Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
1a	$\frac{1}{k}+\frac{2}{k}+\frac{3}{k}+\frac{4}{k}=1\Rightarrow k=10$	**M1** **A1**	1.1a 2.1	TBC
		(2)		
1b	$1\times\frac{1}{10}+2\times\frac{2}{10}+3\times\frac{3}{10}+4\times\frac{4}{10}=3$	**M1** **A1**	1.1a 2.1	TBC
	$1^2\times\frac{1}{10}+2^2\times\frac{2}{10}+3^2\times\frac{3}{10}+4^2\times\frac{4}{10}=10$	**M1** **A1**	1.1a 1.1b	
		(4)		
1c	$10-3^2=1$	**B1**	1.1b	TBC
		(1)		
1d	$\mathrm{E}(Y)=3\times3-2=7$	**B1**	1.1b	TBC
	$\mathrm{Var}(Y)=3^2\times1=9$	**B1**	1.1b	
		(2)		
				(9 marks)
Notes				

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
2	Expectation, in points	**M1**	3.3	TBC
	$20\times\frac{3}{5}+-2k\times\frac{1}{5}+-4k\times\frac{1}{5}=3$	**A1**	1.1a	
	$12-\frac{6}{5}k=3$	**M1**	1.1b	
	$k=7.5$	**A1**	2.1	
				(4 marks)

Notes

Award 1st **M1** for attempt to form expression for expectation in terms of *k*. Does not need to be equal to 3.

Award 1st **A1** for correct equation in *k*, unsimplified or simplified.

Award 2nd **M1** for attempt to solve *their* equation in *k*.

Alternative method

20 – 0.2(20 + 2*k*) – 0.2(20 + 4*k*) = 3 for 1st M1, A1

(or any scalar multiple of this equation)

Leading to:12 – 1.2*k* = 3 as above

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
3a	0.15	**B1**	1.2	TBC
		(1)		
3b	E(X) =	**M1**	1.1a	TBC
	$-3\times0.1+-2\times0.2+-1\times0.15+0\times0.4+1\times0.15=-0.7$	**A1**	1.1b	
	E(X^2) = $9\times0.1+4\times0.2+1\times0.15+0\times0.4+1\times0.15=2$	**M1**	1.1a	
	Var(X) = $2-(-0.7)^2=1.51$	**A1**	2.1	
		(4)		
3c	P($X > 2Y$) $\Rightarrow$ P($X < -\frac{2}{3}$) = 0.1 + 0.2 + 0.15 = 0.45	**M1** **A1**	3.1a 1.1b	TBC
		(2)		
				(7 marks)

Notes

3b,

Allow follow through from incorrect part **a** for all **M** marks.

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
4a	$2k+3k+3k+4k=1 \Rightarrow 12k=1 \Rightarrow k=\frac{1}{12}$	**M1** **A1**	1.1a 2.1	TBC
		(2)		
4b	$E(X) = 1\times\frac{2}{12}+2\times\frac{3}{12}+4\times\frac{3}{12}+5\times\frac{4}{12}=\frac{40}{12}=\frac{10}{3}$ $E(X^2) = 1\times\frac{2}{12}+4\times\frac{3}{12}+16\times\frac{3}{12}+25\times\frac{4}{12}=\frac{27}{2}$ $Var(X) = \frac{27}{2}-\left(\frac{10}{3}\right)^2=\frac{43}{18}$	**M1** **A1** **M1** **A1**	1.1a 1.1b 1.1a 1.1b	TBC
		(4)		
4c	$(-4)^2\times\frac{43}{18}=\frac{344}{9}$	**M1** **A1**	1.2 2.1	TBC
		(2)		
				(8 marks)

Notes

4b

Allow follow through from *their k* for **M** marks.

4c

Allow follow through from their Var(X) for **M** mark.

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
5a	$a + b = 0.4$ E(Y) = $-5\times0.2+-3\times0.1+a+5b+7\times0.3=2.4$ $\Rightarrow a+5b=1.6$ $a = 0.1$, $b = 0.3$	**B1** **M1** **M1** **A1** **A1**	1.1b 3.1a 1.1b 1.1b 1.1b	TBC
		(5)		
5b	E(X^2) = $1\times0.2+0\times0.1+4\times0.1+16\times0.3+25\times0.3=12.9$ E(X) = 2.7 Var(X) = 12.9 – 2.7^2 = 5.61	**M1** **M1** **A1**	1.1a 1.1b 2.1	TBC
		(3)		
5c	22.44	**B1**ft	1.1b	TBC
		(1)		
5d	P(X – 3 > 2Y) = P(X < 1) = 0.3	**M1** **A1**	3.1a 1.1b	TBC
		(2)		
				(11 marks)

Notes

5a

1st **M1** for attempt to find Ys.

2nd **M1** for attempt to form equation for E(Y).

5c

Allow follow through from **b**.

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
6a	-1.7 = 4 – 3E(X) $\Rightarrow$ E(X) = 1.9 $-1\times a+0\times b+1\times a+2\times b+3\times a+4\times c=1.9$ $\Rightarrow 3a+2b+4c=1.9$ [1] (or scalar multiple of this equation, e.g. 9a + 6b + 12c = 5.7) P(Y < 0) gives P(X > 2) hence $a+b+c=0.6$ [2] $3a+2b+c=1$ [3] Solve system using matrices or elimination: a = 0.1, b = 0.2, c = 0.3	**M1** **M1** **M1** **M1** **M1** **A1** **A1**	3.1a 1.1b 2.1 1.1b 1.1b 1.1b 1.1b	TBC
		(7)		
6b	27.81 ÷ 9 = 3.09	**M1** **A1**	1.1a 1.2	TBC
		(2)		
6c	P(X < Y) means P(X < 1) P(X < 1) = 0.1 + 0.2 = 0.3	**M1** **A1**ft	3.1a 1.1b	TBC
		(2)		
				(11 marks)

Notes

6a

1st **A1** for any two of a, b and c correct.

6c

Allow follow through from *their* a and b.