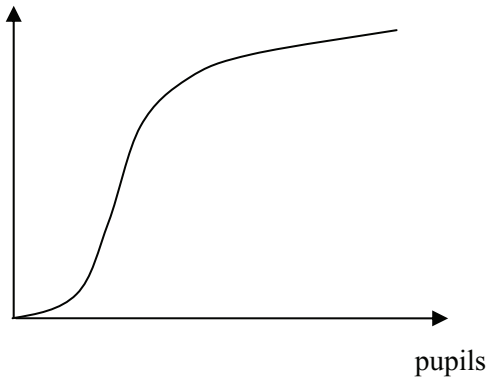
1	$18p = 2.7 \quad p = 0.15$ P(2, 3, 4) = $^{18}C_2 \times (0.15)^2(0.85)^{16} + {}^{18}C_3(0.15)^3(0.85)^{15}$ $+ {}^{18}C_4(0.15)^4(0.85)^{14}$ = 0.655	B1 M1 A1 A1 **[4]**	Correct value for p Summing 3 binomial probs o.e Correct unsimplified answer Correct answer
2	P(pencil case | find) = $\frac{P(\text{pencilcase and find})}{P(\text{find})} = \frac{0.7 \times 1}{0.7 + 0.3 \times 0.2}$ = 0.921	M1 A1 A1 A1 **[4]**	Attempt to use cond prob formula, must be quotient Correct num of a fraction Correct denominator Correct answer
3	**(i)** P(any other number) = 9/70 $P(X < 2) = 27/70 + 1/10$ = 34/70 (17/35) (0.486)	B1 B1ft **[2]**	9/70 Seen Ft their probs if < 1
	(ii) $E(X) = 108/70$ (54/35) (1.543) $\text{Var}(X) = ((-2)^2 + \ldots + 5^2) \times 9 / 70 - (54/35)^2$ = 5.33	M1 M1 A1 **[3]**	Valid attempt at $E(X)$ (needn't be accurate) Using a variance formula correctly with mean^2 subtracted numerically, no extra division Correct final answer
	(iii) $a = 1$	B1 **[1]**	
4	**(i)** Options 5 bat 5 bl 1 Wk in $^{10}C_5 \times {}^9C_5 \times {}^2C_1 = 63504$ ways or 5 bat 4 bl 2 Wk in $^{10}C_5 \times {}^9C_4 \times {}^2C_2 = 31752$ ways or 6 bat 4 bl 1 Wk in $^{10}C_6 \times {}^9C_4 \times {}^2C_1 = 52920$ ways Total = 148176 (148000)	M1 M1 A1 A1 **[4]**	Multiplying three combinations together Summing more than one sensible option Two options correct unsimplified Correct final answer
	(ii) $\frac{11!}{5!4!2!} = 6930$	B1 **[1]**	Correct answer evaluated
	(iii) Omit a pen $\frac{10!}{4!4!2!} = 3150$ Omit a diary $\frac{10!}{5!3!2!} = 2520$ Omit a notebook $\frac{10!}{5!4!} = 1260$ Total = 6930	M1 B1 A1 **[3]**	Summing three options One option correct Correct final answer

5 (a)	$z > \frac{2\mu - \mu}{\sigma} = \frac{\mu}{\sigma} = \frac{7\sigma^2}{3\sigma}$	M1	Standardising attempt resulting in $z >$ some μ/σ
	$\frac{7\sigma}{3} = 1.272$	M1 B1	Substituting to eliminate μ or σ 1.272 seen
	$\sigma = 0.545$ $\mu = 0.693$	A1 **[4]**	Both answers correct
(b)	$P(X < a + 33) = 0.75$ $z = 0.674$	M1 A1	Using 0.75 oe ± 0.674 seen
	$\frac{a + 33 - 33}{\sqrt{21}} = 0.674$	M1	Standardising, no cc, must have sq rt
	$a = 3.09$	A1 **[4]**	Correct answer
6 (i)		M1 M1 (Indpt)	Sensible attempt at graph using u.c.b. 2500 seen in median attempt on a CF graph Can be implied
	Median 270	A1 **[3]**	Correct answer + or – 5
(ii)	20% less than 160	M1 A1 **[2]**	Using 20% Correct answer + or – 5
(iii)	2100 – 1600 = 500	B1 **[1]**	
(iv)	(50.5 × 200 + 125.5 × 600 + 175.5 × 800 + 225.5 × 500 + 300.5 × 2000 + 400.5 × 600 + 525.5 × 300) / 5000 = 268	M1 M1 A1 A1 **[4]**	Using an attempt at mid-points Using an attempt at frequencies Correct mid-points or frequencies Correct answer only
7 (a) (i)	P(at least one 3) = 1 – P(no 3s) $= 1 - (5/6)^9$ = 0.806	 M1 A1 **[2]**	 Using 1 – none Correct answer
(ii)	P(at least 1 three) = $1 - (5/6)^n$ $1 - (5/6)^n > 0.9$ $n > 12.6$ $n = 13$	B1 M1 M1 A1 **[4]**	 Equation or inequality involving n and 0.9 Solving attempt of sensible equation, can be trial Correct answer
(b)	P(R wins his 1st ball) = P(GY) = 15/56 (0.268) P(R wins 2nd ball) = P(GGGY) = 3/28 P(R wins 3rd ball) = P(GGGGGY) $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6} \times \frac{2}{5} \times \frac{1}{4} \times \frac{3}{3} = 1/56$ P(R wins) = 11/28 (0.393)	M1 M1 M1 A1 **[4]**	Using P(GY) Attempt to find P(GGGY) or P(GGGGGY) Adding three options Correct answer