

Question	Scheme	Marks	AOs
2(a)	$\alpha + \beta + \gamma = \frac{3}{2}, \alpha\beta + \alpha\gamma + \beta\gamma = 6, \alpha\beta\gamma = -\frac{7}{2}$	B1	1.1b
		(1)	
(b)(i)	$\frac{2}{\alpha} + \frac{2}{\beta} + \frac{2}{\gamma} = \frac{2(\alpha\beta + \alpha\gamma + \beta\gamma)}{\alpha\beta\gamma} = 2 \times \frac{\text{"6"}}{\text{"-7/2"}}$	M1	1.1b
	$= -\frac{24}{7} \text{ oee}$	A1ft	1.1b
(ii)	$(\alpha - 1)(\beta - 1)(\gamma - 1) = (\alpha\beta - (\alpha + \beta) + 1)(\gamma - 1) = \dots$	M1	1.1b
	$= \alpha\beta\gamma - (\alpha\beta + \alpha\gamma + \beta\gamma) + \alpha + \beta + \gamma - 1$	A1	1.1b
	$= -9$	A1	1.1b
(iii)	$\alpha^2 + \beta^2 + \gamma^2 = (\alpha + \beta + \gamma)^2 - 2(\alpha\beta + \alpha\gamma + \beta\gamma)$	M1	3.1a
	$= \left(\frac{3}{2}\right)^2 - 2 \times 6$		
	$= \frac{9}{4} - 2(6) = -\frac{39}{4} \text{ oee}$	A1ft	1.1b
		(7)	

(8 marks)

Notes

(a)

B1: Correct values stated.

(b) Note question requires use of (a) so other methods will score no marks.

(i)

M1: Use a **correct** identity with an attempt to substitute their values into the correct places (allowing a slip) to find the value required. If identity is not shown it may be implied by the working.

A1ft: Correct value (follow through their part (a)) Note that this means the error.

$\Sigma\alpha_i = 3, \Sigma\alpha_i\beta_j = 12, \Pi\alpha_i = -7$ will score M1A1ft for the correct answer albeit from incorrect values.

(ii)

M1: Attempts to expand the product fully (allow sign slips and at most one incorrect or missing term).

A1: Correct expansion in terms of product, pair sum and sum - must be seen grouped or implied by substitution of values seen.

A1: Correct value.

(iii)

M1: Use a **correct** identity with an attempt to substitute their values into the correct places (allowing a slip) to find the value required. If identity is not shown it may be implied by the working.

A1ft: Correct value from correct working (follow through their part (a)). Note this means the

error $\Sigma\alpha_i = -\frac{3}{2}$ will still give the A1ft here if correct identity is used.