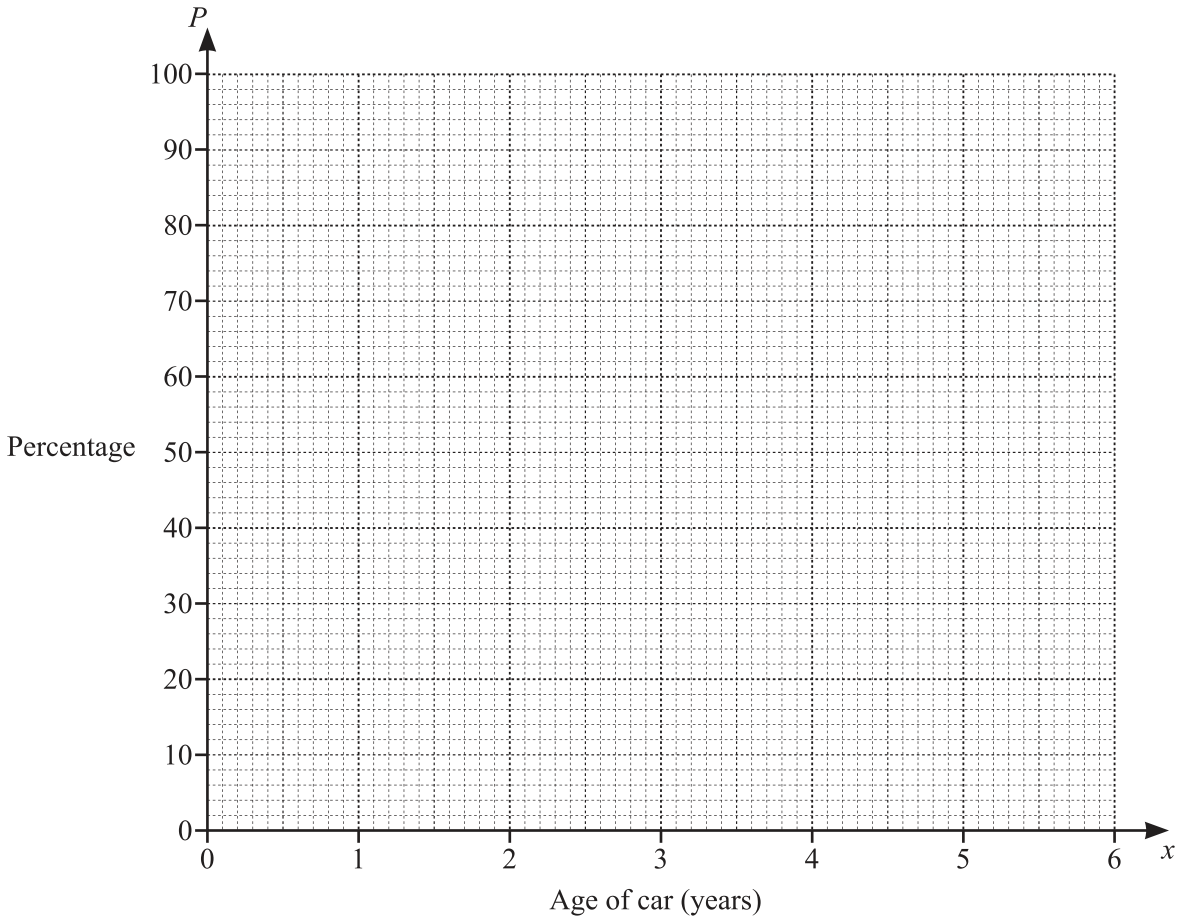
8 *John's Cars* model the value of a car in this way.

Each year, the value of the car decreases by a percentage of its value when it was new.

The table shows the value of the car as a percentage of its value when it is new.

Age of car (x years)	0	1	2	3	4	5	6
Percentage of value when new (P)	100	72	58	48	44	42	40

(a) On the grid, plot the values of P against x.



(b) Show which of the two models gives a higher value for Eddie's car when it is 5 years old.

9 Eddie models the percentage values used by *John's Cars*.

$$P = 56.2 - 15.6\log_{10}x \quad \text{for } x > 0.$$

(a) On the axes, sketch the graph of this model.

(b) How well does this model fit the percentages used by *John's Cars* for cars that are less than 3 years old?

....

10 Lia makes a different model $P = \dfrac{100}{(1+ax)}$.

(a) The table in **question 8** shows that $P = 72$ when $x = 1$.
These values fit Lia's model.

Find the value of a, correct to 1 decimal place.

....

(b) **On the axes in question 9**, sketch the graph of this model.

(c) How well does Lia's model fit the percentages used by *John's Cars*?

....

....

11 **(a)** Use Lia's model to write a model for the value, $\$V$, of a car that costs $\$C$ when it is new.

....

(b) Use this model to find the age of Eddie's car when its value is $6500.
Give your answer in years and months, correct to the nearest month.

....

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