

Ques	Solution	Mark	Notes
1(a)	$E(X) = 3, \text{Var}(X) = 2.1$ si $E(Y) = 2E(X) + 1$ $= 7$ $\text{Var}(Y) = 4\text{Var}(X)$ $= 8.4$	B1 M1 A1 M1 A1	
(b)	$P(Y = 7) = P(X = 3)$ $= \binom{10}{3} \times 0.3^3 \times 0.7^7$ $= 0.267$	M1 A1	Award M1 just for this line Award M0A0 for no working Accept 0.6496 – 0.3828 or 0.6172 – 0.3504
2(a)	$P(A \cap B) = P(A) + P(B) - P(A \cup B)$ oe $P(A \cap B) = 0.4 + 0.5 - 2P(A \cap B)$ $P(A \cap B) = 0.3$	M1 A1	Award B1 for a valid verification
(b)	$P(A B) = \frac{P(A \cap B)}{P(B)}$ $= \frac{0.3}{0.5} = 0.6$	M1 A1	Accept the use of a Venn diagram in (b) and (c)
(c)	$P(B A') = \frac{P(B \cap A')}{P(A')} (= \frac{P(B) - P(B \cap A)}{1 - P(A)})$ $= \frac{0.5 - 0.3}{1 - 0.4}$ $= \frac{1}{3} (0.33)$	M1 A1 A1	
3(a)	$P(\text{A chooses G}) = 0.3$	B1	
(b)	$P(\text{B chooses Y}) = \frac{8}{10} \times \frac{2}{9} + \frac{2}{10} \times \frac{1}{9}$ $= 0.2$	M1A1 A1	Accept 0.2 without working
(c)	$P(\text{Diff colours}) = \frac{3}{10} \times \frac{7}{9} + \frac{5}{10} \times \frac{5}{9} + \frac{2}{10} \times \frac{8}{9}$ $= \frac{31}{45}$	M1A1 A1	Accept $\frac{{}^5C_1 \times {}^3C_1 + {}^5C_1 \times {}^2C_1 + {}^3C_1 \times {}^2C_1}{{}^{10}C_2}$
4(a)(i)	$P(X = 9) = \frac{e^{-10} \times 10^9}{9!}$ $= 0.1251$	M1 A1	Accept 0.4579 – 0.3328 or 0.6672 – 0.5421 Award M0 if no working seen
(ii)	$P(X < 12) = 0.6968$	M1A1	Award M1A0 if in adjacent row or column
(b)	Looking at the appropriate section of the table, $n = 19$	M1 A1	Award M1A0 for 18 or 20

<p>5(a)(i)</p> <p>(ii)</p> <p>(b)</p>	$P(\text{male and bike}) = 0.6 \times 0.75$ $= 0.45$ $P(\text{owns a bike}) = 0.6 \times 0.75 + 0.4 \times 0.3$ $= 0.57$ $P(\text{female bike}) = \frac{0.12}{0.57}$ $= 0.211 \text{ (4/19) cao}$	<p>M1A1</p> <p>M1A1</p> <p>A1</p> <p>B1B1</p> <p>B1</p>	<p>B1 num, B1 denom FT denominator from (a)</p>
<p>6(a)</p> <p>(i)</p> <p>(ii)</p> <p>(b)</p>	<p>Let $X =$ no. of defective cups so X is $B(50,0.05)$</p> $P(X = 2) = \binom{50}{2} \times 0.05^2 \times 0.95^{48}$ $= 0.261$ $P(3 \leq X \leq 8) = 0.9992 - 0.5405$ <p>or $0.4595 - 0.0008$</p> $= 0.4587$ <p>Let $Y =$ no. of defective plates so Y is $B(250,0.015) \approx \text{Po}(3.75)$ si</p> $P(Y = 4) = \frac{e^{-3.75} \times 3.75^4}{4!}$ $= 0.194$	<p>B1</p> <p>M1</p> <p>A1</p> <p>B1B1</p> <p>B1</p> <p>M1</p> <p>A1</p>	<p>si</p> <p>Accept 0.5405 – 0.2794 or 0.7206 – 0.4595 M0A0 if no working Award no marks if no working seen</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M0A0 if no working</p>
<p>7(a)</p> <p>(b)</p> <p>(c)</p>	$k \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{6} \right) = 1$ $k \times \frac{15}{12} = 1$ $k = \frac{4}{5}$ $E(X) = \frac{4}{5} \left(\frac{2}{2} + \frac{3}{3} + \frac{4}{4} + \frac{6}{6} \right)$ $= 3.2$ <p>The possible pairs are (3,4), (4,3), (2,6),(6,2)</p> $\text{Prob} = \frac{4}{5} \times \frac{1}{3} \times \frac{4}{5} \times \frac{1}{4} \times 2 + \frac{4}{5} \times \frac{1}{2} \times \frac{4}{5} \times \frac{1}{6} \times 2$ $= 0.213 \text{ (16/75)}$	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1A1</p> <p>A1</p>	<p>Or equivalent</p> <p>Accept verification</p> <p>B1 for (3,4),(2,6)</p> <p>M1A0A0 if factor 2 missing</p>

8(a)	$P(1^{\text{st}} \text{ hit with } 3^{\text{rd}} \text{ throw}) = 0.7 \times 0.7 \times 0.3$ $= 0.147$	M1 A1	
(b)(i)	$P(\text{F wins } 1^{\text{st}} \text{ throw}) = P(\text{G misses}) \times P(\text{F hits})$ $= 0.8 \times 0.3 = 0.24$	M1 A1	
(ii)	$P(\text{F wins with } 2^{\text{nd}} \text{ throw})$	M1	
(iii)	$= P(\text{G miss}) \times P(\text{F miss}) \times P(\text{G miss}) \times P(\text{F hits})$ $= 0.8 \times 0.7 \times 0.8 \times 0.3 = 0.1344$ $P(\text{F wins}) = 0.24 + 0.24 \times 0.56 + 0.24 \times 0.56^2 + \dots$ $= \frac{0.24}{1 - 0.56}$ $= 0.545 \left(\frac{6}{11} \right)$	A1 M1 B1 A1	
9(a)	$E\left(\frac{1}{X}\right) = \frac{4}{9} \int_1^2 \frac{1}{x} (4x - x^3) dx$ $= \frac{4}{9} \left[4x - \frac{x^3}{3} \right]_1^2$ $= 0.741 \quad (20/27)$ $F(x) = \frac{4}{9} \int_1^x (4u - u^3) du$ $= \frac{4}{9} \left[2u^2 - \frac{u^4}{4} \right]_1^x$ $= \frac{8x^2}{9} - \frac{x^4}{9} - \frac{7}{9}$ $P(1.25 \leq X \leq 1.75) = F(1.75) - F(1.25)$ $= 0.5625 \quad (9/16)$ The median m satisfies $\frac{8m^2 - m^4 - 7}{9} = 0.5$ $m^4 - 8m^2 + 11.5 = 0$ $m^2 = \left(\frac{8 \pm \sqrt{64 - 46}}{2} \right) = 1.88$ $m = 1.37$	M1A1 A1 A1 M1 A1 A1 M1 A1 M1 A1 A1	M1 for the integral of $\frac{1}{x} f(x)$ A1 for completely correct although limits may be left until 2nd line Award M0 if no working Allow x as dummy variable Limits may be left until next line but must then be applied FT from (b)(i) if possible FT from (b)(i) if possible Condone the absence of \pm