# Statistics Solutions

## A)

(a) $\bar{x} = \frac{1+1+1+2+5}{5} = \frac{10}{5} = 2$

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 1 | -1 | 1 |
| 1 | -1 | 1 |
| 1 | -1 | 1 |
| 2 | 0 | 0 |
| 5 | 3 | 9 |
| $n=5$ | | $12 = \Sigma(x-\bar{x})^2$ |

$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = \sqrt{\frac{12}{5-1}} = \sqrt{\frac{12}{4}} = \underline{\sqrt{3}}$

(b) Standard deviation $= \sqrt{3}$ because distance between each of the numbers is the same.

## B)

(a) (i) $\frac{17+22+25+16+21+16+16}{7} = \frac{133}{7} = 19 = \bar{x}$

(ii)

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 16 | -3 | 9 |
| 16 | -3 | 9 |
| 16 | -3 | 9 |
| 17 | -2 | 4 |
| 21 | 2 | 4 |
| 22 | 3 | 9 |
| 25 | 6 | 36 |
| $n=7$ | | $\Sigma(x-\bar{x})^2 = 80$ |

$s = \sqrt{\frac{80}{7-1}} = \sqrt{\frac{80}{6}} = \sqrt{13.\dot{3}} = \underline{3.65}$

(b) The conditions are likely to result in the best growth because the mean is 19 which is within $(20 \pm 5)°C$ and the standard deviation is 3.65 which is $1.35 < 5$.

## C)

(a) (i) $\frac{19+21+23+21+19+20}{6} = \frac{123}{6} = 20.5$

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 19 | -1.5 | 2.25 |
| 19 | -1.5 | 2.25 |
| 20 | -0.5 | 0.25 |
| 21 | 0.5 | 0.25 |
| 21 | 0.5 | 0.25 |
| 23 | 2.5 | 6.25 |
| $n=6$ | | $\Sigma(x-\bar{x})^2 = 11.5$ |

$s = \sqrt{\frac{11.5}{6-1}} = \sqrt{\frac{11.5}{5}} = \sqrt{2.3} = \underline{1.52 = s}$

(b) The system is operating effectively because the mean is 20.5 °C which lies within $(20 \pm 0.6)°C$ and the s.d is 1.52 which is 0.48 less than 2°C.

D) p(Less than 7) = 1 (D)

E) (a)(i) mean $\bar{x} = \frac{15+18+14+17+16+19}{6} = \frac{99}{6} = 16.5$

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 14 | -2.5 | 6.25 |
| 15 | -1.5 | 2.25 |
| 16 | -0.5 | 0.25 |
| 17 | 0.5 | 0.25 |
| 18 | 1.5 | 2.25 |
| 19 | 2.5 | 6.25 |

$n=6$

$\Sigma(x-\bar{x})^2 = 17.5$

$s = \sqrt{\frac{17.5}{6-1}} = \sqrt{\frac{17.5}{5}} = \sqrt{3.5} = \underline{1.87 = s}$

(b) (i) Mean $= \frac{123}{6} = 20.5$

(ii) standard deviation = 1.87 again because gaps between numbers hasn't changed.

F) (a)

| $x$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 395 | -5 | 25 |
| 400 | 0 | 0 |
| 408 | 8 | 64 |
| 390 | -10 | 100 |
| 405 | 5 | 25 |
| 402 | 2 | 4 |
| | | 218 |

$s = \sqrt{\frac{218}{6-1}} = \sqrt{\frac{218}{5}} = \sqrt{43.6} = 6.6 = s$

(b) The new methods are successful as the mean weight hasn't changed but the s.d has fallen by 0.8 grams showing more consistency among the weights.

G) (a) Equation of line of best fit

$\Rightarrow \overset{x_1\ \ y_1}{(5, 110)} \quad \overset{x_2\ \ y_2}{(15, 70)}$

$M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{70-110}{15-5} = \frac{-40}{10} = -4$

y-intercept = 130

Equation $y = Mx + c$
$y = -4x + 130$

$U = -4T + 130$

(b) $U = -4(30) + 130$
$U = -120 + 130$
$\underline{U = 10}$

H) (a) $\bar{x} = 10 + 18 + 26 + 32 + 49 = \frac{135}{5} = 27$

| $x$ | $x - \bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|
| 10 | -17 | 289 |
| 18 | -9 | 81 |
| 26 | -1 | 1 |
| 32 | 5 | 25 |
| 49 | 22 | 484 |
| | | $880 = \Sigma(x-\bar{x})^2$ |

$n = 5$

$s = \sqrt{\frac{880}{5-1}} = \sqrt{\frac{880}{4}} = \sqrt{220} = 14.83 = s$

(b) The s.d for the maths results was much higher then the s.d for the physics which means that the marks in the physics test were much closer together then the maths results.

(c) Equation of line of best fit:

$\underset{x_1\ y_1}{(10, 25)}$ $\underset{x_2\ y_2}{(40, 40)}$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{40-25}{40-10} = \frac{15}{30} = \frac{1}{2}$

$y$ - intercept $= 20$

$\Rightarrow y = \frac{1}{2}x + 20$

$P = \frac{1}{2}M + 20$

(d) $P = \frac{1}{2}(76) + 20$

$= 38 + 20$

$P = 58$

They would probably get 58% in the Physics test.

I) (a)

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Red | R,1 | R,2 | R,3 | R,4 | R,5 |
| Yellow | Y,1 | Y,2 | Y,3 | Y,4 | Y,5 |
| Blue | B,1 | B,2 | B,3 | B,4 | B,5 |
| Green | G,1 | G,2 | G,3 | G,4 | G,5 |

(b) $\frac{2}{20} = \frac{1}{10}$

J) P(Girl wearing a blazer) = $\frac{29}{100}$