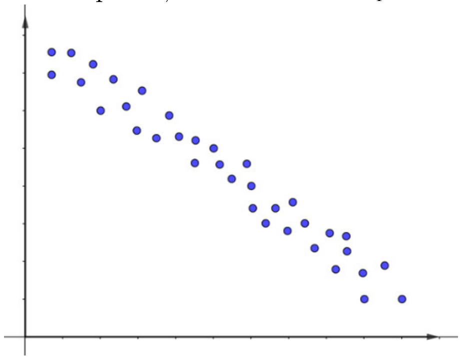
Exercise 1 Calc. : ✗

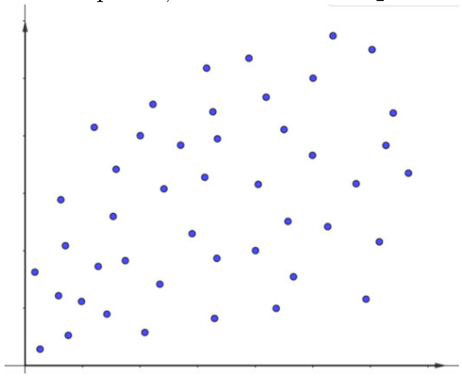
5 marks

We consider the following scatter diagrams with the corresponding linear correlation coefficients r_1, r_2, r_3 and r_4.
Arrange these correlation coefficients in ascending order and **explain** your answer.

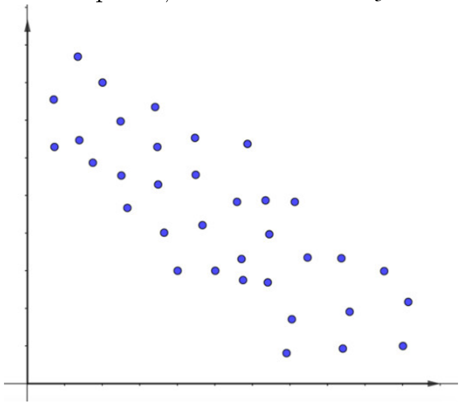
Scatter plot 1, with coefficient r_1



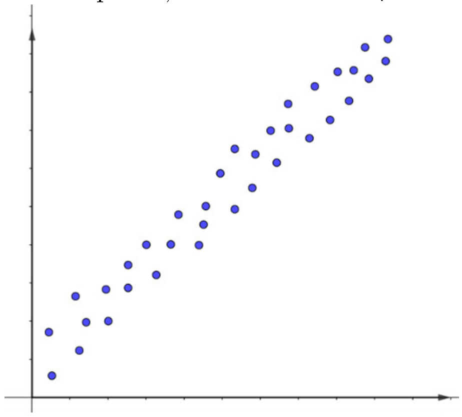
Scatter plot 2, with coefficient r_2



Scatter plot 3, with coefficient r_3

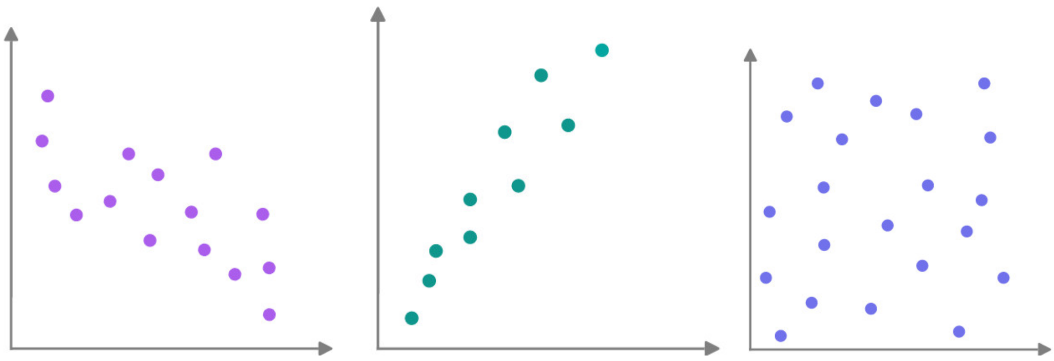


Scatter plot 4, with coefficient r_4



Exercise 2 Calc. : ✗

Trois diagrammes ci-dessous présentent des nuages de points.



1 2 3

5 marks

Relier chaque diagramme de nuages de points (1, 2, 3) avec l'énoncé le plus approprié (a, b, c) et **expliquer** vos réponses.
a : Nous avons représenté graphiquement l'âge d'un homme et le nombre de cheveux sur sa tête.
b : Nous avons représenté graphiquement la pointure d'une femme et la longueur de ses cheveux.
c : Nous avons représenté graphiquement l'alimentation et le gain de poids d'une personne.

Exercise 3 Calc. : ✗

5 marks	On suppose que plus les enfants maîtrisent leur 1ère langue (langue maternelle), plus ils réussiront dans leur langue seconde. Dans un groupe préscolaire, 12 enfants bilingues ont été testés dans leur langue maternelle et leur langue seconde. La note maximale pour chaque test était de 20 points. Les résultats des deux tests sont présentés dans le tableau ci-dessous :

Notes de la langue maternelle	5	9	12	13	15	16	18	19	20
Notes de la langue seconde	5	5	5	8	5,5	9,5	13	19	20

a) **Tracer** un graphique en nuage de points représentant les données du tableau. Les points de la première langue sont la variable indépendante et les points de la langue seconde sont la variable dépendante.

b) Le coefficient de corrélation linéaire est $r = 0,84$. En se basant sur ce coefficient de corrélation, **interpréter** la relation entre ces deux variables.

c) Nous décidons d'utiliser une régression exponentielle. **Tracez** sur le graphique de la question a) le graphe d'une fonction exponentielle qui correspond à ces résultats.

Exercise 4 Calc. : ✗

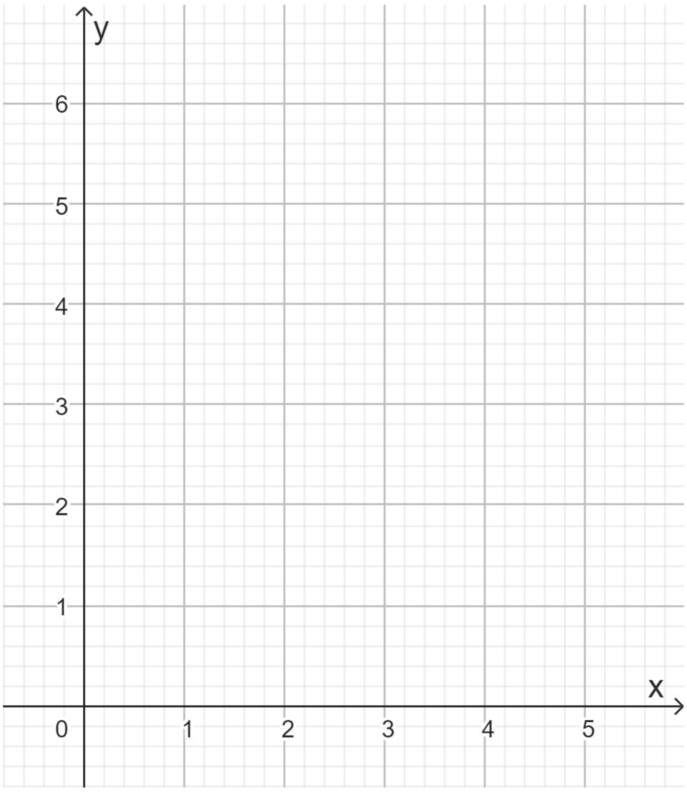
5 marks

A B C D

a) **Expliquez** laquelle ou lesquelles des figures parmi A, B, C, et D représente(nt) une corrélation linéaire appropriée.

b) **Expliquez** si le nuage de points B présente un coefficient de corrélation r positif ou négatif.

c) **Copiez** le système de coordonnées illustré sur votre copie et **dessinez**-y un nuage de points (au moins 5 points) qui présente une corrélation linéaire avec le coefficient de corrélation $r \approx 1$.

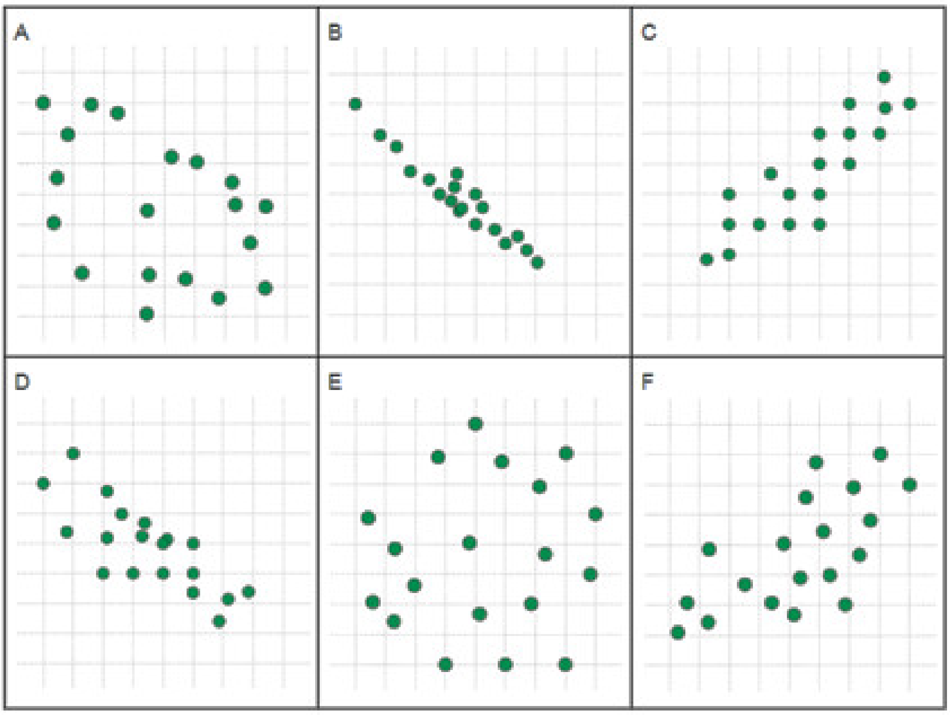


Exercise 5 Calc. : ✗

5 marks

From the following set, **match** each correlation coefficient, r, with the scatter plot which you consider, best represents its value. **Justify** each match you make.

$$\{-0.96; \quad -0.7; \quad -0.4; \quad 0.1; \quad 0.6; \quad 0.86\}$$



Exercise 6 Calc. : ✗

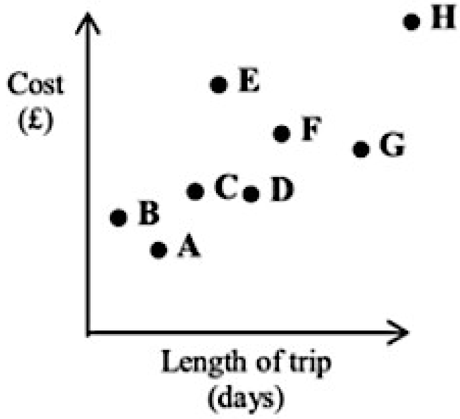
BIZBOB 123 LIMITED

BIZBOB 123 manufactures medical and dental supplies.

The scatter diagram, on the right, shows the cost in pounds and length in days, of business trips taken by its employees, **A** through **H**, over the previous year.

Note: Each of the points A–H on the scatter diagram represents the cost and length of the corresponding employee's business trip.

Business trips are usually undertaken by car.



2 marks

a) One of BIZBOB's employees took a plane for a business trip. **Identify** which of the employees **A** through **H** this would be. **Explain** why you identified this employee.

BIZBOB 123's finance wizard states that there is some linear correlation between the length of a business trip, L, and the total associated cost, C, that the company incurs for each trip.

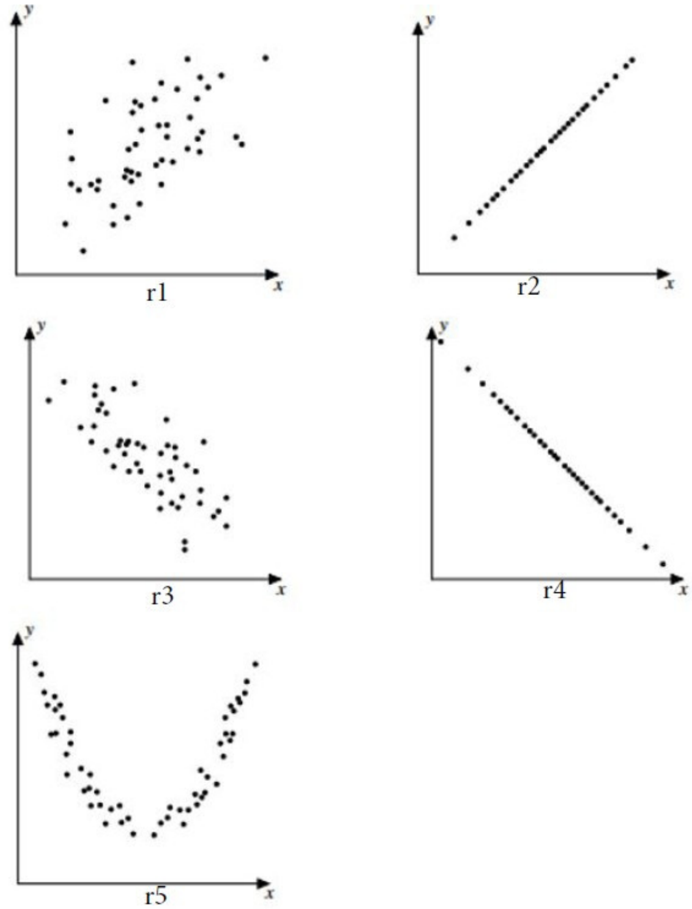
She claims that the equation of the regression line of C on L is:

$$C = a \cdot L + b, \qquad a, b \in \mathbb{R}$$

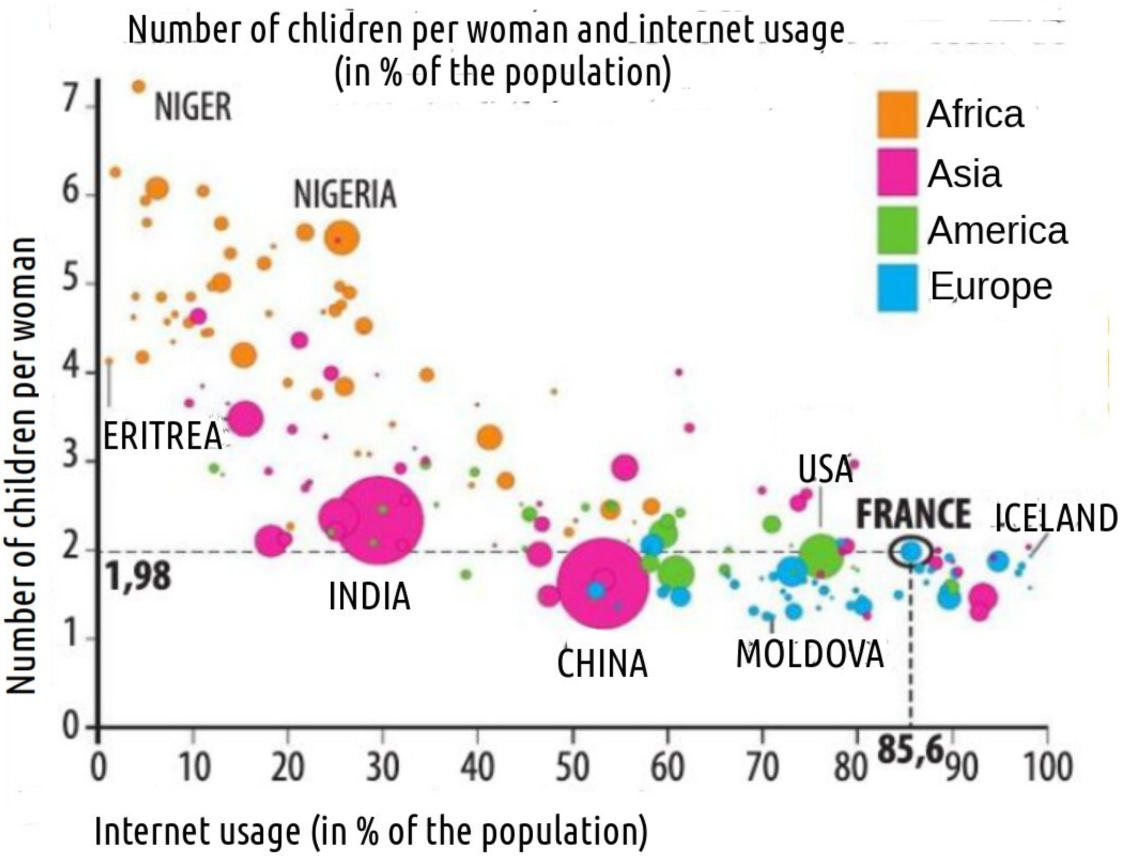
3 marks

b) **Explain** the meaning of the gradient a and the intercept b. **Provide** an example, to support each explanation.

Exercise 7 Calc. : ✗

5 marks	**Arrange**, by increasing order of size, the linear correlation coefficients, $r1$, $r2$, $r3$, $r4$, and $r5$, seen in these scatter diagrams. **Give reasons** for the order you have identified. *Note that the axes of all the diagrams are to the same scale.* 

Exercise 8 Calc. : ✗



1 mark — a) **State** the variables of this graph.

2 marks — b) **Identify** the way in which the variables are correlated in the graph.

2 marks — c) **Explain** any causality that there might be between the variables.

Exercise 9 Calc. : ✗

A statistical study of two numerical variables produces the scatter diagram on the right.

1 mark — a) **Show by calculation** that the coordinates of the mean point are $(4, 6)$.

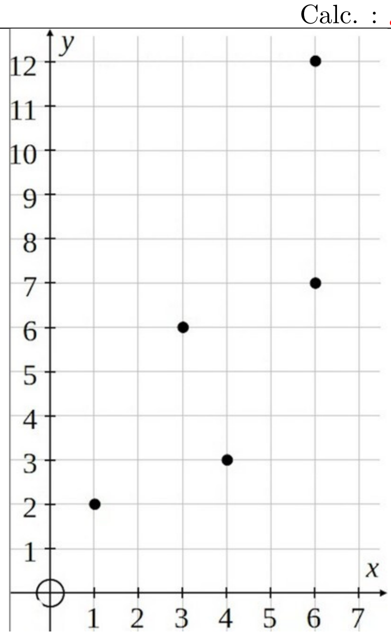
$y = \frac{5}{4}x + 1$ is chosen as a regression line for the data.

1 mark — b) **Show by calculation** that the mean point lies on this line.

1.5 marks — c) **Calculate** the value of y corresponding to $x = 2$.

1.5 marks — d) We can establish from the line that a value of $y = 38.5$ corresponds to a value of $x = 30$.

Comment on the whether such an extrapolation is reasonable.



Exercise 10 Calc. : ✗

5 marks

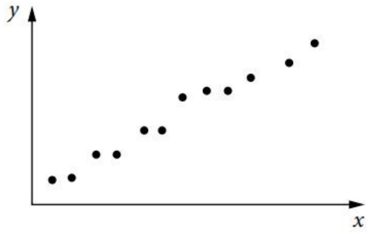
Answer the following multiple choice questions. No justification is needed.
There is one good answer per question.
One mark is awarded per correct answer. No mark penalty for wrong answers.

a) Which statement characterises the data shown on the scatter diagram?

1. Weak, positive, linear trend
2. Moderate, positive, linear trend
3. Moderate, negative, linear trend
4. Strong, negative, linear trend

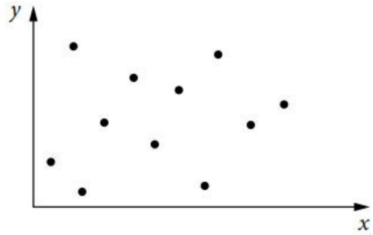
b) For the scatter diagram shown, what is the value of r?

1. $-1 < r < -0.7$
2. $-0.5 < r < -0.3$
3. $0.3 < r < 0.5$
4. $0.7 < r < 1$



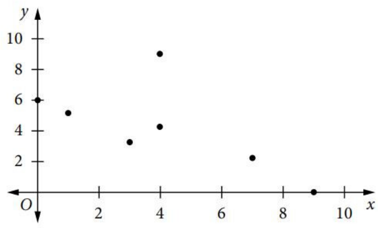
c) For the scatter diagram shown, what is the value of r?

1. $-1 < r < -0.7$
2. $-0.5 < r < -0.3$
3. $-0.2 < r < 0.2$
4. $0.3 < r < 0.5$



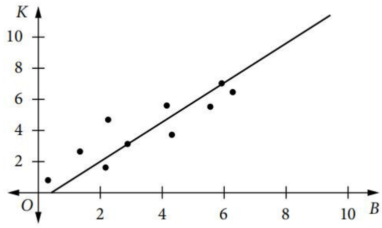
d) For the scatter diagram shown, the Pearson's coefficient r was found to be -0.6. The point $(4, 9)$ was found to be recorded incorrectly and should have been plotted as $(4, 1)$. Based on this change, what is the correct coefficient r?

1. Positive but closer to 0
2. Positive but closer to 1
3. Negative but closer to 0
4. Negative but closer to -1



e) A scatter diagram is shown with its line of best fit. What is the equation of the line of best fit?

1. $y = 4x - 3$
2. $y = \frac{4}{3}x + 1$
3. $y = \frac{4}{3}x - 1$
4. $y = \frac{3}{4}x + 1$



Exercise 11 Calc. : ✗

2 marks, 1 mark, 1 mark, 1 mark

Over eight consecutive years, a city nursery has measured the growth of an outdoor bamboo species for that year. The annual rainfall in the area where the bamboo was growing was also recorded. The data are shown in the table below.

Rainfall (mm)	450	620	560	830	680	650	720	540
Growth (cm)	25	45	25	85	50	55	50	20

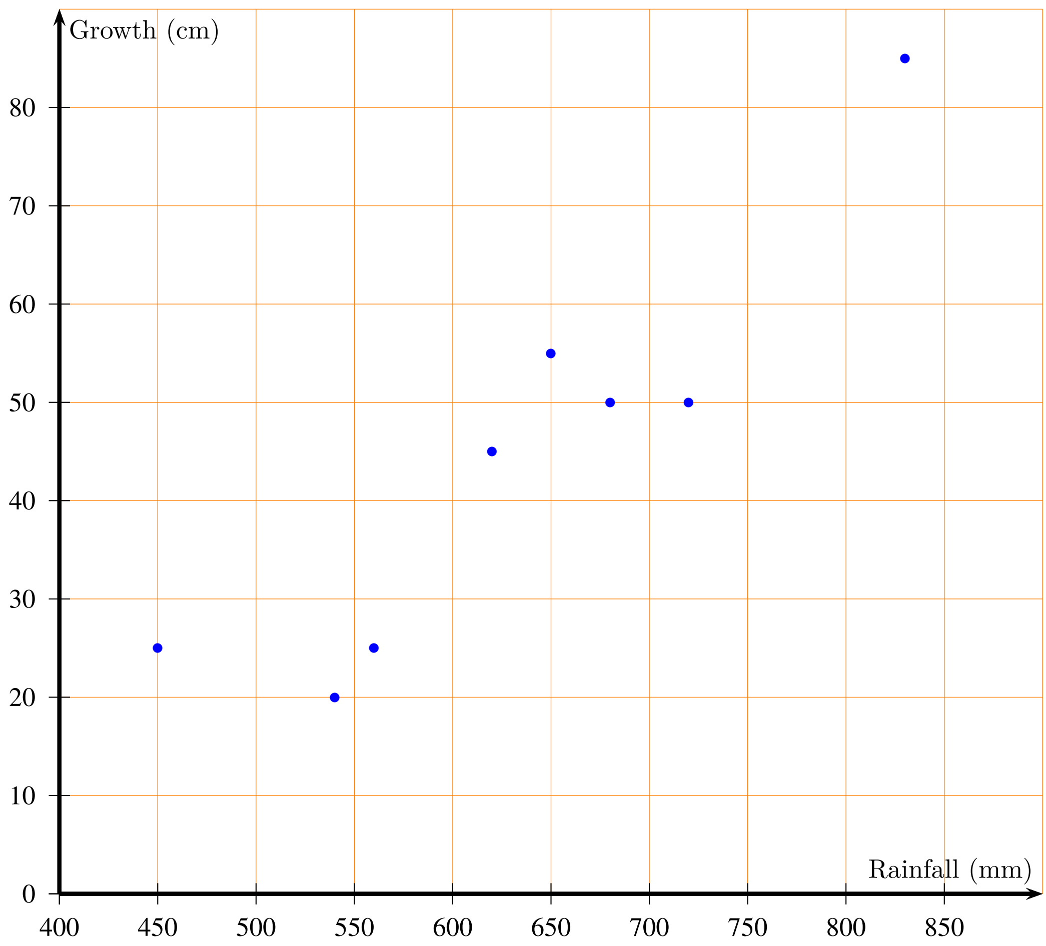
The scatter diagram of the above data is shown on the annex page (to be handed in).

(2 marks) a) Given the mean point is approximately $(630, 44)$, **draw** the line of best fit by eye on the diagram.

(1 mark) b) Use this line to **estimate** the growth for a rainfall reading of 500 mm.

(1 mark) c) Use this line to **estimate** the rainfall for a given year if the growth was 30 cm.

(1 mark) d) **Explain** why your answers in b) and c) are reliable.



Exercise 12 Calc. : ✗

The table below gathers the values of two variables x and y:

x	0	2	4	6	8	10
y	6	7	10	14	15	20

(3.5 marks) a) **Draw** a scatter diagram using these values.

(1.5 marks) b) **Compute** and **add** the mean point to your graph.

Exercise 13 Calc. : ✗

	State if the following sentences are True (T) or False (F) and **justify** your statements:
1 mark	a) The point $A(e; 1)$ belongs to the function $y = \ln(x)$.
1 mark	b) When a function is positive, its first derivative is necessarily increasing.
1 mark	c) Let f be a function defined by $f(x) = e^x - 1$. Its first derivative is equal to zero for $x = 0$.
1 mark	d) Let f be a function defined over $\mathbb{R}$ such that $\int_0^3 f(x)\,dx > 0$ and $\int_3^6 f(x)\,dx < 0$. We can thus write : $\int_0^6 f(x)\,dx = 0$
1 mark	e) A set of bivariate data points $(x; y)$ has a linear correlation coefficient of -0.95. We can thus state that the correlation is weak.