| **Question** | **Scheme** | | **Marks** |
| --- | --- | --- | --- |
| **1(a)** | Rotation of 45 degrees anticlockwise, about the origin | | B1B1 |
|  |  | | **(2)** |
| **1(b)** |  | | B1 |
|  |  | | **(1)** |
| **1(c)** |  | | B1 |
|  | | M1 |
|  | | A1 |
|  |  | | **(3)** |
|  |  | | **(6 marks)** |
| **2(a)** |  | |  |
|  | | M1 |
|  | | A1 |
|  |  | | **(2)** |
| **2(b)** |  | | M1 |
|  | | dM1 |
| A1ft |
|  |  | | **(3)** |
| **2(c)** |  | |  |
|  | | M1 |
| A1ft |
|  |  | | **(2)** |
|  |  | | **(7 marks)** |
| **3(a)** | Determinant: 2 – 3*a*  = 0 and solve for *a* = | | M1 |
| So  or equivalent | | A1 |
|  |  | | **(2)** |
| **3(b)** | Determinant: | |  |
|  |  | | M1A1 |
|  |  | | **(2)** |
| **3(c)** |  | | M1dep  M1A1A1 |
|  |  | | **(4)** |
|  |  | | **(8 marks)** |
| **4(i)** | 5*k*(*k*+1) - -3(3*k*-1)=0 | | M1 |
|  | | A1 |
| so *k* = | | M1 |
|  | | A1 |
|  |  | | **(4)** |
| **4(ii)(a)** |  | | M1 A1 |
|  |  | | **(2)** |
| **4(ii)(b)** | = | | M1 |
|  | |  |
| Vertices at (0, 0) ( -2, 0) (0*,* 2*c*) | | A1 A1 |
|  |  | | **(3)** |
| **4(ii)(c)** | Area of *T* is | | B1 |
|  | | M1 |
| So *c* = | | A1 |
|  |  | | **(3)** |
|  |  | | **(12 marks)** |
| **5(i)** |  | | B1 |
|  | | B1 |
|  | | M1A1 |
|  |  | | **(4)** |
| **5(ii)** | Area triangle T = | | M1A1 |
|  | | M1A1 |
| Area triangle *T* = | | M1 |
|  | | A1 |
|  |  | | **(6)** |
|  |  | | **(10 marks)** |
| **6(a)** |  | | M1A1 |
| OR | |  |
|  | |  |
|  |  | | **(2)** |
| **6(b)** |  | | M1 |
| \* | | A1\* cso |
| Numerical approach award 0/2. | |  |
|  |  | | **(2)** |
| **6(c)** |  | | B1 |
|  | | M1 |
|  | | A1 A1 |
| **OR:** | |  |
|  | | B1 |
|  | | M1 |
|  | | A1 A1 |
|  |  | | **(4)** |
|  |  | | **(8 marks)** |
| **7(a)** |  | Correct attempt at the determinant | M1 |
| (so **A** is non singular) | det(A) = -2 **and** some reference to zero | A1 |
|  | **scores M0** | | **(2)** |
| **7(b)** |  | Recognising that **A**-1 is required | M1 |
|  | At least 3 correct terms in | M1 |
|  | B1ft |
| Fully correct answer | A1 |
|  | **Correct answer only score 4/4** | | **(4)** |
|  | **Ignore poor matrix algebra notation if the intention is clear** | | **(6 marks)** |
| **8(a)** |  |  |  |
|  | 4 | B1 |
|  |  |  | **(1)** |
| **8(b)** |  |  | M1 |
|  |  | A1 |
|  |  |  | **(2)** |
| **8(c)** |  | or | M1 |
|  | 18 or ft answer. | A1 |
|  |  |  | **(2)** |
| **8(d)** |  |  |  |
|  | At least one attempt to applyby any of the three vertices in | M1 |
|  |  |  |
|  | At least one correct **column** o.e. | A1 |
| At least twocorrect **columns** o.e. | A1 |
| Vertices are | All three **coordinates** correct. | A1 |
|  |  |  | **(4)** |
|  |  | | **(9 marks)** |
| **9(a)** |  | | B1 |
|  |  | | **(1)** |
| **9(b)** | Therefore, | | M1 |
| Either,  or    or | | A1 |
| giving | | A1 |
|  |  | | **(3)** |
| **9(c)** |  | | M1 A1 |
|  |  | | **(2)** |
| **9(d)** |  | | M1 A1 |
|  |  | | **(2)** |
| **9(e)** | Rotation; anti-clockwise (or  clockwise) about | | B1 B1 |
|  |  | | **(2)** |
| **9(f)** |  | | M1 |
|  | | A1 |
|  | | M1 |
|  | | A1 |
|  |  | | **(4)** |
|  |  | | **(14 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | FP1 2014R | 3 |  | Matrix algebra | 1.1b, 3.1a |
| 2 | FP1 2013R | 6 |  | Matrix algebra | 1.1b, 2.1, 3.1a |
| 3 | FP1 Jan 2013 | 6 |  | Matrix algebra | 1.1b, 2.1, 3.1a |
| 4 | FP1 2015 | 7 |  | Matrix algebra | 1.1b, 2.1, 3.1a |
| 5 | FP1 2014 | 7 |  | Matrix algebra | 1.1b, 1.2 |
| 6 | FP1 2013 | 8 |  | Matrix algebra | 1.1b, 2.1, 3.1a |
| 7 | FP1 Jan 2012 | 8 |  | Matrix algebra | 1.1b, 2.1, 3.1a |
| 8 | FP1 2011 | 8 |  | Matrix algebra | 1.1b, 3.1a |
| 9 | FP1 2012 | 9 |  | Matrix algebra | 1.1b, 2.1 |