**Making it fair**

**In-class investigation**

**Solutions and marking key**

**Question 1**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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| (a) Solution  **Science marks for Classes 8.1 and 8.2 (out of 50)**   |  |  |  | | --- | --- | --- | | **Statistic** | **Class 8.1** | **Class 8.2** | | Range | 28 | 26 | | Inter-quartile range | 9 | 7 | | | | |
| Marking key/mathematical behaviours | | | Marks |
| * Calculates the range * Calculates interquartile range | | | 1  1 |
|  | Solution | Marking key/mathematical behaviours | Marks |
| (b) | Class 8.1  Mean is higher i.e.,33.76 cf 25.16 | * Determines better performance * Justifies selection by comparing a summary statistic | 1  1 |
| (c) | They could have earned more marks in the extra time | * Provides fair reason for adjustment | 1 |
| (d) | If all the students had already finished | * Provides valid reason not to adjust | 1 |

**Question 2**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | The decrease needs to be proportional to the achievement  The loss affects some more than others with respect to % scores | * Identifies differentiated effect on students. | 1 |
| (b) | Contains sufficient number of students  Good variation within sample | * Identifies one or two features of representative samples | 1  1 |
| (c) | Yes. She goes from 40% to 50%. | * Provides valid reason to explain impact on Ria | 1 |

**Question 3**

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|  | Solution | Marking key/mathematical behaviours | Marks |
| (a) | The test allowed a mark a minute and 10 minutes could give 10 marks. | * Relates 10 to test time | 1 |
| (b) | Tom 51, Don 25, Sam 35, Ria 30, Fay 37 | * Adds 10 to original scores | 1 |

**Question 3 (cont’d)**

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| --- | --- | --- | --- |
| (c) | Range = 26  Interquartile range = 7  Mean = 35.16 | * Calculates each statistic accurately | 3 |
| (d) | Tom is over 100%  It is unlikely that all students would have got 10 marks in the remaining time – the harder questions may have been at the end. | * States two reasons to explain why adding 10 is inappropriate | 2 |

**Question 4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| (a) Solution   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Student | Tom | Don | Sam | Ria | Fay | | Original mark | 41 | 15 | 25 | 20 | 27 | | One fifth of original mark | 8.2 | 3 | 5 | 4 | 5.4 | | Adjusted mark | 49.2 | 18 | 30 | 24 | 32.4 | | Round to the nearest whole number | 49 | 18 | 30 | 24 | 32 | | |
| Marking key/mathematical behaviours | Marks |
| * Calculates one fifth of originals * Adds on one fifth * Rounds to whole number | 1  1 |

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|  | Solution | Marking key/mathematical behaviours |  |
| (b) | Range = 31.2 (or 31)  Interquartile range = 8.4 | * Calculates range * Calculates interquartile range | 1  1 |
| (c) | The increase varies according to student performance  Proportion of time lacking to do test is considered | * States two reasons to explain why adding a fifth is better than adding 10 | 2 |

**Question 5**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| (a) Solution   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Student | Tom | Don | Sam | Ria | Fay | | Original mark | 41 | 15 | 25 | 20 | 27 | | Multiply by 1.25 to get new score | 51.25 | 18.75 | 31.25 | 25 | 33.75 | | Gain in marks | 10.25 | 3.75 | 6.25 | 5 | 6.75 | | Round new score to nearest whole number | 51 | 19 | 31 | 25 | 34 | | |
| Marking key/mathematical behaviours | Marks |
| * Multiplies by 1.25 accurately * Determine increase in marks * Rounds correctly to nearest whole number | 1  1  1 |

**Question 5 (cont’d)**

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|  | Solution | Marking key/mathematical behaviours |  |
| (b) | 32.5 | * Calculates range of new scores | 1 |
| (c) | No. Tom gets 49.2 when a fifth is added and 51.25 when original score is multiplied by 1.25 | * Explains why the effect is different or provides example to justify | 1 |
| (d) | Don, Ria, Sam, Fay, Tom | * Provides student in ascending order of original marks | 1 |
| (e) | Don, Ria, Sam, Fay, Tom | * Provides student in ascending order of gain from original marks | 1 |
| (f) | The lists are the same because the increase is proportional to the original marks. | * Compares lists and justifies | 1 |
| (g) | Multiplying by 1.25  Assuming 50 marks in 50 minutes then in 40 minutes to get 50 marks you need to multiply by 1.25. Adding on one fifth ony gives 48 | * Identifies correct method * Gives mathematical argument for the method | 1  1 |

**Question 6**

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|  | Solution | Marking key/mathematical behaviours | |  |
| (a) | 844 | | * Determines class total | 1 |
| (b) | 629 | | * Determines class total | 1 |
| (c) | (i) 33.76 – 25.16  (ii) (844-629)÷ 25 | | * Recognises both methods to determine change in mean | 1  1 |
| (d) | Tom Don  Original 41 15  Marks added 8.6 8.6  % increase 21% 57% | | * Complete table with known values * Calculates % increase for Tom * Calculates % increase for Don | 1  1  1 |
| (e) | Median = 25 + 8.6 = 33.6  IQR = 35.6 – 28.6 = 7 | | * Calculates median * Calculates IQR | 1  1 |
| (f) | No. The % gain is much higher for Don than Tom | | * Concludes that the process is unfair and justifies conclusion | 1 |

**Question 7**

Solution

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| Process  Student | Original marks | Add 10 to original marks | Add a fifth of the original marks | Multiply original marks by 1.25 | Add 8.6 to original marks | |
| Tom | 41 | 51 | 49 | 51 | 50 | |
| Don | 15 | 25 | 18 | 19 | 24 | |
| Sam | 25 | 35 | 30 | 31 | 34 | |
| Ria | 20 | 30 | 24 | 25 | 29 | |
| Fay | 27 | 37 | 32 | 34 | 36 | |
| Marking key/mathematical behaviours | | | | | | Marks |
| * Copies all data from earlier questions accurately * Identifies best option is add 10 for all students * Identifies worst option is adding a fifth for all students | | | | | | 2  1  1 |