Unit 3 Quiz MDM4U

①

a) This is an observational study. The relationship being studied is the association between having had magnetic therapy and pain reduction.

b) This is an experimental study. The relationship being studied is the effect of lying in bed for an extended period on subjects, in the context of gathering information for travelling to Mars.

c) This is an experimental study. The relationship being studied is the effect of handedness (left handedness or right handedness) on math grades.

②

a) From the above data

↳ There is a gradual decrease in fares from year to year i.e Year 2009 ~~has~~ experience a decline in domestic fares - Compared Year 2008 -

↳ From each year there is difference of ~~10% to 10%~~ range 8-10% in the major cities of Canada.

b) For Comparision between 2008 and 2009

↳ In all the cities, domestic fare is higher in 2008 than 2009.

(c) cont'd

↳ In the city Regina, data of 2008 was untraceable in the year 2009, Domestic fare in Regina city is [illegible] We can conclude that in the year 2008 Domestic fare will be higher than 160 following the general trend.

↳ Vast difference could be observed in Vancouver, Halifax and toronto.

(3)

a) This event represents an experiment rather than just a study. An experiment involves deliberately manipulating one or more variable. (in this case, the height from which the ball is dropped) to observe the effect on another variable (the height of the bounce). ~~The researcher controls the drop~~

b) The researcher controls the drop height to see how it influences the bounce height

Hence, The height from which the ball is being dropped is controlled and the bounce height corresponding to it is being changed.

c) As ~~we can~~ observed from the data, with increasing drop height the bounce height also increases

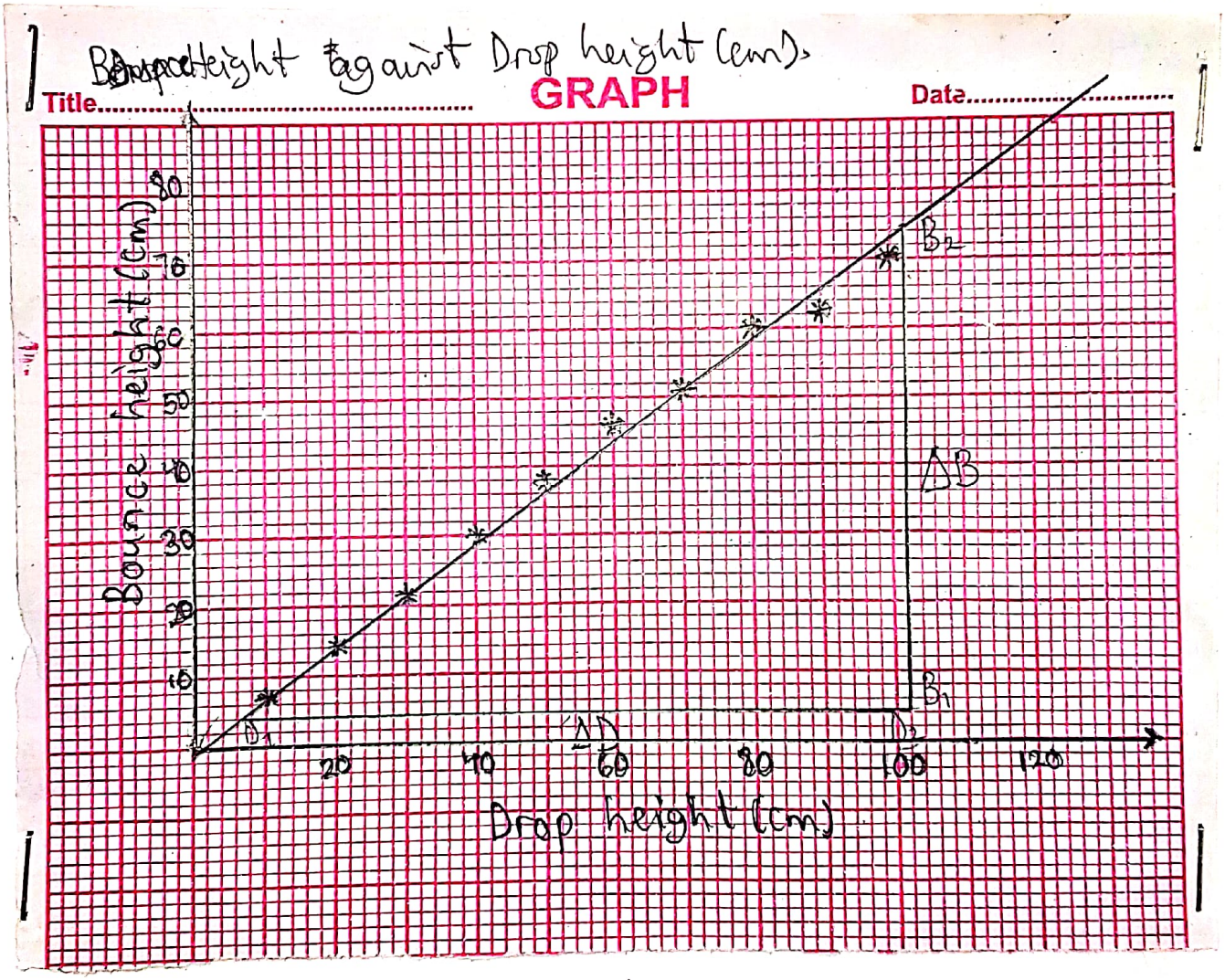
Using correlation function in Excel, the ~~following~~ correlation value is 0.99 or 99%

③ Cont'd

Below is the table of result from the correlation analysis.

	Drop Height (cm)	Bounce Height (cm)
Drop Height (cm)	1	
Bounce Height (cm)	0.997290829	1

(d) A Graph of Bounce Height (cm) against Drop Height (cm)



The above scatter plot shows clearly that a very strong linear relationship between drop height and bounce height exist

(e) Since the line of best is a linear one

$y = mx + c$

Here

$$y_B = mx_D + C$$

where y_B = value of bounce height

x_D = value of drop height

m = slope

C = intercept

$$\boxed{C = 0}$$

To find m

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta B}{\Delta D} = \frac{B_2 - B_1}{D_2 - D_1}$$

$$m = \frac{74 - 4}{100 - 10} = \frac{70}{92} = 0.7608$$

$$m = 0.7609$$

$$\boxed{m \approx 0.76}$$

$$y_B = mx_D + C$$

$$y_B = 0.76 x_D + 0$$

$$\boxed{y_B = 0.76 x_D}$$

When drop height $x_D = 130$

$$y_B = 0.76(130)$$

$$y_B = 98.91$$

∴ The Ball height prediction when the drop height is 130 is

$$= 98.9\text{cm}$$

$$\boxed{y_B \approx 99\text{cm}}$$

(4)

a) Numerical, discrete: The number of emails in your inbox.

b) Numerical, continous: The weight of a person/individual.

c) Categorical, ordinal: ~~The~~ Education level (e.g., high school, bachelor's, master's, or doctorate degree).

d) Categorical, nominal: Car band (eg Toyota, ford, BMW)

(5)

a) Convenience sampling

In this case, the social networking site is using convenien sampling by asking users about their favourite band. Thi type of sampling is based on selecting items or individuals that are easy to access.

b) Systematic sampling

This type of sampling involves selecting every nth item from a larger population. In this case, the Pelee Island Bird Observato is using systematic sampling by setting up traps in three locations to gather birds during their annual bird count

(6)

a) The age ranges are too broad and may not capture specific age groups accurately. Also, there's a lack of clarity regarding the upper limit of each range
e.g does "above 60" include 100 year olds?

Revised: What is your age range?
☐ Under 15 ☐ 15-20 ☐ 21-35
☐ 36-60 ☐ 61 and above.

b) The question assume a causal relationship between violence in video games and real-life violence without providing evidence
Also the response option lack nuance.

Revised: How does you feel about implementing a violence rating system in video games?
☐ Strongly agree ☐ Agree ☐ Neutral
☐ Oppose ☐ Strongly oppose

c) The question is too vague and doesn't specify what aspects of the new logo are being evaluated

Revised: What is your opinion on the new school logo design?
☐ Like it ☐ Dislike it.

(7)

a) This study is observational because the researchers are observing and recording data without intervening or manipulating variables. They are simply observing the effects of different solicitation characteristics on donation amounts.

b) This study is also observational because the teacher is merely observing a correlation between class size and class average over time. There is no manipulation of variable or control group involved.

(8)

a) **Sampling Bias**: Conducting a survey about favourite ice cream flavours at a dairy farm may result in biased results if only employees are surveyed, excluding customers.

b) **Measurement Bias**: Using a faulty scale to measure weight consistently overestimate the weight of objects, leading to inaccurate data.

c) **Response Bias**:- In a political poll, respondents may alter their answer to allign with the perceived expectations of the pollster

d) **Non-response Bias**: In an online survey about smartphone preferences. If only tech-savvy individuals respond, the results may not accurately represent the broader population's preferences.

(9)

a) from the given data:

C.I	f	x	fx	cf
0-2	(3) f_0	1	3	3
(2-4)	(11) f_1	3	33	14
4-6	(7) f_2	5	35	21
6-8	2	7	14	23
8-10	1	9	9	24
	24		94	

Estimated mean.

$$= \frac{\Sigma fx}{\Sigma f} = \frac{94}{24} = 3.9167$$

Estimated Mean = 3.9167

Median number of hours.

$$= \frac{N}{2} = \frac{24}{2} = 12$$

$$\text{Median} = l + \left(\frac{N/2 - m}{f}\right) c$$

$$= 2 + \left(\frac{24/2 - 3}{11}\right) 2$$

$$= 2 + \left(\frac{12-3}{11}\right)^2$$

$$= 2 + \left(\frac{9}{11}\right)^2 = 2 + \frac{18}{11}$$

$$= 3.636 \qquad \frac{22+18}{11} = \frac{40}{11}$$

Median number of hours = 3.636

(9) cont'd

Modal Interval

$f_0 = 3 \quad f_1 = 11 \quad f_2 = 9$

Since modal class = **2-4**

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)c$$

$$= 2 + \left(\frac{11 - 3}{2(11) - 3 - 7}\right)2$$

$$= 2 + \left(\frac{8}{22 - 3 - 7}\right)^2 = 2 + \left(\frac{8}{22 - 10}\right)^2$$

$$= 2 + \left(\frac{8}{12}\right)^2, \quad 2 + \frac{8}{6}$$

$$\frac{12 + 8}{6} = \frac{20}{6}$$

$$= 3.333$$

Modal Interval	= 2-4
Modal Class	= 3.333

5) Since Mean is greater than the median
i.e Mean (3.9167) > Median (3.636).

The data is skewed to the right.

a) The statistical measure shown in this graph are as follows.

- Mean
- Median
- Quartile
- Interquartile range

b) The following measures of central tendency are used in the internet service provider analysis.

- Mean
- Median

c) Yes, the Internet service provider claim is accurate.