Name: _____ Alpha # _____

Bayview Secondary School
Mathematics Department [Course Code: MDM4U1]
Assessment OF Learning: 1- & 2-Variable Statistics

Instructions: Version 2

1) Show all necessary steps and work clearly in your calculations to demonstrate your understanding of the concepts and chain of thoughts to obtain full marks for questions that are worth more than one mark.
2) DO NOT round any numbers in any steps of your solutions. Round only the final answers in approximate values to **3 decimal places** unless specific instructions are given in the question.
3) Graphing calculators, cell phones, audio- or video-recording devices, digital music players or, e-mail or text-messaging devices are prohibited during the assessment.
4) Use only the space provided to complete the assessment.
5) Two marks are awarded for proper mathematical form throughout the assessment. [2 marks]

Knowledge (11)	Thinking (7)	Application (16)	Communication (5)

Knowledge and Understanding

1) Help Jessie to calculate her updated mark in her data management course given the entries shown on the table. [3 marks]

Category	Course Weight (%)	Unit 1 Test	Unit 2 Test	Unit 3 Test
Knowledge	22	7/7	15/25	10/11
Application	28	10/10	19/26	14/15
Communication	10	4/4	3/3	5/5
Thinking	10	6/8	7/10	6/7

Knowledge: $\frac{7+15+10}{7+25+11}(0.22)=\frac{176}{1075}$

Application: $\frac{10+19+14}{10+26+15}(0.28)=\frac{301}{1275}$

Communication: $\frac{4+3+5}{4+3+5}(0.10)=\frac{1}{10}$

Thinking: $\frac{6+7+6}{8+10+7}(0.10)=\frac{19}{250}$

Updated mark is: $\left(\frac{176}{1075}+\frac{301}{1275}+\frac{1}{10}+\frac{19}{250}\right)\div 0.70 = 0.8226$

∴ Jessie's updated mark is 82.3%.

2) The weights, in kilograms, of a sample of 5 grade 12 students in our class were recorded as shown on the right. Calculate:

47, 50, 52, 55, 67, 67, 68

a) The mean [2 marks]

$\bar{x}=\frac{\Sigma x}{n}$

$=\frac{47+50+52+55+67+67+68}{7}$

$=58$ kg

b) The standard deviation [2 marks]

$s=\sqrt{\frac{\Sigma(x-58)^2}{7-1}}$

$=\sqrt{82}$

$\doteq 9.055$ kg

3) The following represents scores of a sample of 14 students who participated in a math contest.

18	72
35	96
42	96
44	96
52	100
63	109
72	110

a) Determine the score that represents 37th percentile. [2 marks]

$P=\frac{37}{100}(14+1)$

$=5.55^{th}$

$=6^{th}$

∴ the score 63 represents 37th percentile.

b) What percentile corresponds to the score of 72? [2 marks]

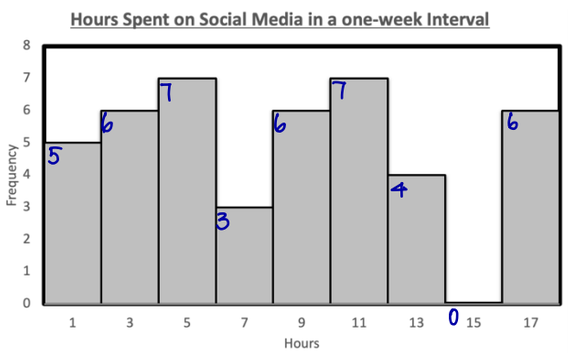
$p=100\left(\frac{6+0.5(2)}{14}\right)$

$=50^{th}$

∴ the score of 72 represent 50th percentile.

Thinking

1) Given the histogram of the number of hours in one week spent on social media in a sample of 44 people:



a) Determine the **mean** of the data set. [2 marks]

$\bar{x}=\frac{\Sigma fx_i}{n}$

$=\frac{1(5)+3(6)+5(7)+7(3)+9(6)+11(7)+13(4)+15(0)+17(6)}{44}$

$\doteq 8.273$ hours

b) Complete the cumulative frequency column from the table. [1 mark]

Number of hours	0 – 2	2 – 4	4 – 6	6 – 8	8 – 10	10 – 12	12 – 14	14 – 16	16 – 18
Cumulative Frequency	5	11	18	21	27	34	38	38	44

c) Construct a **box-and-whisker plot (NOT MODIFIED!!!).** [4 marks]

$Q2=\frac{44+1}{2}$

$=22.5^{th}$

$Q2=9$

$Q1=\frac{22+1}{2}$

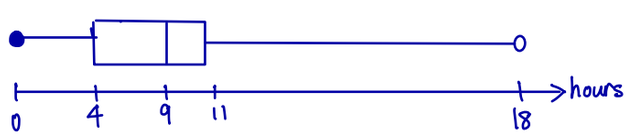
$=11.5^{th}$

$=\frac{3+5}{2}$

$Q1=4$

$Q3=\frac{11+11}{2}$

$=11$



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Application

1) A farmer used a 5-hectare field to test a new formula of organic fertilizer for growing tomatoes in 5 months. The amount of fertilizer, x *litres*, applied and the number of tomatoes harvest, y *in pounds*. The data is recorded in the table shown on the right.

x	y	x^2	y^2	xy
7	25	49	625	175
8	26	64	676	208
9	32	81	1024	288
9	33	81	1089	297
10	30	100	900	300
43	146	375	4314	1268

   a. Determine the **equation of the linear regression** using the least-square method. [5 marks]

$a = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$ $\quad b = \bar{y} - a\bar{x}$

$a = \frac{5(1268) - (43)(146)}{5(375) - (43)^2}$ $\quad b = \frac{146}{5} - \frac{31}{13}\left(\frac{43}{5}\right)$

$= \frac{31}{13}$ or $\div 2.385$ or $2\frac{5}{13}$ $\quad = 8\frac{9}{13}$ or $\frac{113}{13}$ or $\div 8.692$

∴ the equation is $y = 2.385x + 8.692$.

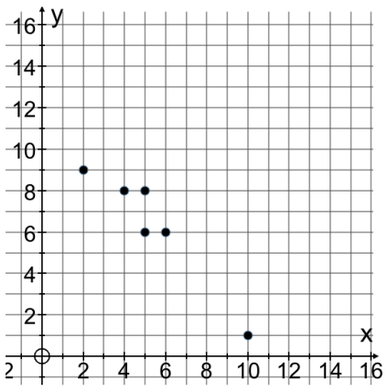
   b. Comment on the meaning of the slope. [2 marks]

For every litre of fertilizer applied, the farmer can grow 2.385 pounds more tomatoes.

   c. What type of causation between the two variables? [1 mark]

Cause and Effect.

2) A set of 2-variable statistics was presented on a scatter plot.



a) Determine the coefficient of correlation. [2 marks]

x	y	x^2	y^2	xy
2	9	4	81	18
4	8	16	64	32
5	6	25	36	30
5	8	25	64	40
6	6	36	36	36
10	1	100	1	10
32	38	206	282	166

$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{(n\Sigma x^2 - (\Sigma x)^2)(n\Sigma y^2 - (\Sigma y)^2)}}$

$= \frac{6(166) - 32(38)}{\sqrt{(6(206) - 32^2)(6(282) - 38^2)}}$

$\div -0.959$

b) Comment on the strength of the correlation. [2 marks]

There is a strong negative linear correlation between the two variables.

3) Given the following set of data for the marks of a data management class,

7	8	17	17	18
18	19	19	19	20
20	21	22	22	30

   a) Determine the median. [1 mark]

$\frac{15+1}{2} = 8^{th}$ ∴ median is 19.

   b) Identify any outliers in the set. [3 marks]

$Q2 = 19$
$Q1 = 17$
$Q3 = 21$

$1.5(IQR) = (Q3 - Q1)(1.5)$
$= (21 - 17)(1.5)$
$= 4(1.5)$
$= 6$

$Q1 - 6 = 17 - 6 = 11$

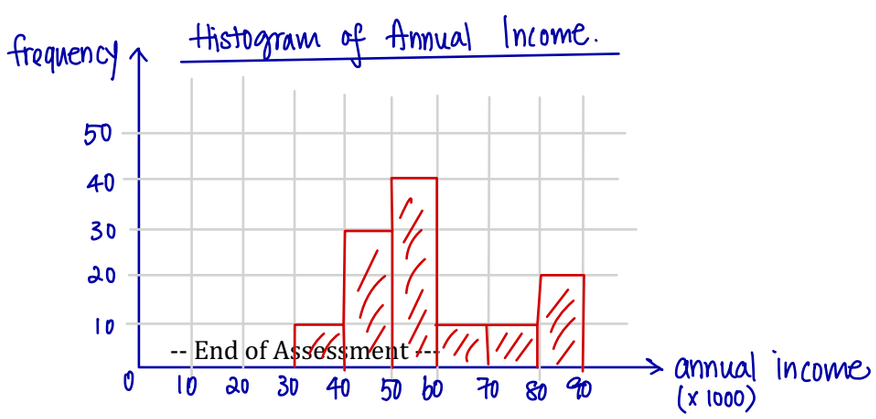
$Q3 + 6 = 21 + 6 = 27$

∴ outliers are 7, 8, 30.

Communication

1) The annual income survey was conducted. 120 people participated and the data was collected as shown. Illustrate the data using a frequency histogram. Be sure to label the graph clearly. [5 marks]

Annual Income (x$1000)	Frequency
30-40	10
40-50	30
50-60	40
60-70	10
70-80	10
80-90	20



-- End of Assessment --