

## Y1P3 XMQs and MS

(Total: 8 marks)

1. P1\_2020 Q7 . 5 marks - Y1P3 Equations and inequalities
2. P1(AS)\_2021 Q1 . 3 marks - Y1P3 Equations and inequalities

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| Question      | Scheme  | Marks | AOs       |
|---------------|---|-------|-----------|
| 7             | Attempts equation of line<br>Eg Substitutes $(-2,13)$ into $y = mx + 25$ and finds $m$  | M1    | 1.1b      |
|               | Equation of $l$ is $y = 6x + 25$  | A1    | 1.1b      |
|               | Attempts equation of $C$<br>Eg Attempts to use the intercept $(0,25)$ within the equation<br>$y = a(x \pm 2)^2 + 13$ , in order to find $a$ | M1    | 3.1a      |
|               | Equation of $C$ is $y = 3(x+2)^2 + 13$ or $y = 3x^2 + 12x + 25$   | A1    | 1.1b      |
|               | Region $R$ is defined by $3(x+2)^2 + 13 < y < 6x + 25$ o.e.   | B1ft  | 2.5       |
|               |   | (5)   |           |
|               |   |       | (5 marks) |
| <b>Notes:</b> |   |       |           |

The first two marks are awarded for finding the equation of the line

**M1:** Uses the information in an attempt to find an equation for the line  $l$ .

E.g. Attempt using two points: Finds  $m = \pm \frac{25-13}{2}$  and uses one of the points in their  $y = mx + c$  or equivalent to find  $c$ . Alternatively uses the intercept as shown in main scheme.

**A1:**  $y = 6x + 25$  seen or implied. This alone scores the first two marks. Do not accept  $l = 6x + 25$

It must be in the form  $y = \dots$  but the correct equation can be implied from an inequality. E.g.  $\dots < y < 6x + 25$

The next two marks are awarded for finding the equation of the curve

**M1:** A complete method to find the constant  $a$  in  $y = a(x \pm 2)^2 + 13$  or the constants  $a, b$  in  $y = ax^2 + bx + 25$ .

An alternative to the main scheme is deducing equation is of the form  $y = ax^2 + bx + 25$  and setting and solving a pair of simultaneous equations in  $a$  and  $b$  using the point  $(-2, 13)$  the gradient being 0 at  $x = -2$ . Condone slips. Implied by  $C = 3x^2 + 12x + 25$  or  $3x^2 + 12x + 25$

FYI the correct equations are  $13 = 4a - 2b + 25$  ( $2a - b = -6$ ) and  $-4a + b = 0$

**A1:**  $y = 3(x+2)^2 + 13$  or equivalent such as  $y = 3x^2 + 12x + 25$ ,  $f(x) = 3(x+2)^2 + 13$ .

Do not accept  $C = 3x^2 + 12x + 25$  or just  $3x^2 + 12x + 25$  for the A1 but may be implied from an inequality or from an attempt at the area, E.g.  $\int 3x^2 + 12x + 25 dx$

**B1ft:** Fully defines the region  $R$ . Follow through on their equations for  $l$  and  $C$ .

Allow strict or non-strict inequalities as long as they are used consistently.

E.g. Allow for example " $3(x+2)^2 + 13 < y < 6x + 25$ " " $3(x+2)^2 + 13 \leq y \leq 6x + 25$ "

Allow the inequalities to be given separately, e.g.  $y < 6x + 25, y > 3(x+2)^2 + 13$ . Set notation may be used so

$\{(x, y) : y > 3(x+2)^2 + 13\} \cap \{(x, y) : y < 6x + 25\}$  is fine but condone with or without any of  $(x, y) \leftrightarrow y \leftrightarrow x$

Incorrect examples include " $y < 6x + 25$  or  $y > 3(x+2)^2 + 13$ ",  $\{(x, y) : y > 3(x+2)^2 + 13\} \cup \{(x, y) : y < 6x + 25\}$

Values of  $x$  could be included but they must be correct. So  $3(x+2)^2 + 13 < y < 6x + 25, x < 0$  is fine

If there are multiple solutions mark the final one.

1. In this question you should show all stages of your working.

Solutions relying on calculator technology are not acceptable.

Using algebra, solve the inequality

$$x^2 - x > 20$$

writing your answer in set notation.

(3)

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| Question   | Scheme  | Marks      | AOs  |
|--|---|------------|------|
| 1  | Finds critical values $x^2 - x > 20 \Rightarrow x^2 - x - 20 > 0 \Rightarrow x = (5, -4)$ | M1         | 1.1b |
|  | Chooses outside region for their values Eg. $x > 5, x < -4$                               | M1         | 1.1b |
|  | Presents solution in set notation $\{x : x < -4\} \cup \{x : x > 5\}$ oe                  | A1         | 2.5  |
|  |   | <b>(3)</b> |      |
| <b>(3 marks)</b>   |   |            |      |
| <b>Notes</b>   |   |            |      |
| <p><b>M1:</b> Attempts to find the critical values using an algebraic method. Condone slips but an allowable method should be used and two critical values should be found</p> <p><b>M1:</b> Chooses the outside region for their critical values. This may appear in incorrect inequalities such as <math>5 &lt; x &lt; -4</math></p> <p><b>A1:</b> Presents in set notation as required <math>\{x : x &lt; -4\} \cup \{x : x &gt; 5\}</math> Accept <math>\{x &lt; -4 \cup x &gt; 5\}</math>.<br/>Do not accept <math>\{x &lt; -4, x &gt; 5\}</math></p> <p>Note: If there is a contradiction of their solution on different lines of working do not penalise intermediate working and mark what appears to be their final answer.</p> |   |            |      |