Mark Scheme 4766 June 2005

Statistics 1 (4766)

Qn	Answer	Mk	Comment
1 (i)	Mean = $657/20 = 32.85$	B1 cao	
(ii)	Variance = $\frac{1}{19}(22839 - \frac{657^2}{20}) = 66.13$ Standard deviation = 8.13	M1 A1 cao	
	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)	Length of journey		
	120 100 100 100 100 100 100 100	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	

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Final Mark Scheme

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
	Var $(X) = (2+24+108+320)\frac{1}{40} - 3.25^2$	M1 M1 dep	Sum of r ² p -3.25 ²
	= 11.35 - 10.5625		
	= 0.7875	A1 cao	
(iii)	Expected number of weeks = $\frac{6}{40}$ x45 = 6.75 weeks	M1 A1	Use of np
4 (i)	Number of choices $= \begin{pmatrix} 6 \\ 3 \end{pmatrix} = 20$	M1 A1	For $\begin{pmatrix} 6 \\ 3 \end{pmatrix}$
(ii)	Number of ways = $\binom{6}{3} \times \binom{7}{4} \times \binom{8}{5}$	M1 M1	Correct 3 terms Multiplied
	$= 20 \times 35 \times 56$		
	= 39200	A1 cao	
(iii)	Number of ways of choosing 12 questions = $\binom{21}{12}$ = 293930	M1	For $\begin{pmatrix} 21\\ 12 \end{pmatrix}$
	Probability of choosing correct number from each section = $39200/293930$ = 0.133	M1 ft A1 cao	

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	B1	All correct
	6	6	6	6	12	30	6		
(ii)	(A) P(I	LCM >	> 6) = (1/3				B1	
	(<i>B</i>) $P(LCM = 5n) = 11/36$							B1	
	(<i>C</i>) $P(LCM > 6 \cap LCM = 5n) = 2/9$						M1 A1 cao	Use of diagram	
(iii)	$\frac{1}{3} \times \frac{11}{36}$	$\frac{1}{5} \neq \frac{2}{9}$						M1	Use of definition
	Hence	events	are no	t inder	benden	t		E1	



(4)		A 1	
(A)	$P(First team) = 0.9^3 = 0.729$	AI	
(<i>B</i>)	P(Second team) = $0.9 \times 0.9 \times 0.1 + 0.9 \times 0.1 \times 0.5 + 0.1 \times 0.9 \times 0.5$	M1 M1	1 correct triple 3 correct triples added
	= 0.081 + 0.045 + 0.045 = 0.171	A1	
(iii)	P(asked to leave) = 1 - 0.729 - 0.171		
	= 0.1	B1	
(iv)	P(Leave after two games given leaves)		
	$=\frac{0.1\times 0.5}{0.1} = \frac{1}{2}$	M1 ft A1 cao	Denominator
(v)	P(at least one is asked to leave)	M1 ft	Calc'n of 0.9
	$=1-0.9^3 = 0.271$	M1 A1 cao	1 – () ³
(vi)	P(Pass a total of 7 games)		
	=P(First, Second, Second) + P(First, First, Leave after three games)	M1 M1 ft	Attempts both $0.729(0.171)^2$
	$= 3 \times 0.729 \times 0.171^2 + 3 \times 0.729^2 \times 0.05$	M1 ft	0.05(0.729) ²
	= 0.064 + 0.080 = 0.144	M1 A1 cao	multiply by 3

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

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