Mark Scheme 4732
June 2006

Note: "(3 sfs)" means "answer which rounds to ... to 3 sfs". If correct ans seen to $\geq$ 3sfs, ISW for later rounding
Penalise 2 sfs only once in <u>paper</u>.

1(i)	Negative, because (grad or coeff of x in 1st equn or x-value or reg coeff or B or –0.6) is negative	B1	**1**	Neg because x incr & y decr
(ii)	$x = -1.6 \times 7.0 + 21$ $x = 9.8$	M1 A1	 **2**	Sub $y=7.0$ in 2nd eqn. Allow 1 sign error If sub in both must choose 2nd
(iii)	$y = -0.6(-1.6y + 21) + 13$ or similar $\bar{x} = 5$, $\bar{y} = 10$	M1 A1A1	 **3**	Obtain correct eqn in 1 variable. Allow 1 num'l error Allow without bars
Total			**6**	
	In qus 2 & 3 "prod" means "product of two probabilities"			
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(i)	$\dfrac{7!}{3! \times 2(!)}$ $= 420$	M1M1 A1	 **3**	M1: $7!/$(a factorial); or … $\div (3! \times 2(!))$ M1: all correct
(ii)	$\dfrac{5!}{2(!)}$ $= 60$	M1 A1	 **2**	M1: 5! seen (not part of a C) or $5 \times 4!$ or 120 seen or … $\div 2(!)$ alone

(iii)	$1 - {}^4/_7 \times {}^3/_6$ or $1 - {}^4C_2 / {}^7C_2$ or $1 - {}^4P_2 / {}^7P_2$
	    or ${}^3/_7 \times {}^2/_6 + {}^3/_7 \times {}^4/_6 + {}^4/_7 \times {}^3/_6$ oe
	    or ${}^3C_2 / {}^7C_2 + {}^3C_1 {}^4C_1 / {}^7C_2$
	
	 $= {}^5/_7$ or 0.714 (3 sfs)
		M1M1
		
		 A1
			
			 3
				M1:$1-$ prod or $1-…/{}^7C_2$ or $1-{}^4C_2 /..$ (or Ps)
				    or add 3 prods or add 2 correct prods
				    or ${}^3C_2 / {}^7C_2$ or ${}^3C_1 {}^4C_1 / {}^7C_2$
				    or add ≥ 5 out of 7 correct prods
				 M1: all correct

Total			**8**	

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4(i)	0.4207 or 0.421 (3 sfs) or $0.8^{25}+25 \times 0.8^{24} \times 0.2 + .. \, ^{25}C_4 \times 0.4^{21} \times 0.2^4$ 0.579(3)		B1 B1	**2**	or $1 - 0.6167$ or 0.3833 (3 sfs) or 1- (6 correct terms, 0 to 5)
(ii)	$^{10}C_3 \times (1-0.27)^7 \times 0.27^3$ $= 0.261$ (3 sfs)		M1 A1	**2**	
(iii)		Allow "=" thro'out $1 - 0.73^n > 0.95$ $0.73^9 = 0.059$ or $0.73^n < 0.05$ $0.73^{10} = 0.043$ $n\log 0.73 < \log 0.05$ oe $n = 10$	M1 M1 A1	**3**	or $1 - {^n}C_0 \times 0.27^0 \times 0.73^n > 0.95$ oe allow incorrect sign M1 must be correct ft ($1 - 0.27$) from (ii) for M1M1 10 with incorrect sign in wking: SCB2 10 with just $0.73^9 = 0.059$: M1M1A1
Total			**7**		
5(i)	$\frac{1}{3} + \frac{1}{4} + p + q = 1$ oe $0 \times \frac{1}{3} + 1 \times \frac{1}{4} + 2p + 3q = 1\frac{1}{4}$ oe equalize coeffs, eg mult eqn (i) by 2 or 3 Or make p or q subject of (i) or (ii) $p = \frac{1}{4}$, $q = \frac{1}{6}$ oe		B1 B1 M1 A1A1	**5**	allow one error. ft their equns subst or subtr not nec'y
(ii)	$\Sigma x^2 p$ (not /4 or /3 etc) $(= 2\frac{3}{4})$ $- (1\frac{1}{4})^2$ $= 1.1875$ or $1\frac{3}{16}$ oe sd $= \sqrt{(\text{their } 1.1875)} = 1.09$ (3 sfs)		M1 M1 A1 B1f	**4**	≥ 2 non-zero terms correct. dep +ve result indep if +ve result or $\_ x - 1\frac{1}{4})^2 p$ (≥ 2 (non-0) terms correct): M2 ft (i) ($0 \leq p$, $q < 1$) or letters p, q both M1s cao dep 1st M1 & $\sqrt{(+ve no.)}$ eg $\sqrt{2.75} = 1.66$
Total			**9**		

6(i)(a)	Ranks: 2 4 7 5 3 1 6 6 4 1 3 5 7 2
	       7 1 6 3 2 5 4 1 7 2 5 6 3 4
	Σd^2
	$(= 60)$
	$r_s = 1 - \dfrac{6 \times 60}{7 \times 48}$
	
	    $= -^1/_{14}$ or -0.071 (3 dps)
		M1
		A1
		M1
		
		M1
		
		A1 **5**
			≥ 5 ranks correct in each set
			all correct
			dep ranks attempted even if opp orders,
			          allow arith errors
			Correct formula with $n = 7$, dep 2nd M1
			
			calc r for ranks:
			$S_{xx}=S_{yy}= 140 - 28^2/7.$ $S_{xy} = 110-28^2/7$
			    $(= 28)$ $(= -2)$
			corr subst in one corr S (any version):M1
			corr subst in $r = S_{xy} / \sqrt{(S_{xx}S_{yy})}$:M1
			
			-0.07 without wking: M1A1M2A0

(b)	Little (or no) connection (agreement, rel'nship) between dist and commission Allow disagreement	B1ft **1**	No mks unless $\|r_s\| \leq 1$ ft their r_s Must refer to context. Not "little corr'n between dist and com" not "strong disagreement"
(c)	Unchanged. No change in rank	B1B1 **2**	Ignore other comment
(ii)(a)	$= -1$	B1 **1**	indep
(b)	Close to -1 or, eg ≈ -0.9	B1	cao not referring to "corr'n" rather than r allow "neg", not neg corr'n or neg skew
Total		**10**	

7(i)			Correct (149.5)	With 150	Tot = 2000
	Midpoints attempted ≥ 2 classes	M1			
	$\sum xf / 100$ or $\sum xf / \sum f$ attempted ≥ 2 terms	M1			
	x within class, not class width		2720.5/100	2725/100	Allow
	Mean = 27.2 (to 3 sfs) (not 27.25)				Ms
	art 27.2 from fully correct wking	A1			
	$\sum x^2 f$ or $\sum x - \bar{x})^2 f \geq 2$ terms	M1			& poss As
	$\sqrt{(\sum x^2 f/100 - \bar{x}^2)}$ or $\sqrt{((\sum x - \bar{x})^2 f/100)}$ or $/\sum f$				
		M1			
	fully corr method, not $\sqrt{neg}$		27.2	27.25	
		A1 **6**	240702.25	242050	
	= 40.5 to 41.1 (3 sfs)		40.82	40.96	
			allow class widths for 2nd M1 only		
(ii)	Recog LQ in 1st class <u>and</u> UQ in 3rd class	B1			
	Graph: Interp:				
	Attempt 25(.25)th value LQ = 3.0 to 4.3				
	Attempt 75(.75)th value UQ = 27 to 29	M1	both nec'y		
	Subtract	M1	dep B1 or M1		
	IQR = 23 or 24 or 25	A1 **4**	integer. dep M2		
(iii)(a)	Increase	B1 **1**			
(b)	Increase	B1 **1**	Ignore "probably" etc		
(c)	No change	B1 **1**			
Total		**13**			

8(i)	Geometric.	B1		
	Each attempt (or result or try) indep	B1 **2**	In context. Not "events,. trials, outcomes" . Ignore extra	
(ii)(a)	$(^2/_3)^3$ x $^1/_3$	M2	$(^2/_3)^2$ x $^1/_3$ or $(^2/_3)^4$ x $^1/_3$:	
			allow other numerical "p" (0<p<1):M1	
	= $^8/_{81}$ or 0.0988 (3 sfs)	A1 **3**		
(b)	$(^2/_3)^3$	M1	not $(^2/_3)^3$ x	
	$1 - (^2/_3)^3$	M1	or $^1/_3 + ^2/_3 x^1/_3 + (^2/_3)^2 x^1/_3$ M2	
			$1 - (^2/_3)^4$ or $1 - ("q")^4$ M1	
			or 3 terms, with 2 correct M1	
			or 3 correct terms + 1 extra M1	
			or "p" + "qp" + "$q^2 p$" M1	
			or 1 – sum of 3 correct terms M1	
	= $^{19}/_{27}$ or 0.704 (3sfs)	A1 **3**	"p" means num value, not $^1/_3$	
(iii)	3	B1f **1**	or $^1/_{"p"}$	
(iv)	$1 - ^{19}/_{27}$ (1 – 0.7037) or 0.2963	M1	ft (b) for M1M1 must see method if ft	
	$(^8/_{27})^2$ x $^{19}/_{27}$ 0.2963^2 x 0.7037	M1	Allow figs rounded to 2 sfs for M1M1	
	= $^{1216}/_{19683}$ = 0.0618 (3 sfs)	A1 **3**	cao. allow art 0.0618 or 0.0617	
Total		**12**		

Total 72 marks