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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress Descriptor** |
| **1a** | Focus = (7, 0) | **B1** | 1.1a | 4thUse the focus-directrix property of the parabola |
| Directrix is *x* = −7 | **B1** | 1.2 |
|  | **(2)** |  |  |
| **1b** | Rearranges  and substitutes into *y*2 = 28*x* | **M1** | 1.1b | 5thFind tangents and normals to parabolas |
| Obtains correct quadratic equation.*my*2 − 28*y* + 28*c* = 0 | **A1** | 1.1b |
| States or implies that for line to be tangent, *b*2 − 4*ac* = 0784 − 112*mc* = 0 | **M1** | 2.1 |
| Solves to obtain given answer with no errors. | **A1** | 1.1b |
|  | **(4)** |  |  |
| (6 marks) |
| Notes |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2a** | Gradient  | **M1** | 1.1a | 5thFind tangents and normals to parabolas |
| Finds correct gradient. | **A1** | 1.1b |
| Uses a correct straight line method.*x*1 = *t*2, *y*1 = 2*t*Tangent equation is  | **M1** | 1.1a |
| Rearranges to given answer *ty* = *x* + *t*2 | **A1** | 1.1b |
|  | **(4)** |  |  |
| **2b** | Substitutes coordinates into tangent equation from part **a**.At point (3, 4) tangent equationis 4*t* = 3 + *t*2 | **M1** | 1.1a | 5thFind tangents and normals to parabolas |
| Rearranges and factorises or uses quadratic formula to obtain values for *t*.*t*2 − 4*t* + 3 = 0(*t* − 1)(*t* − 3) = 0*t* = 1 or *t* = 3 | **M1** | 1.1b |
| When *t* = 1, *y* = *x* + 1When  | **A2** | 3.2a |
|  | **(4)** |  |  |

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| **2c** | *y*-axis intercepts are (0, 1) and (0, 3) | **M1** | 3.1a | 6thSolve loci problems involving parabolas |
| Finds focus of parabola using *at*2 = *t*2, so *a* = 1Focus at (1, 0) | **M1** | 1.1a |
| Midpoint of (1, 0) and (3, 4) = (2, 2) | **M1** | 1.1b |
| Equidistant from a point means locus is a circle. | **M1** | 1.1b |
| Finds centre point and radius.Centre (2, 2)Radius = distance from (0, 1) to (2, 2) or from (0, 3) to (2, 2)Radius  | **M1** | 1.2 |
| Obtains correct equation.Equation for locus: (*x* − 2)2 + (*y* − 2)2 = 5 | **A1** | 3.2a |
|  | **(6)** |  |  |
| (14 marks)  |
| **Notes****2a M1:** For a correct method to obtain the gradient in terms of *t*. Could also convert equation to Cartesian form and use implicit differentiation to obtain the same answer. **A1**: Obtains given answer with no errors.**2b A2:** One **A1** mark for each correct equation.**2c M1:** Only one point required. **M1:** States or implies that locus is a circle. |