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**1 Mark Scheme**

**Advanced Subsidiary**

**Paper 1: Pure Mathematics**

**Paper**

**PAPER B Mark Scheme**

**NOTE: 1a:** Award the mark for a different explanation that is mathematically correct, provided that the explanation is clear and not ambiguous.

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| Any reasonable explanation.  For example, the student did not correctly find all values of 2*x* which satisfy . Student should have subtracted 150° from 360° first, and then divided by 2.  N.B. If insufficient detail is given but location of error is correct then mark can be awarded from working in part (b). | **B1** |
|  | **(1 mark)** |
| *x* = 75° | **B1** |
| *x* = 105° | **B1** |
|  | **(2 marks)** |
|  | **Total 3 marks** |

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| Makes an attempt to use Pythagoras’ theorem to find.  **2 Mark Scheme**  For example, seen. | **M1** |
|  | **A1** |
| Displays the correct final answer. | **A1** |
|  | **(3 marks)** |

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| Attempt to multiply the numerator and denominator by . For example,  **3 Mark Scheme** | **M1** |
| Attempt to multiply out the numerator (at least 3 terms correct). | **M1** |
| Attempt to multiply out the denominator (for example, 3 terms correct but **must** be rational or 64 – 3 seen or implied). | **M1** |
| *p* and *q* stated or implied (condone if all over 61).  or | **A1** |
|  | **(4 marks)** |

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| Picks a number less than or equal to zero, e.g. *x* = −1, and attempts a substitution into both sides. For example,  **4b Mark Scheme** | **M1** |
| Correctly deduces for their choice of *x* that the inequaltity does not hold. For example, 3 ≮ 0 | **A1** |
|  | **(2 marks)** |
|  | **Total 6 marks** |

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| Makes an attempt to expand the binomial expression  **4a Mark Scheme**  (must be terms in *x*0, *x*1, *x*2, *x*3 and at least 2 correct). | **M1** |
|  | **A1** |
| 0 < 3*x* | **A1** |
| *x* > 0\* as required. | **A1\*** |
|  | **(4 marks)** |

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| Uses laws of indices correcty at least once anywhere in solution (e.g.or  or  seen or implied). | **B1** |
| Makes an attempt at integrating  Raising at least one *x* power by 1 would constitute an attempt. | **M1** |
| Fully correct integration.  (no need for +*C* here). | **A1** |
| Makes an attenpt to substitute (4, 19) into the integrated expression. For example,  is seen. | **M1** |
| Finds the correct value of *C*. *C* = −13 | **A1** |
| States fully correct final answer  or any equivalent form. | **A1** |
|  | **(6 marks)** |

**5 Mark Scheme**

**NOTES:** Award all 6 marks for a fully correct final answer, even if some working is missing.

**6 Mark Scheme**

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| States  or implies this by making a substitution. | **M1** |
| Simplifies the equation to form a quadratic in cos *x*. | **M1** |
| Correctly factorises this equation.  or uses equivalent method for solving quadratic (can be implied by correct solutions). | **M1** |
| Correct solution. cos *x*  or | **A1** |
| Finds one correct solution for *x*. (48.2°,60°, 311.8° or 300°). | **A1** |
| Finds all other solutions to the equation. | **A1** |
|  | **(6 marks)** |

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| States or implies the expansion of a binomial expression to the 8th power, up to and including the *x*3 term.  **7a Mark Scheme**    or | **M1** |
| Correctly substitutes 1 and 3*x* into the formula: | **M1** |
| Makes an attempt to simplify the expression (2 correct coefficients (other than 1) or both 9*x*2 and 27*x*3). | **M1 dep** |
| States a fully correct answer: | **A1** |
|  | **(4 marks)** |
| States *x* = 0.01 or implies this by attempting the substitution:  **7b Mark Scheme** | **M1** |
| Attempts to simplify this expression (2 calculated terms correct):  1 + 0.24 + 0.0252 + 0.001512 | **M1** |
| 1.266712 = 1.2667 (5 s.f.) | **A1** |
|  | **(3 marks)** |
|  | **Total 7 marks** |

**8a Mark Scheme**

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| alevel_ut_p1_u8_markscheme_aw2 | Attempt to find intersection with *x*-axis. For example, | **M1** |
| Solving  to find *x* = −a + 1, so coordinates of *x*-intercept are (−a + 1, 0) oe | **A1** |
| Substituting *x* = 0 to derive , so coordinates of *y*-intercept are | **B1** |
| Asymptote shown at *x* = −a stated or shown on graph. | **B1** |
| Increasing log graph shown with asymptotic behaviour and single *x*-intercept. | **M1** |
| Fully correct graph with correct asymptote, all points labelled and correct shape. | **A1** |
|  | | **(6 marks)** |
| seen. | | **M1** |
| The graph of is a stretch, parallel to the *y*-axis, scale factor 2, of the graph of . | | **A1** |
|  | | **(2 marks)** |
|  | | **Total 8 marks** |

**8b Mark Scheme**

**NOTES: 8a:** Award all 5 points for a fully correct graph with asymptote and all points labelled, even if all working is not present

**8b Mark Scheme**

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| **9a Mark Scheme**  cid:image001.png@01D2F97F.B27153E0 | Graph of *y* = 2*x* + 5 drawn. | **B1** |
| Graph of 2*y* + *x* = 6 drawn. | **B1** |
| Graph of *y* = 2 drawn onto the coordinate grid and the triangle correctly shaded. | **B1** |
|  | | **(3 marks)** |
| Attempt to solve *y* = 2*x* + 5 and 2*y* + *x* = 6 simultaneously for *y*.  **9b Mark Scheme** | | **M1** |
| *y* = 3.4 | | **A1** |
| Base of triangle = 3.5 | | **B1** |
| Area of triangle =  × (“3.4” – 2) × 3.5 | | **M1** |
| Area of triangle is 2.45 (units2). | | **A1** |
|  | | **(5 marks)** |
|  | | **Total 8 marks** |

**NOTES: 9b:** It is possible to find the area of triangle by realising that the two diagonal lines are perpendicular and therefore finding the length of each line using Pythagoras’ theorem. Award full marks for a correct final answer using this method.

In this case award the second and third accuracy marks for finding the lengthsand

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| States that or  **10a Mark Scheme**  (if *θ* shown on diagram sign must be consistent with this). | **M1** |
| Finds −33.7° (must be negative). | **A1** |
| **10b Mark Scheme** | **(2 marks)** |
| Makes an attempt to use the formula **F** = m**a** | **M1** |
| Finds *p* = 10 Note: | **A1** |
| Finds *q* = −2 Note: | **A1** |
|  | **(3 marks)** |
| Attempt to find **R** (either or ).  **10c Mark Scheme** | **M1** |
| Makes an attempt to find the magnitude of their resultant force. For example, | **M1** |
| Presents a fully simplified exact final answer. | **A1** |
|  | **(3 marks)** |
|  | **Total 8 marks** |

**11 Mark Scheme**

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| Attempts to differentiate. | | **M1** |
|  | | **A1** |
| States or implies that the graph of the gradient function will cut the *x*-axis when fʹ(*x*) = 0 | | **M1** |
| Factorises fʹ(*x*) to obtain  *x* = −, *x* = 6 | | **A1** |
| States or implies that the graph of the gradient function will cut the *y*-axis at fʹ(0).  Substitutes *x* = 0 into fʹ(*x*)  Gradient function will cut the *y*-axis at (0, −24). | | **M1** |
| Attempts to find the turning point of fʹ(*x*) by differentiating (i.e. finding fʹʹ(*x*)) | | **M1** |
|  | | **A1** |
| Substitutes  into fʹ(*x*) to obtain | | **A1ft** |
| C:\Users\radhsona\Downloads\alevel_unittest_aw1.jpg | A parabola with correct orientation with required points correctly labelled. | **A1ft** |
|  |  | **(9 marks)** |

**NOTES:** A mistake in the earlier part of the question should not count against the students for the last part. If a student sketches a parabola with the correct orientation correctly labelled for their values, award the final mark.

*Note that a fully correct sketch without all the working but with all points clearly labelled implies 8 marks in this question.*

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| Equates the curve and the line.  **12a Mark Scheme** | **M1** |
| Simplifies and factorises. (*x* – 7)(*x* – 2) = 0 (or uses other valid method for solving a quadratic equation). | **M1** |
| Finds the correct coordinates of *A*. *A*(2, 8). | **A1** |
| Finds the correct coordinates of *B*. *B*(7, 13). | **A1** |
|  | **(4 marks)** |
| Makes an attempt to find the area of the trapezium bounded by *x* = 2, *x* = 7, the *x*-axis and the line.  **12b Mark Scheme**  For example,  or seen. | **M1** |
| Correct answer. Area = 52.5 o.e. | **A1** |
|  | **(2 marks)** |
| .  **12c Mark Scheme** | **B1** |
| Makes an attempt to find the integral. Raising at least one *x* power by 1 would constitute an attempt. | **M1** |
| Correctly finds | **A1** |
| Makes an attempt to substitute limits into the definite integral. | **M1** |
| Correct answer seen.  or  oe seen. | **A1** |
|  | **(5 marks)** |
| Understands the need to subtract the two areas. ±()  **12d Mark Scheme** | **M1** |
| 20.8 units2 seen (must be positive). | **A1** |
|  | **(2 marks)** |
|  | **Total 13 marks** |

**NOTES: 12a**: If A0A0, award A1 for full solution of quadratic equation (i.e. *x* = 2, *x* = 7).

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| Student completes the square twice. Condone sign errors.  **13a Mark Scheme** | **M1** |
| So centre is (4, −5) | **A1** |
| and radius is | **A1** |
|  | **(3 marks)** |
| Substitutes *x* = 10 into equation (in either form).  **13b Mark Scheme**  or | **M1** |
| Rearranges to 3 term quadratic in *y*  (could be in completed square form ) | **M1** |
| Obtains solutions *y* = −3, *y* = −7 (must give both). | **A1** |
| Rejects *y* = −7 giving suitable reason (e.g. −7 < −5) or ‘it would be below the centre’ or ‘*AQ* must slope upwards’ o.e. | **B1** |
|  | **(4 marks)** |
| **13c Mark Scheme** | **B1** |
| (i.e. −1 over their ) | **B1ft** |
| Substitutes their *Q* into a correct equation of a line. For example,  or | **M1** |
| *y* = −3*x* + 27 | **A1** |
|  | **(4 marks)** |

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| o.e. (could just be in coordinate form).  **13d Mark Scheme** | **M1** |
| o.e. so student concludes that point *P* has coordinates (2, 1). | **M1** |
| Substitutes their *P* and their gradient  ( from 5c) into a correct equation of a line. For example,  or | **M1** |
|  | **A1** |
|  | **(4 marks)** |
| **13e Mark Scheme** | **B1** |
| Uses Pythagoras’ theorem to find  . | **B1** |
| Area of *EPA* =  (could be in two parts). | **M1** |
| Area = | **A1** |
|  | **(4 marks)** |
|  | **Total 19 marks** |