| Question Number | Scheme | Marks |
|---|---|---|
| 7(a) | $\mathrm{E}(C) = 4\mu - 3\mu - \mu [= 0]$ | M1 |
| | $\mathrm{Var}(C) = 16\sigma^2 + 9\sigma^2 + \frac{\sigma^2}{3}\left[= \frac{76\sigma^2}{3}\right]$ | M1 |
| | $\mathrm{N}\left(0, \frac{76\sigma^2}{3}\right)$ | A1 |
| | | (3) |
| (b) | $\mathrm{P}\left(Z < \frac{\sigma - "0"}{\sqrt{"\frac{76\sigma^2}{3}"}}\right)$ | M1A1 |
| | = 0.5793 Calc: 0.5787 awrt 0.579 | dA1 |
| | | (3) |
| (c) | $4W_1 - 3W_2 - \bar{W} = \frac{11W_1 - 10W_2 - W_3}{3}$ | M1 |
| | $\mathrm{E}(Q) = 0$ | B1 |
| | $\mathrm{Var}(Q) = \frac{121\sigma^2 + 100\sigma^2 + \sigma^2}{9}\left[= \frac{222\sigma^2}{9} = \frac{74\sigma^2}{3}\right]$ | M1 |
| | $\mathrm{P}\left(Z < \frac{2\sigma - 0}{\sqrt{\frac{74\sigma^2}{3}}}\right)$ | M1A1 |
| | = 0.6554 Calc: 0.6564… awrt 0.655 – awrt 0.656 | dA1 |
| | | (6) |

| | **Notes** | **Total 12** |
|---|---|---|
| (a) | **M1** | for a correct method to find E($C$). May be implied by E($C$) = 0 |
| | **M1** | for a correct method to find Var($C$). May be implied by Var($C$) = $\frac{76\sigma^2}{3}$ |
| | **A1** | Cao |
| (b) | **M1** | for standardising ft their mean and their standard deviation. Allow ± May be implied by ± awrt 0.199 |
| | **A1** | for a fully correct standardisation using 0 and $\frac{76\sigma^2}{3}$ Allow ±May be implied by ± awrt 0.199 |
| | **dA1** | dependent on previous A1 awrt 0.579 |
| (c) | **M1** | for writing $Q$ as a single fraction (May be implied by 2nd M1) Allow $4W_1 - 3W_2 - \frac{1}{3}W_1 - \frac{1}{3}W_2 - \frac{1}{3}W_3$ oe |
| | **B1** | for E($Q$) = 0 May be seen in a standardisation |
| | **M1** | for a correct method to find Var($Q$) May be seen in a standardisation. May be implied by Var($Q$) = $\frac{74\sigma^2}{3}$ |
| | **M1** | for standardising using 0 and their standard deviation |

| | | |
|---|---|---|
| | **A1** | for a fully correct standardisation using 0 and $\frac{74\sigma^2}{3}$ oe |
| | **dA1** | Dependent on the previous A mark. For answer in the range awrt 0.655 to awrt 0.656 |