



## Solutions

1a.

$1 - \left(\frac{3}{10} + \frac{1}{5} + \frac{2}{5}\right)$	<b>M1</b>
$\frac{1}{10}$	<b>M1</b>

1b.

$\frac{3}{10} + \left(2 \times \frac{1}{5}\right) + \left(3 \times \frac{2}{5}\right)$	<b>M1</b>
$\frac{19}{10}$ (oe)	<b>M1</b>

2a.

$0.1 + 0.3 + 2p + p = 1$	<b>M1</b>
$p = 0.2$ (oe)	<b>M1</b>

2b.

$(1 \times 0.1) + (2 \times 0.3) + (3 \times 0.8) + (4 \times 0.2)$	<b>M1</b>
$= 2.7$ (oe)	<b>M1</b>





## Solutions

1.

$E(X) = (0 \times 0.1) + (1 \times 0.2) + (2 \times 0.3) + (3 \times 0.4)$	<b>M1</b>
$E(X) = 2.0$	<b>A1</b>
$\text{Var}(X) = (0^2 \times 0.1) + (1^2 \times 0.2) + (2^2 \times 0.3) + (3^2 \times 0.4)$ (= 5)	<b>M1</b>
$\text{Var}(X) = 5 - 2^2$	<b>M1</b>
$\text{Var}(X) = 1$	<b>A1</b>

2.

$E(X) = (1 \times 0.28) + (2 \times 0.18) + (3 \times 0.04) + (4 \times 0.01)$	<b>M1</b>
$E(X) = 0.8$ (oe)	<b>A1</b>
$\text{Var}(X) = 0.28 + (2^2 \times 0.18) + (3^2 \times 0.04) + (4^2 \times 0.01)$ (= 1.52)	<b>M1</b>
$\text{Var}(X) = 1.52 - 0.8^2$	<b>M1</b>
$\text{Var}(X) = 0.88$ (oe)	<b>A1</b>



## Solutions

1a.

$E(X) = (1 \times 0.2) + (2 \times 0.1) + (3 \times 0.4)$	<b>M1</b>
$E(X) = 1.6$	<b>A1</b>

1b.

$E(3X - 2) = 3E(X) - 2$	<b>M0</b>
$E(3X - 2) = 3 \times 1.6 - 2$	<b>M1</b>
$E(3X - 2) = 2.8$	<b>A1</b>

1c.

$E(X^2) = 1 \times 0.2 + 4 \times 0.1 + 9 \times 0.4 (= 4.2)$	<b>M1</b>
$\text{Var}(X) = 4.2 - 1.6^2$	<b>M1</b>
$\text{Var}(X) = 1.64$	<b>A1</b>

1d.

$\text{Var}(aX + b) = a^2 \text{Var}(X)$ $\text{Var}(3X - 2) = 3^2 \text{Var}(X)$	<b>M1</b>
$\text{Var}(3X - 2) = 14.76$ (awrt 14.8)	<b>A1</b>





## Solutions

1a.

$2k + k + 0 + k = 1$	<b>M1</b>
$4k = 1$ $k = 0.25$	<b>A1</b>

1b.

$x$	0	1	2	3	<b>M0</b>
$P(X = x)$	0.5	0.25	0	0.25	
$xP(X = x)$	0	0.25	0	0.75	
$x^2P(X = x)$	0	0.25	0	2.75	
$E(X) = \sum xP(X = x) = 0 + 0.25 + 0 + 0.75$					<b>M1</b>
$E(X) = 1$					<b>A1</b>
$E(X^2) = 0 + 0.25 + 0 + 2.25$					<b>M1</b>
$E(X^2) = 2.5$					<b>A1</b>

1c.

$\text{Var}(3X - 2) = 3^2 \text{Var}(X)$	<b>M1</b>
$\text{Var}(3X - 2) = 9(2.5 - 1^2)$	<b>M1</b>
$\text{Var}(3X - 2) = 13.5$	<b>A1</b>







## Solutions

1a.

$x$	0	10	20	30	<b>M1</b> ( $x$ values)
	0.4	$0.6 \times 0.4$	$0.6^2 \times 0.4$	$0.6^3$	
$P(x = x)$	0.4	0.24	0.144	0.216	<b>M1</b> $P(X = x)$
(or)	$\frac{4}{10}$	$\frac{6}{25}$	$\frac{18}{225}$	$\frac{27}{125}$	<b>M1, A1, A1</b> all 4 values

1b.

$E(X) = (0 \times 0.4) + \dots + (30 \times 0.216)$	<b>M1</b>
$E(X) = 11.76$ (awrt 11.8)	<b>A1</b>
$E(X^2) = (10^2 \times 0.24) + \dots + (30^2 \times 0.216) = 276$	<b>A1</b>
$\text{Std Dev} = \sqrt{276 - 11.76^2} = 11.7346 \dots$	<b>M1</b>
$\text{Std Dev} = 11.7$ 3.s.f	<b>A1</b>

