(Higher and Foundation)

Q1.

The equation

$x^3 - 6x = 72$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **all** your working.

$x =$ . . . . . .

(Total for Question is 4 marks)

Q1.

Question		Working	Answer	Mark	Notes
		$x = 4$ gives 40 $x = 5$ gives 95 $x = 4.1$ gives 44.(321) $x = 4.2$ gives 48.(888) $x = 4.3$ gives 53.(707) $x = 4.4$ gives 58.(784) $x = 4.5$ gives 64.(125) $x = 4.6$ gives 69.(736) $x = 4.7$ gives 75.(623) $x = 4.8$ gives 81.(792) $x = 4.9$ gives 88.(249) $x = 4.61$ gives 70.3(12..) $x = 4.62$ gives 70.8(91..) $x = 4.63$ gives 71.4(72..) $x = 4.64$ gives 72.0(57..) $x = 4.65$ gives 72.6(44..)	4.6	4	B2 for a trial $4.6 \leq x \leq 4.7$ evaluated (B1 for a trial $4 \leq x \leq 5$ evaluated) B1 for a different trial $4.6 < x \leq 4.65$ evaluated B1 (dep on at least one previous B1) for 4.6 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct to 1dp (rounded or truncated) if the value of x is to 2 dp. (Accept 72 for $x = 4.64$) NB : no working scores no marks even if the answer is correct.

(Higher)

Q2.

$$p^2 = \frac{x - y}{xy}$$

$x = 8.5 \times 10^9$
$y = 4 \times 10^8$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

.....

(Total for Question is 3 marks)

Q2.

Question		Working	Answer	Mark	Notes
		$\sqrt{\frac{8.5\times10^{9}-4\times10^{8}}{8.5\times10^{9}\times4\times10^{8}}}$ $=\sqrt{\frac{8.1\times10^{9}}{3.4\times10^{18}}}$ $=\sqrt{2.3823529...\times10^{-9}}$ **OR** $\sqrt{\frac{1}{4\times10^{8}}-\frac{1}{8.5\times10^{9}}}$ $=\sqrt{2.5\times10^{-9}-1.17647\times10^{-10}}$ $=\sqrt{2.3823529...\times10^{-9}}$	4.9×10^{-5}	3	B3 for 4.88×10^{-5} to 4.9×10^{-5} (B2 for digits 238(23529) or 24 or 488(09353) or 49) (B1 for digits 81 or 34) **OR** B3 for 4.88×10^{-5} to 4.9×10^{-5} (B2 for digits 238(23529) or 24 or 488(09353) or 49) (B1 for digits 25 or 117(647))

Q3.

Solve

$3x^2 - 4x - 2 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question is 3 marks)

Q3.

Question		Working	Answer	Mark	Notes
		$a = 3, b = -4, c = -2$ $x = \frac{--4 \pm \sqrt{(-4)^2 - 4 \times 3 \times -2}}{2 \times 3}$ $= \frac{4 \pm \sqrt{16+24}}{6} = \frac{4 \pm \sqrt{40}}{6}$ =1.72075922 or = – 0.3874258867 OR $x^2 - \frac{4}{3}x - \frac{2}{3} = 0$ $\left(x - \frac{2}{3}\right)^2 - \left(\frac{2}{3}\right)^2 - \frac{2}{3} = 0$ $x - \frac{2}{3} = \sqrt{\left(\frac{2}{3}\right)^2 + \frac{2}{3}}$ $x = \frac{2}{3} \pm \sqrt{\frac{10}{9}}$	1.72, –0.387	3	M1 for $\frac{--4 \pm \sqrt{(-4)^2 - 4 \times 3 \times -2}}{2 \times 3}$ (condone incorrect signs for –4 and –2) M1 for $\frac{4 \pm \sqrt{40}}{6}$ or $\frac{2 \pm \sqrt{10}}{3}$ A1 for one answer in the range 1.72 to 1.721 and one answer in the range – 0.387 to – 0.38743 **OR** M1 for $\left(x - \frac{2}{3}\right)^2$ oe M1 for method leading to $\frac{2}{3} \pm \sqrt{\frac{10}{9}}$ oe A1 for one answer in the range 1.72 to 1.721 and one answer in the range – 0.387 to – 0.38743

Q4.

h is inversely proportional to the square of r.

When $r = 5$, $h = 3.4$

Find the value of h when $r = 8$

$h =$ . . . . . .

(Total for Question is 3 marks)

Q4.

		Working	Answer	Mark	Notes
			1.33	3	M1 for 3.4 $\frac{k}{5^2}$ oe or 3.4×5^2 (=85) M1 for '3.4×5^2' $\div 8^2$ A1 for answer in range 1.32 to 1.33 or $^{85}/_{64}$

(Higher)

Q5.

A and **B** are straight lines.

Line **A** has equation $2y = 3x + 8$

Line **B** goes through the points (−1, 2) and (2, 8)

Do lines **A** and **B** intersect?

You must show all your working.

(Total for Question is 3 marks)

Q5.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
*		Yes with explanation	3	M1 For **Line A**: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4 OR for **Line B**: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$ M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made eg gradients, equations or points. C1 for gradients 1.5 **and** 2 **and** Yes **with** explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations OR M1 for a diagram that shows both lines drawn and intersecting at (0,4) M1 for a diagram that shows both lines and their intersection point identified as (0,4) C1 for Yes and states the intersection point as (0,4)

Q6.

Solve the simultaneous equations

$x^2 + y^2 = 9$
$x + y = 2$

Give your answers correct to 2 decimal places.

x = ... y = ...
or x = ... y = ...

(Total for Question is 6 marks)

Q6.

		Working	Answer	Mark	Notes
			$x = 2.87$, $y = -0.87$ and $x = -0.87$, $y = 2.87$	6	M1 for $x^2 + (2 - x)^2 = 9$ M1 for $4 - 4x + x^2$ A1 for $2x^2 - 4x - 5 = 0$ oe 3 term simplified quadratic M1 for a correct method to solve their quadratic Eg $x = \frac{4 \pm \sqrt{(16 - 4 \times 2 \times -5)}}{4}$ A1 for $x = 2.87$, $y = -0.87$ or better A1 for $x = -0.87$, $y = 2.87$ or better Award marks for equivalent algebraic expressions. Apply the same scheme as above for y first.

Q7.

p is inversely proportional to t.

When $t = 4$, $p = 12$

Find the value of p when $t = 6$

.....

(Total for Question is 3 marks)

Q7.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
			8	3	M1 for $p = \frac{k}{t}$ oe $(k \neq 1)$ or $12 = \frac{k}{4}$ M1 for correct method to find k or $p = \frac{48}{t}$ oe or (dep on M1) for k=48 A1 cao OR M1 for $\frac{6}{4}$ oe M1 for $12 \div \frac{6}{4}$ oe A1 cao

(Higher)

Q8.

A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30
The total cost of 1 adult ticket and 3 child tickets is £22

Work out the cost of an adult ticket and the cost of a child ticket.

adult ticket £.....

child ticket £.....

(Total for question = 4 marks)

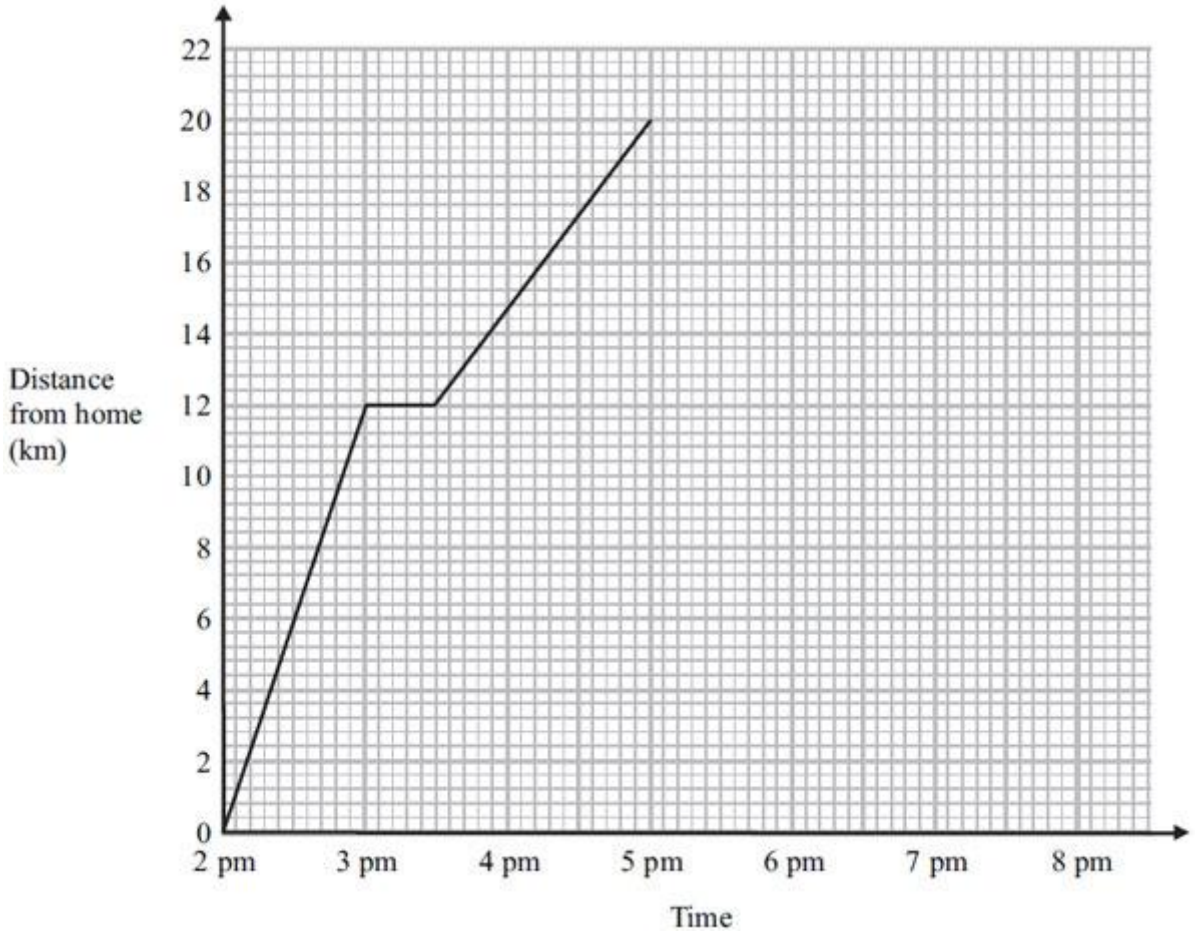
Q8.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
		$3x + y = 30$ $x + 3y = 22$	8.50 4.50	4	M1 for forming two algebraic equations M1 for a correct process to eliminate one variable (condone one arithmetic error) M1 (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) A1 for 8.5(0) and 4.5(0)

Q9.

Simon went for a cycle ride.
He left home at 2 pm.

The travel graph represents part of Simon's cycle ride.



At 3 pm Simon stopped for a rest.

(a) How many minutes did he rest?

.....

(1)

(b) How far was Simon from home at 5 pm?

.....

(1)

At 5 pm Simon stopped for 30 minutes.
Then he cycled home at a steady speed.
It took him 1 hour 30 minutes to get home.

(c) Complete the travel graph.

(2)

(Total for Question is 4 marks)

Q9.

		Working	Answer	Mark	Notes
	(a)		30	1	B1 for 30 minutes
	(b)		20	1	B1 cao
	(c)		graph completed	2	B1 for horizontal line from (5, 20) to (5.30, 20) B1 for a single straight line with the correct gradient from '(5.30, 20)' to the time axis

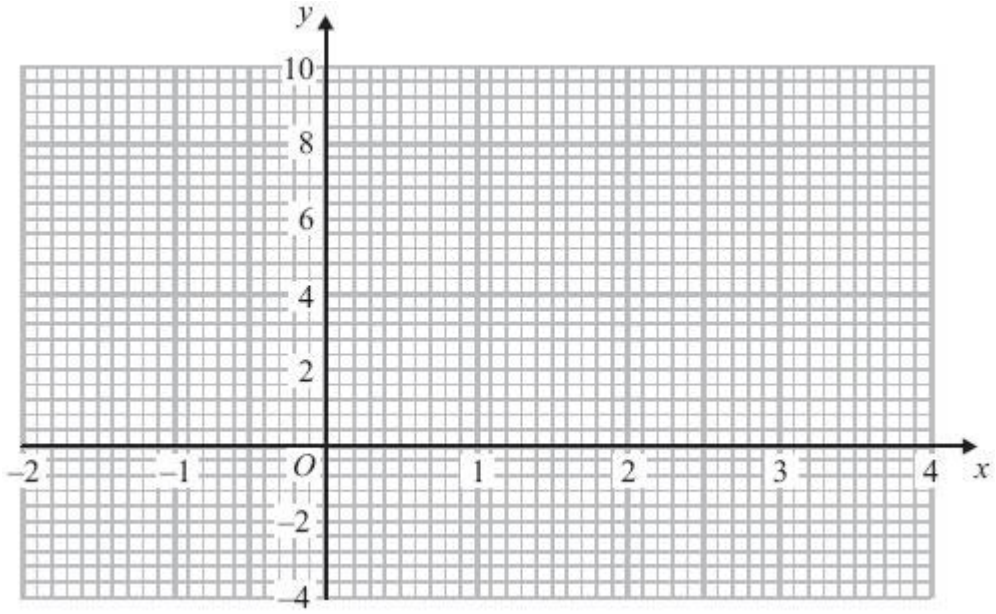
Q10.

(a) Complete the table of values for $y = x^2 - 2x$

x	–2	–1	0	1	2	3	4
y		3	0			3	

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x$ for values of x from –2 to 4



(2)

(c) Solve $x^2 - 2x - 2 = 1$

.....

(2)

(Total for Question is 6 marks)

Q10.

		Working	Answer	Mark	Notes
	(a)		-2 -1 0 1 2 3 4 **8** 3 0 **-1** **0** 3 **8**	2	B2 for 8, -1, 0, 8 (B1 for at least two of 8, -1, 0, 8)
	(b)		Correct curve	2	M1 (ft) for at least 5 points plotted correctly A1 for a fully correct curve
	(c)	$x^2 - 2x - 3 = 0$ OR $(x - 3)(x + 1) = 0$	3 and −1	2	M1 for the straight line $y = 3$ drawn to intersect the "graph" from (a) A1 for both solutions **OR** M1 for identifying $y = 3$ from the table A1 for both solutions **OR** M1 for $(x \pm 3)(x \pm 1)$ A1 for both solutions

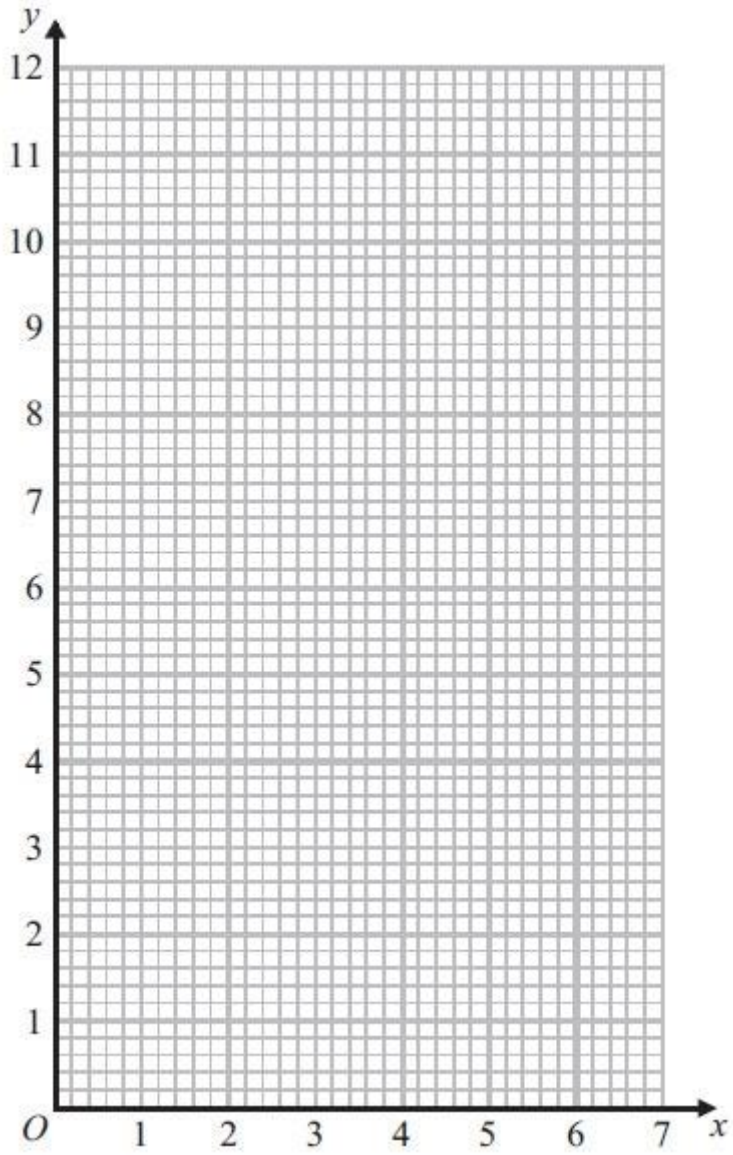
(Higher)

Q11.

(a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y		6	3		1.5		1

(2)



(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leq x \leq 6$

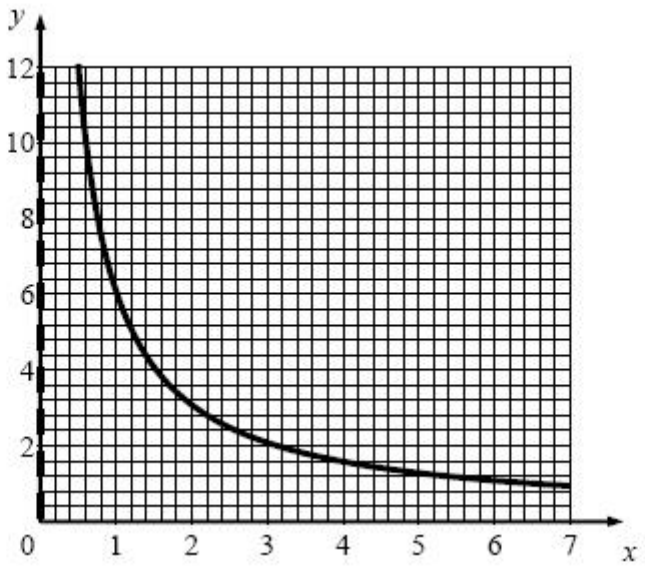
(2)

(Total for Question is 4 marks)

Q11.

Question		Working	Answer	Mark	Notes
	(a)		Correct table	2	B2 all 3 correct (B1 1 or 2 correct)
	(b)		Correct graph	2	M1 at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (0.5, 12) to (6, 1)

x	0.5	1	2	3	4	5	6
y	12	(6)	(3)	2	(1.5)	1.2	(1)



Q12.

(a) Solve $2x^2 + 9x - 7 = 0$

Give your solutions correct to 3 significant figures.

.....

(3)

(b) Solve $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$

Give your solutions correct to 3 significant figures.

.....

(2)

(Total for Question is 5 marks)

Q12.

Question		Working	Answer	Mark	Notes
	(a)	$x = \frac{-9 \pm \sqrt{9^2 - 4 \times 2 \times -7}}{2 \times 2} = \frac{-9 \pm \sqrt{137}}{4}$	0.676, − 5.18	3	M1 $\frac{-9 \pm \sqrt{9^2 - 4 \times 2 \times -7}}{2 \times 2}$ allow substitution of ±7 for *c* M1 $\frac{-9 \pm \sqrt{137}}{4}$ A1 answers in ranges 0.67 - 0.68 **and** − 5.17 to − 5.18 **OR** M1 $(x + 9/4)^2$ oe M1 for method leading to $\pm\sqrt{\frac{137}{16}} - 9/4$ A1 answers in ranges 0.67 - 0.68 **and** − 5.17 to − 5.18
	(b)	Put $y = 1/x$ and use part (a) Or $7y^2 - 9y - 2 = 0$ $y = \frac{--9 \pm \sqrt{(-9)^2 - 4 \times 7 \times (-2)}}{2 \times 7}$ $\frac{9 \pm \sqrt{137}}{14}$	1.48, − 0.193	2	M1 $y = 1/x$ or $x = 1/y$ A1 (ft) answers in range 1.47 - 1.48 **and** − 0.19 to − 0.194 **OR** M1 fully correct method which leads to $7y2 - 9y - 2 = 0$ **or** $-7y2 + 9y + 2 = 0$ with correct method to solve (condone sign errors in substitution) A1 (ft) answers in range 1.47 - 1.48 **and** − 0.19 to − 0.194

(Higher)

Q13.

$A = 4bc$

$A = 100$
$b = 2$

(a) Work out the value of c.

.....

(2)

$m = \sqrt{\frac{k+1}{4}}$

(b) Make k the subject of the formula.

.....

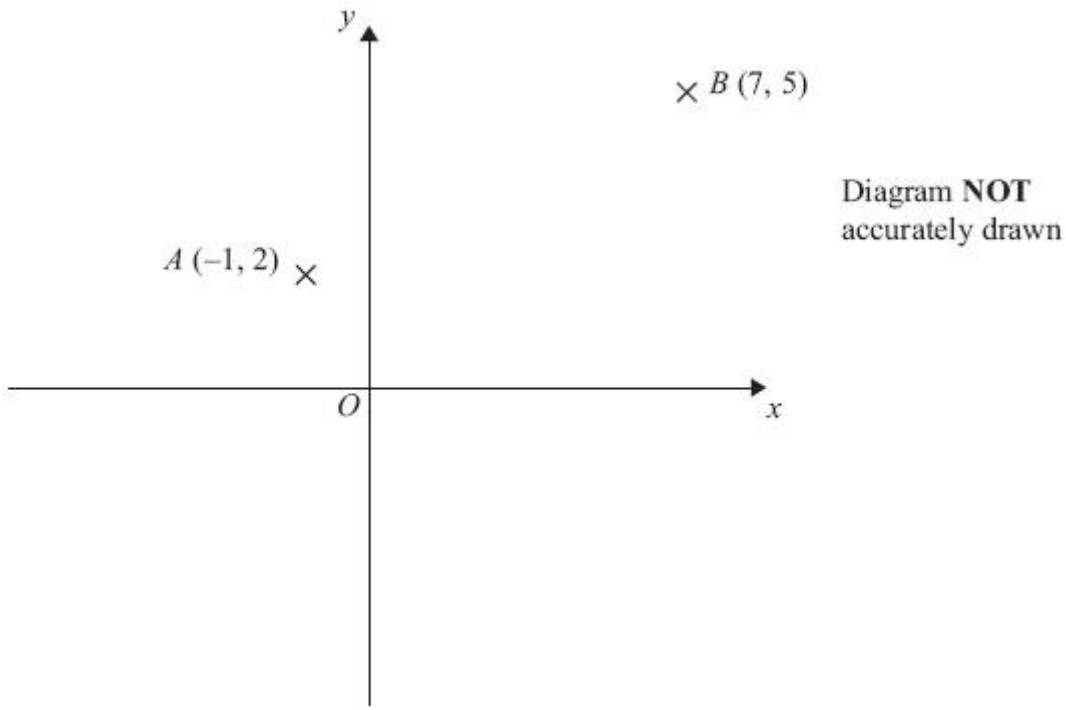
(3)

(Total for Question is 5 marks)

Q13.

		Working	Answer	Mark	Notes
	(a)	$100 = 4 \times 2 \times c$	12.5	2	M1 for correct substitution into formula A1 for 12.5 oe
	(b)	$m^2 = \frac{k+1}{4}$ $4m^2 = k + 1$ $k = 4m^2 - 1$ or $2m = \sqrt{(k+1)}$ $4m^2 = k + 1$ $k = 4m^2 - 1$	$k = 4m^2 - 1$	3	M1 for correct method to clear fraction **or** remove square root sign M1 (dep) for a fully correct method to both clear fraction **and** remove square root sign A1 for $k = 4m^2 - 1$ **or** $k = (2m + 1)(2m - 1)$

Q14.



A is the point (–1, 2)
B is the point (7, 5)

(a) Find the coordinates of the midpoint of *AB*.

.....

(2)

P is the point (–4, 4)
Q is the point (1, –5)

(b) Find the gradient of *PQ*.

.....

(2)

(Total for Question is 4 marks)

Q14.

		Working	Answer	Mark	Notes
	(a)		(3, 3.5) oe	2	M1 for a correct method to find the value of either the *x* coordinate or the *y* coordinate of the midpoint **or** *x* = 3 **or** *y* = 3.5 A1 cao
	(b)		-1.8 oe	2	M1 for correct method to find the gradient OR (+)1.8 A1 for -1.8 oe

(Higher and Foundation)

Q15.
Here are the first four terms of an arithmetic sequence.

3 10 17 24

(a) Find, in terms of *n*, an expression for the *n*th term of this arithmetic sequence.

.....

(2)

(b) Is 150 a term of this sequence?

You must explain how you get your answer.

.....

.....

.....

.....

.....

(2)

(Total for Question is 4 marks)

Q15.

PAPER: 1MA0_2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		$7n - 4$	2	B2 for $7n - 4$ (B1 for $7n + d$ where d is an integer)
(b)		explanation	2	M1 for '$7n - 4$' = 150 **or** any other valid method, eg. counting on 7s (to get 150) A1 for a complete explanation eg. the 22nd term is 150 or $n = 22$ from solution of equation or a clear demonstration based on 22 or complete sequence

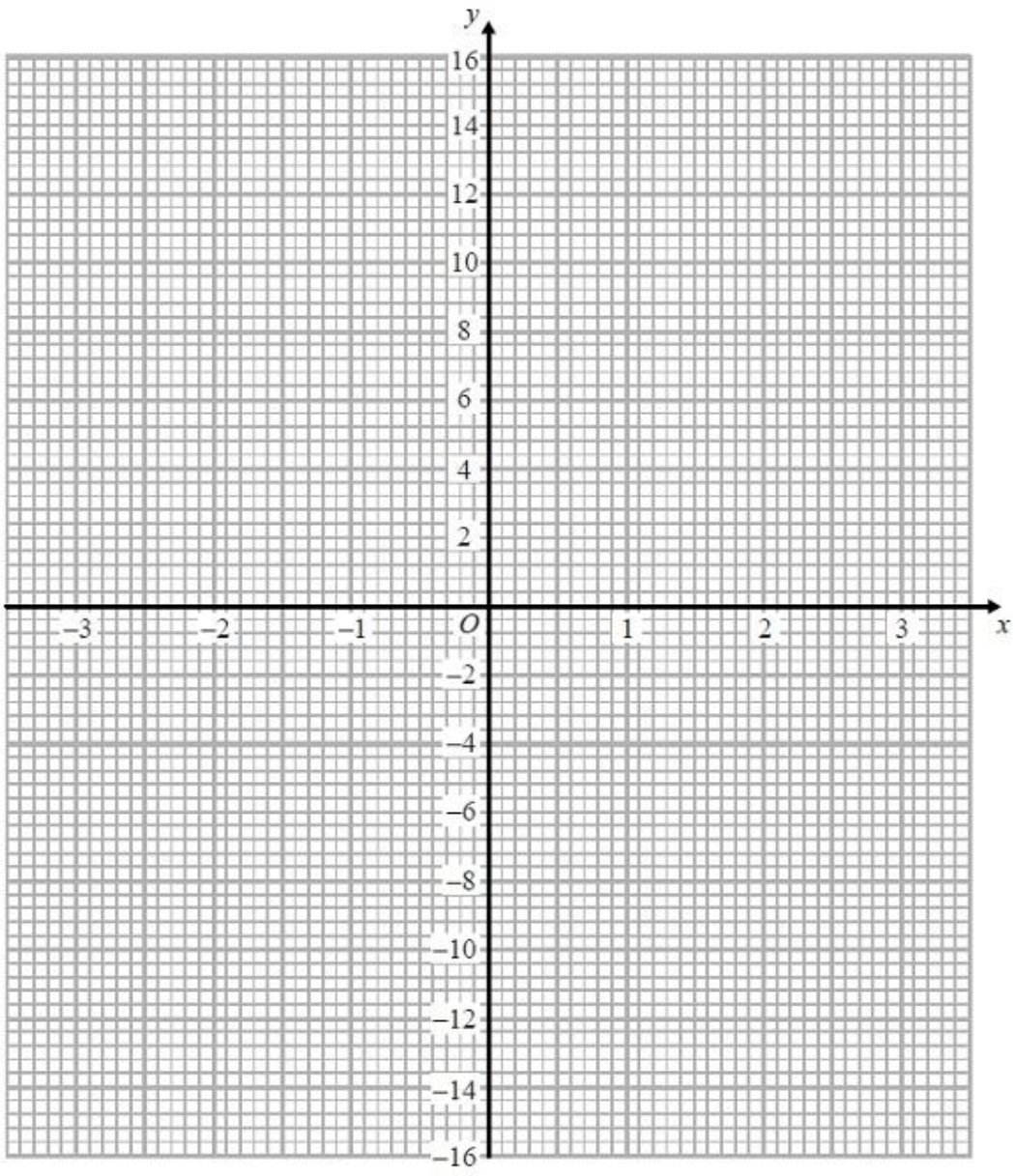
Q16.

(a) Complete the table of values for $y = x^3 - 4x$

x	−3	−2	−1	0	1	2	3
y			3	0			15

(2)

(b) On the grid, draw the graph of $y = x^3 - 4x$ from $x = -3$ to $x = 3$



(2)

(Total for Question is 4 marks)

Q16.

PAPER: 1MA0 2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
(a)		**-15**, **0**, 3, 0 ,**-3**, **0**, 15	2	B2 for all correct (B1 for any 2 or 3 correct)
(b)		Correct graph	2	M1 for at least 5 points plotted correctly (ft from table if at least B1 awarded in (a)) A1 for a fully correct curve

Q17.

D is directly proportional to *x*.

D = 36 when *x* = 5

Work out the value of *D* when *x* = 8

D = ...

(Total for Question is 2 marks)

Q17.

Paper: 5MB3H_01					
Question		Working	Answer	Mark	Notes
			57.6	2	M1 for $\frac{D}{8} = \frac{36}{5}$ oe A1 for 57.6 oe