Topic Y5 Probability and proof (Post-TT) [40] MARKSCHEME

1.

(i)	$^2/_3$+prod of 2 P's or 1– prod of 2 P's $^2/_3 + {^1/_3} \times {^3/_4}$ or $1 - {^1/_3} \times {^1/_4}$ $= {^{11}/_{12}}$ or 0.917 (3 sfs)	M1 M1 A1 **3**	or $^1/_3 \times {^3/_4}$ or $^1/_3 \times {^1/_4}$
(ii)	$^1/_3 \times p$ $^2/_3 + {^1/_3} \times p = {^5/_6}$ oe $p = {^1/_2}$	M1 M1 A1 **3**	or $^1/_3(1-p)$ or $^1/_3(1-p) = 1 - {^5/_6}$ SW: ½ x $^1/_3 = {^1/_6}$ M2A0, unless clear this is a check

2.

2(i)	$^4/_7$ or 0.571 (3 sfs)	B1 **1**	
(ii)	$^5/_8 \times {^4/_7} + {^3/_8} \times {^5/_8}$ $= {^{265}/_{448}}$ or 0.592 (3 sfs)	M1M1 A1 **3**	M1: one correct prod or add any two prods M1: all correct
(iii)	$^3/_8 \times {^5/_8} + {^5/_8} \times {^3/_7}$ $= {^{225}/_{448}}$ or 0.502 (3 sfs)	M1M1 A1 **3**	M1: one correct prod or add any two prods M1: all correct
Total		7	

3.

Assume that there is a greatest even positive integer $N = 2k$ $N + 2 = 2k + 2 = 2(k+1)$ Which is even and $N + 2 > N$ This contradicts the assumption Therefore there can be no greatest even positive integer	***E1** **M1** **dep*E1** **[3]**	**2.1** **2.1** **2.4**	Proof must start with an assumption for contradiction There must be a statement denying the assumption for the final **E1**	

4.

(i)	$\frac{6}{14} \times \frac{5}{13} \times \frac{3}{12}$ $\times\ 3!$ oe $= \frac{45}{182}$ or 0.247 (3 sfs)oe	M1 M1 A1 3	$^6C_1 \times {^5C_1} \times {^3C_1}$ $\div\ {^{14}C_3}$ With repl M0M1A0
(ii)	$\frac{6}{14} \times \frac{5}{13} \times \frac{4}{12} + \frac{5}{14} \times \frac{4}{13} \times \frac{3}{12} + \frac{3}{14} \times \frac{2}{13} \times \frac{1}{12}$ $= \frac{31}{364}$ or 0.0852 (3 sf)	M2 A1 3	$^6C_3 + {^5C_3} + {^3C_3}$ M1 for any one ($\div\ {^{14}C_3}$)M1 all 9 numerators correct. With repl M1$(6/14)^3+(5/14)^3+(3/14)^3$
Total		**[6]**	

5.

4(a)	$\mathrm{P}(S \cap D') = 0$	B1	1.1b
		(1)	
(b)	$\mathrm{P}\left(C \mid S \cap D\right) = \frac{0.27}{0.6} \quad = \frac{9}{20} = 0.45$	M1	3.1b
	$\therefore 80 \times "0.45"$	M1	1.1b
	$=36$	A1	1.1b
		(3)	
(c)	$[\mathrm{P}(C) \times \mathrm{P}(S) = \mathrm{P}(C \cap S)]$		
	$\mathrm{P}(S) = 0.6$, $\mathrm{P}(C) = 0.27 + v + u$, $\mathrm{P}(S \cap C) = 0.27$	M1	3.1a
	$0.6 \times \left(0.27 + u + v\right) = 0.27$ or $u + v = 0.18$ o.e	A1	1.1b
	$\left[\mathrm{P}(D \mid C) = \frac{\mathrm{P}(D \cap C)}{\mathrm{P}(C)}\right]$ $\mathrm{P}(D \cap C) = 0.27 + v$	M1	3.1a
	$\frac{14}{15} = \frac{0.27 + v}{0.27 + v + u}$ or $14u - v = 0.27$ o.e	A1	1.1b
	$15u = 0.45$	M1dd	1.1b
	$u = 0.03 \quad v = 0.15$	A1	1.1b
	$w = 0.22$	A1ft	1.1b
		(7)	
			(11 marks)

6.

(i)	$^1/_6 + 3 \times (^1/_6)^2$ $= ^1/_4$	M2 A1 3	or $3 \times (^1/_6)^2$ or $^1/_6 + (^1/_6)^2$ or $^1/_6 + 2(^1/_6)^2$ or $^1/_6 + 4(^1/_6)^2$ M1
(ii)	$^1/_3$	B1 1	
(iii)	3 routes clearly implied out of 18 possible (equiprobable) routes $^1/_6$	M1 M1 A1 3	or $^1/_3 \times ^1/_6 \times 3$ M2 or $^1/_3 \times ^1/_6$ or $^1/_6 \times ^1/_6 \times 3$ or $^1/_3 \times ^1/_3 \times 3$ or $^1/_4 - ^1/_6$ M1 but $^1/_6 \times ^1/_6 \times 2$ M0 $\frac{(\frac{1}{6})^2 \times 3}{\frac{1}{2}}$ or $\frac{\frac{1}{4} - \frac{1}{6}}{\frac{1}{2}}$ or $\frac{\frac{1}{2} \times \frac{1}{6}}{\frac{1}{2}}$ oe M2 or $\frac{\mathrm{P(4\&twice)}}{\mathrm{P(twice)}}$ stated or $\frac{\mathrm{prob}}{\frac{1}{2}}$ M1 Whatever 1st, only one possibility on 2nd M2 $^1/_6$, no wking M1M1A1 $^1/_{12}$, no wking M0