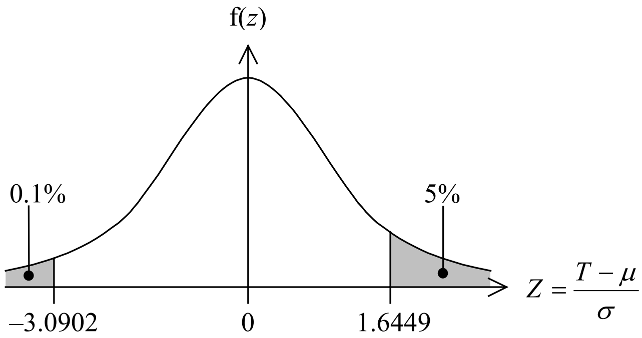
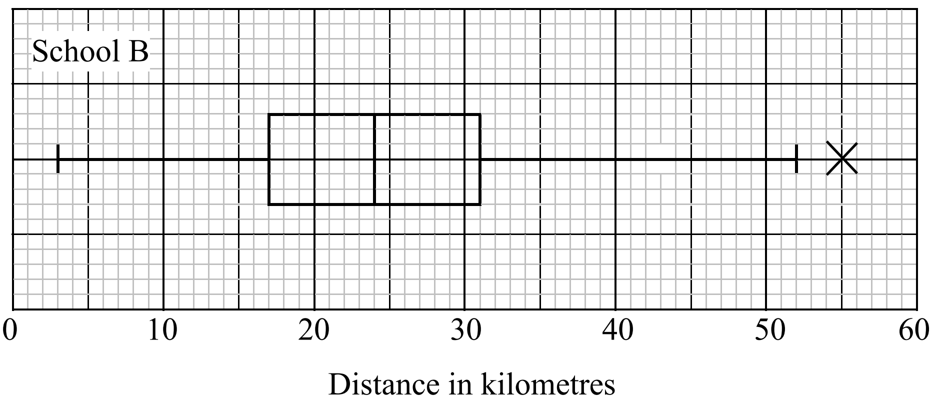
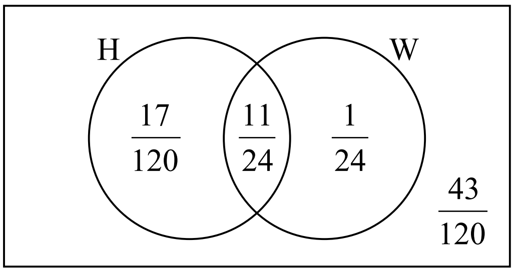
Question Number	Scheme		Marks
1. (*a*)	A statistical process devised to describe or make predictions about the expected behaviour of a real-world problem.		B1 B1 (2)
(*b*) (i)	The number showing on the uppermost side of a die after it has been rolled.		B1
(ii)	The height of adult males.		B1 (2)
			(4 marks)
2.			
	$P(T > 55) = 0.05$		
	$\therefore P\left(Z > \frac{55 - \mu}{\sigma}\right) = 0.05$	1.6449	B1
		Standardising	M1
	$\Rightarrow \frac{55-\mu}{\sigma} = 1.6449$	Completely correct	A1
	$P\ (T < 10) = 0.001$		
	$\therefore P\left(Z < \frac{10 - \mu}{\sigma}\right) = 0.001$	−3.0902	B1
	$\Rightarrow \frac{10-\mu}{\sigma} = -3.0902$	Standardising	M1
		Completely correct	A1
	$\therefore 55 - \mu = 1.6449\sigma$		
	$10 - \mu = -3.0902\sigma$	Attempt to solve	M1
	$\therefore \mu = 39.368$	$\mu = 39.4$	A1
	$\sigma = 9.5035$	$\sigma = 9.50$	A1 (9)
			(9 marks)

Question Number	Scheme	Marks
3. (*a*)	$k\,(1 + 2 + 3 + 4 + 5) = 1$ Use of $\sum \mathrm{P}(X = x) = 1$	M1 A1
	$\Rightarrow k = \underline{\dfrac{1}{15}}$ *	A1 (3)
(*b*)	$\mathrm{E}(X) = \dfrac{1}{15}\{1 + 2 \times 2 + \ldots + 5 \times 5\}$ Use of $\mathrm{E}(X) = \sum x\mathrm{P}(X = x)$	M1 A1
	$= 15$	A1
	$\therefore \mathrm{E}(2X + 3) = 2\mathrm{E}(X) + 3$	M1
	$= \dfrac{31}{3}$	A1 ft (5)
(*c*)	$\mathrm{E}(X^2) = \dfrac{1}{15}\{1 + 2^2 \times 2 + \ldots + 5^2 \times 5\}$ Use of $\mathrm{E}(X^2) = \sum x^2\mathrm{P}(X = x)$	M1
	$= 15$	A1
	$\mathrm{Var}(X) = 15 - \left(\dfrac{11}{3}\right)^2$ Use of $\mathrm{Var}(X) = \mathrm{E}(X^2) - [\mathrm{E}(X)]^2$	M1
	$= \underline{\dfrac{14}{9}}$	A1
	$\mathrm{Var}(2X - 4) = 4\,\mathrm{Var}(X)$ Use of $\mathrm{Var}(aX) = a^2\mathrm{Var}(X)$	M1
	$= \underline{\dfrac{56}{9}}$	A1 ft (6)
		(14 marks)

Question Number	Scheme		Marks
4. (*a*)	$b = \dfrac{15 \times 484 - 143 \times 391}{15 \times 2413 - (143)^2}$		M1 A1
	$= -3.0899$	AWRT –3.09	A1
	$a = \dfrac{391}{15} - (-3.0899)\left(\dfrac{143}{15}\right)$		M1 A1
	$= 55.5237$	AWRT 55.5	A1
	$\therefore\ y = 55.52 - 3.09x$		B1 ft
	$\therefore\ h - 100 = 55.52 - 3.09(s - 20)$		M1 A1 ft
	$\therefore\ h = 217.32 - 3.09s$	AWRT 217; 3.09	A1 (10)
(*b*)	For every extra revolution/minute the life of the drill is reduced by 3 hours.		B1 B1 (2)
(*c*)	$s = 30 \Rightarrow h = 124.6$	AWRT 125	M1 A1 ft (2)
			(14 marks)

Question Number	Scheme	Marks
5. (*a*)	Advantages: Uses central 50% of the data	
	Not affected by extreme values (outliers)	
	Provide an alternative measure of spread to the variance/standard deviation, i.e. IQR/STQR	
	Disadvantages: Not always a simple calculation, e.g. interpolation for a grouped frequency distribution	
	Different measures of calculation – no single argued method	
	Does not use all the data directly	
	Any 4 sensible comments – at least one advantage and one disadvantage	B1 B1 B1 B1 (4)
(*b*)	Indicates maximum/minimum observations and possible outliers	
	Indicates relative positions of the quartiles	
	Indicates skewness	
	When plotted on the same scale enables comparisons of distributions	
	Any 4 sensible comments	B1 B1 B1 (3)
(*c*)	$Q_1 - 1.5(Q_3 - Q_1) = -4 \Rightarrow$ no outlier below lower quartile	B1
	$Q_2 + 1.5(Q_3 - Q_1) = 52 \Rightarrow$ an outlier (55) above upper quartile	B1
		
	Same scale and label	B1
	Q_1, Q_2, Q_3, 3, 52	B1
	55	B1 (3)
	continued over…	

Question Number	Scheme	Marks
5. (*d*)	A: $Q_3 - Q_2 = 10$; $Q_2 - Q_1 = 10 \Rightarrow$ symmetrical B: $Q_3 - Q_2 = 7$; $Q_2 - Q_1 = 7 \Rightarrow$ symmetrical both distributions are symmetrical	
	Median B (24) > Median A (22) $\Rightarrow$ on average teachers in B travel slightly further to school than those in A	
	Range of B is greater than that of A	
	25% of teachers in A travel 12 km or less compared with 25% of teachers in B who travel 17 km or less	
	50% of teachers in A travel between 12 km and 32 km as compared with 17 km and 31 km for B	
	Any 4 sensible comments	B1 B1 B1 B1 (4)
		(16 marks)

Question Number	Scheme	Marks
6. (a)	$P(H \cap W) = P(H \mid W)P(W)$	M1
	$= \frac{11}{12} \times \frac{1}{2} = \underline{\frac{11}{24}}$ *	A1 (2)
(b)		
	Diagram	M1
	$H \cap W'$	M1 A1
	$H' \cap W$	A1
	$H \cap W$	B1 (5)
(c)	P (only one has a degree) $= \frac{17}{120} + \frac{1}{24} = \frac{11}{60}$	M1 A1 (2)
(d)	P (neither has a degree) $= 1 - \left\{\frac{17}{120} + \frac{11}{24} + \frac{1}{24}\right\}$	M1 A1
	$= \underline{\frac{43}{120}}$	A1 (3)
(e)	Possibilities Any one	B1
	$-(HW')(H'W); (H'W)(HW'); (HW)(H'W'); (H'W')(HW)$ All correct	B1
	$\therefore$ P (only 1 H or 1 W) $= \left(2 \times \frac{17}{120} \times \frac{1}{24}\right) + \left(2 \times \frac{11}{24} \times \frac{43}{120}\right)$ $2 \times \frac{17}{120} \times \frac{1}{24}$	B1 ft
	$= \underline{\frac{49}{144}}$ $2 \times \frac{11}{24} \times \frac{43}{120}$	B1 ft
	Adding their probabilities	M1
	$\frac{49}{144}$	A1 (6)
		(18 marks)