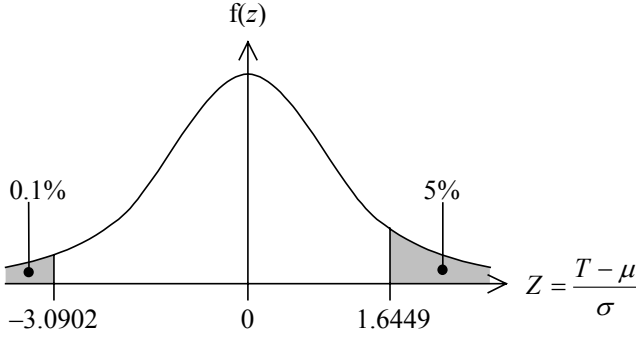
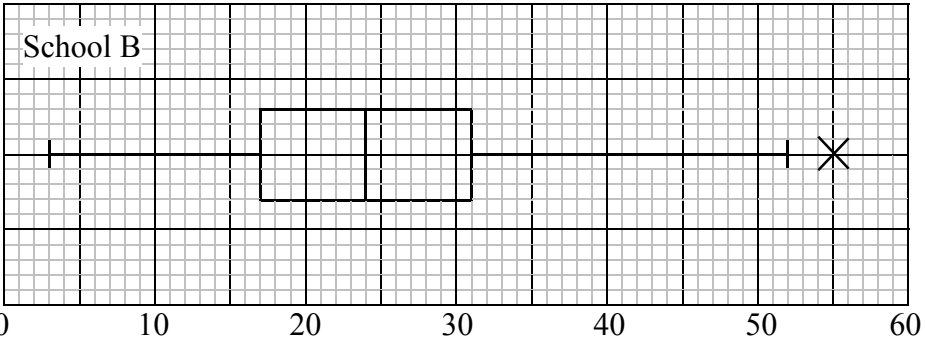


Question Number	Scheme	Marks
<p>1. (a)</p> <p>(b) (i)</p> <p>(ii)</p>	<p>A statistical process devised to describe or make predictions about the expected behaviour of a real-world problem.</p> <p>The number showing on the uppermost side of a die after it has been rolled.</p> <p>The height of adult males.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

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

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

Question Number	Scheme	Marks
<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>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</p> <p>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</p> <p>Any 4 sensible comments – at least one advantage and one disadvantage</p> <p>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</p> <p>$Q_1 - 1.5(Q_3 - Q_1) = -4 \Rightarrow$ no outlier below lower quartile $Q_2 + 1.5(Q_3 - Q_1) = 52 \Rightarrow$ an outlier (55) above upper quartile</p> <div style="text-align: center;">  <p style="text-align: center;">Distance in kilometres</p> </div> <p style="text-align: right;">Same scale and label Q₁, Q₂, Q₃, 3, 52 55</p> <p><i>continued over...</i></p>	<p>B1 B1 B1 B1 (4)</p> <p>B1 B1 B1 (3)</p> <p>B1</p> <p>B1</p> <p>B1 B1 B1 (3)</p>

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

Question Number	Scheme	Marks
<p>6.</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> <p>(e)</p>	<p>$P(H \cap W) = P(H W)P(W)$</p> <p>$= \frac{11}{12} \times \frac{1}{2} = \frac{11}{24}$ *</p> <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 10px auto;"> </div> <p>$P(\text{only one has a degree}) = \frac{17}{120} + \frac{1}{24} = \frac{11}{60}$</p> <p>$P(\text{neither has a degree}) = 1 - \left\{ \frac{17}{120} + \frac{11}{24} + \frac{1}{24} \right\}$</p> <p>$= \frac{43}{120}$</p> <p>Possibilities $-(HW')(H'W); (H'W)(HW'); (HW)(H'W'); (H'W')(HW)$</p> <p>$\therefore P(\text{only 1 H or 1 W}) = \left(2 \times \frac{17}{120} \times \frac{1}{24} \right) + \left(2 \times \frac{11}{24} \times \frac{43}{120} \right)$</p> <p>$= \frac{49}{144}$</p>	<p>M1</p> <p>A1 (2)</p> <p>Diagram M1</p> <p>$H \cap W'$ M1 A1</p> <p>$H' \cap W$ A1</p> <p>$H \cap W$ B1 (5)</p> <p>M1 A1 (2)</p> <p>M1 A1</p> <p>A1 (3)</p> <p>Any one B1</p> <p>All correct B1</p> <p>$2 \times \frac{17}{120} \times \frac{1}{24}$ B1 ft</p> <p>$2 \times \frac{11}{24} \times \frac{43}{120}$ B1 ft</p> <p>Adding their probabilities M1</p> <p>$\frac{49}{144}$ A1 (6)</p> <p>(18 marks)</p>