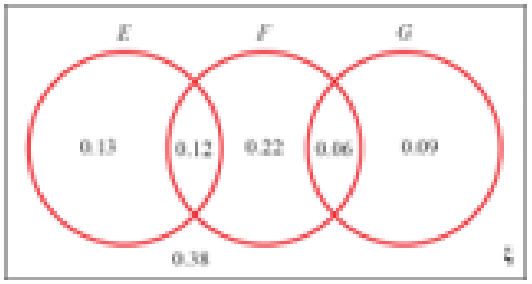
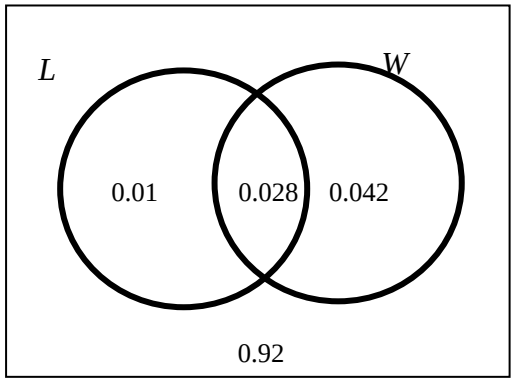
Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
1a	$P(E \mid F') = \frac{P(E' \cap F')}{P(F')}$ or $\frac{0.47}{0.6}$	M1	3.1a	4th Calculate probabilities using set notation.
	$= \frac{47}{60}$ or 0.783 (3 s.f.)	A1	1.1b	
		(2)		
1b	$P(E) \times P(F) = 0.25 \times 0.4 = 0.1 \neq P(E \cap F) = 0.12$	M1	2.1	4th Understand and use the definition of independence in probability calculations.
	So, E and F are not statistically independent.	A1	2.4	
		(2)		
1c		B1	2.5	3rd Understand and use Venn diagrams for multiple events.
	Use of independence and all values in G correct. All values correct.	M1A1 M1A1	3.1a 1.1b 1.1b 1.1b	
		(5)		
1d	$P([F \cup G]') = 0.13 + 0.38$	M1	3.1a	4th Calculate probabilities using set notation.
	$= 0.51$	A1	1.1b	
		(2)		

(11 marks)

2		0 (R)	1 (S)	2 (T)	≥3	T
	D (D)	24	32	41	23	120
	SD (D')	40	37	88	35	200
	T	64	69	129	58	320				
(a)	$P(D) = \frac{120}{320}$ or $\frac{3}{8}$ or 0.375	B1	1	CAO: or equivalent
(b)	$P(D \cap R) = \frac{24}{320}$ or $\frac{3}{40}$ or 0.075	B1	1	CSO: or equivalent
(c)	$P(D \cup T) = \frac{120+88}{320} = \frac{129+24+32+23}{320}$	M1		
	$= \frac{208}{320}$ or $\frac{13}{20}$ or 0.65	A1	2	CAO: or equivalent
(d)	$P(D \mid R) = \frac{P(D \cap R)}{P(R)} \underset{\text{(ii)}}{=} \frac{24/(320)}{64/(320)}$	M1		M0 if independence assumed
	$= \frac{24}{64}$ or $\frac{3}{8}$ or 0.375	A1	2	CAO: or equivalent
(e)	~~$P(R \mid D') = \frac{P(R \cap D')}{P(D')} = \frac{40/(320)}{200/(320)}$~~	M1		numerator
		M1		allow independence assumed denominator
	$= \frac{40}{200}$ or $\frac{1}{5}$ or 0.2	A1	3	CAO: or equivalent
(f)	R and S or R and T or S and T	B1	1	not D and D'
(g)	$P(D) = 0.375 = P(D \mid R)$ or (i) = (iv)	M1		$P(D) \times P(R) = 0.375 \times 0.2$ $= 0.075 = P(D \cap R)$ or (ii) or $P(R \mid D) = P(R) = 0.2$, etc
	so YES	A1	2	
(h)	A semi-detached house or two children (or both)	B1 B1	2	CAO or equivalent
(i)	A detached house and/with less than two children	B1 B1	2	CAO (0 or 1 must not include 'both')
	Total		**16**	

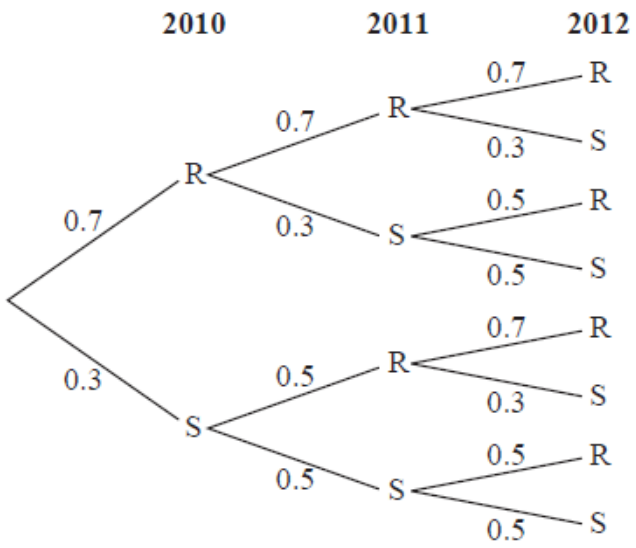
3	**(a)**		$P(L \cap W) = P(L \mid W) \times P(W) = 0.4 \times 0.07 = 0.028$	M1 A1 **[2]**	For $P(L \mid W) \times P(W)$ cao	
	(b)			B1 B1 B1 **[3]**	For two labelled intersecting circles For at least 2 correct probabilities. For remaining probabilities	FT their 0.028 provided < 0.038
	(c)		$P(L \cap W) = 0.028, P(L) \times P(W) = 0.038 \times 0.07 = 0.00266$ Not equal so not independent	M1 A1 E1* dep on M1 **[3]**	For correct use of $P(L) \times P(W)$ If P(L) wrong, max M1A0E0. No marks if P(W) wrong For 0.00266 Allow 'they are dependent' Do not award E1 if $P(L \cap W)$wrong	Or EG $P(L \mid W) = 0.4, P(L) = 0.038$ Not equal so not independent M1 is for comparing with some attempt at numbers $P(L \mid W)$ with $P(L)$, A1 for 0.038 If P(L) wrong, max M1A0E0

4a 0.252 (2)

4b 0.440 (4)

Total mark: 6

5a



(4)

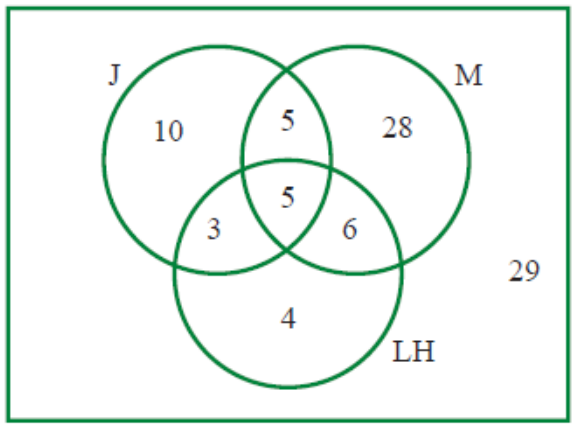
5b 0.372 (2)

5c 0.395 (2)

5d 8 (2)

Total marks: 10

6a



ℰ
(90)

(4)

Key: J = Juniors
M = Males
LH = Left-handed players

6b 1/4 (2)

6c 1/6 (2)

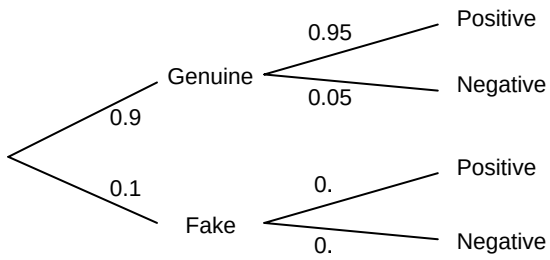
6d 28/45 (2)

6e 4/5 (2)

6f 19/24 (2)

6g 10/39 (2)

Total marks: 16

7 **(a)**		G1 for left hand set of branches fully correct including labels and probabilities G1 for right hand set of branches fully correct	**2**
(b)	P (test is positive) = (0.9)(0.95) + (0.1)(0.2) = 0.875	M1 Two correct pairs added A1 CAO	**2**
(c)	P (test is correct) = (0.9)(0.95) + (0.1)(0.8) = 0.935	M1 Two correct pairs added A1 CAO	**2**
(d)	P (Genuine|Positive) = 0.855/0.875 = 0.977	M1 Numerator M1 Denominator A1 CAO	**3**
(e)	P (Fake|Negative) = 0.08/0.125 = 0.64	M1 Numerator M1 Denominator A1 CAO	**3**
(f)	EITHER: A positive test means that the painting is almost certain to be genuine so no need for a further test. However, more than a third of those paintings with a negative result are genuine so a further test is needed. NOTE: Allow sensible alternative answers	E1FT E1FT	**2**
(g)	P (all 3 genuine) = $(0.9 \times 0.05 \times 0.96)^3$ $= (0.045 \times 0.96)^3$ $= (0.0432)^3$ $= 0.0000806$	M1 for 0.9 x 0.05 (=0.045) M1 for complete correct triple product M1*indep* for cubing A1 CAO	**4**
		TOTAL	**18**