# Pure Year 1 exam questions (AS maths)-AQA

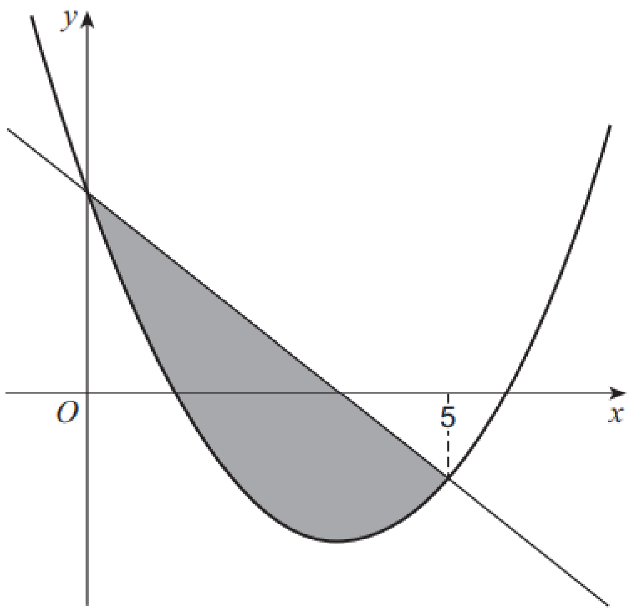
**NOTE**:
*Please be aware that in the Year 12 collections, you will find questions from the A-Level (Year 13) papers. However, these questions are intentionally included because they align with Year 12 content and topics.*
*Happy studying!*

# Ch 4 Equations and inequalities

## June 2022 Question 2 Paper 3 (A-Level)

**2** The shaded region, shown in the diagram below, is defined by

$$x^2 - 7x + 7 \leq y \leq 7 - 2x$$




Identify which of the following gives the area of the shaded region.

Tick (✓) **one** box.

**[1 mark]**

$\int (7 - 2x)\,dx - \int (x^2 - 7x + 7)\,dx$ ☐

$\int_0^5 (x^2 - 5x)\,dx$ ☐

$\int_0^5 (5x - x^2)\,dx$ ☐

$\int_0^5 (x^2 - 9x + 14)\,dx$ ☐

**ANSWER**

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **2** | Ticks correct box | 3.1a | B1 | $\int_0^5 (5x - x^2)\,dx$ |
| | **Question 2 Total** | | **1** | |

## November 2021 Question 1 Paper 1 (A-Level)

**1** State the set of values of $x$ which satisfies the inequality

$$(x-3)(2x+7) > 0$$

Tick (✓) **one** box.

**[1 mark]**

$\left\{x : -\frac{7}{2} < x < 3\right\}$ ☐

$\left\{x : x < -3 \text{ or } x > \frac{7}{2}\right\}$ ☐

$\left\{x : x < -\frac{7}{2} \text{ or } x > 3\right\}$ ☐

$\left\{x : -3 < x < \frac{7}{2}\right\}$ ☐

**ANSWER**

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 1 | Ticks the correct box | 1.1b | B1 | $\left\{x : x < -\frac{7}{2} \text{ or } x > 3\right\}$ |
| | **Question Total** | | **1** | |

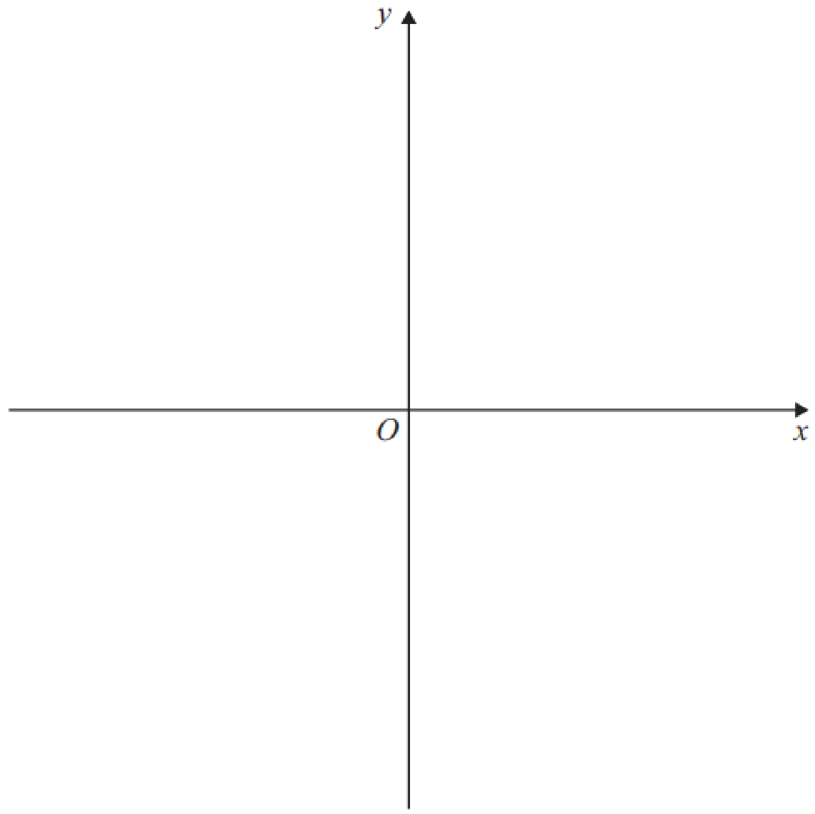
## November 2021 Question 5 Paper 1

**5 (a)** Sketch the curve

$$y = (x - a)^2(3 - x) \qquad \text{where } 0 < a < 3$$

indicating the coordinates of the points where the curve and the axes meet.

**[4 marks]**



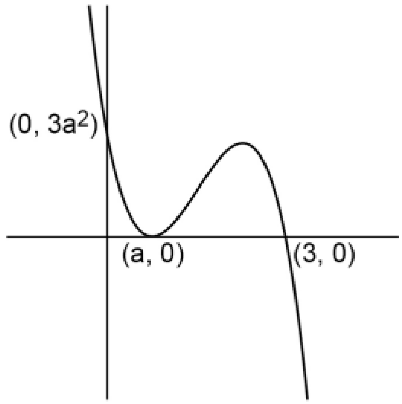

**5 (b)** Hence, solve

$$(x - a)^2(3 - x) > 0$$

giving your answer in set notation form.

**[2 marks]**

## ANSWER

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **5(a)** | Draws a correctly orientated cubic graph | 1.1b | B1 | $y$ = 0 at 3 and $a$ (twice)<br> |
| | Draws a graph cutting $x$ axis at (3, 0) labelled.<br>Condone omission of 0 | 1.1b | B1 | |
| | Draws a graph meeting $x$ axis at ($a$, 0) labelled.<br>Condone omission of 0 | 2.2a | B1 | |
| | Draws a graph cutting $y$ axis at (0, $3a^2$) labelled.<br>Condone omission of 0 | 1.1b | B1 | |
| | **Subtotal** | | **4** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **5(b)** | Deduces that $x < a$ or $a < x < 3$ OE | 2.2a | M1 | $\{x: x < a\} \cup \{x: a < x < 3\}$ |
| | Expresses answer in set notation.<br>Or $\{x: 0 < x < 3,\ x \neq a\}$ | 2.5 | R1 | |
| | **Subtotal** | | **2** | |

## November 2020 Question 7 Paper 3 (A-Level)

**7 (a)** Using ${}^nC_r = \frac{n!}{r!(n-r)!}$ show that ${}^nC_2 = \frac{n(n-1)}{2}$

**[2 marks]**

**7 (b) (i)** Show that the equation

$$2 \times {}^nC_4 = 51 \times {}^nC_2$$

simplifies to

$$n^2 - 5n - 300 = 0$$

**[3 marks]**

**7 (b) (ii)** Hence, solve the equation

$$2 \times {}^nC_4 = 51 \times {}^nC_2$$

**[2 marks]**

## ANSWER

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 7(a) | Substitutes $r$ = 2 into given formula and writes out either $n!$ or ($n$-2)! correctly up to at least three terms<br><br>Accept $n! = n \times (n-1) \times (n-2)!$ or $(n-2)! = (n-2) \times (n-3) \times (n-4)!$<br><br>Condone omission of brackets | 1.1a | M1 | ${}^nC_2 = \frac{n!}{2!(n-2)!}$<br>$= \frac{n\times(n-1)\times(n-2)\times\ldots}{2\times(n-2)\times\ldots}$<br>$= \frac{n(n-1)}{2}$ |
| | Completes reasoned argument, eliminating common factors correctly leading to the correct form<br>Must see $\frac{n\times(n-1)}{2}$ **AG** | 2.1 | R1 | |
| 7(b)(i) | Simplifies to obtain ${}^nC_4$ as $\frac{2n(n-1)(n-2)(n-3)}{4!}$ or better | 1.1b | B1 | $2\times {}^nC_4 = 51\times {}^nC_2$<br>$\frac{2\ n!}{4!(n-4)!} = \frac{51\ n(n-1)}{2}$ |
| | Writes ${}^nC_4$ and ${}^nC_2$ in terms of $n$ and forms an equation using<br>$2\times {}^nC_4 = 51\times {}^nC_2$<br>Allow ${}^nC_4 = \frac{2\ n!}{4!(n-4)!}$ or<br>$\frac{2n(n-1)(n-2)(n-3)}{4!}$ or<br>${}^nC_2 = \frac{n!}{2!(n-2)!}$ | 3.1a | M1 | $\frac{2n(n-1)(n-2)(n-3)}{4!} = \frac{51\times n\times(n-1)}{2}$<br><br>$\frac{(n-2)(n-3)}{6} = 51$<br>$n^2 - 5n + 6 = 306$<br>$n^2 - 5n - 300 = 0$ |
| | Completes reasoned argument to obtain given result<br>Must see $\frac{(n-2)(n-3)}{6} = 51$ or<br>$(n-2)(n-3) = 306$ **OE**<br>**AG** | 2.1 | R1 | |
| 7(b)(ii) | Obtains at least one correct solution to the equation<br>$n^2 - 5n - 300 = 0$<br><br>**PI** by correct answer | 1.1a | M1 | $n = -15$ or 20<br>since $n$ > 0, so $n$ = 20 |
| | States $n$ = 20 | 3.2a | A1 | |
| | **Total** | | **7** | |

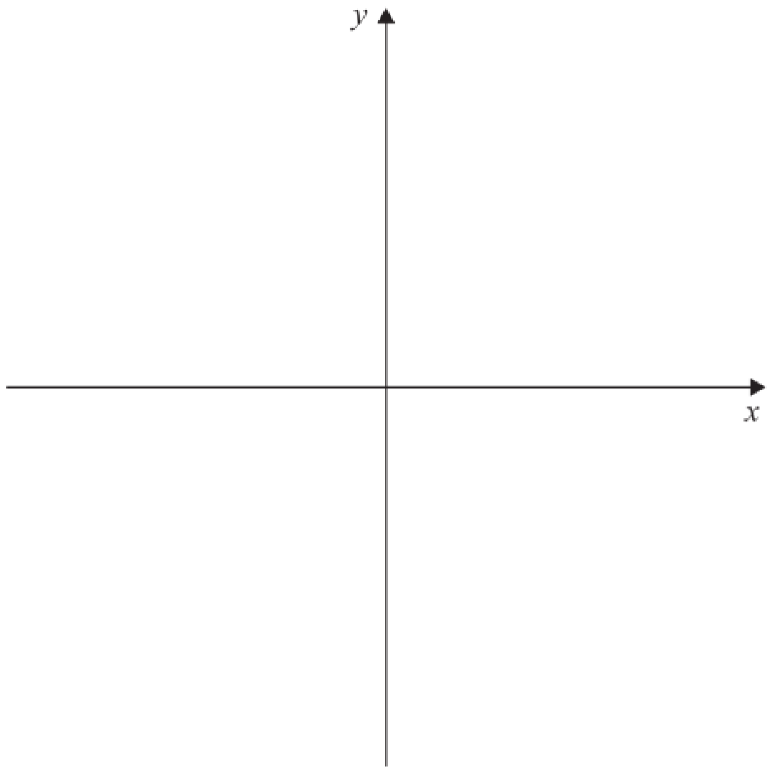
## June 2019 Question 4 Paper 3 (A-Level)

**4** Sketch the region defined by the inequalities

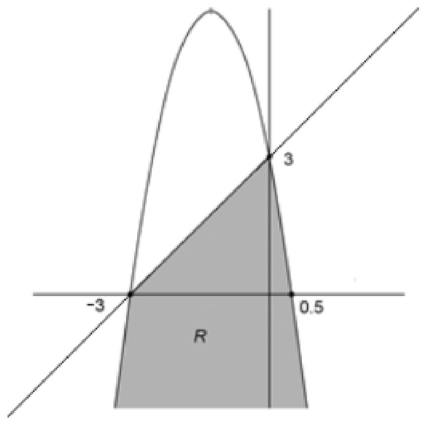
$$y \leq (1 - 2x)(x + 3) \text{ and } y - x \leq 3$$

Clearly indicate your region by shading it in and labelling it *R*.

**[3 marks]**



**ANSWER**

| Q | Marking instructions | AO | Mark | Typical solution |
|---|---|---|---|---|
| **4** | Draws quadratic curve in the correct orientation eg vertex above $x$-axis and two intersections on the $x$-axis | 1.1a | M1 |   |
| | Labels all correct points of intersection for the correct quadratic curve with vertex clearly in the 2nd quadrant<br>Must see −3, 0.5 and 3 | 1.1b | A1 | |
| | Draws **correct straight line** passing through (−3, 0) and (0, 3) or straight line which intersects their quadratic curve on the negative $x$-axis and positive $y$-axis **and shades** corresponding region for their quadratic curve<br><br>**FT** their quadratic<br>All lines must be **solid**<br>Condone missing label R | 2.2a | A1F | |
| | **Total** | | **3** | |

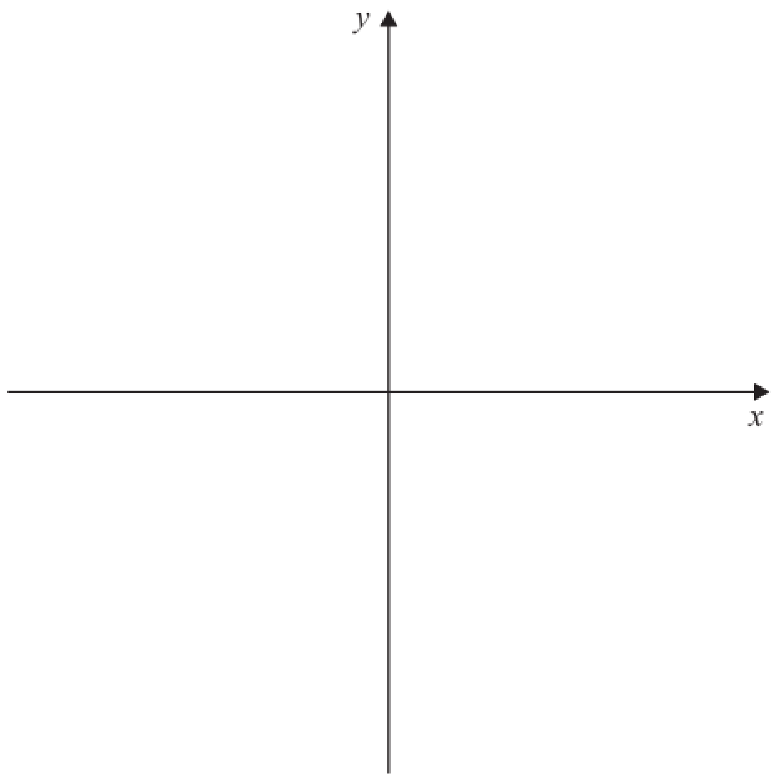
## June 2018 Question 4 Paper 3 (A-Level)

**4** Sketch the region defined by the inequalities

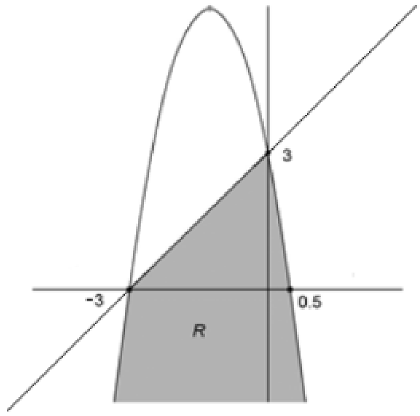
$$y \leq (1 - 2x)(x + 3) \text{ and } y - x \leq 3$$

Clearly indicate your region by shading it in and labelling it *R*.

**[3 marks]**



**ANSWER**

| Q | Marking instructions | AO | Mark | Typical solution |
|---|---|---|---|---|
| **4** | Draws quadratic curve in the correct orientation eg vertex above $x$-axis and two intersections on the $x$-axis | 1.1a | M1 |  |
| | Labels all correct points of intersection for the correct quadratic curve with vertex clearly in the 2nd quadrant<br>Must see −3, 0.5 and 3 | 1.1b | A1 | |
| | Draws **correct straight line** passing through (−3, 0) and (0, 3) or straight line which intersects their quadratic curve on the negative $x$-axis and positive $y$-axis **and shades** corresponding region for their quadratic curve<br><br>**FT** their quadratic<br>All lines must be **solid**<br>Condone missing label R | 2.2a | A1F | |
| | **Total** | | **3** | |