| Question number | Scheme | Marks |
|---|---|---|
| 2 | $\alpha+\beta=\frac{5}{3},\ \alpha\beta=\frac{4}{3}$ | B1 |
| | $\alpha+\frac{1}{2\beta}+\beta+\frac{1}{2\alpha}=\alpha+\beta+\frac{\alpha+\beta}{2\alpha\beta},=\frac{5}{3}+\frac{\frac{5}{3}}{\frac{8}{3}}=\frac{55}{24}$ | M1,A1 |
| | $\left(\alpha+\frac{1}{2\beta}\right)\left(\beta+\frac{1}{2\alpha}\right)=\alpha\beta+\frac{1}{2}+\frac{1}{2}+\frac{1}{4\alpha\beta},=\frac{4}{3}+1+\frac{3}{16}=\frac{121}{48}$ | M1,A1 |
| | $x^2-\frac{55}{24}x+\frac{121}{48}\ (=0)$ | M1 |
| | $48x^2-110x+121=0$ | A1 [7] |
| | | **Total 7 marks** |

| | **Notes** |
|---|---|
| B1 | For both correct values of the sum and product. |
| M1 | For the **correct** algebra for the SUM.<br>They must reach<br>$\alpha+\beta+\frac{(\alpha+\beta)}{2\alpha\beta}$ or $\left[\alpha+\beta+\frac{2(\alpha+\beta)}{4\alpha\beta}\right]$<br>or $\frac{2\alpha\beta(\alpha+\beta)+(\alpha+\beta)}{2\alpha\beta}$ or $\frac{(\alpha+\beta)(2\alpha\beta+1)}{2\alpha\beta}$<br>Their **correct** expression for the sum must be such as to substitute $\alpha+\beta$ and $\alpha\beta$ directly in. |
| A1 | **S**ubstitute in their values for $\alpha+\beta$ and $\alpha\beta$.<br>Sum = $\frac{55}{24}$ |
| M1 | For the **correct** algebra for the PRODUCT.<br>They must reach $\alpha\beta+\frac{1}{2}+\frac{1}{2}+\frac{1}{4\alpha\beta}$ or $\frac{(2\alpha\beta+1)^2}{4\alpha\beta}$<br>Their **correct** expression for the product must be such as to substitute $\alpha\beta$ directly in |
| A1 | **S**ubstitute in their values for $\alpha\beta$.<br>Product = $\frac{121}{48}$ |
| M1 | Use their SUM and PRODUCT correctly in a quadratic equation.<br>$x^2+(-\text{their sum})x+(\text{their product})\ \ (=0)$ |
| A1 | $48x^2-110x+121=0$ oe for example $96x^2-220x+242=0$<br>Must be integer values only. |