

**Monday 16 January 2012 – Morning**

**GCSE MATHEMATICS B (MEI)**

**B294B** Paper 4 Section B (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**  
None

**Other materials required:**

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

**Duration:** 1 hour



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

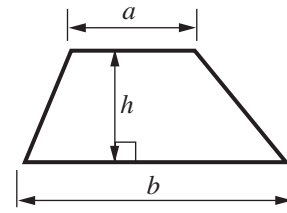
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show your 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**

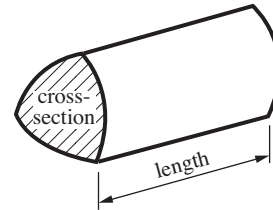
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Section B starts with question 11.
- You are expected to use a calculator in Section B of this paper.
- Use the  $\pi$  button on your calculator or take  $\pi$  to be 3.142 unless the question says otherwise.
- The total number of marks for this Section is **50**.
- This document consists of **16** 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

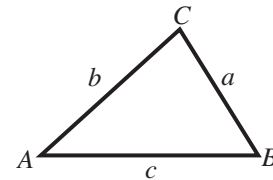


**In any triangle  $ABC$**

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

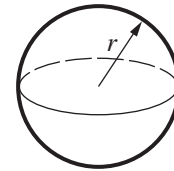
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



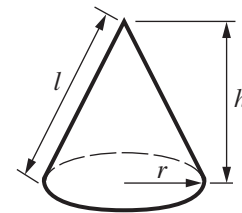
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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**

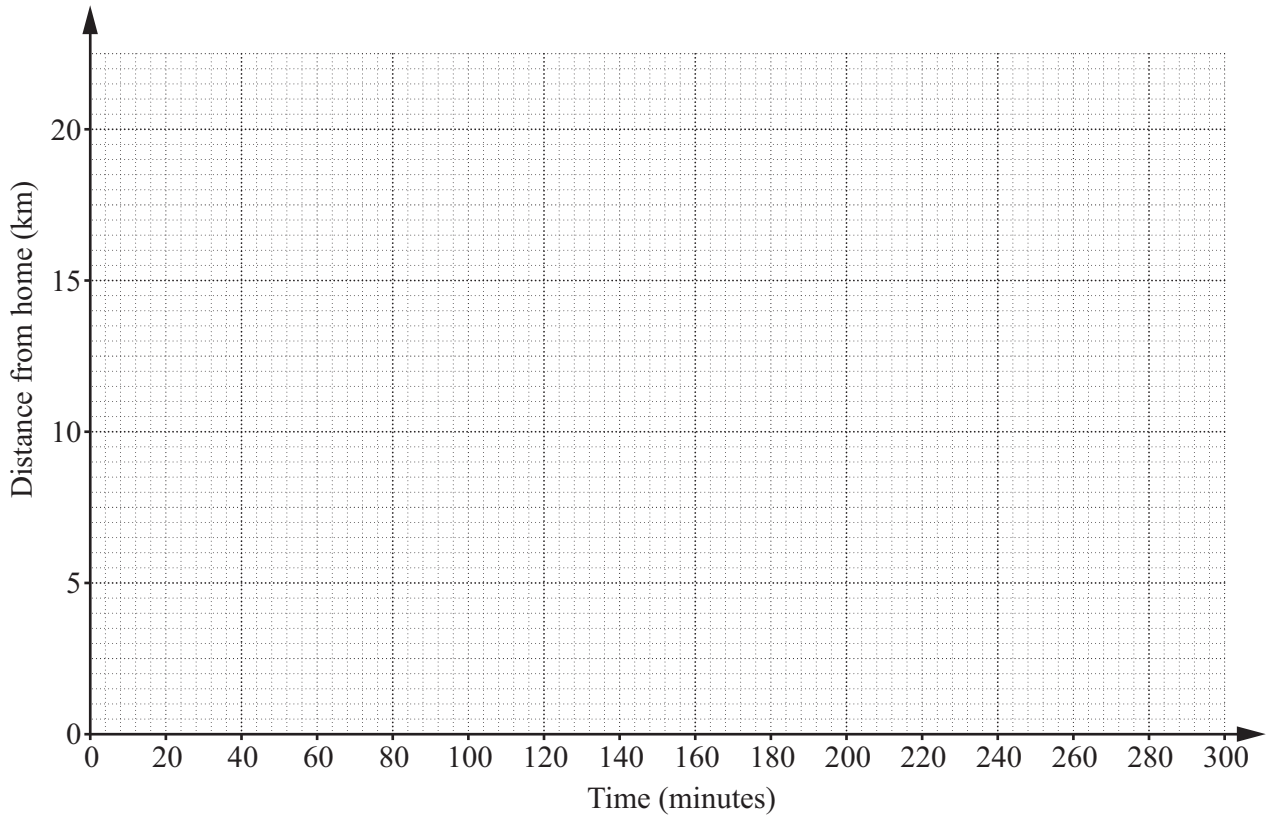
The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

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

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- 11 Greg cycled from home to his Grandma's house.  
His Grandma lives 20 km away.  
He cycled the first 8 km, at a steady speed, in 40 minutes.  
He then rested for 10 minutes.  
He then cycled the remaining 12 km at a steady speed that was faster than during the first part of the journey.  
Greg stayed at his Grandma's house for one hour.  
He then cycled home at a steady speed of 12 km/h.

Draw a possible distance-time graph for Greg's journey.



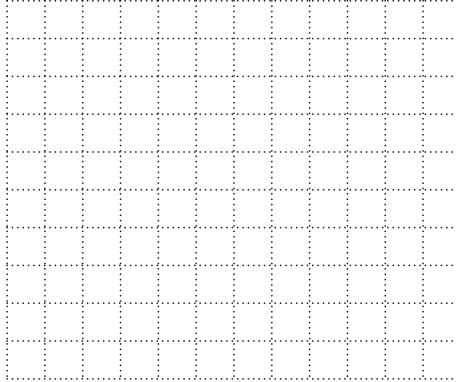
[6]

- 12 (a) Choose transformations from this list for your answers.  
In each part, list **all** the possible transformations.

Rotation	Reflection	Translation	Enlargement
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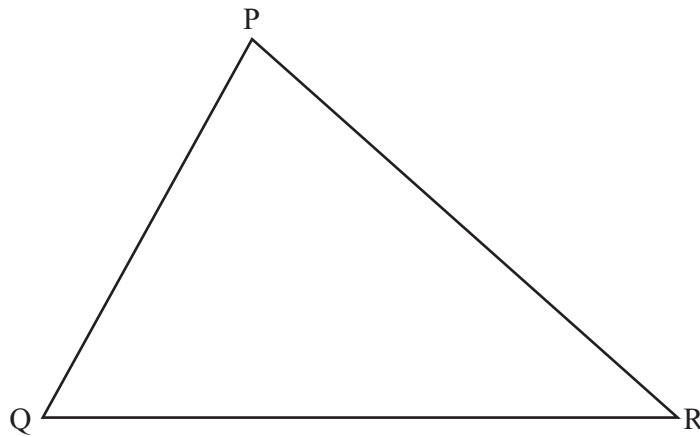
- (i) A transformation maps triangle A onto triangle B.  
The angles of triangle A are the same as the corresponding angles of triangle B.  
The transformation could be .....  
..... [2]
- (ii) A transformation maps triangle C onto triangle D.  
Triangle C is congruent to triangle D.  
The transformation could be .....  
..... [1]
- (iii) A transformation maps triangle E onto triangle F.  
Triangle F has a smaller area than triangle E.  
The transformation could be .....  
..... [1]
- (iv) A transformation maps triangle G onto triangle H.  
The gradient of each side of triangle G is the same as the gradient of each corresponding side of triangle H.  
The transformation could be .....  
..... [1]

- (b) Describe fully the **single** transformation equivalent to a translation through  $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$  followed by a translation through  $\begin{pmatrix} -4 \\ 6 \end{pmatrix}$ .  
You may use this grid to help you.



..... [2]

13



Shade the locus of points which are

- inside the triangle,
- at least 4 cm from Q and
- nearer to QR than to QP.

[3]

14 The table shows the shoe sizes of some pupils in a school.

Shoe size	Frequency	Shoe size $\times$ Frequency
4	3	12
5	22	
6	$x$	
7	8	
Total		

(a) Complete the five empty boxes in the table. [2]

(b) The mean shoe size of the pupils is 5.6.

Write down an equation in  $x$  and solve it to find the number of pupils wearing size 6 shoes.

(b) ..... [4]

- 15** The population of a species of bird increases by 10% per year.  
At the end of 2008 the population was 15 000.

**(a)** Calculate the population at the end of

**(i)** 2007,

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

**(ii)** 2011.

**(ii)** ..... [2]

- (b)** Assuming the population continues to increase at this rate, calculate the first year in which the population will be more than 30 000.

**(b)** ..... [2]

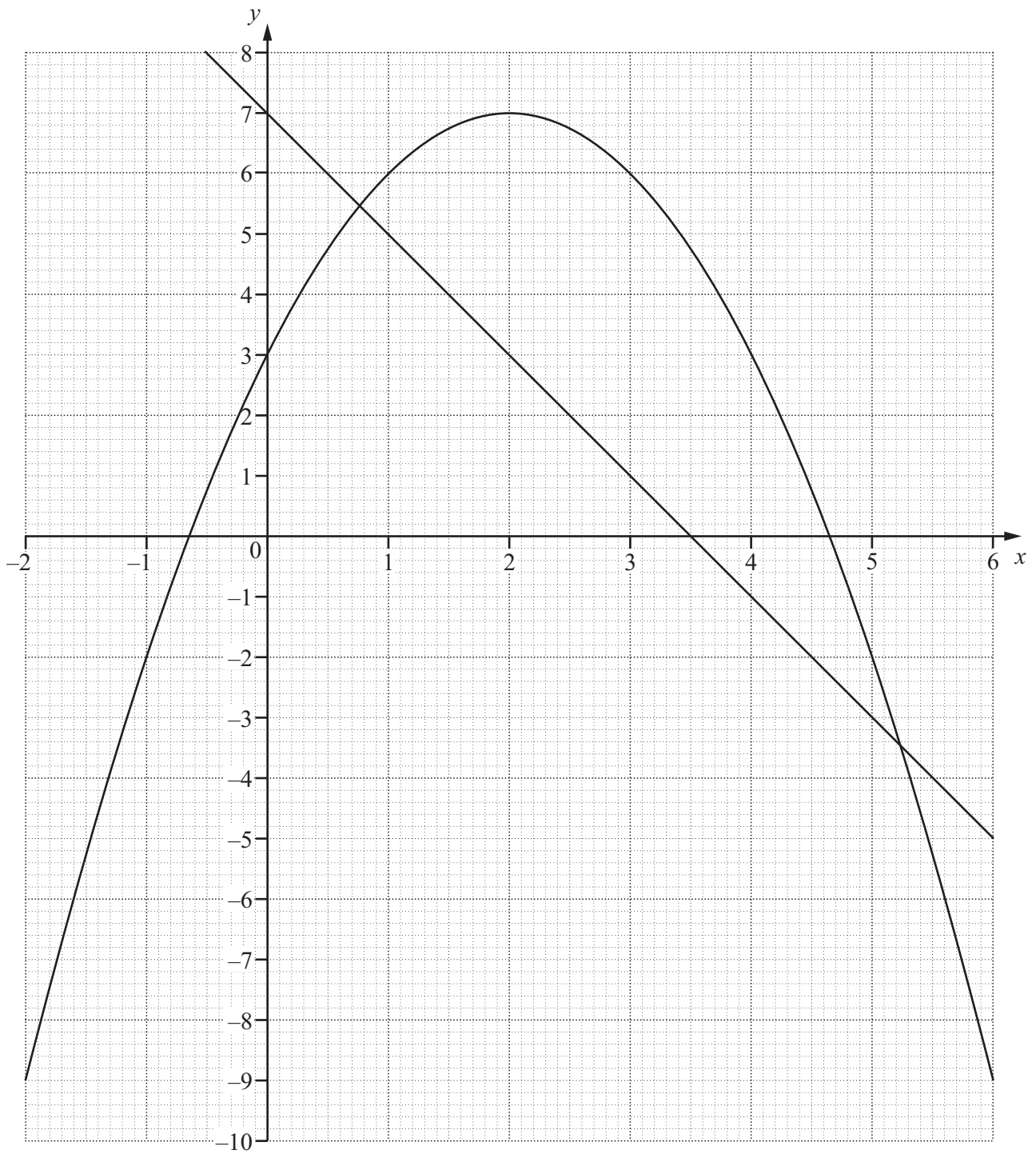
**(c)** Given that

- $P$  is the population and
- $t$  is the number of years after the end of 2008,

write down a formula for  $P$  in terms  $t$ .

**(c)** ..... [2]

16 The graphs of  $y = 3 + 4x - x^2$  and  $y = 7 - 2x$  are drawn on this grid.





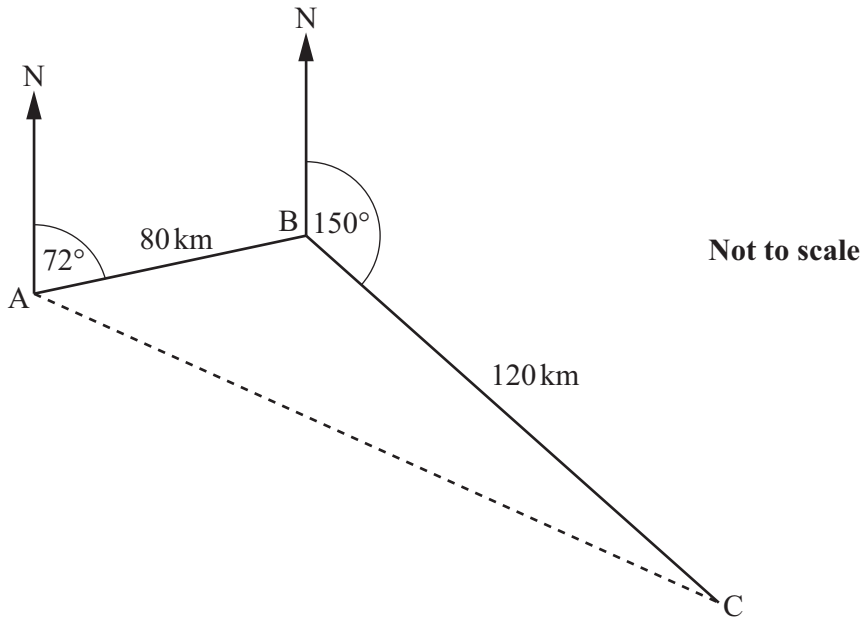
(a) Find and simplify the equation satisfied by the  $x$ -coordinates of the points of intersection of the two graphs.

(a) ..... [2]

(b) By drawing another suitable straight line on your graph, solve  $5 + 3x - x^2 = 0$ .

(b) ..... [3]

- 17 A ship sails on a bearing of  $072^\circ$  for 80 km from A to B.  
It then sails on a bearing of  $150^\circ$  for 120 km from B to C.



- (a) Show that angle ABC is  $102^\circ$ .

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

- (b) The ship then sails from C to A.

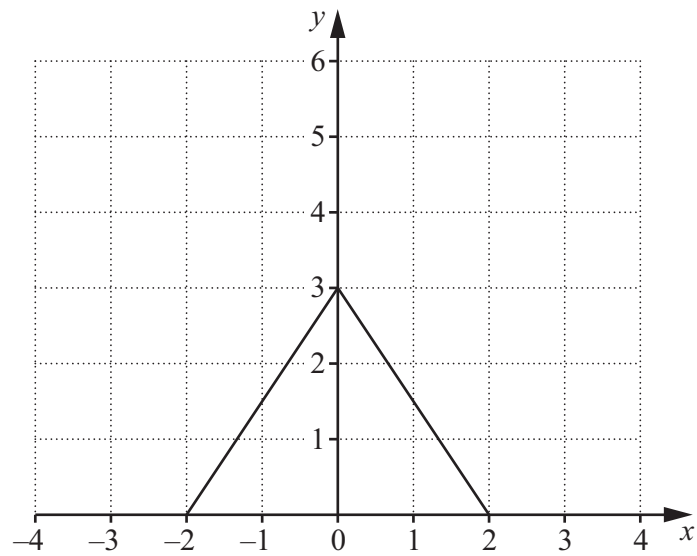
- (i) Calculate the distance CA.

(b)(i) ..... km [3]

(ii) Calculate the bearing of A from C.

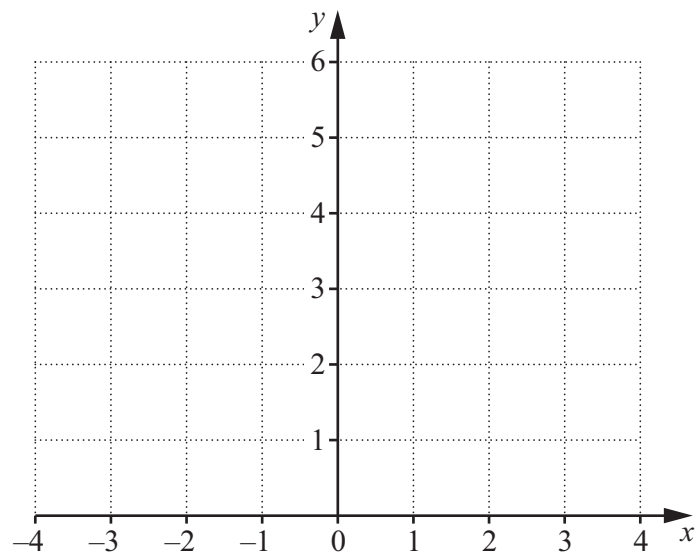
(ii) ..... ° [4]

18 This graph represents the function  $y = f(x)$ .



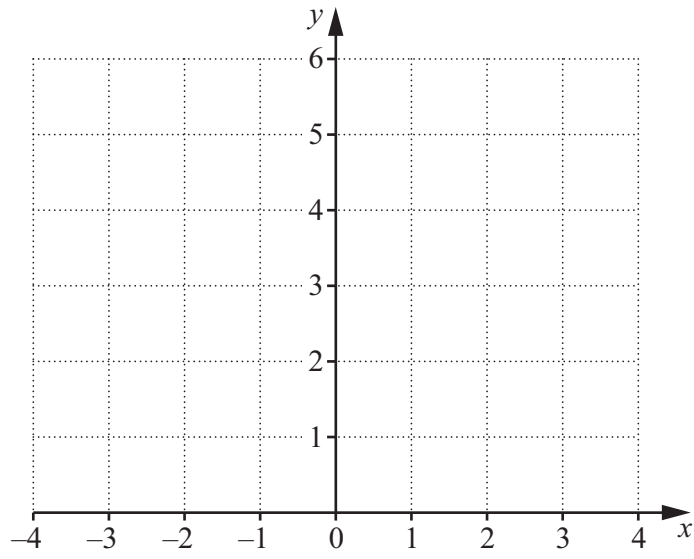
On these grids, draw the graphs of

(a)  $y = f(x + 2)$ ,



[1]

(b)  $y = f(2x)$ .



[1]

**TURN OVER FOR QUESTION 19**

19 A local drama group performs a play every Thursday, Friday and Saturday for a four-week season.

The size of the audience for each performance is shown in this table.

Week 1			Week 2			Week 3			Week 4		
Thur	Fri	Sat	Thur	Fri	Sat	Thur	Fri	Sat	Thur	Fri	Sat
120	160	172	135	168	180	140	170	185	142	176	$q$

Here are the 3-point moving averages for these data.

150.7, 155.7,  $p$ , 161, 162.7, 163.3, 165, 165.7, 167.7, 170

(a) Calculate the value of  $p$ .

(a) ..... [2]

(b) Calculate the value of  $q$ .

(b) ..... [3]

**15**  
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