REG-DISP-2425-ASM-SET 3-MATH
Suggested solutions

Conventional Questions

1. (a) $57 = \dfrac{41 + 47 + \ldots + (70 + a)}{12}$ 1M

$a = 5$ 1A

(b) Range $= 75 - 41 = 34$ kg 1A

Interquartile range $= 66 - 49.5 = 16.5$ kg 1A

Standard deviation ≈ 10.7 kg 1A

2. (a) Median = 4 1A

Inter-quartile range $= 6 - 2$

$= 4$ 1A

Standard deviation ≈ 1.99 1A

(b) (i) 8 1A

(ii) 31 1A

3. (a) $(80 + c) - (40 + a) = 39$ 1M

$c - a = -1$

$62.5(20) = (40 + a) + (40 + b) + 45 + \ldots + (80 + c)$ 1M

$a + b + c = 14$

Adding two equations, we have $b + 2c = 13$. As b and c are integers, we have b is odd.

Note that $0 \le b \le 5$. 1M

Thus, $a = 5$, $b = 5$ and $c = 4$. 1A

(b) Interquartile range $= 74.5 - 53.5 = 21$ words per minute 1M+1A

Standard deviation ≈ 12.2 word per minute 1A

4. (a) Median $= 31 = 30 + b$

$b = 1$ 1A

$14 = 36 - (20 + a)$ 1M

$a = 2$ 1A

(b) (i) Original mode = 36, correspond to a frequency of 4.

The second highest frequency is 2.

Upon the leaving of any player, the frequency of datum 36 is at least 3. 1M

Thus, the new mode is still 36.

There is no change. 1A

(ii) The range is decreased only when the youngest play or the oldest player leaves the team, 1M

which results in standard deviations 7.16 and 7.13 respectively.

Greatest possible standard deviation is 7.16. 1A

5. (a) (i) Mode = 39

Thus, $a = b = 9$. 1A

(ii) $\dfrac{(50 + c) + 51}{2} - \dfrac{(30 + d) + 30}{2} = 21$ 1M

$c - d = 1$

Range $= (60 + d) - (20 + c)$

$= 40 - (c - d)$

$= 39$ 1A

(b) Mean $= \dfrac{(20 + c) + 25 + 26 + \ldots + (60 + d)}{20}$ 1M

$= \dfrac{830 + 2(c + d)}{20}$

Since $c - d = 1$, $1 \le c \le 5$ and $2 \le d \le 5$, we have $3 \le c + d \le 9$. 1M

$\dfrac{830 + 2(3)}{20} = 41.8 \le \text{mean} \le \dfrac{830 + 2(9)}{20} = 42.4$

Thus, mean = 42 and $c + d = 5$. 1A

Solving, we have $c = 3$ and $d = 2$.

Standard deviation ≈ 11.9 1A

6. (a) 2A+2A

Score x	**Class mark**	**Frequency**
$40 < x \le 50$	45	20
$50 < x \le 60$	55	50
$60 < x \le 70$	65	10
$70 < x \le 80$	75	0
$80 < x \le 90$	85	30
$90 < x \le 100$	95	10

(b) Standard deviation ≈ 16.8 1A

(c) Required probability $= \dfrac{20}{80}$ 1M

$= \dfrac{1}{4}$ 1A

7. (a) Let $\overline{x}$ and σ be the mean and standard deviation of all scores respectively.

$$\begin{cases} \dfrac{58 - \overline{x}}{\sigma} = -0.8 \\ \dfrac{71 - \overline{x}}{\sigma} = 1.8 \end{cases}$$ 1M

Solving, we have $\overline{x} = 62$ and $\sigma = 5$. 1A+1A

(b) Score of Leo $= 62 + (-0.3)(5) = 60.5 > 60$ 1A

The claim is agreed. 1A

8. (a) $1.5 = \dfrac{60 - x}{6}$ 1M

$x = 51$ 1A

(b) Standard score of Cindy in Mathematics test $= \dfrac{70 - 50}{15}$

$= \dfrac{4}{3} < 1.5$ 1M

The claim is disagreed. 1A

9. (a) Let μ marks and σ marks be the mean and the standard deviation of the distribution respectively.

$$\begin{cases} \dfrac{90 - \mu}{\sigma} = 3 \\ \dfrac{65 - \mu}{\sigma} = 0.5 \end{cases}$$ 1M

Solving, we have $\mu = 60$ and $\sigma = 10$. 1A

The mean of the distribution is 60 marks.

(b) The median (55 marks) is lower than the mean (60 marks). 1M

The claim is agreed. 1A

10. (a) It could happen that the 18th and the 19th students got 50 marks that make up the median 50 marks. 1M

The probability is therefore greater than 0.5. So, the claim is disagreed. 1A

(b) Standard score of Peter relative to boys $= \dfrac{48 - 52}{12} = -\dfrac{1}{3}$

Standard score of Mary relative to girls $= \dfrac{48 - 52}{10} = -\dfrac{2}{5} < -\dfrac{1}{3}$ 1M

The claim is agreed. 1A

11. (a) $y = 7$ 1A

$67 - \dfrac{1}{2}[(40 + x) + 51] = 18$

$x = 7$ 1A

(b) Mean $= \dfrac{34 + 35 + \ldots + 83}{20}$

$= 58$

Standard deviation $= \sigma \approx 13.5$

Required standard score $= \dfrac{62 - 58}{\sigma}$ 1M

≈ 0.296 1A

(c) Sum of the two deleted data $= 58 \times 2 = 116$

The only possible set of deleted data is $\{42, 74\}$. 1M

In this case, new standard deviation is 13.2, which is lower than the original standard deviation.

The new mean is also 58.

Thus, the new standard score increases. 1M

The claim is disagreed. 1A

END OF PAPER