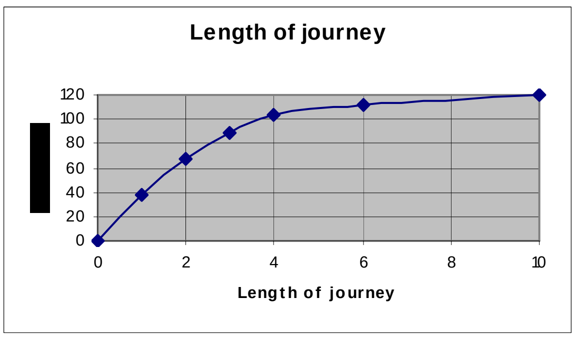
Mark Scheme 4766
June 2005

Statistics 1 (4766)

Qn	Answer	Mk	Comment
1			
(i)	Mean = 657/20 = 32.85	B1 cao	
	Variance = $\frac{1}{19}(22839 - \frac{657^2}{20}) = 66.13$	M1 A1 cao	
(ii)	Standard deviation = 8.13		
	32.85 + 2(8.13) = 49.11	M1 ft	Calculation of 49.11
	none of the 3 values exceed this so no outliers	A1 ft	
2			
(i)		G1 G1 G1	For calculating 38,68,89,103,112,120 Plotting end points Heights inc (0,0)
(ii)	Median = 1.7 miles	B1	
	Lower quartile = 0.8 miles	M1	
	Upper quartile = 3 miles	M1	
	Interquartile range = 2.2 miles	A1 ft	
(iii)	The graph exhibits positive skewness	E1	

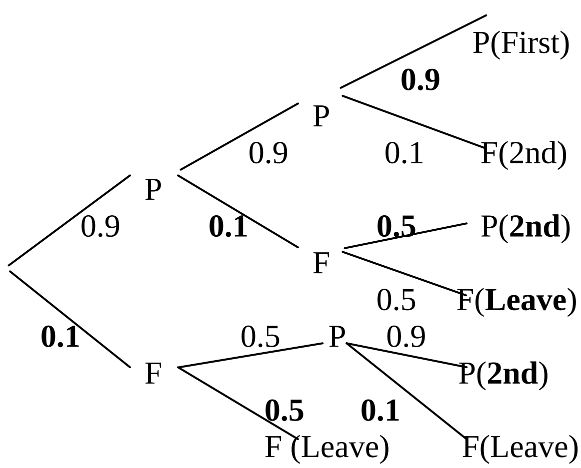
3 (i)	$P(X = 4) = \frac{1}{40}(4)(5) = \frac{1}{2}$ (Answer given)	B1	Calculation must be seen
(ii)	$E(X) = (2+12+36+80)\frac{1}{40}$ So $E(X) = 3.25$	M1 A1 cao	Sum of rp
	$\text{Var}(X) = (2+24+108+320)\frac{1}{40} - 3.25^2$ $= 11.35 - 10.5625$ $= 0.7875$	M1 M1 dep A1 cao	Sum of r^2p -3.25^2
(iii)	Expected number of weeks = $\frac{6}{40} \times 45$ = 6.75 weeks	M1 A1	Use of np
4 (i)	Number of choices = $\binom{6}{3} = 20$	M1 A1	For $\binom{6}{3}$
(ii)	Number of ways = $\binom{6}{3} \times \binom{7}{4} \times \binom{8}{5}$ $= 20 \times 35 \times 56$ $= 39200$	M1 M1 A1 cao	Correct 3 terms Multiplied
(iii)	Number of ways of choosing 12 questions $= \binom{21}{12} = 293930$ Probability of choosing correct number from each section = 39200/293930 = 0.133	M1 M1 ft A1 cao	For $\binom{21}{12}$

5 (i)

	1	**2**	**3**	**4**	**5**	**6**
1	1	2	3	4	5	6
2	2	2	6	4	10	6
3	3	6	3	12	15	6
4	4	4	12	**4**	**20**	12
5	5	10	15	**20**	**5**	**30**
6	6	6	6	12	**30**	**6**

5 (i)	(table above)	B1	All correct
(ii)	(*A*) P(LCM > 6) = 1/3	B1	
	(*B*) P(LCM = 5n) = 11/36	B1	
	(*C*) P(LCM > 6 ∩ LCM = 5n) = 2/9	M1 A1 cao	Use of diagram
(iii)	$\frac{1}{3} \times \frac{11}{36} \neq \frac{2}{9}$	M1	Use of definition
	Hence events are not independent	E1	

6 (i)



6 (i)	(tree diagram above)	G1 G1	Probabilities Outcomes
(ii)		M1	

(*A*)	P(First team) = 0.9^3 = 0.729	A1	
(*B*)	P(Second team) = $0.9\times0.9\times0.1+0.9\times0.1\times0.5+0.1\times0.9\times0.5$ = 0.081 + 0.045 + 0.045 = 0.171	M1 M1 A1	1 correct triple 3 correct triples added
(iii)	P(asked to leave) = 1 -0.729 – 0.171 = 0.1	B1	
(iv)	P(Leave after two games given leaves) $= \dfrac{0.1\times0.5}{0.1} = \dfrac{1}{2}$	M1 ft A1 cao	Denominator
(v)	P(at least one is asked to leave) $=1-0.9^3$ = 0.271	M1 ft M1 A1 cao	Calc'n of 0.9 $1 – (\ )^3$
(vi)	P(Pass a total of 7 games) =P(First, Second, Second) + P(First, First, Leave after three games) $= 3\times0.729\times0.171^2 + 3\times0.729^2\times0.05$ = 0.064 + 0.080 = 0.144	M1 M1 ft M1 ft M1 A1 cao	Attempts both $0.729(0.171)^2$ $0.05(0.729)^2$ multiply by 3

7 (i)	$X \sim B\left(15,\dfrac{1}{6}\right)$ $P(X=0) = \left(\dfrac{5}{6}\right)^{15}$ = 0.065	M1 A1 cao	$\left(\dfrac{5}{6}\right)^{15}$
(ii)	$P(X=4) = \dbinom{15}{4}\times\left(\dfrac{1}{6}\right)^4\times\left(\dfrac{5}{6}\right)^{11}$ = 0.142 (or 0.9102-0.7685)	M1 M1 A1 cao	$\left(\dfrac{1}{6}\right)^4\left(\dfrac{5}{6}\right)^{11}$ multiply by $\dbinom{15}{4}$

(iii)	$P(X > 3) = 1 - P(X \leq 3)$ $= 1 - 0.7685 = 0.232$	M1 A1	
(iv) (*A*)	Let p = probability of a six on any throw $H_0 : p = \frac{1}{6}$ $H_1 : p < \frac{1}{6}$ $X \sim B\left(15, \frac{1}{6}\right)$ $P(X = 0) = 0.065$ $0.065 < 0.1$ and so reject H_0 Conclude that there is sufficient evidence at the 10% level that the dice are biased against sixes.	B1 B1 M1 M1 dep E1 dep	Definition of p Both hypotheses 0.065 Comparison
(*B*)	Let p = probability of a six on any throw $H_0 : p = \frac{1}{6}$ $H_1 : p > \frac{1}{6}$ $X \sim B\left(15, \frac{1}{6}\right)$ $P(X \geq 5) = 1 - P(X \leq 4) = 1 - 0.910 = 0.09$ $0.09 < 0.1$ and so reject H_0 Conclude that there is sufficient evidence at the 10% level that the dice are biased in favour of sixes.	B1 M1 M1 dep E1 dep	Both hypotheses 0.09 Comparison
(v)	Conclusions contradictory. Even if null hypothesis is true, it will be rejected 10% of the time purely by chance. Or other sensible comments.	E1 E1	Contradictory By chance