# Mixed Exam Questions – Week 8 – Mark Scheme

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|---|---|---|---|---|
| 1 **(a)(i)** | States correct value of $p$ | AO1.2 | B1 | $p = \frac{1}{2}$ |
| **(a)(ii)** | States correct value of $q$ | AO1.2 | B1 | $q = -2$ |
| **(b)** | Uses valid method to find $x$, PI | AO1.1a | M1 | $\frac{1}{2} + x = -2$ |
| | Obtains correct $x$, ACF | AO1.1b | A1 | $x = -2.5$ |
| | **Total** | | **4** | |

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| 2 | Multiplies numerator and denominator by the conjugate surd of the denominator | AO1.1a | M1 | $\frac{(5\sqrt{2}+2)(3\sqrt{2}-4)}{(3\sqrt{2}+4)(3\sqrt{2}-4)}$ <br> $= \frac{30-20\sqrt{2}+6\sqrt{2}-8}{2}$ <br> $= \frac{22-14\sqrt{2}}{2}$ <br> $= 11-7\sqrt{2}$ |
| | Obtains **either** numerator **or** denominator correctly, in expanded or simplified form | AO1.1b | A1 | |
| | Constructs rigorous mathematical argument to show the required result <br><br> Only award if they have a completely correct solution, which is clear, easy to follow and contains no slips <br><br> NMS = 0 | AO2.1 | R1 | |
| | **Total** | | **3** | |

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| 3 | Explains that equal gradients implies that lines are parallel | AO2.4 | E1 | Parallel lines have equal gradient |
| | Finds the gradient of the given line<br>CAO | AO1.1b | B1 | $2x + 3y + 4 = 0 \Rightarrow y = -\frac{2}{3}x - \frac{4}{3}$<br>So gradient is $-\frac{2}{3}$ |
| | Finds the gradient of the line through the 2 given points<br>CAO | AO1.1b | B1 | Gradient of line through (9, 4) and (3, 8) is $\frac{8-4}{3-9} = -\frac{2}{3}$ |
| | Deduces that the two lines are parallel | AO2.2a | R1 | So line with equation $2x + 3y + 4 = 0$ is parallel to the line joining the points with coordinates (9, 4) and (3, 8) as both have gradient $-\frac{2}{3}$ |
| | **Total** | | **4** | |

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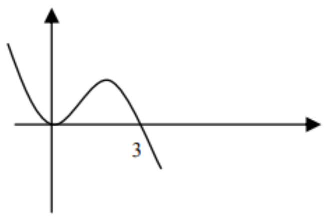
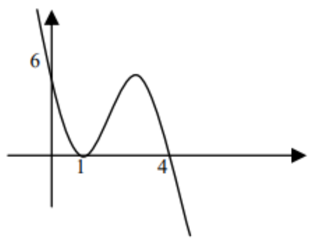
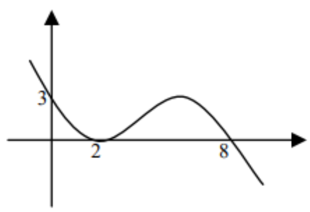
| 4 | (a) | <br> | (See below)<br>Clearly through origin (or (0, 0) seen)<br>3 labelled (or (3, 0) seen) | M1<br>A1<br>A1<br>(3) |
| | (b) | <br> | Stretch parallel to $y$-axis<br>1 and 4 labelled (or (1, 0) and (4, 0) seen)<br>6 labelled (or (0, 6) seen) | M1<br>A1<br>A1<br>(3) |
| | (c) | <br> | Stretch parallel to $x$-axis<br>2 and 8 labelled (or (2, 0) and (8, 0) seen)<br>3 labelled (or (0, 3) seen) | M1<br>A1<br>A1<br>(3) |
| | | | | **Total 9 marks** |

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| 5 | | | $4x^4y^{-3}$ or $\frac{4x^4}{y^3}$ as final answer | 3<br><br>**[3]** | B1 each 'term';<br>or M1 for numerator = $64x^{15}y^3$ and M1 for denominator = $16x^{11}y^6$ |

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| 6 | Forms discriminant – condone one error in discriminant | AO1.1a | M1 | for distinct real roots, disc > 0<br>$4^2 - 4\times 3\times(2k-1) > 0$ |
| | States that discriminant > 0 for real and distinct roots | AO2.4 | R1 | $16 - 12(2k-1) > 0$<br>$28 - 24k > 0$ |
| | Forms an inequality from 'their' discriminant | AO1.1a | M1 | $k < \frac{7}{6}$ |
| | Solves inequality for $k$ correctly<br>Allow un-simplified equivalent fraction | AO1.1b | A1 | |
| | **Total** | | **4** | |

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| 7 | (a) | $y-(-4) = \frac{1}{3}(x-9)$ or $\frac{y-(-4)}{x-9} = \frac{1}{3}$<br>$3y - x + 21 = 0$ (o.e.) (condone 3 terms with integer coefficients e.g. $3y+21=x$) | M1 A1<br>A1<br>(3) |
| | (b) | Equation of $l_2$ is: $y = -2x$ (o.e.)<br>Solving $l_1$ and $l_2$ : $-6x - x + 21 = 0$<br>$p$ is point where $x_p = 3$, $y_p = -6$ — $x_p$ or $y_p$<br>$y_p$ or $x_p$ | B1<br>M1<br>A1<br>A1f.t. $(-2x)$<br>(4) |
| | (c ) | ($l_1$ is $y = \frac{1}{3}x - 7$) C is (0, -7) or OC = 7<br>Area of $\Delta OCP = \frac{1}{2}OC\times x_p$, $= \frac{1}{2}\times 7\times 3 = 10.5$ or $\frac{21}{2}$ | B1f.t.<br>M1 A1c.a.o.<br>(3) |
| ALT | | By Integration: M1 for $\pm\int_0^{x_P}(l_1 - l_2)\,dx$,<br>B1 ft for correct integration (follow through their $l_1$) , then A1cao. | **(10)** |

| Q | Marking Instructions | AO | Marks | Typical Solution |
|---|---|---|---|---|
| 8 **(a)** | Circles correct answer | AO1.1b | B1 | 29 |
| **(b)** | Circles correct answer | AO2.2a | B1 | $90^{\circ} < \theta < 135^{\circ}$ |
| | **Total** | | **2** | |
| 9 **(a)** | Finds correct acceleration | AO1.1b | B1 | $0.5\ \text{m s}^{-2}$ |
| **(b)** | Identifies $5T$ as the distance travelled after the first 15 seconds | AO3.4 | B1 | Distance at constant speed $= 5T$<br><br>Distance in first 15 secs $=$<br>$\frac{1}{2} \times (3+8) \times 10 + \frac{1}{2} \times (8+5) \times 5$<br>$= 55 + 32.5 = 87.5$<br><br>$5T + 87.5 = 120$<br><br>So $T = 6.5$ |
| | Uses the information given to form an equation to find $T$<br>(award mark for either trapezium expression separate, totalled or implied) | AO3.1b | M1 | |
| | Correctly calculates the distance for the first 15 secs | AO1.1b | A1 | |
| | Deduces the values of $T$ from the mathematical models applied | AO2.2a | A1 | |
| | **Total** | | **5** | |