Note: "(3 sfs)" means "answer which rounds to ... to 3 sfs". If correct ans seen to ≥ 3sfs, ISW for later rounding
Penalise 2 sfs only once in paper.

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)	$\frac{7!}{3! \times 2(!)}$ = 420	M1M1 A1 **3**	M1: 7!/(a factorial); or … ÷ (3! x 2(!)) M1: all correct
(ii)	$\frac{5!}{2(!)}$ = 60	M1 A1 **2**	M1: 5! seen (not part of a C) or 5 x 4! or 120 seen or … ÷ 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 ${}^3C_2 / {}^7C_2 + {}^3C_1 \times {}^4C_1 / {}^7C_2$ $= {}^5/_7$ 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 ${}^3C_1 \times {}^4C_1 / {}^7C_2$ or add ≥ 5 out of 7 correct prods M1: all correct
Total		**8**	

4(i)	0.4207 or 0.421 (3 sfs) or $0.8^{25}+25x0.8^{24}x0.2 + .. {}^{25}C_4x0.4^{21}x0.2^4$ 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 - ${}^nC_0 \times 0.27^0 \times 0.73^n > 0.95$ 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)	$^1/_3 + {}^1/_4 + p + q = 1$ oe $0 \times {}^1/_3 + 1 \times {}^1/_4 + 2p + 3q = 1{}^1/_4$ oe equalize coeffs, eg mult eqn (i) by 2 or 3 Or make p or q subject of (i) or (ii) $p = {}^1/_4$, $q = {}^1/_6$ oe	B1 B1 M1 A1A1 **5**	 allow one error. ft their equns subst or subtr not nec'y
(ii)	Σx^2p (not /4 or /3 etc) $(= 2^3/_4)$ – $(1^1/_4)^2$ = 1.1875 or $1^3/_{16}$ oe sd = √(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 $\Sigma(x-1^1/_4)^2p$ (≥ 2 (non-0) terms correct): M2 ft (i) ($0 \leq p, q < 1$) or letters p, q both M1s cao dep 1st M1 &√(+ve no.) eg √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) $r_s = 1 - \frac{6\times 60}{7\times 48}$ $= -{}^{1}/_{14}$ or -0.071 (3 dps)	M1 A1 M1 M1 A1 **5**	$\geq$ 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)	Midpoints attempted ≥ 2 classes $\sum xf$ / 100 or $\sum xf$ / $\sum f$ attempted ≥ 2 terms *x* within class, not class width Mean = 27.2 (to 3 sfs) (not 27.25) art 27.2 from fully correct wking $\sum x^2 f$ or $\sum x - \bar{x})^2 f$ ≥ 2 terms $\sqrt{(\sum x^2 f /100 - \bar{x}^2)}$ or $\sqrt{((\sum x - \bar{x})^2 f /100)}$ or $/\sum f$ fully corr method, not √neg = 40.5 to 41.1 (3 sfs)	M1 M1 A1 M1 M1 A1 **6**	Correct (149.5) | With 150 | Tot = 2000 2720.5/100 | 2725/100 | Allow Ms & poss As 27.2 | 27.25 240702.25 | 242050 40.82 | 40.96 allow class widths for 2nd M1 only
(ii)	Recog LQ in 1st class & UQ in 3rd class Graph: Interp: Attempt 25(.25)th value LQ = 3.0 to 4.3 Attempt 75(.75)th value UQ =27 to 29 Subtract IQR = 23 or 24 or 25	B1 M1 M1 A1 **4**	 both nec'y dep B1or M1 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. Each attempt (or result or try) indep	B1 B1 **2**	In context. Not "events,. trials, outcomes" . Ignore extra
(ii)(a)	$(^2/_3)^3 \times {}^1/_3$ $= {}^8/_{81}$ or 0.0988 (3 sfs)	M2 A1 **3**	$(^2/_3)^2 \times {}^1/_3$ or $(^2/_3)^4 \times {}^1/_3$: allow other numerical "*p*" (0<*p*<1):M1
(b)	$(^2/_3)^3$ $1 - (^2/_3)^3$ $= {}^{19}/_{27}$ or 0.704 (3sfs)	M1 M1 A1 **3**	not $(^2/_3)^3 \times$ …. or $^1/_3 + {}^2/_3 \times {}^1/_3 + (^2/_3)^2 \times {}^1/_3$ M2 $1 - (^2/_3)^4$ or $1 - (\text{"}q\text{"})^4$ M1 or 3 terms, with 2 correct M1 or 3 correct terms + 1 extra M1 or "*p*" + "*qp*" + "q^2p" M1 or 1 – sum of 3 correct terms M1 "*p*" means num value, not $^1/_3$
(iii)	3	B1f **1**	or $^1/_{\text{"}p\text{"}}$
(iv)	$1 - {}^{19}/_{27}$ | (1 – 0.7037) or 0.2963 $(^8/_{27})^2 \times {}^{19}/_{27}$ | $0.2963^2 \times 0.7037$ $= {}^{1216}/_{19683}$ | = 0.0618 (3 sfs)	M1 M1 A1 **3**	ft (b) for M1M1 must see method if ft Allow figs rounded to 2 sfs for M1M1 cao. allow art 0.0618 or 0.0617
Total		**12**	

Total 72 marks