MATHEMATICS APPLICATIONS

YEAR 12 UNIT 3

TEST 1 - BIVARIATE DATA and SEQUENCES

2022

PART A - CALCULATOR FREE

TIME: **25 mins**

MARKS: **25 marks**

STUDENT'S NAME: Solutions

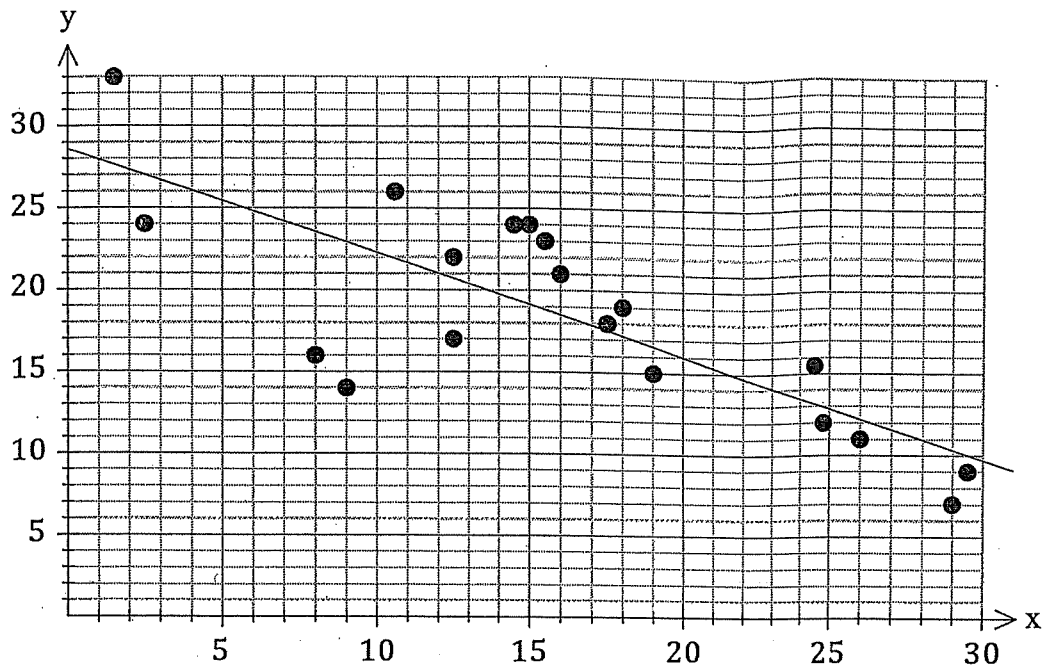
CIRCLE YOUR TEACHER'S NAME:

Mr Galbraith	Mr Ismail	Mrs Kalotay
Mr Lee	Ms Smirke	Ms Thompson

MATERIALS SUPPLIED: Formula Sheet

1) [6 marks]

A least squares line with the equation $y = 28.5 - 0.62x$ has been fitted to the scatterplot below.



a) State whether the following statements are true (**T**) or False (**F**) (5)

T **A:** It is the line for which the sum of the squares of the vertical distances from the line to each data point is a minimum.

F **B:** the slope can be interpreted as 'for each increase of one unit in x, y increases by 0.62 units.

T **C:** using the regression line to predict y for x = 20 is a case of interpolation.

T **D:** the residual for the point (18, 19) will be positive.

T **E :** the line underpredicts the value of y for the data point (16, 21.1)

b) It is realised point (5, 10) has been omitted from the scatterplot and the calculations for the least squares line. If this point is included, which one of the following will be the effect on the least squares line? (1)

A: the gradient will increase in value, the intercept will decrease.

B: the gradient will decrease in value, the intercept will decrease.

C: the gradient and intercept will remain the same.

D: the gradient will increase in value, the intercept will increase.

E: the gradient will decrease in value, the intercept will increase.

6

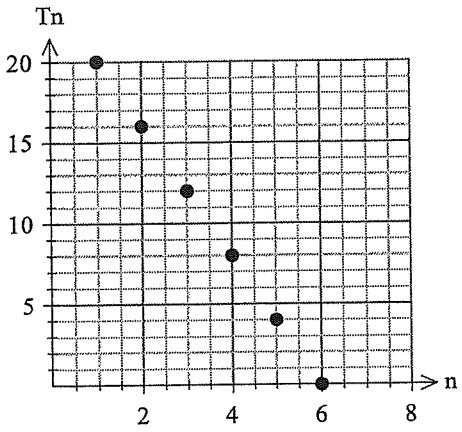
2) [7 marks]

Each of the following below defines a sequence. For each:

i. State whether the sequence is arithmetic, geometric or neither. (3)

ii. Determine the recursive rule. (4)

a)

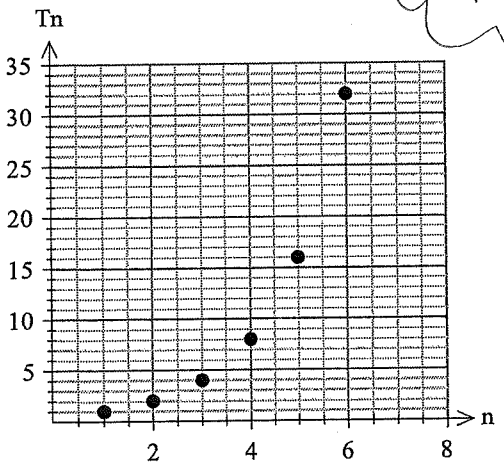


i. AP ✓

ii. $T_{n+1} = T_n - 4 \quad T_1 = 20$ ✓

* ✓ all 3 T_1 given
if omitted, they just lose the ①

b)



i. GP ✓

ii. $T_{n+1} = 2T_n \quad T_1 = 1$ ✓

c) 5, −15, 45, −135, 405

i. GP ✓

ii. $T_{n+1} = -3T_n \quad T_1 = 5$ ✓

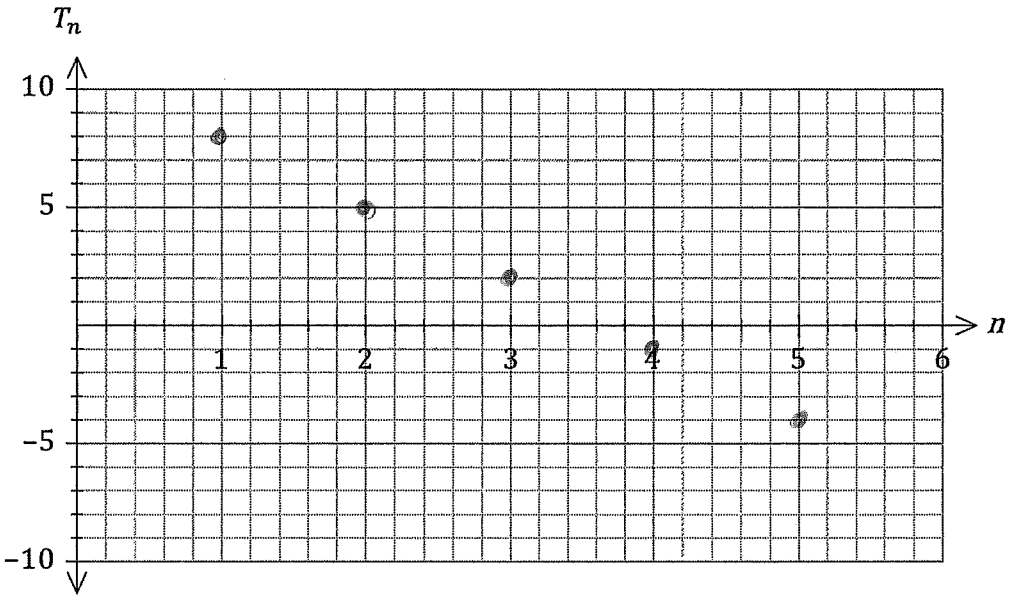
7

3) [4 marks]

Consider the following recurrence relation

$$T_{n+1} = T_n - 3, T_3 = 2$$

a) Display the first five terms of this sequence on the axes below. (2)



✓✓

−1/error or omission

b) Determine:

i. T_0 (1)

11 ✓

ii. T_{10} (1)

$T_5 + 5d = -4 + 5(-3)$

$= -4 + (-15)$

$= -19$ ✓

4

4) [8 marks]

A group of high school students were asked the question 'Does constant revision throughout the year lead to an improved examination result?'

The results are summarised below.

	Agree	Disagree	Undecided
Under 13	14	42	14
13-16	56	16	8
Over 16	42	5	3

a) State the explanatory variable for these data. (1)

Age ✓

The incomplete table below shows row percentages.

	Percentages		
	Agree	Disagree	Undecided
Under 13	* 20	60	* 20
13-16	70	20	* 10
Over 16	84	* 10	* 6

✓✓✓ -1/error omission

b) Show how the value of 20% was calculated. (1)

$\frac{16}{(56+18+16} \times 100$ or $\frac{16}{80} \times 100$ ✓

c) Complete the table. (3)

d) Determine whether there is any association between the variables. If so, describe the association and justify. (3)

(MPA)

Yes there is an association

Younger students have a lower proportion (20%) agreeing compared to the older students (84%)

(*compare EV for 1 RV) note ↑

✓ Yes
✓ reason
✓ evidence

END OF PART A

/8