SHARP

Worksheet 14 Memorandum – Statistics

Grade 10 – Mathematics

1. a) **mean:** The average of the observations / scores. All the scores are added together and divided by the total number of scores to find the average.

   b) **range:** The range is difference between the biggest and smallest score or observation. In other words range is the biggest score minus the smallest score.

   c) **mode:** The score or observation that happens the most.

   d) **median:** The score or observation that is in the centre of all the scores or observations. It is the score in the exact middle of the data.

   e) **quartile:** A quartile represents the score or observation that marks one quarter of the data. In other words, it is the score that is halfway between the median and either the lowest (first quartile) or highest (third quartile) score. (Remember that the median is the second quartile)

   f) **interquartile range:** Is the difference between the first and third quartile, or it is the third quartile minus the first quartile.

   g) **maximum:** The biggest score in the data.

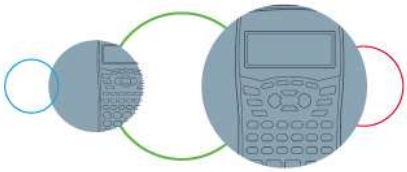
   h) **percentile:** Just as a quartile measures a quarter of the data, a percentile shows the score at a certain percentage of the data. For example, the median is the 50^{th} percentile – it represents 50% of the data.

   i) **population:** Is the entire collection of all the possible observations, for example all the zebras in Africa would be a population, or all the people in South Africa.

   j) **sample:** A sample is a small group taken from the population and tested, scored or observed, for example – interviewing every 1000^{th} person in South Africa.

2.

4	13	19	21	28	29	34	42	48	50	52	52	54
56	58	58	58	61	63	63	63	65	66	67	69	72
72	74	76	81	87								



a) $mean = \frac{sum\ of\ all\ scores}{total\ number\ of\ scores}$

$\therefore mean = \frac{87+74+76+21+65+29+28+13+63+56+58+54+19+63+66+52+4+72+34+69+58+42+50+52+48+67+63+72+58+81+61}{31}$

$\therefore mean = \frac{1655}{31}$

$\therefore mean = 53.39$

b) 2

c) Range = biggest – smallest

Range = 87 – 4 = 83

d) Position= $\frac{n+1}{2} = \frac{31+1}{2} = 16$

$\therefore$ Median = 58 Mode = 58 and 63

e) Q1 Position $= \frac{n+1}{4} = \frac{31+1}{4} = 8$

$\therefore$ Q1 = 42

Q3 Position $= \frac{3(n+1)}{4} = \frac{3(31+1)}{4} = 24$

$\therefore$ Q3 = 67

f) IQR = Q3 – Q1 = 67 – 42 = 25

g) 12

h) Position $= \frac{40(n+1)}{100} = \frac{40(31+1)}{10} = 12.8 \approx 13$

$\therefore$ 40th Percentile = 54

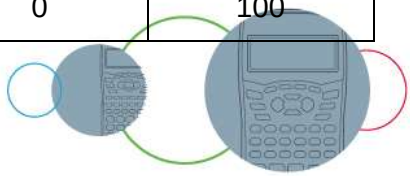
i) Position $= \frac{60(n+1)}{100} = \frac{60(31+1)}{10} = 19.2 \approx 19$

$\therefore$ 60th Percentile = 63

j) The test seemed to be a fair to easy test. The average is 53% while the 40th percentile is 54, this means that more than 60% of the students got more than the average score.

3.

Rating	Frequency	Cumulative Frequency	Rating	Frequency	Cumulative Frequency
1	3	3	6	18	56
2	6	9	7	17	73
3	8	17	8	15	88
4	9	26	9	12	100
5	12	38	10	0	100



a) mode: 6

b) Median Position $= \frac{n+1}{2} = \frac{100+1}{2} = 50.5$ ∴ Median = 6

Q1 Position $= \frac{n+1}{4} = \frac{100+1}{4} = 25.25$ ∴ Q1 = 4

Q3 Position $= \frac{3(n+1)}{4} = \frac{3(100+1)}{4} = 75.75$ ∴ Q3 = 8

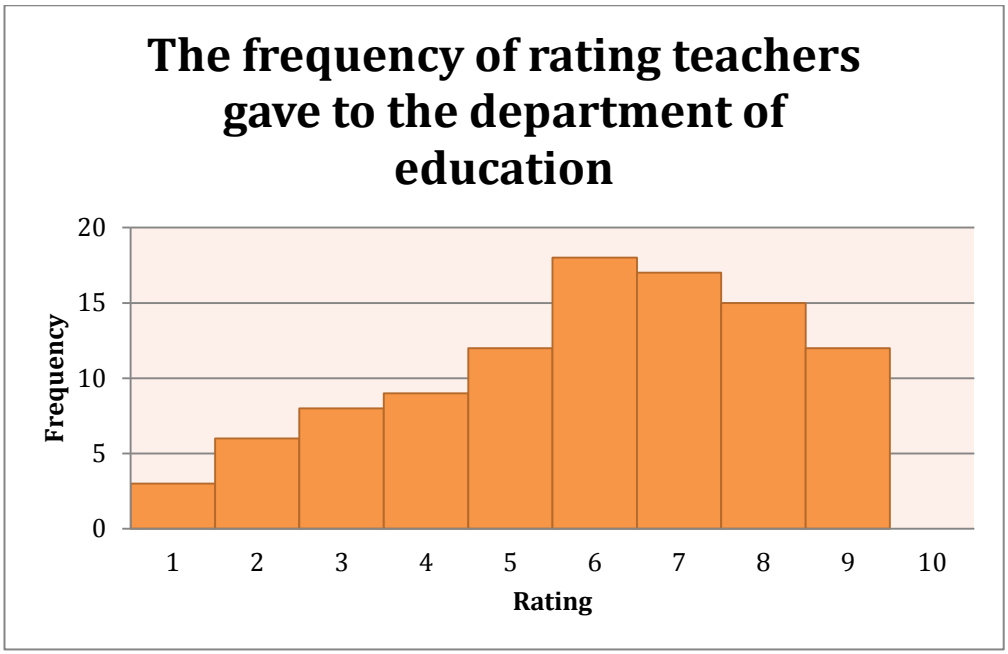
c) $Mean = \frac{1(3)+2(6)+3(8)+4(9)+5(12)+6(18)+7(17)+8(15)+9(12)+10(0)}{100}$

$mean = \frac{3+12+24+36+60+108+119+120+108+0}{100}$

$mean = \frac{590}{100}$

$\therefore mean = 5.9$

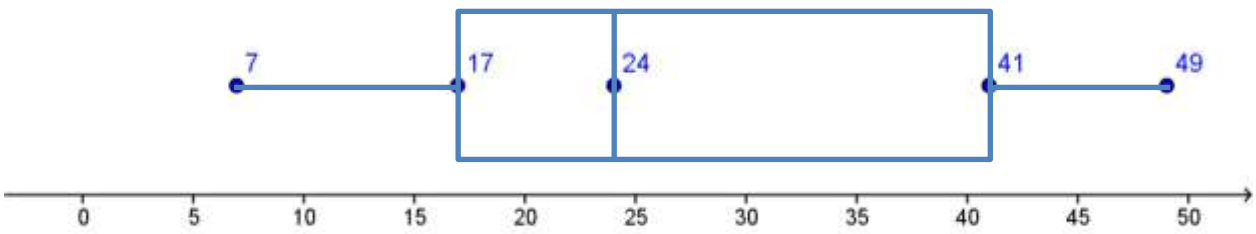
d)



e) Range = biggest – smallest = 9 – 1 = 8

IQR = Q3 – Q1 = 8 – 4 = 4

4.



a) Range = biggest – smallest = 49 – 7 = 42

b) IQR = Q3 – Q1 = 41 – 17 = 24

c) Between 24 and 41 is 25% of the data.

$\therefore$ 25% of $20 = 20 \times \frac{25}{100} = 5$

$\therefore$ Danielle got 5 scores between 24 and 41.

d) Between 17 and 41 is 50% of the data.

$\therefore$ 50% of $20 = 20 \times \frac{50}{100} = 10$

$\therefore$ Danielle got 10 scores between 17 and 41.

e) Danielle's lower scores are all closer together while her scores above 24 are much further spread out.

f) That her dancing has improved and that she got 5 scores between 41 and 49.

g) 5 competitions (25% of the competitions she entered).

5. a)

Mark Obtained	Midpoint	Tally	Frequency	Cumulative Frequency
$0 < x \leq 5$	2.5	|||| ||	7	7
$5 < x \leq 10$	7.5	|||	3	10
$10 < x \leq 15$	12.5	|||| |||	8	18
$15 < x \leq 20$	17.5	|||| ||	7	25
$20 < x \leq 25$	22.5	|||| |||| ||||	14	39
$25 < x \leq 30$	27.5	|||| |||| ||	12	51
$30 < x \leq 35$	32.5	|||| ||||	9	60

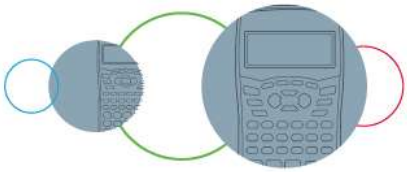
b) i) $mean = \frac{2.5(7)+7.5(3)+12.5(8)+17.5(7)+22.5(14)+27.5(12)+32.5(9)}{60}$

$mean = \frac{17.5+22.5+100+122.5+315+330+292.5}{60}$

$mean = \frac{1200}{60}$

$\therefore mean = 20$

ii) $20 < x \leq 25$



iii) Median Position $= \frac{n+1}{2} = \frac{60+1}{2} = 30.5$

Median = $20 < x \leq 25$

Q1 Position $= \frac{n+1}{4} = \frac{60+1}{4} = 15.25$

Q1 = $10 < x \leq 15$

Q3 Position $= \frac{3(n+1)}{4} = \frac{3(60+1)}{4} = 45.75$

Q3 = $25 < x \leq 30$

iv) 90th Percentile Position $= \frac{90(n+1)}{100} = \frac{90(60+1)}{100} = 54.9$

90th Percentile $= 30 < x \leq 35$

v) The test was quite easy – most of the grade 5's did very well.

6. 6 10 12 15 16 17 19 21 21 22 22 23 23
24 25 26 29 29 34 46 54 58 64 72

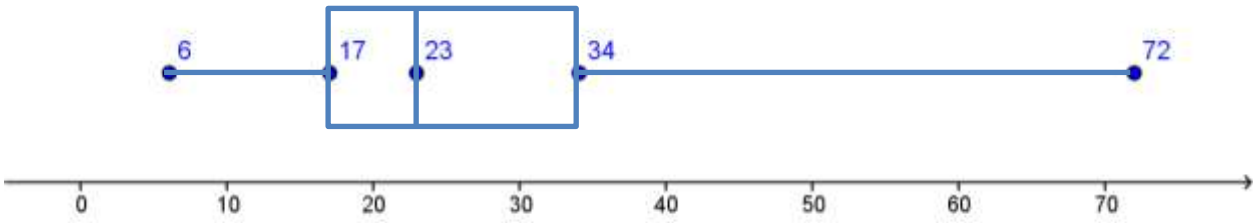
a) Minimum: 6 Maximum: 72

Median Position $= \frac{n+1}{2} = \frac{24+1}{2} = 12.5$ Median $= \frac{23+23}{2} = 23$

Q1 Position $= \frac{n+1}{4} = \frac{24+1}{4} = 6.25$ Q1 = 17

Q3 Position $= \frac{3(n+1)}{4} = \frac{3(24+1)}{4} = 18.75$ Q3 = 34

b)



c) 50%

d) IQR = Q3 – Q1 = 34 – 17 = 17

e) 75% of the SHARKS' scores are grouped very close together, the top 25% of the scores are very far apart.

7.

Distance	Midpoint	Frequency	Cumulative Frequency
$0 < x \leq 5$	2.5	3	3
$5 < x \leq 10$	7.5	6	9
$10 < x \leq 15$	12.5	8	17
$15 < x \leq 20$	17.5	7	24
$20 < x \leq 25$	22.5	1	25

a) $mean = \frac{2.5(3)+7.5(6)+12.5(8)+17.5(7)+22.5(1)}{25}$

$mean = \frac{7.5+45+100+122.5+22.5}{25}$

$mean = \frac{297.5}{25}$

$\therefore mean = 11.9$

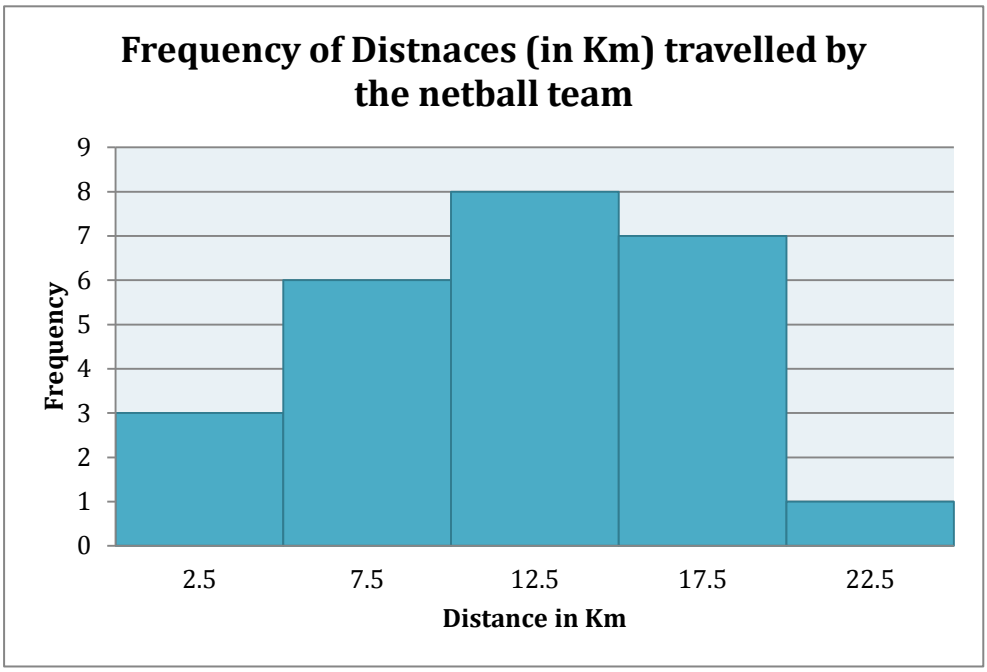
b) $10 \leq x < 15$

c) Median Position $= \frac{n+1}{2} = \frac{25+1}{2} = 13$ Median = $10 \leq x < 15$

Q1 Position $= \frac{n+1}{4} = \frac{25+1}{4} = 6.5$ Q1 = $5 \leq x < 10$

Q3 Position $= \frac{3(n+1)}{4} = \frac{3(25+1)}{4} = 19.5$ Q3 = $15 \leq x < 10$

d)



e) Most of the data lies between 5 and 20km – the data is relatively evenly spread.

8. a) $45 \leq x < 55$

b) n = 7+ 13 + 18 + 23 + 34+ 16 + 8 = 119

c) Median Position $= \frac{n+1}{2} = \frac{119+1}{2} = 60$

$\therefore$ Median in group $\rightarrow 35 \leq x < 45$

d) Range = biggest – smallest = 75 – 5 = 70grams

e) $mean = \frac{7(10)+13(20)+18(30)+23(40)+34(50)+16(60)+8(70)}{119}$

$mean = \frac{70+260+540+920+1700+960+560}{119}$

$mean = \frac{5010}{119}$

$\therefore mean = 42.1$

f) Below 55 = 95