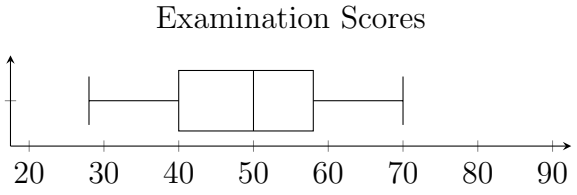
BECA / IB Math 02-Descriptive Statistics Name:
14 December 2021

2.5 Classwork: Linear regression

1. The box-and-whisker plot represents the examination scores of a group of students. The range of the scores is 42 marks, and the interquartile range is 18 marks.



   (a) Find the value of

      i. the minimum score;

      ii. the third quartile.

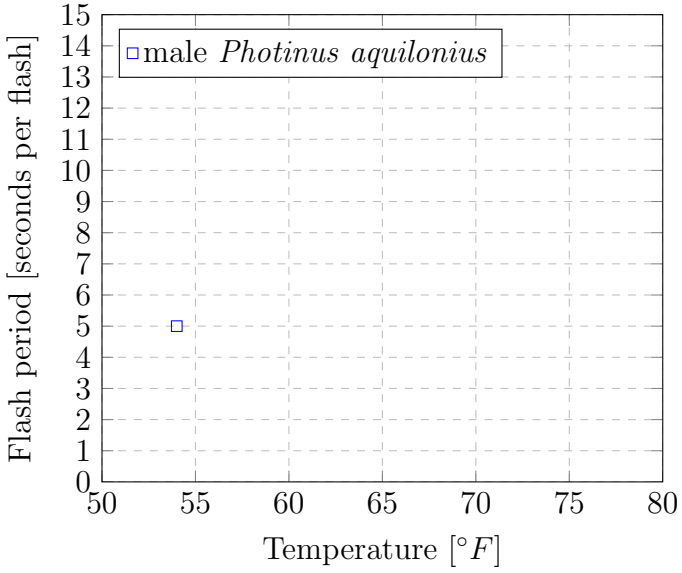
   (b) What percentage of the students scored below 40?

2. The flash rate of fireflies depends on various factors, including temperature. Firefly field data (simulated) where T is the temperature and $f(T)$ is the number of seconds between flashes is shown below.

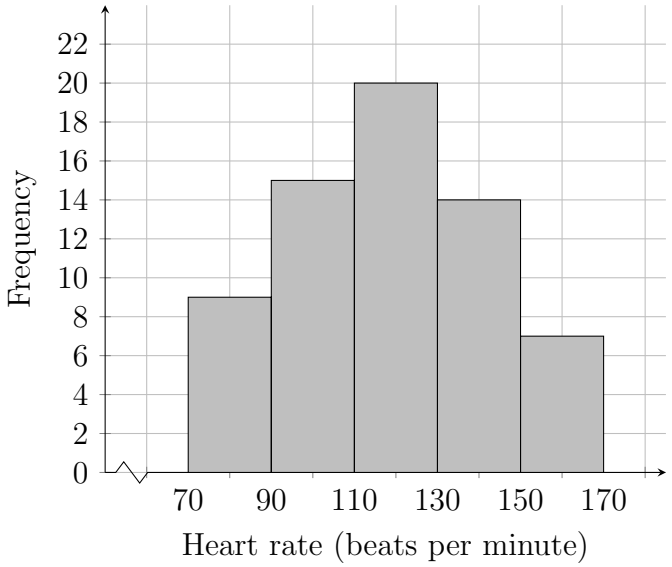
   Plot the data in the table on the grid below (one point is plotted for you) and draw a line of best fit.

T	54	60	64	70	75
$f(T)$	5	8	10	11	13

Temperature dependence of male *Photinus aquilonius* fireflies



3. The histogram below shows the heart rate x in beats per minute for 65 athletes after a fitness exercise.



The following is the frequency table for the distribution of x.

HR (x)	$70 \leq x < 90$	$90 \leq x < 110$	$110 \leq x < 130$	$130 \leq x < 150$	$150 \leq x < 170$
Freq	9	p	20	14	7

(a) Write down the value of p. [1 mark]

(b) Write down the modal class. [2 marks]

(c) What percentage of the athletes have a heart rate of 130 beats per minute or greater? [2 marks]

(d) Consider the class interval $70 \leq x < 90$.

i. Write down the interval width. [1 mark]

ii. Write down the mid-interval value. [1 mark]

(e) Hence find an estimate for the

i. mean; [2 marks]

ii. standard deviation. [2 marks]

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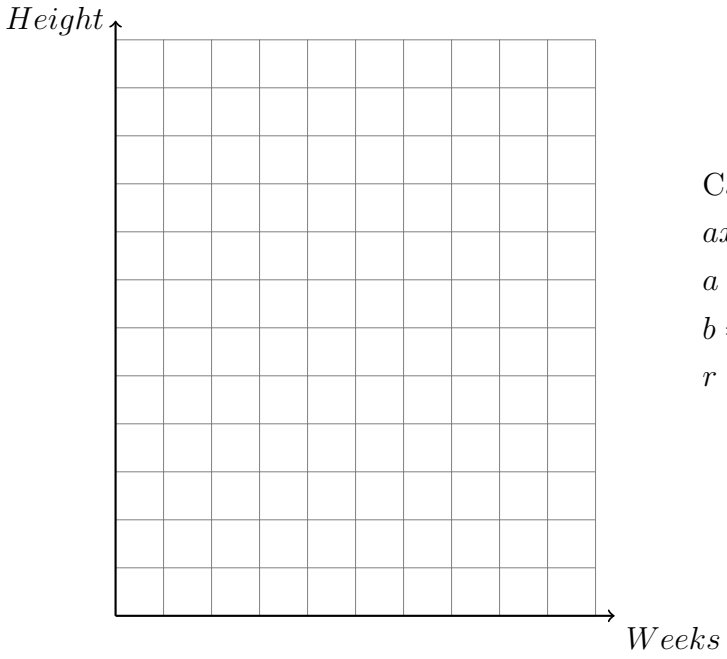
4. Dr. Huson buys a new plant and measures how tall it is after a number of weeks. Some of his measurements are shown below. Plot the points in the grid below.

Weeks	2	5	7	10
Height (cm)	5	6	8	9



Calculator
$ax + b$
$a = 0.529$
$b = 3.82$
$r = 0.976$

State, to the *nearest tenth*, the linear regression equation that approximates the height, y, of the plants after x weeks.

Explain what the y-intercept means in the context of the problem.

Explain what the slope means in the context of the problem.

5. An environmental group records the numbers of coyotes and foxes in a wildlife reserve after t years, starting on 1 January 1995.

   Let c be the number of coyotes in the reserve after t years. The following table shows the number of coyotes after t years.

number of years (t)	0	2	10	15	19
number of coyotes (c)	115	197	265	320	406

   The relationship between the variables can be modelled by the regression equation $c = at + b$.

   (a) Find the value of a and b. [3 marks]

   (b) Find Pearson's correlation coefficient r and characterize its value. [2 marks]

   (c) Use the regression equation to estimate the number of coyotes in the reserve when $t = 7$. [3 marks]

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6. There are 250 high school students at BECA ranging in age from 13 to 18 years old. The following table shows the frequencies of each age.

Age (years)	13	14	15	16	17	18
Frequency	27	53	60	55	43	12

(a) Write down the mode. [1 mark]

(b) Find the value of the range. [1 marks]

(c) Find the median. [1 marks]

(d) Find the mean. [2 marks]

(e) Find the standard deviation. [2 marks]

(f) Four years later the same 250 people have moved on to college and career. Find the new values of the

i. mean; [1 marks]

ii. standard deviation. [1 marks]