Question 11 **(19 marks)**

University students from the faculty of Human Movement were tasked with determining the relationship between grip strength and age in adults who participate in regular exercise. They visited a health club and collected data from female volunteers. There is an expectation that grip strength will eventually decrease with age.

(a) After data was collected and analysed from 13 female volunteers, the students stated: "51% of the variation in grip strength cannot be explained by the variation in age". On the basis of this statement, determine the correlation coefficient between age and grip strength. (3 marks)

The students decided to omit one particular data point from all calculations.

(b) What is the most likely reason for removing this data point? (1 mark)

The table below shows the remaining 12 data points.

Age (a) (years)	34	61	20	41	49	26	63	38	56	55	46	35
Grip strength (s) (kg)	49.4	33.6	46.6	43.1	43.1	47.1	30.2	47.7	39.5	41.3	40.7	49.6

(c) Calculate r_{as} the correlation coefficient between age and grip strength. (1 mark)

(d) Determine the equation of the least-squares line between age and grip strength. (1 mark)

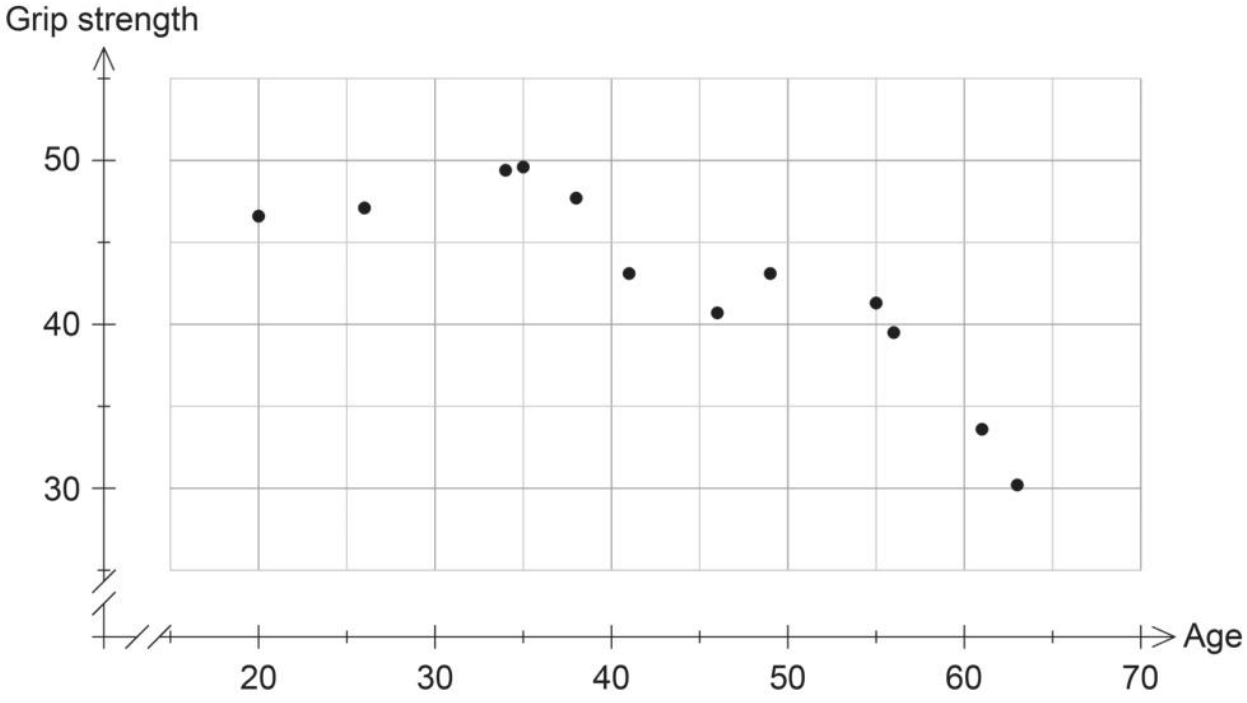
(e) Interpret the gradient of the least-squares line in the context of this question. (2 marks)

(f) Explain why the vertical intercept of the least-squares line is meaningless in the context of this question. (1 mark)

(g) Use your least-squares line to predict the grip strength of a female aged 64 who participates in regular exercise. (1 mark)

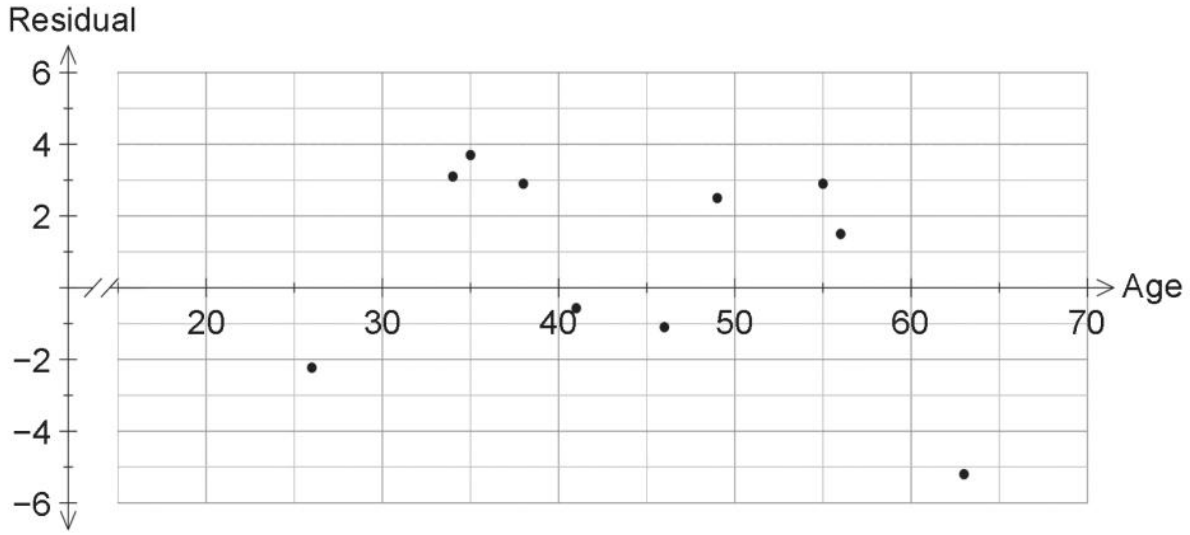
(h) Discuss the validity of the prediction in part (g) above. (2 marks)

(i) Draw the least-squares line for these data on the scatterplot below. (1 mark)



A spare grid is provided at the end of this Question/Answer booklet. If you need to use it, cross out your attempt and indicate that you have redrawn it on the spare grid.

The incomplete residual plot for these data is drawn below.



(j) Determine the **two** missing residuals and plot them on the graph above. (3 marks)

A spare grid is provided at the end of this Question/Answer booklet. If you need to use it, cross out your attempt and indicate that you have redrawn it on the spare grid.

(k) On the basis of your analysis of the data, make **three** reasonable statements about the connection between age and grip strength for females. (3 marks)