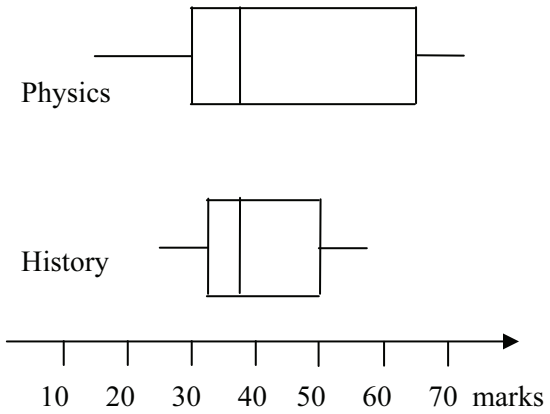
1	$\mu = 250 \times 0.86 = 215$	B1		250 × 0.86 and 250 × 0.86 × 0.14 seen o.e
	$\sigma^2 = 250 \times 0.86 \times 0.14 = 30.1$	M1		Standardising, with or without cc, must have sq rt in denom
	$P(X > 210) = 1 - \Phi\left(\frac{210.5 - 215}{\sqrt{30.1}}\right)$	M1		Continuity correction 210.5 or 209.5 only
	$= \Phi(0.820)$	M1		Correct region (> 0.5) ft their mean
	$= 0.794$	A1	[5]	Correct answer
2	**(i)** $133/n + 25 = 28.325$	M1		Equation involving 133, 25 and 28.325
	$n = 40$	A1		Correct answer for n
	$3762/40 - 3.325^2 = 82.99$	M1		Using coded mean in variance formula
	standard deviation = 9.11	A1	[4]	Correct answer
	(ii) $82.99 = \Sigma x^2/40 - 28.325^2$	M1		Using uncoded material in variance formula
	$\Sigma x^2 = (82.99 + 28.325^2) \times 40$			
	$= 35412$ (35400)	A1		Correct answer
	OR			
	$\Sigma(x - 25)^2 = \Sigma x^2 - 50\Sigma x + 40 \times 25^2$	M1		Expanding and substituting for Σx
	$\Sigma x^2 = 3762 + 50 \times 1133 + 25000$			
	$= 35412$	A1	[2]	Correct answer
3	**(i)** $P(X = 1) = P(GBBB)\ 4 \times {}_1C_1$	M1		Considering values of X of 1, 2, 3, 4
	$= 5/8 \times 3/7 \times 2/6 \times 1/5 \times 4 = 1/14$	M1		Attempting to find the probability of at least 2 values of X
	$P(X = 2) = P(GGBB) \times {}_4C_2 = 3/7$			
	$P(X = 3) = P(GGGB) \times {}_4C_3 = 3/7$	A1		One correct probability
	$P(X = 4) = P(GGGG) \times {}_4C_4 = 1/14$	A1		All correct
	OR			
	$P(1) = {}_5C_1 / {}_8C_4 = 1/14$	M1		Considering values of X of 1, 2, 3, 4
	$P(2) = {}_3C_2 \times {}_5C_2 / {}_8C_4 = 3/7$	M1		Dividing by ${}_8C_4$
	$P(3) = {}_3C_1 \times {}_5C_3 / {}_8C_4 = 3/7$	A1		One correct probability
	$P(4) = {}_5C_4 / {}_8C_4 = 1/14$	A1	[4]	All correct
	(ii) $\text{Var}(X) = 1/14 + 12/7 + 27/7 + 16/14 - (5/2)^2$	M1		Using a variance formula correctly with mean^2 subtracted numerically, no extra division
	$= 15/28$ (0.536)	A1	[2]	Correct final answer

4	**(i)**	History: lowest 27, highest 57, LQ = 33 med = 39 UQ = 50  	M1 [1]	Attempt to find history quartiles and median by putting in order or stem and leaf (can be implied if the answer is reasonable) Correct history median and quartiles Uniform scale and labels Correct history graph ft their quartiles line not through box Correct physics graph
	(ii)	Physics marks are more spread out than History marks	B1 [1]	Any sensible comment
5	**(i)**	$z = 1.882$ or 1.881	B1	± 1.882 or ± 1.881 seen
		$1.882 = (32 - 20) / \sigma$	M1	Equation using their z (must be a z-value) 32, 20 and s
		$\sigma = 6.38$	A1 [3]	Correct answer
	(ii)	$P(x > 13) = P\left(z > \frac{13-20}{6.376}\right)$	M1	Standardising
		$= P(z > -1.0978)$	M1	Correct area > 0.5
		$= 0.864$	A1 [3]	Correct answer
	(iii)	P(at least 2) = 1 – P(0, 1)	M1	Using 0.03 and 0.97 or 0.06 and 0.94 in a binomial expression powers summing to 7
		$= 1 - (0.97)^7 - (0.03)(0.97)^6{}_7C_1$	M1	Correct unsimplified binomial expansion
		$= 0.0171$	A1 [3]	Correct answer
6	**(a)**	**(i)** $\frac{12!}{2!3!2!} = 19958400$ (20,000,000)	M1 A1 [2]	Dividing by 2! 3! 2! Correct answer
		(ii) $\frac{4!}{2!} \times \frac{9!}{2!3!} = 362880$	B1 B1 B1 [3]	4! seen multiplied 9! or 9 × 8! seen multiplied Correct final answer
	(b)	**(i)** $3876 \times 4!$	M1	Multiplying by 4!
		$= 93024$	A1 [2]	Correct answer
		(ii) $(3!)^4 \times 4!$	M1	3! or 6 or 4! seen
		$= 31104$	A1 [2]	Correct final answer

7	**(i)**	P(2, N2, 2) = 1/4 × 1 × 1/7 = 1/28	M1		Considering at least two options of 2s and 8s
		P(8, 8, N8) = 1/4 × 2/5 × 3/7 = 3/70	M1		Considering three options for the 8s
		P(8, N8, 8) = 1/4 × 3/5 × 4/7 = 3/35	M1		Summing their options if more than 3 in total
		P(N8, 8, 8) = 3/4 × 2/5 × 4/7 = 6/35	B1		One option correct
		Σ = 47/140 (0.336)	A1	[5]	Correct answer
	(ii)	P(2, 2 given same) = $\frac{1/28}{47/140}$	M1		1/28 in numerator of a fraction
		= 5/47 (0.106)	A1	[2]	Correct answer
	(iii)	P(X) = 47/140	M1		Attempt to compare P(A and B) with P(A) × P(B) or using conditional probabilities
		P(Y) = 1/4			
		P(X and Y) = 1/28 ≠ 47/140 × 1/4	A1		Legitimate correct answer
		Not independent		[2]	