	S5MA6ENA **EXAMINATION DATE: 29TH NOVEMBER** **EXAMINATION TIMES: 9.45-11.15** **TEACHERS: MS EGHOLM AND MR SEARLE** **NAME OF STUDENT:**

FORMAT:

There are 9 questions in this booklet.

There are a total of 67 marks available.

Please write your answers in this booklet

DURATION OF THE EXAMINATION:

90 minutes

AUTHORIZED MATERIAL:

Pencil and Ruler for graphs

NOTE

- Answers must be supported by explanations that show the reasoning behind the results or solutions provided.
- If graphs are used to find a solution, they must be sketched as part of the answer.
- Unless indicated otherwise, full marks will not be awarded if a correct answer is not accompanied by supporting evidence or explanations of how the results or the solutions have been achieved.
- When the answer provided is not the correct one, some marks can still be awarded if it is shown that an appropriate method and/or a correct approach has been used.

Stay calm and believe in yourself!

Question 1	**Indices**
	Simplify the following expressions:
2 marks	a) $5x^3y^2 \times 3x^4y^3$
	Answer:
2 marks	b) $\dfrac{20p^4q^5}{4pq^2}$
	Answer:
2 marks	c) $\dfrac{a^2}{a\sqrt{a}}$
	Answer:
2 marks	d) $(x^2y^4)^{-\frac{1}{2}}$
	Answer:

Question 2	**Standard form**
	Given that $p = 6.5 \times 10^6$, $q = 5 \times 10^{-4}$ and $r = 1.8 \times 10^3$, **evaluate** the following:
2 marks	a) pq
	Answer:
3 marks	b) $\dfrac{p}{q}$
	Answer:
3 marks	c) $q^2 r$
	Answer:

Question 3	**Quadratic equations**
	Solve the following equations:
2 marks	a) $x^2 - 6x + 5 = 0$
	Answer:
3 marks	b) $x^2 + 2x - 2 = 0$
	Answer:
3 marks	c) $2x^2 - x - 6 = 0$
	Answer:

Question 4	**Graphs**

The number of plastic bottles found in a lake each month can be modelled by the formula

$$n = 10 \times 2^t$$

where t is the time in months.

1 mark

a) **Determine** how many plastic bottles was found initially.
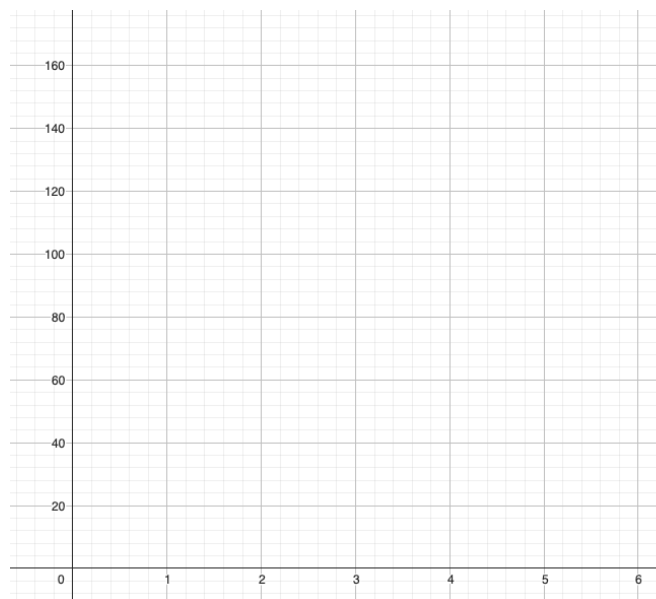
   Answer:

2 marks

b) **Complete** the table

Months (t)	0	1	2	3	4
Number of Bottles (n)					

2 marks

c) Use the diagram below to **plot** a graph showing the relationship between n and t.

1 mark

d) **Determine** the type of function for the graph.

   Answer:

1 mark

e) Use your graph to **estimate** how many bottles were found after 3.5 months.

   Answer:

| 1 mark | f) **Comment**: will this formula always give an accurate account of the number of bottles in the lake? |
| | **Answer:** |

Question 5	**Trigonometric ratios**
6 marks	**Complete** the table showing the exact values for the following trigonometric functions

Angle θ	$0°$	$30°$	$45°$	$60°$	$90°$
$sin(\theta)$				$\dfrac{\sqrt{3}}{2}$	1
$cos(\theta)$	1				
$tan(\theta)$			1		

Question 6	**Trigonometric equations**
2 marks	**Isolate** x in the following expressions

a) $-z + y - x = 25$

Answer:

2 marks	b) $-9x - p^2 = -27p$
	Answer:
3 marks	c) $3 = \dfrac{y-z}{\sqrt{x}}$
	Answer:

Question 7	**Vectors**
	Two vectors $\vec{p}$ and $\vec{q}$ are shown on the grid.
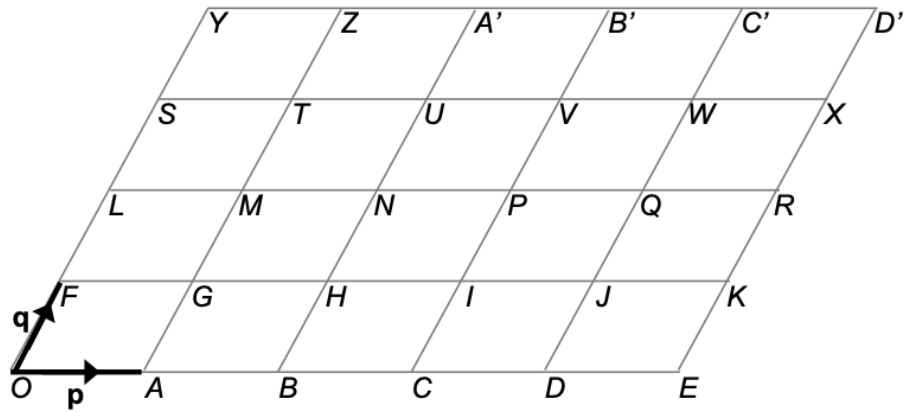
<table>
<tr><td>1 marks</td><td>

a) **Write** any position vector that is equal to $\vec{p} - 2\vec{q}$.

Answer:

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<tr><td>1 marks</td><td>

b) **Write** any position vector that is equal to $-2\vec{p} - \vec{q}$.

Answer:

</td></tr>
<tr><td>3 marks</td><td>

c) By drawing on the grid, **show** that
$$(\vec{p} - 2\vec{q}) + (-2\vec{p} - \vec{q}) = -\vec{p} - 3\vec{q}$$

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<tr><td>3 marks</td><td>

d) **Find the value** of c and d:
$$\begin{pmatrix} c \\ 5 \end{pmatrix} + 2 \begin{pmatrix} 3 \\ d \end{pmatrix} = \begin{pmatrix} d \\ 8 \end{pmatrix}$$

Answer:

</td></tr>
</table>

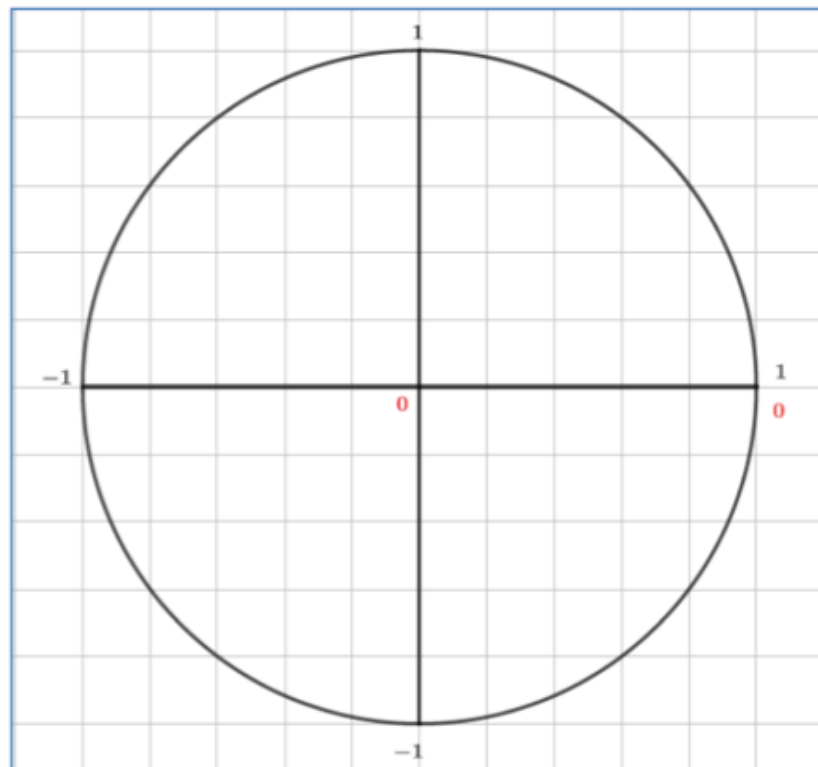| Question 8	Angles and the unit circle
3 marks	a) **Convert** the following degrees to radians $$45°, \quad 225°, \quad 720°, \quad 30°$$ **Answer:**
3 marks	b) **Draw** the angles from above in the unit circle

| Question 9 | **Trigonometric functions** |

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The depth of water, d metres, in a harbour at a time, t hours after midnight, is given by
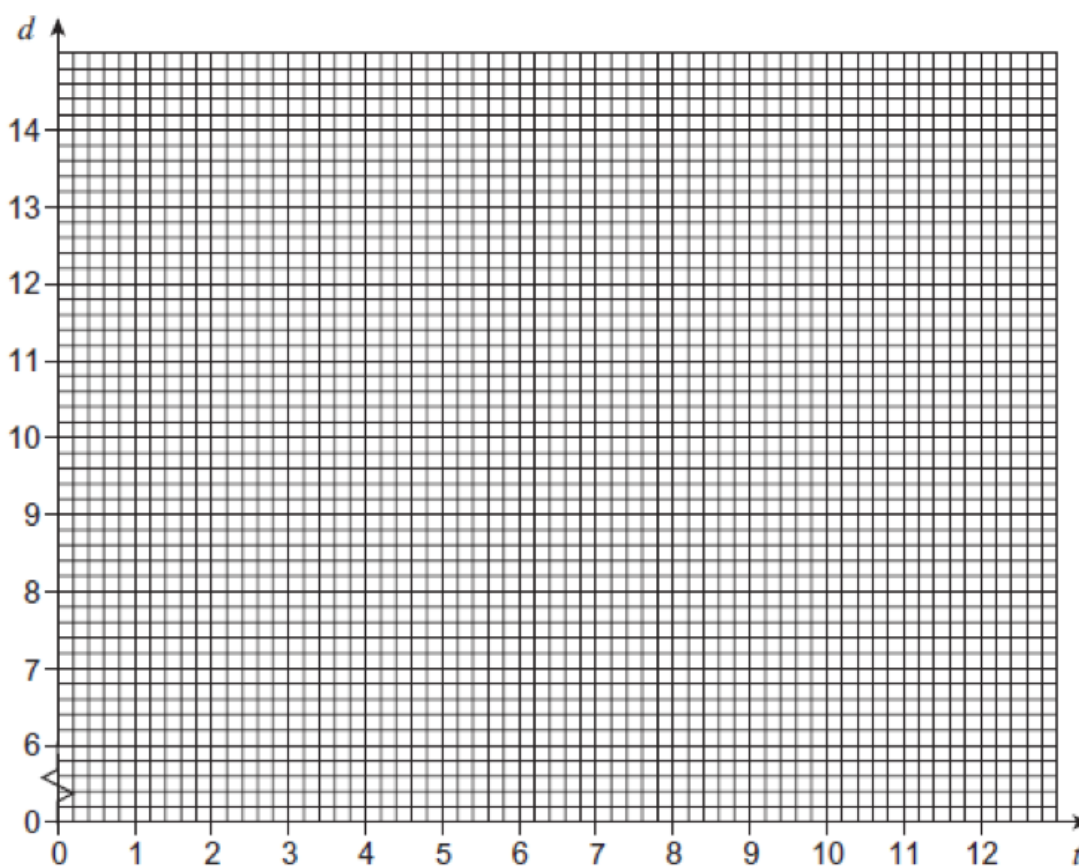
$$d = 4\cos\left(\frac{\pi}{6}t + \pi\right) + 10$$

3 marks

a) **Fill out** the missing values in the table below

t	0	1	2	3	4	5	6	7	8	9	10	11	12
d	6	6.5	8	10	12	13.5		13.5	12	10		6.5	

2 marks

b) On the grid below, **draw** the graph of $d = 4\cos\left(\frac{\pi}{6}t + \pi\right) + 10$

3 marks

c) The depth of water must be at least 9 metre for a ship to enter the harbour. At midnight a ship is waiting to enter the harbour.

Use the graph to **estimate** the earliest time the ship can enter.

Answer:

END OF TEST

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