Quiz 1-B [14 marks]

1. [Maximum mark: 7] 21N.2.AHL.TZ0.1

In Lucy's music academy, eight students took their piano diploma examination and achieved scores out of 150. For her records, Lucy decided to record the average number of hours per week each student reported practising in the weeks prior to their examination. These results are summarized in the table below.

Average weekly practice time (h)	28	13	45	33	17	29	39	36
Diploma score (D)	115	82	120	116	79	101	110	121

(a) Find Pearson's product-moment correlation coefficient, r, for these data. [2]

Markscheme

use of GDC to give *(M1)*

$r = 0.883529\ldots$

$r = 0.884$ *A1*

Note: Award the *(M1)* for any correct value of r, a, b or $r^2 = 0.780624\ldots$ seen in part (a) or part (b).

[2 marks]

(b) The relationship between the variables can be modelled by the regression equation $D = ah + b$. Write down the value of a and the value of b. [1]

Markscheme

$a = 1.36609\ldots$, $b = 64.5171\ldots$

$a = 1.37\ ,\ b = 64.5$ **A1**

[1 mark]

(c) One of these eight students was disappointed with her result and wished she had practised more. Based on the given data, determine how her score could have been expected to alter had she practised an extra five hours per week. [2]

Markscheme

attempt to find their difference **(M1)**

$5 \times 1.36609\ldots$ OR
$1.36609\ldots(h+5) + 64.5171\ldots - (1.36609\ldots h + 64.5171\ldots)$

$6.83045\ldots$

$= 6.83\ (6.85\ \text{from}\ 1.37)$

the student could have expected her score to increase by 7 marks. **A1**

Note: Accept an increase of $6,\ 6.83$ or 6.85.

[2 marks]

(d) Lucy asserts that the number of hours a student practises has a direct effect on their final diploma result. Comment on the validity of Lucy's assertion. [1]

Markscheme

Lucy is incorrect in suggesting there is a causal relationship.

This might be true, but the data can only indicate a correlation. ***R1***

Note: Accept 'Lucy is incorrect as correlation does not imply causation' or equivalent.

[1 mark]

(e) Lucy suspected that each student had not been practising as much as they reported. In order to compensate for this, Lucy deducted a fixed number of hours per week from each of the students' recorded hours.

State how, if at all, the value of r would be affected. [1]

Markscheme

no effect ***A1***

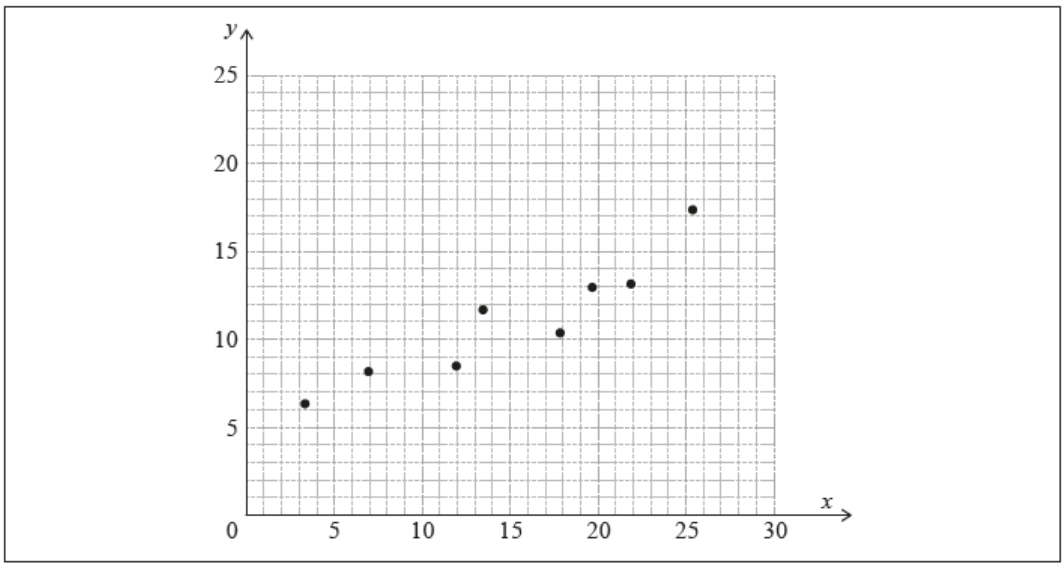
[1 mark]

2. [Maximum mark: 7] 21M.2.SL.TZ1.2

The following table shows the data collected from an experiment.

x	3.3	6.9	11.9	13.4	17.8	19.6	21.8	25.3
y	6.3	8.1	8.4	11.6	10.3	12.9	13.1	17.3

The data is also represented on the following scatter diagram.



The relationship between x and y can be modelled by the regression line of y on x with equation $y = ax + b$, where $a,\ b \in \mathbb{R}$.

(a) Write down the value of a and the value of b. [2]

Markscheme

$a = 0.433156\ldots,\ b = 4.50265\ldots$

$a = 0.433,\ b = 4.50$ ***A1A1***

[2 marks]

(b) Use this model to predict the value of y when $x = 18$. [2]

Markscheme

attempt to substitute $x = 18$ into their equation ***(M1)***

$y = 0.433 \times 18 + 4.50$

$= 12.2994\ldots$

$= 12.3$ ***A1***

[2 marks]

(c) Write down the value of $\overline{x}$ and the value of $\overline{y}$. [1]

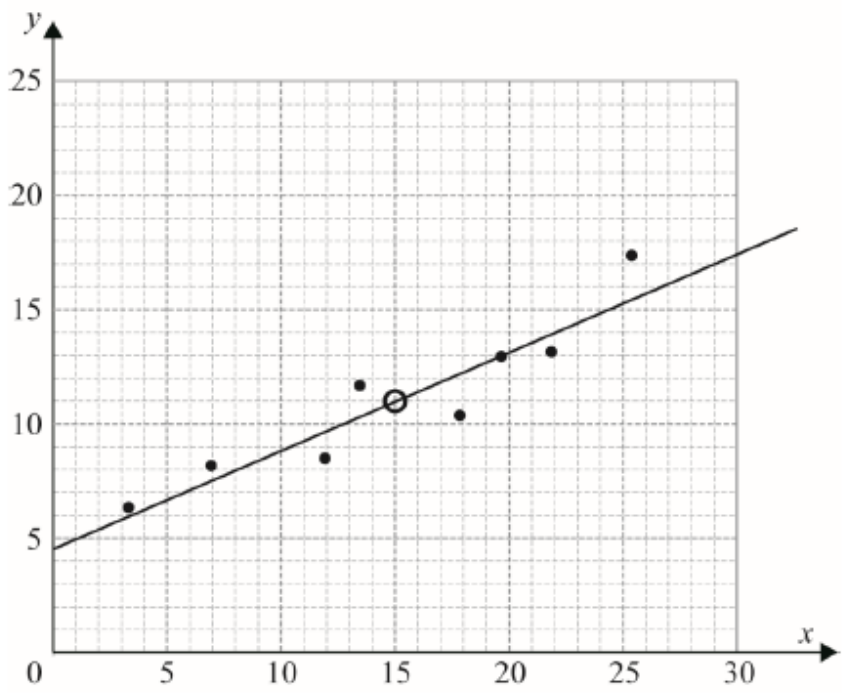
Markscheme

$\overline{x} = 15, \ \overline{y} = 11$ **A1**

[1 mark]

(d) Draw the line of best fit on the scatter diagram. [2]

Markscheme



A1A1

Note: Award marks as follows:

A1 for a straight line going through $(15, 11)$

A1 for intercepting the y-axis between their $b \pm 1.5$ (when their line is extended), which includes all the data for $3.3 \leq x \leq 25.3$.

If the candidate does not use a ruler, award ***A0A1*** where appropriate.

[2 marks]