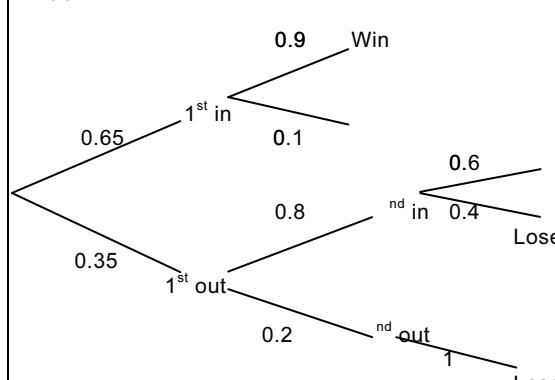


A LEVEL (P6) PROBABILITY

MARK SCHEME

1 (i)  (ii) $\begin{aligned} & 0.65 \times 0.1 + 0.35 \times 0.8 \times 0.4 + 0.35 \times 2 \\ & = 0.247 \end{math} (iii) \begin{aligned} & \frac{0.65 \times 0.1}{0.247} \\ & = 0.263 \quad (= 5/19) \end{aligned} $	4 3 2	<p>B1 For top branches correct (0.65, 0.9, 0.1)</p> <p>B1 For bottom branches correct (0.35, 0.8, 0.2)</p> <p>B1 For win/lose option after 2nd in (0.6, 0.4)</p> <p>B1 For all labels including final lose at end of bottom branch</p> <p>M1 For evaluating 1st in and lose seen</p> <p>M1 For 1st out 2nd in lose, or 1st out 2nd out lose</p> <p>A1 For correct answer</p> <p>M1 For dividing their 1st in and lose by their answer to (ii)</p> <p>A1ft For correct answer, ft only on 0.65 × 0.1/their (ii)</p>
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2 (i) $\begin{aligned} P(L) &= 0.5 \times 0.04 + 0.3 \times 0.06 + \\ &\quad 0.2 \times 0.17 \\ &= 0.072 \quad (9/25) \end{aligned}$	M1 A1 A1	<p>For summing three relevant 2-factor terms</p> <p>For correct expression</p> <p>For correct answer</p>
(ii) $\begin{aligned} P(B L) &= \frac{0.3 \times 0.06}{0.072} \\ &= 0.25 \end{aligned}$	B1 ft M1 A1	<p>For their 0.3 × 0.06 in numerator, must be divided by $k \neq 1$</p> <p>For dividing by their P(L)</p> <p>For correct answer</p>

3 (i) $618/1281 (0.482)$ (ii) $412/1281 (0.322)$ or tree diagram options (iii) $P(E) = 717/1281$ Their (i) \times their $P(E) \neq$ their (ii) Not independent (iv) $358/564 (0.635)$ or $(0.279/0.440)$	B1	For correct numerator
	B1 [2]	For correct denominator
	B1ft [1]	Follow through on their denominator if $p < 1$ or $2/3 \times$ their (i)
	M1	For attempting to find $P(E)$
	M1dep	For showing they know what independence means, mathematically
	A1ft [3]	ft on their (i) \times their $P(E) \neq$ their (ii)
	B1	For correct numerator, 0.28 gets B0 with PA
	B1 [2]	For correct denominator

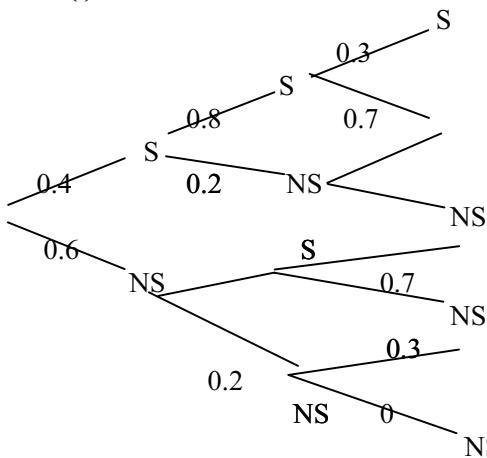
4 (i) $0.8x + (0.2) \times (0.75) = 0.5$ $x = 0.438$	B1	0.8 seen
	M1	Summing two 2-term brackets
(ii) $P(S \text{ given } B) = 0.15 / 0.5$ $= 0.3$	M1	Equating their LHS containing x to 0.5
	A1 4	Correct answer
(iii) $P(S \text{ given } B) = 0.15 / 0.5$ $= 0.3$	M1	Correct numerator
	A1 2	Correct answer

5 (i) list 14,15,16,25,26, 36, and reversed $P(\text{scores differ by 3 or more}) = 12/36$ $(1/3)(0.333)$	M1	For an attempt at listing
	A1	Selecting at least 6 correct pairs
(ii) $20/36$	A1 3	Correct answer
	M1	Some identification on the list, must include one of 25, 26, 33, 34, 35
(iii) $P(A \cap B) \neq 0$ implies not mut excl, or equivalent $P(A \cap B) = 6/36$ so not mut excl	A1 2	Correct answer
	B1	Correct statement about mut excl events
	B1 ft 2	Correct answer using their data

6 (i)	$P(\text{team}) = 0.5 + 0.5 \times 0.6$	B1	One correct product
	$= 0.8$	M1	Summing two 2-factor products
(ii)	$P(\text{training session} \text{team}) = \frac{0.5}{0.5 + 0.5 \times 0.6}$	A1 3	Correct answer
	$= 0.625 (5/8)$	M1	Selecting correct term from (i) as their numerator
		M1	Dividing by their (i) (must be < 1)
		A1 3	Correct answer

7 (i)	$P(A) = 0.2$	B1 1	o.e. Must be single fraction or 20%
	$P(\text{not } S) = 0.2 \times 0.7 + 0.8 \times 0.35$	M1	Summing two 2-factor probabilities or subtracting $P(S)$ from 1
	$= 0.42$	A1 2	o.e. Correct answer no decimals in fractions
(iii)	$P(B S') = \frac{0.8 \times 0.35}{0.42}$	M1	$\frac{(1 - \text{their}(i)) \times 0.35}{\text{their}(ii)}$ if marks lost in (i) or (ii)
	$= 0.667$	A1 2	Correct answer c.w.o

8 (i)



B1 Correct shape and labels

B1 [2] Correct probabilities

(ii) $P(S, S, NS) = 0.4 \times 0.8 \times 0.7$
 $= 0.224 (28/125)$

M1 Multiplying 3 probs once and 0.7 seen
 A1 [2] Correct answer

(iii) $P(S, NS, S) + P(NS, S, S) + 0.224$
 $= 0.392 (49/125)$

M1 Summing three different 3-factor terms
 B1 Correct expression for $P(S, NS, S)$ or $P(NS, S, S)$
 A1 [3] Correct answer

(iv) $P(\text{stops at first light}) \mid \text{exactly 2 lights})$

$$\begin{aligned} &= P \frac{(S, NS, S) \text{ or } (S, S, NS)}{0.392} \\ &= \frac{0.4 \times 0.2 \times 0.3 + 0.4 \times 0.8 \times 0.7}{0.392} \\ &= 0.633 \quad (31/49) \end{aligned}$$

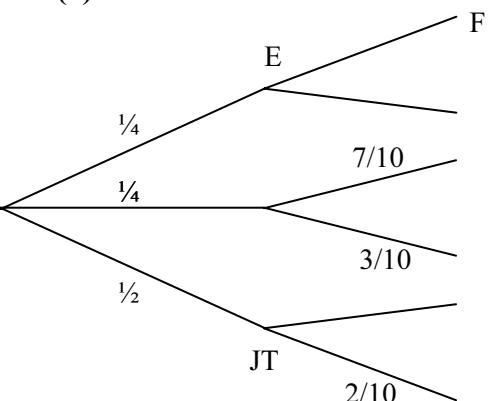
M1

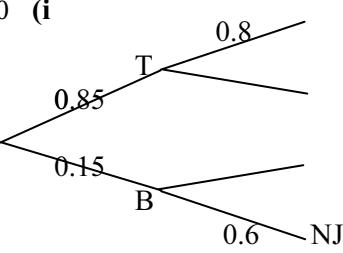
Summing two 3-factor terms in numerator (need not be different) (must be a division)

M1* dep

Dividing by their (iii) if their (iii) < 1 , dep on previous M

A1ft [3] ft their $E(X)$ provided $2 < E(X) < 12$

9 (i) $P(E) = \frac{1}{4}$, $P(C) = \frac{1}{4}$, $P(JT) = \frac{1}{2}$	B1 B1 [2]	$\frac{1}{4}, \frac{1}{4}$, and $\frac{1}{2}$ seen oe 3 evaluated probs correctly associated
(ii) 	M1 A1ft [2]	E, C, JT then F on appropriate shape All probs and labels showing and correct, ft their (i) if $\Sigma p = 1$. If nothing seen in part (i) then give M1 A1ft bod provided their $\Sigma p = 1$ No retrospective marking
(iii) $P(F) = (1/4 \times 6/10) + (1/4 \times 7/10) + (1/2 \times 8/10)$ $= 29/40 (0.725)$	M1 B1 [2]	Summing 3 appropriate two-factor products provided $\Sigma p = 1$ Correct answer
(iv) $P(C NF) = \frac{P(C \cap NF)}{P(NF)}$ $= \frac{3/40}{(1 - 29/40)}$ $= 3/11 (0.273)$ OR using ratios $3/(4+3+4)$	B1ft M1 A1 [3]	$1 - 29/40$ seen in denom, ft $1 -$ their (iii) attempt at cond prob with their $C \cap F$ or $C \cap NF$ in numerator correct answer

10 (i) 	M1	Correct shape with T and B first
	A1 [2]	All probs and labels correct

<p>(ii) $P(T \mid NJ) = \frac{P(T \text{ and } NJ)}{P(NJ)}$</p> $P(T \text{ and } NJ) = 0.85 \times 0.2 = 0.17$ $P(NJ) = 0.85 \times 0.2 + 0.15 \times 0.6 = 0.26$ $P(T \mid NJ) = 0.17 / 0.26$ $= 17/26 \text{ oe } (= 0.654)$	B1 M1 A1 A1	<p>Correct numerator of a fraction with $0 <$ any denominator < 1</p> <p>Summing 2 two-factor products</p> <p>Correct denom</p> <p>Correct answer</p>
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<p>11 (i) $P(1^{\text{st}} \text{ correct}) = 0.7 + 0.2 \times 0.95$</p> $= 0.89 \text{ AG}$	B1	
<p>(ii)</p>	M1 M1 M1 B1 B1 A1	<p>Considering any 2 of CC, CHA, HAC or $HAHF$ [where C = Peter correct, H = ask for help, A = audience correct, P = phone correct] or tree diagram with ‘top half’ labels and probs shown</p> <p>Considering <i>other</i> 2</p> <p>Summing 4 probabilities</p> <p>Two correct probabilities</p> <p>Three correct probabilities</p> <p>Correct</p>
$P(CC) = 0.7 \times 0.7 (= 0.49)$ $P(CHA) = 0.7 \times 0.2 \times 0.95 (= 0.133)$ $P(HAC) = 0.2 \times 0.95 \times 0.7 (= 0.133)$ $P(HAHF) = 0.2 \times 0.95 \times 0.2 \times 0.65 (= 0.0247)$	[6]	
$P(\text{both correctly answered}) = 0.781$	A1	
<p>(iii) $P(\text{audience} \mid \text{both correct})$</p> $= \frac{P(CHA) + P(HAC) + P(HAHF)}{\text{ans (ii)}}$ $= \frac{0.7 \times 0.2 \times 0.95 + 0.2 \times 0.95 \times 0.7 + 0.2 \times 0.95 \times 0.2 \times 0.65}{0.7807}$ $= 0.2907/0.7807$ $= 0.372$	M1* M1dep A1	<p>Summing two or three 3-factor terms in numerator of a fraction</p> <p>Dividing by their (ii)</p> <p>Correct answer</p>
	[3]	

<p>12 (i) $(2,12), (3, 8), (4, 6), (6, 4), (8,3), (12,2)$</p> $P(Q) = 6/144 (1/24) (0.0417)$	M1 A1 [2]	<p>Listing or picking out at least 3 different options from a 12 by 12 (mult) table or seeing 3, 4, 5 or $6/144$</p> <p>Correct answer</p>
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(ii) $P(\text{both} > 8) = 1/3 \times 1/3 = 1/9 = P(R)$ (16/144)	M1 A1 [2]	Squaring a sensible prob or picking out 12 – 25 options Correct answer
(iii) since $P(R \text{ and } Q) = 0$ Yes, R and Q are exclusive	B1* B1dep [2]	o.e. in words
(iv) $P(R \text{ and } Q) = 0 \neq P(R) \times P(Q)$ or $P(R Q) = 0, \neq P(R)$ No, not independent	B1* B1dep [2]	o.e. in words

13 $\frac{\binom{13}{3} \times \binom{39}{4}}{\binom{52}{7}}$ $= 0.176$ OR $P(\text{RRR}) =$ $\frac{13}{52} \times \frac{12}{51} \times \frac{11}{50} \times \frac{39}{49} \times \frac{38}{48} \times \frac{37}{47} \times \frac{36}{46} \times {}^7C_3$ $= 0.176$	M1 M1 A1 M1 M1 A1 [3]	Using combinations with attempt to evaluate product of 2 in num and only 1 in denom Correct numerator or denominator Correct answer OR Multiplying 3 unequal red probs with 4 unequal non-red probs Multiplying a probability by 7C_3 Correct answer
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14 (i)	<table border="1"> <tr> <th></th><th>A</th><th>B</th><th></th><th>D</th></tr> <tr> <td>Rick</td><td>1/3</td><td>2</td><td></td><td>2/9</td></tr> <tr> <td>Brenda</td><td>1/4</td><td>1</td><td></td><td>1/4</td></tr> <tr> <td>Ali</td><td>2/35</td><td></td><td></td><td>3/5</td></tr> </table> $P(\text{Rick } B, \text{ Brenda } B, \text{ Ali not } B) + P(\text{Rick } B, \text{ Brenda not } B, \text{ Ali } B) + P(\text{Rick not } B, \text{ Brenda } B, \text{ Ali } B) = 11/210 + 2/210 + 1/90 = 23/315$ $P(\text{Rick } B, \text{ Brenda } B, \text{ Ali } B) = 1/315$ $\text{Prob(at least 2 at entrance } B) = 24/315 (8/105) (0.0762)$		A	B		D	Rick	1/3	2		2/9	Brenda	1/4	1		1/4	Ali	2/35			3/5	M1 M1 A1 [4]	Obtaining probs of each person for each entrance (can be implied or awarded in part (i) or part (ii)) Considering options 2 meet 1 doesn't, must have at least two 3-factor terms Adding option all three meet, must be added to a prob Correct answer
	A	B		D																			
Rick	1/3	2		2/9																			
Brenda	1/4	1		1/4																			
Ali	2/35			3/5																			
(ii)	$P(\text{entrance } A) = 1/210 (0.00476)$ $P(\text{entrance } B) = 1/315 (0.00317)$ $P(\text{entrance } C) = 1/63 (0.0159)$ $P(\text{entrance } D) = 1/30 (0.0333)$ $P(\text{same entrance}) = 2/35 (0.0571)$	M1 M1 A1 A1 [4]	Obtaining a three-factor prob for any entrance Adding four three-factor probabilities for the 4 entrances Two or more correct entrance probabilities Correct answer																				

15 $P(E \text{ and } 12) = \frac{2}{5} \times \frac{4}{36} = \frac{8}{180} (2/45)$ $P(12) = \frac{3}{5} \times \frac{1}{36} + \frac{8}{180} = \frac{11}{180} (0.0611)$ $P(E 12) = \frac{P(E \text{ and } 12)}{P(12)}$ $= \frac{8}{11} (0.727)$ <p>OR list Even: 2 and (4,3) or (3,4) or (2,6) or (6,2) 4 and ditto Gives 8 options</p> <p>Odd: 1 and (6,6) or 3 and (6,6) or 5 and (6,6) Gives 3 options</p> $\text{Prob}(E 12) = 8/11$	M1 A1 M1 A1ft M1dep A1 [6]	2/5 or 3/5 mult by dice-related probability seen anywhere $\frac{2}{5} \times \frac{4}{36}$ seen oe Summing two 2-factor probs involving 2/5 and 3/5 $3/5 \times 1/36 + \text{their } P(E \text{ and } 12)$, ft their $P(E 12)$ Subst in condit prob formula, must have a fraction Correct answer List attempt evens 8 options List attempt odds 3 options $(\text{Their even})/(\text{their total})$ Correct answer
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16 (i)	M1 A1 [2]	Y = young, M = middle-aged, O = old Correct shape with Ph, NPh first All probabilities and correct
(ii) $P(\text{Ph} M) = \frac{0.68 \times 0.25}{0.68 \times 0.25 + 0.32 \times 0.1}$ $= 0.842 (170/202)$	B1 M1 A1 [3]	For correct numerator using cond prob formula with numerator < denominator For attempt at $P(35 - 60 \text{ years old})$, involving the sum of two 2-factor probs, seen anywhere Correct answer

17 $P(\text{pencil case} \mid \text{find}) =$ $\frac{P(\text{pencilcase and find})}{P(\text{find})} = \frac{0.7 \times 1}{0.7 + 0.3 \times 0.2}$ $= 0.921$	M1 A1 A1 A1 [4]	Attempt to use cond prob formula, must be quotient Correct num of a fraction Correct denominator Correct answer
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18 (i) $P(3\text{m}) = 4/5 (0.8)$ $P(5\text{m}) = 1/5 (0.2)$ $E(X) = 17/5 (3.4)$ $\text{Var}(X) = 16/25 (0.64)$	B1 B1 M1 A1 [4]	$P(3\text{m}) = 4/5$ or $P(5\text{m}) = 1/5$ seen or implied Correct $E(X)$ Subtract their mean ² numerically from $\sum x^2 p$, no extra dividing Correct answer
(ii) $P(3, 5) + P(5, 3) = 0.8 \times 0.2 + 0.2 \times 0.8$ $= 8/25 (0.32)$	M1 A1 [2]	Summing two 2-factor terms Correct answer, ft on $2 \times p \times (1 - p)$, their p
(iii) $P(11) = P(3, 3, 5) + P(3, 5, 3) + P(5, 3, 3)$ $= (4/5 \times 4/5 \times 1/5) \times 3$ $= 48/125 (0.384)$	M1 M1 A1 [3]	Mult 2 probs for 3 with 1 prob for 5 Multiplying probs for 11 by 3 or summing 3 options Correct final answer

19 (i) $0.25p = 0.075$ $p = 0.075/0.25 = 0.3$	B1 [1]	Answer given, must show some working
(ii) $P(2 M) = \frac{P(2 \text{ and } M)}{P(M)}$ $= \frac{0.45 \times 0.85}{0.3 \times 0.1 + 0.45 \times 0.85 + 0.25 \times 0.3}$ $= \frac{0.3825}{0.4875}$ $= 0.785$	M1 B1 A1 A1 [4]	attempt at cond prob with single prod in num and Σ three 2-factor o.e prods in denom correct numerator of a fraction correct unsimplified denom correct answer

20 (i)			
	Designer	Not designer	Total
H-h shoes	2	4	6
L-h shoes	1	3	4
Sports	5	5	10
Total		12	20

	B1	one row or column correct
	B1 [2]	all correct
(ii) $1/20 (0.05)$	B1ft [1]	correct answer, ft their table

(iii) 10/20 (1/2, 0.5) B1ft [1] correct answer, ft their table

(iv) 2/8 (1/4, 0.25) B1ft [1] correct final answer, ft their table

(v) $P(D) = 8/20 (0.4)$ $P(S) = 10/20 (0.5)$ M1
 $P(D \cap S) = 5/20 (0.25)$
Not independent as $P(D) \times P(S) \neq P(D \cap S)$ A1ft [2] finding $P(D \cap S)$ and comparing with their $P(D) \times P(S)$
correct conclusion, ft their table

$$[\text{OR}_1 P(D|S) = \frac{P(D \cap S)}{P(S)} = \frac{5}{10} \quad P(D) = \frac{8}{20}]$$

Not independent as $P(D|S) \neq P(D)$

$$[\text{OR}_2 P(S|D) = \frac{P(S \cap D)}{P(D)} = \frac{5}{8} \quad P(S) = \frac{10}{20}]$$

Not independent as $P(S|D) \neq P(S)$

$$\begin{aligned} (\text{vi}) \quad P(\text{at most } 4) &= 1 - {}^7C_5(0.4)^5(0.6)^2 - \\ &{}^7C_6(0.4)^6(0.6)^1 - (0.4)^7 \\ &= 0.904 \end{aligned} \quad \begin{matrix} \text{M1} \\ \text{M1} \\ \text{A1} \end{matrix}$$

finding $P(D|S)$ and comparing with their $P(D)$
correct conclusion, ft their table]

finding $P(D|S)$ and comparing with their $P(D)$
correct conclusion, ft their table]

bin probability of form ${}^7C_r p^r (1-p)^{7-r}$, $r \neq 0$ or 7
bin expression for $1 - P(5, 6, 7)$ or $P(0, 1, 2, 3, 4)$, any p
correct answer

21 (i) $P(A \text{ Later}) = 0.5 \times 0.2 = 0.1$	B1	[1]	
(ii) $P(L \text{ given } I) = (0.2 \times 0.1) / (0.5 \times 0.8 + 0.3 \times 0.6 + 0.2 \times 0.1)$ $= 0.02 / 0.6$ $= 0.0333 (1/30)$	B1 M1 A1		0.2 \times 0.1 seen on its own as num or denom of a fraction Attempt at $P(I)$ summing 2 or 3 2-factor prods, seen anywhere Correct unsimplified $P(I)$ as num or denom of a fraction Correct answer accept 0.033

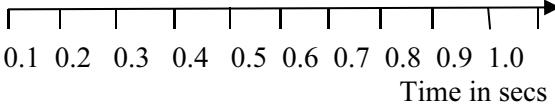
22 (i) $\frac{74}{170} \left(\frac{37}{85} \right) (0.435)$	B1	1	Correct answer
(ii) $\frac{38}{96} \left(\frac{19}{49} \right) (0.396)$	B1 B1	2	Correct unsimplified denominator Correct answer
(iii) $P(\text{high GDP and high birth rate}) = 0$ So they are exclusive	B1* B1dep* 2		Correct reason Correct answer, CWO
(iv) $\frac{42}{74} \times \frac{41}{54}$ $= \frac{1722}{3996} \left(\frac{287}{666} \right) (0.431)$	M1 B1 A1	3	Multiplying 2 probabilities with different numerators and denominators, only one correct probability seen Correct answer

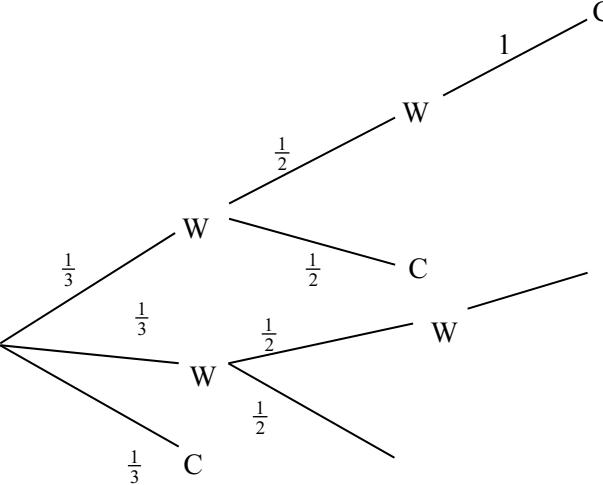
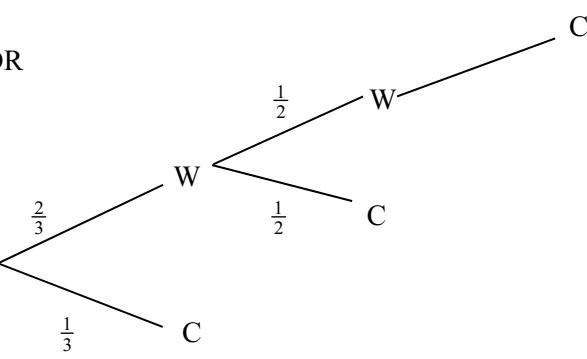
24	either 55/90 (11/18) or 95/160 (19/32) seen	B1	oe
	$P(M \text{ and } 18 - 60) = 0.6 \times 55/90$ $= 0.367 (11 / 30)$	M1	0.6 mult by 55/90 seen as num / denom of a fraction
	$P(18 - 60) = 0.6 \times 55/90 + 0.4 \times 95/160$ $(= 29/48 \text{ or } 0.604)$	M1	Summing 2 two-factor products seen anywhere
	$P(M \mid 18 - 60) = \frac{P(M \cap 18 - 60)}{P(18 - 60)}$ $= 88/145 (0.607)$	A1	Correct unsimplified answer seen as num/denom of a fraction

25	(i) $P(C \cap < 50) = 0.35 \times 0.2 = 0.07$	B1	[1]	
	(ii) $P(C < 50) = \frac{P(C \cap < 50)}{P(< 50)}$	M1	[4]	Summing three 2-factor products seen anywhere (can omit the 1)
	$= \frac{0.35 \times 0.2}{0.25 \times 0.3 + 0.35 \times 0.2 + 0.4(\times 1)}$	A1		0.545 (unsimplified) seen as num or denom of a fraction
	$= \frac{0.07}{0.545}$	M1		Attempt at $P(C \cap < 50)$ as 2-factor prod only seen as num or denom of a fraction
	$= 0.128 (14/109)$	A1		Correct answer

26	(i) $P(X \text{ and } P) = \frac{1}{4} \times \frac{4}{9} = \frac{1}{9}$	M1		Mult a playground prob with a P prob
	$P(Y \text{ and } P) = \frac{1}{4} \times \frac{2}{12} = \frac{1}{24}$	A1		One correct prob
	$P(Z \text{ and } P) = \frac{1}{2} \times \frac{1}{16} = \frac{1}{32}$	M1		Summing at least two 2-factor probs
	$P(P) = \frac{53}{288} = 0.184$	A1	4	Correct answer
	(ii) $P(Y C) = \frac{P(Y \cap C)}{P(C)}$	M1		Attempt at $P(Y \cap C)$ as numerator of a fraction
	$\frac{\frac{1}{4} \times \frac{1}{12}}{\frac{1}{4} \times \frac{1}{12} + \frac{1}{2} \times \frac{4}{16}}$	M1		Attempt at $P(C)$ in form of summing two 2-factor products, seen anywhere
	$= \frac{1}{48} = \frac{1}{7}$	A1		Correct unsimplified $P(C)$ seen anywhere
		A1	4	Correct answer

27	(i) $P(RR) = 0.6 \times 0.7 = 0.42$ $P(AA) = 0.4 \times 0.75 = 0.3$ $P(2 \text{ sets in match}) = 0.72$	B1 B1 B1	3	Only 2 factors Only 2 factors ft previous answers
	(ii) $\frac{P(A \text{ wins and 2 sets})}{P(2 \text{ sets})} = \frac{P(AA)}{P(2 \text{ sets})}$ $= \frac{0.3}{0.72} = \frac{5}{12} (0.417)$	B1 B1	2	Correct num or correct denom of a fraction ft their (i) Correct answer ft their or recovered AA/their or recovered (i)

<p>28 (i) median A = 0.52 LQ = 0.41 UQ = 0.79</p> <p>(ii)</p>  <p><i>A</i></p>  <p><i>B</i></p>  <p>Time in secs</p>	<p>B1 B1 B1ft</p> <p>3</p>	<p>ft wrong units</p> <p>2 correct boxes ft (i) OK if superimposed</p> <p>2 pairs correct whiskers lines up to box not inside</p> <p>Correct uniform scale need at least 4 values on it. No scale no marks unless perfect A and B with all 10 values shown, in which case score B1B1B0</p>
<p>(iii) Smartphone B is quicker, slightly less variable, etc.</p>	<p>B1</p> <p>1</p>	<p>oe sensible answer</p>

<p>29 (i) W = wrong, C = correct</p>  <p>OR</p> 	<p>M1</p> <p>M1</p> <p>B1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>B1</p> <p>A1</p> <p>4</p>	<p>3 branches first qn and 2 by 2 for second qn only</p> <p>One branch twice for third qn or two branches twice with 0 and 1 seen on branches</p> <p>Any two of $\frac{1}{3}$, $\frac{1}{2}$ and 1 seen as probs</p> <p>Probs all correct and sensible labels NB SR for 4 outcomes instead of 3, M1 B1 only</p> <p>2 branches first qn and 1 by 2 for second qn only</p> <p>One branch once for third qn or two branches with 0 and 1 seen on branches</p> <p>Any two of $\frac{1}{3}$ or $\frac{2}{3}$, $\frac{1}{2}$ and 1 seen as probs</p> <p>Probs all correct and sensible labels</p>
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<p>(ii)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">x</td><td style="padding: 2px;">1</td><td style="padding: 2px;"></td><td style="padding: 2px;"></td></tr> <tr> <td style="padding: 2px;">Prob</td><td style="padding: 2px;">$\frac{1}{3}$</td><td style="padding: 2px;">$\frac{1}{3}$</td><td style="padding: 2px;">$\frac{1}{3}$</td></tr> </table> <p>$P(1) = P(C)$ say $= \frac{1}{3}$</p> <p>$P(2) = P(WC) = \frac{1}{6}$ $P(WC) = \frac{1}{6}$ total P (2) $= \frac{1}{3}$</p> <p>$P(3) = P(WWC) = \frac{1}{6}$ $P(WWC) =$ $\frac{1}{6}$ total P(3) $= \frac{1}{3}$</p> <p>$E(X) = 1 \times \frac{1}{3} + 2 \times \frac{1}{3} + 3 \times \frac{1}{3} = 2$</p>	x	1			Prob	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	<p>B1 1, 2, 3 seen only oe</p> <p>B1 2 correct probs</p> <p>B1 3 correct probs</p> <p>B1^b 4 Correct answer ft their probs provided $0.999 \leq \Sigma p \leq 1$</p>
x	1								
Prob	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$						

<p>30 (i) $P(X) = \frac{20}{28} \left(\frac{5}{7}\right)(0.714), 71.4\%$</p>	<p>B1 1 oe</p>
<p>(ii) $P(F) = \frac{20}{28} \times \frac{1}{4} \times \frac{8}{28} \times \frac{6}{10} = \frac{7}{20}$</p>	<p>M1 Summing two 2-factor probs created by One of $\frac{1}{4}$ or $\frac{3}{4}$ multiplied by $20/28$ or $8/28$ Added to $4/10$ or $6/10$ × altn population prob Correct answer</p> <p>A1 2</p>
<p>(iii) $P(X F) = \frac{5/28}{7/20} = \frac{25}{49}(0.510)$</p>	<p>M1 Their unsimplified country X probability $(5/28)$ as num or denom of a fraction Or (their fair hair population) ÷ (total fair hair pop)</p> <p>A1 2 Correct answer</p>