

## Regression line - revision questions (preDP1) [25 marks]

1. [Maximum mark: 6]

20N.2.SL.TZ0.S\_2

Lucy sells hot chocolate drinks at her snack bar and has noticed that she sells more hot chocolates on cooler days. On six different days, she records the maximum daily temperature,  $T$ , measured in degrees centigrade, and the number of hot chocolates sold,  $H$ . The results are shown in the following table.

<b>Maximum temperature (<math>T</math>)</b>	14	8	4	18	13	11
<b>Number of hot chocolates (<math>H</math>)</b>	79	143	191	58	84	105

The relationship between  $H$  and  $T$  can be modelled by the regression line with equation  $H = aT + b$ .

- (a.i) Find the value of  $a$  and of  $b$ . [3]
- (a.ii) Write down the correlation coefficient. [1]
- (b) Using the regression equation, estimate the number of hot chocolates that Lucy will sell on a day when the maximum temperature is  $12^\circ\text{C}$ . [2]

2. [Maximum mark: 6]

19N.1.SL.TZ0.T\_6

Galois Airways has flights from Hong Kong International Airport to different destinations. The following table shows the distance,  $x$  kilometres, between Hong Kong and the different destinations and the corresponding airfare,  $y$ , in Hong Kong dollars (HKD).

Destination	Bali, Indonesia	Sydney, Australia	Bengaluru, India	Singapore	Auckland, New Zealand	Bangkok, Thailand
Distance $x$ , (km)	3400	7400	4000	2600	9200	1700
Airfare $y$ , (HKD)	1550	3600	2800	1300	4000	1400

The Pearson's product-moment correlation coefficient for this data is 0.948, correct to three significant figures.

- (a) Use your graphic display calculator to find the equation of the regression line  $y$  on  $x$ . [2]

The distance from Hong Kong to Tokyo is 2900 km.

- (b) Use your regression equation to estimate the cost of a flight from Hong Kong to Tokyo with Galois Airways. [2]
- (c) Explain why it is valid to use the regression equation to estimate the airfare between Hong Kong and Tokyo. [2]

3. [Maximum mark: 7]

23N.1.SL.TZ1.1

Billy is a keen walker who keeps a record of his performance. The following table shows the time, in minutes, it takes him to walk one kilometre up hills with different gradients. The gradient of each hill is constant.

<b>Gradient <math>G</math> (%)</b>	0	4	10	15	20
<b>Time <math>T</math> (min.)</b>	6.85	8.42	11.20	14.49	17.88

(a.i) Find the equation of the regression line of  $T$  on  $G$ .

[2]

(a.ii) Describe the correlation between  $T$  and  $G$  with reference to the value of  $r$ , the Pearson's product-moment correlation coefficient.

[2]

On Sunday, Billy intends to walk up a hill with a gradient of 13%.

(b) Estimate the time it will take Billy to walk one kilometre up the hill.

[2]

This morning, Billy walked one kilometre up a hill, and it took 22 minutes.

(c) Explain why it would be inappropriate to use the equation found in part (a) to estimate the gradient of this hill.

[1]

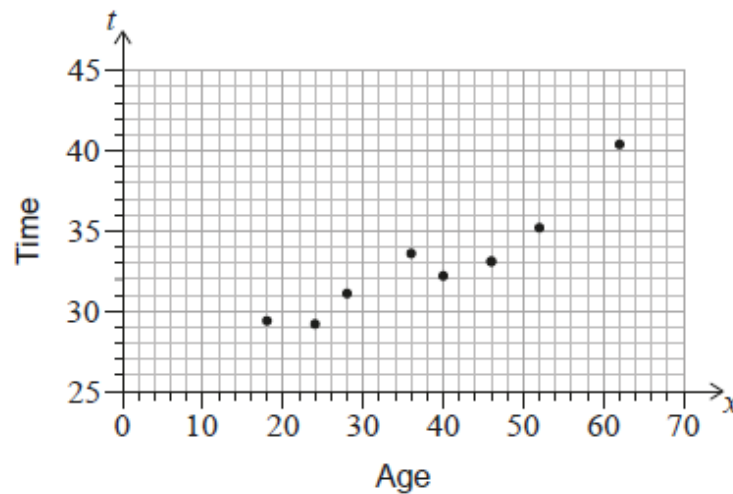
4. [Maximum mark: 6]

21N.1.SL.TZ0.1

Eduardo believes that there is a linear relationship between the age of a male runner and the time it takes them to run 5000 metres.

To test this, he recorded the age,  $x$  years, and the time,  $t$  minutes, for eight males in a single 5000 m race. His results are presented in the following table and scatter diagram.

<b><math>x</math>, years</b>	18	24	28	36	40	46	52	62
<b><math>t</math>, minutes</b>	29.4	29.2	31.1	33.6	32.2	33.1	35.2	40.4



- (a) For this data, find the value of the Pearson's product-moment correlation coefficient,  $r$ .

[2]

Eduardo looked in a sports science text book. He found that the following information about  $r$  was appropriate for athletic performance.

<b>Value of <math> r </math></b>	<b>Description of the correlation</b>
$0 \leq  r  < 0.4$	weak
$0.4 \leq  r  < 0.8$	moderate
$0.8 \leq  r  \leq 1$	strong

(b) Comment on your answer to part (a), using the information that Eduardo found. [1]

(c) Write down the equation of the regression line of  $t$  on  $x$ , in the form  $t = ax + b$ . [1]

(d) A 57-year-old male also ran in the 5000 m race.

Use the equation of the regression line to estimate the time he took to complete the 5000 m race. [2]