

SECTION A: STATISTICS

Answer ALL questions. Write your answers in the spaces provided.

1. Sara is investigating the variation in daily maximum gust,  $t$  kn, for Camborne in June and July 1987.

She used the large data set to select a sample of size 20 from the June and July data for 1987. Sara selected the first value using a random number from 1 to 4 and then selected every third value after that.

- (a) State the sampling technique Sara used. (1)
- (b) From your knowledge of the large data set explain why this process may not generate a sample of size 20. (1)

The data Sara collected are summarised as follows

$$n = 20 \quad \sum t = 374 \quad \sum t^2 = 7600$$

- (c) Calculate the standard deviation. (2)

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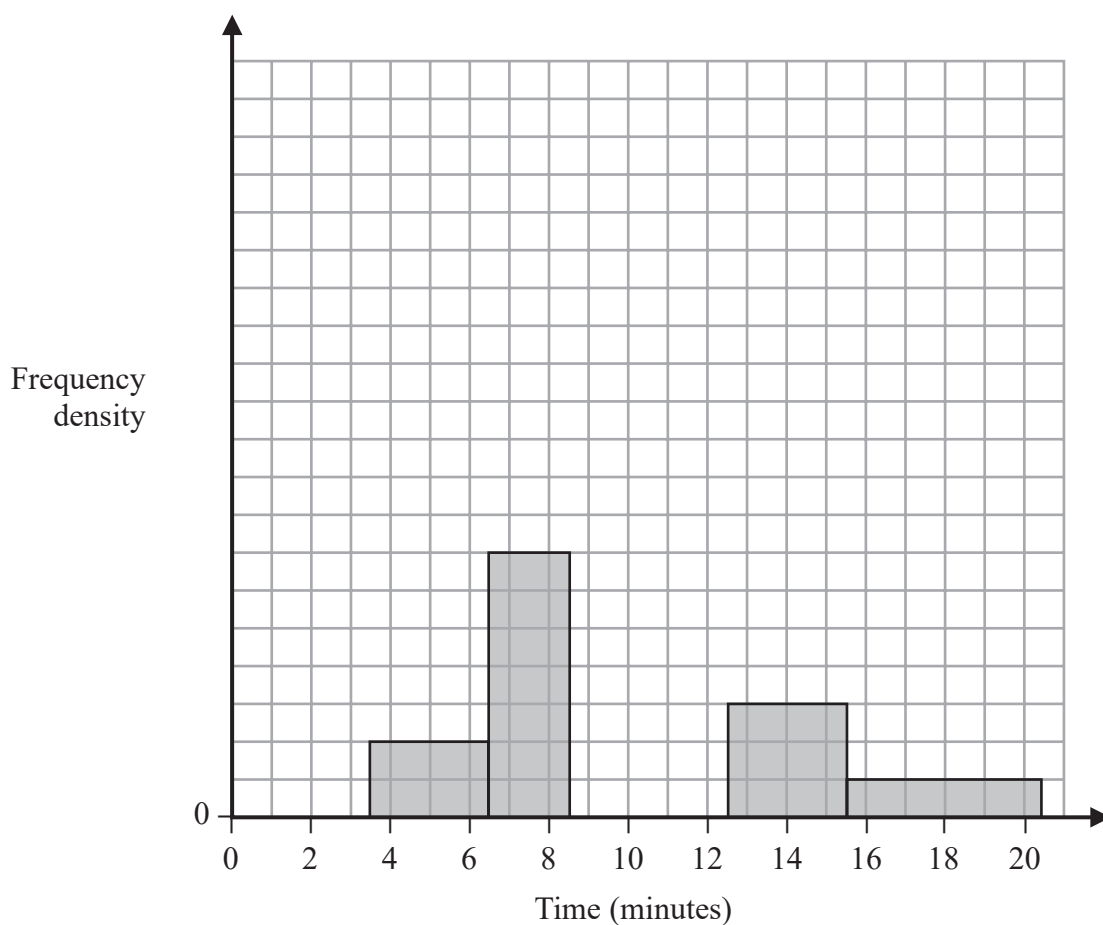
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2. The partially completed histogram and the partially completed table show the time, to the nearest minute, that a random sample of motorists was delayed by roadworks on a stretch of motorway.



Delay (minutes)	Number of motorists
4 – 6	6
7 – 8	
9	17
10 – 12	45
13 – 15	9
16 – 20	

Estimate the percentage of these motorists who were delayed by the roadworks for between 8.5 and 13.5 minutes.

(5)

**Question 2 continued**

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**(Total for Question 2 is 5 marks)**

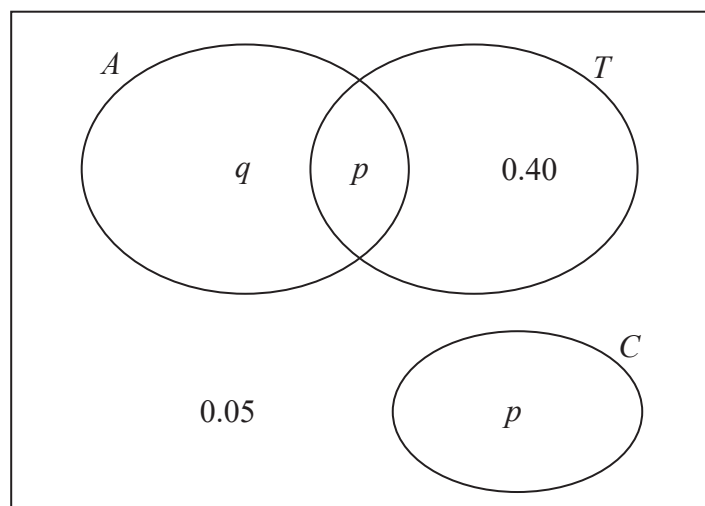
3. The Venn diagram shows the probabilities for students at a college taking part in various sports.

$A$  represents the event that a student takes part in Athletics.

$T$  represents the event that a student takes part in Tennis.

$C$  represents the event that a student takes part in Cricket.

$p$  and  $q$  are probabilities.



The probability that a student selected at random takes part in Athletics or Tennis is 0.75

- (a) Find the value of  $p$ . (1)
- (b) State, giving a reason, whether or not the events  $A$  and  $T$  are statistically independent. Show your working clearly. (3)
- (c) Find the probability that a student selected at random does not take part in Athletics or Cricket. (1)

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4. Sara was studying the relationship between rainfall,  $r$  mm, and humidity,  $h\%$ , in the UK. She takes a random sample of 11 days from May 1987 for Leuchars from the large data set.

She obtained the following results.

$h$	93	86	95	97	86	94	97	97	87	97	86
$r$	1.1	0.3	3.7	20.6	0	0	2.4	1.1	0.1	0.9	0.1

Sara examined the rainfall figures and found

$$Q_1 = 0.1 \quad Q_2 = 0.9 \quad Q_3 = 2.4$$

A value that is more than 1.5 times the interquartile range (IQR) above  $Q_3$  is called an outlier.

- (a) Show that  $r = 20.6$  is an outlier. (1)

(b) Give a reason why Sara might:

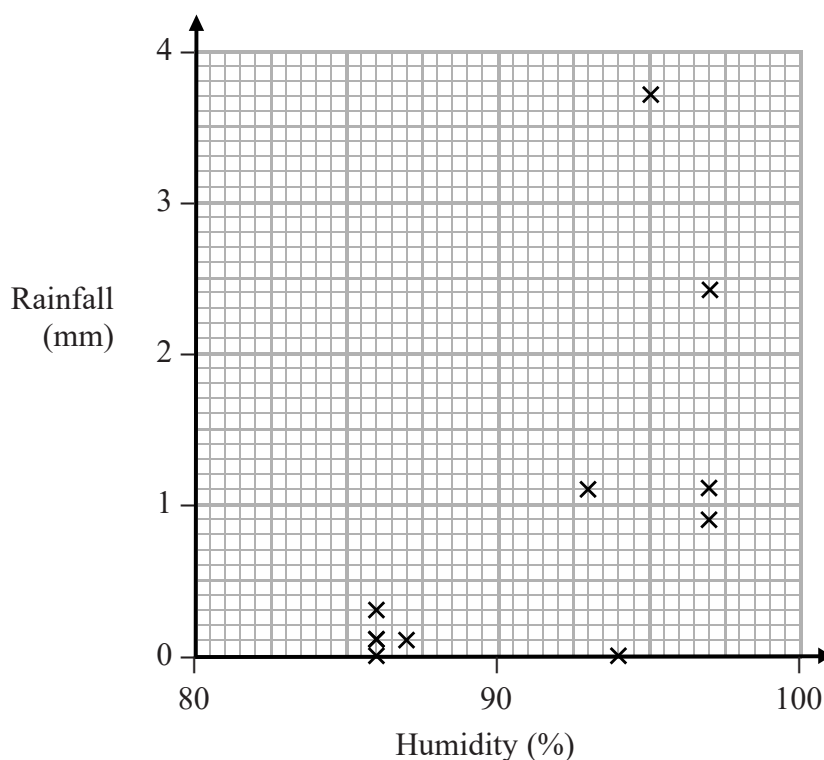
(i) include

(ii) exclude

this day's reading.

(2)

Sara decided to exclude this day's reading and drew the following scatter diagram for the remaining 10 days' values of  $r$  and  $h$ .



- (c) Give an interpretation of the correlation between rainfall and humidity. (1)





5. (a) The discrete random variable  $X \sim B(40, 0.27)$

Find  $P(X \geq 16)$

(2)

Past records suggest that 30% of customers who buy baked beans from a large supermarket buy them in single tins. A new manager suspects that there has been a change in the proportion of customers who buy baked beans in single tins. A random sample of 20 customers who had bought baked beans was taken.

(b) Write down the hypotheses that should be used to test the manager's suspicion.

(1)

(c) Using a 10% level of significance, find the critical region for a two-tailed test to answer the manager's suspicion. You should state the probability of rejection in each tail, which should be less than 0.05

(3)

(d) Find the actual significance level of a test based on your critical region from part (c).

(1)

One afternoon the manager observes that 12 of the 20 customers who bought baked beans, bought their beans in single tins.

(e) Comment on the manager's suspicion in the light of this observation.

(1)

Later it was discovered that the local scout group visited the supermarket that afternoon to buy food for their camping trip.

(f) Comment on the validity of the model used to obtain the answer to part (e), giving a reason for your answer.

(1)

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**Question 5 continued**

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**(Total for Question 5 is 9 marks)**

**TOTAL FOR SECTION A IS 30 MARKS**