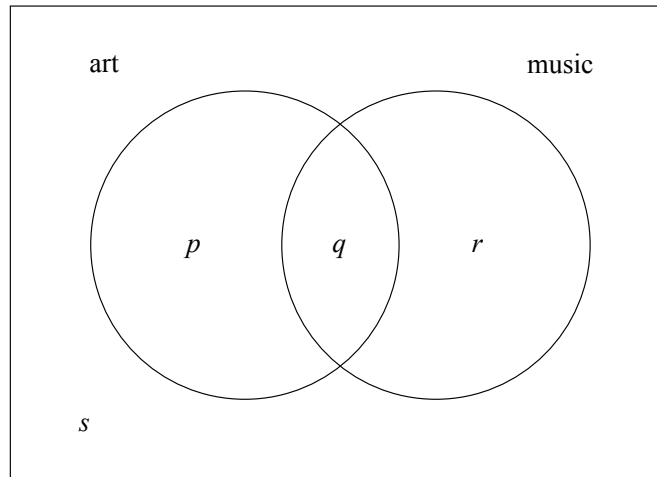1)

[Maximum mark: 13]

In a group of 16 students, 12 take art and 8 take music. One student takes neither art nor music. The Venn diagram below shows the events art and music. The values p, q, r and s represent numbers of students.

(a) (i)   Write down the value of s.

     (ii) Find the value of q.

     (iii) Write down the value of p and of r.   *[5 marks]*

(b) (i)   A student is selected at random. Given that the student takes music, write down the probability the student takes art.

     (ii) **Hence**, show that taking music and taking art are **not** independent events.   *[4 marks]*

(c) Two students are selected at random, one after the other. Find the probability that the first student takes **only** music and the second student takes **only** art.   *[4 marks]*
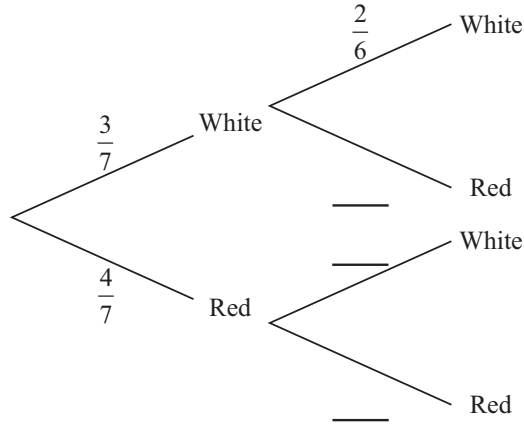
[Maximum mark: 14]

2)

Bag A contains three white balls and four red balls. Two balls are chosen at random without replacement.

(a) (i) **Copy** and complete the following tree diagram. *(Do **not** write on this page.)*

      (ii) Find the probability that two white balls are chosen. *[5 marks]*

Bag B contains four white balls and three red balls. When two balls are chosen at random without replacement from bag B, the probability that they are both white is $\frac{2}{7}$.

A standard die is rolled. If 1 or 2 is obtained, two balls are chosen without replacement from bag A, otherwise they are chosen from bag B.

(b) Find the probability that the two balls are white. *[5 marks]*

(c) Given that both balls are white, find the probability that they were chosen from bag A. *[4 marks]*

3) There are nine books on a shelf. For each book, x is the number of pages, and y is the selling price in pounds (£). Let r be the correlation coefficient.

(a) Write down the possible minimum and maximum values of r. *[2 marks]*

(b) Given that $r = 0.95$, which of the following diagrams best represents the data. *[1 mark]*
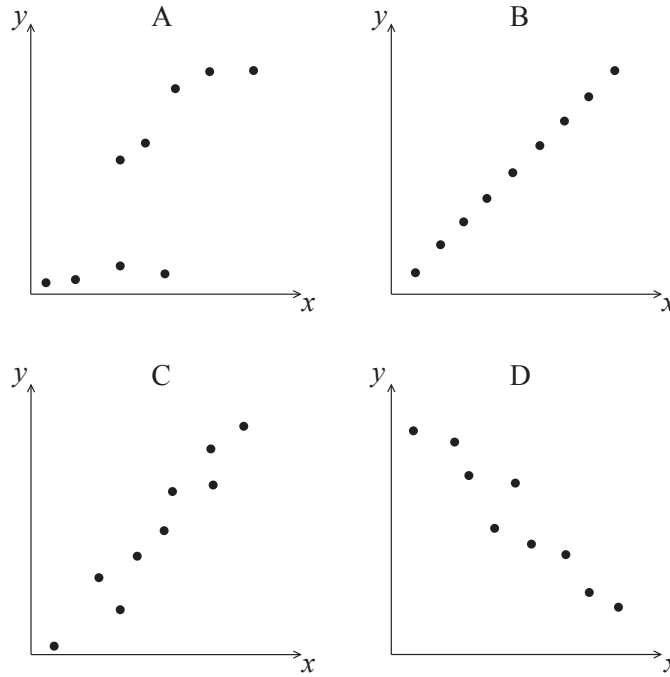
(c) For the data in diagram D, which **two** of the following expressions describe the correlation between x and y?
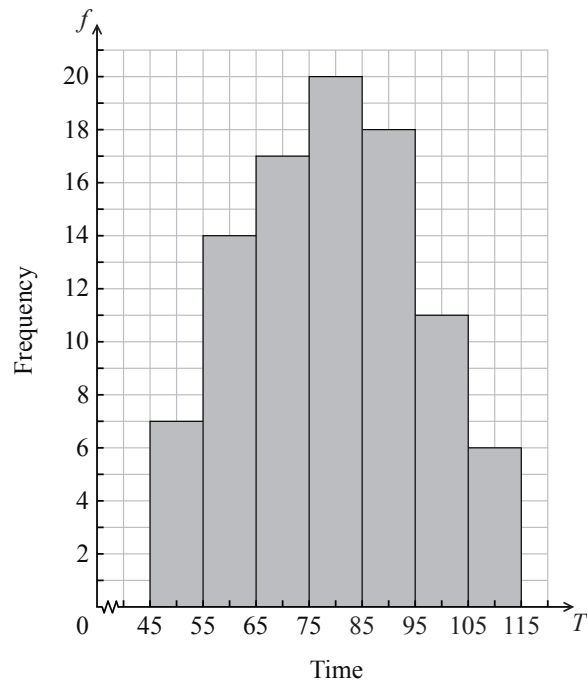
perfect, zero, linear, strong positive, strong negative,
weak positive, weak negative *[2 marks]*

4)

The histogram below shows the time T seconds taken by 93 children to solve a puzzle.

Time

The following is the frequency distribution for T.

Time	$45 \leq T < 55$	$55 \leq T < 65$	$65 \leq T < 75$	$75 \leq T < 85$	$85 \leq T < 95$	$95 \leq T < 105$	$105 \leq T < 115$
Frequency	7	14	p	20	18	q	6

(a) (i) Write down the value of p and of q.

   (ii) Write down the median class.   *[3 marks]*

(b) A child is selected at random. Find the probability that the child takes less than 95 seconds to solve the puzzle.   *[2 marks]*

Consider the class interval $45 \leq T < 55$.

(c) (i) Write down the interval width.

   (ii) Write down the mid-interval value.   *[2 marks]*

(d) Hence find an estimate for the

   (i) mean;

   (ii) standard deviation.   *[4 marks]*

5)

[Maximum mark: 13]

Each day, a factory recorded the number (x) of boxes it produces and the total production cost (y) dollars. The results for nine days are shown in the following table.

x	26	44	65	43	50	31	68	46	57
y	400	582	784	625	699	448	870	537	724

(a)   Write down the equation of the regression line of y on x.   *[2 marks]*

Use your regression line as a model to answer the following.

(b)   Interpret the meaning of

      (i)   the gradient;

      (ii)   the y-intercept.   *[2 marks]*

(c)   Estimate the cost of producing 60 boxes.   *[2 marks]*

(d)   The factory sells the boxes for $19.99 each. Find the least number of boxes that the factory should produce in one day in order to make a profit.   *[3 marks]*