1 A fair spinner with 5 sides numbered 1, 2, 3, 4, 5 is spun repeatedly. The score on each spin is the number on the side on which the spinner lands.

(a) Find the probability that a score of 3 is obtained for the first time on the 8th spin. [1]

.....

.....

.....

.....

.....

.....

.....

(b) Find the probability that fewer than 6 spins are required to obtain a score of 3 for the first time. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2 Georgie has a red scarf, a blue scarf and a yellow scarf. Each day she wears exactly one of these scarves. The probabilities for the three colours are 0.2, 0.45 and 0.35 respectively. When she wears a red scarf, she always wears a hat. When she wears a blue scarf, she wears a hat with probability 0.4. When she wears a yellow scarf, she wears a hat with probability 0.3.

(a) Find the probability that on a randomly chosen day Georgie wears a hat. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Find the probability that on a randomly chosen day Georgie wears a yellow scarf given that she does not wear a hat. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3 The time spent by shoppers in a large shopping centre has a normal distribution with mean 96 minutes and standard deviation 18 minutes.

(a) Find the probability that a shopper chosen at random spends between 85 and 100 minutes in the shopping centre. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

88% of shoppers spend more than t minutes in the shopping centre.

(b) Find the value of t. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4 The random variable X takes the values 1, 2, 3, 4 only. The probability that X takes the value x is $kx(5 - x)$, where k is a constant.

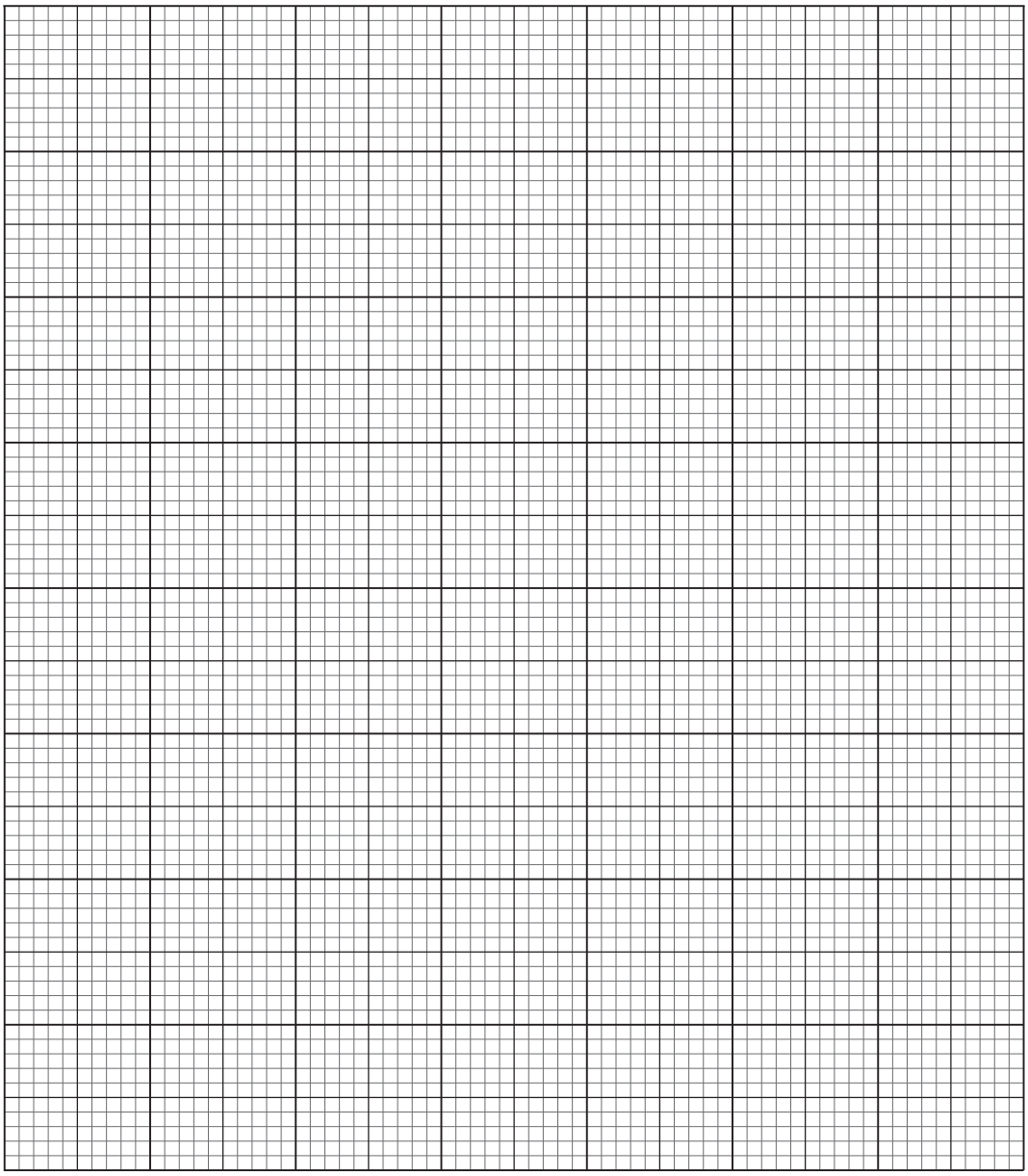
(a) Draw up the probability distribution table for X, in terms of k. [2]

(b) Show that $\text{Var}(X) = 1.05$. [4]

5 A driver records the distance travelled in each of 150 journeys. These distances, correct to the nearest km, are summarised in the following table.

Distance (km)	0 – 4	5 – 10	11 – 20	21 – 30	31 – 40	41 – 60
Frequency	12	16	32	66	20	4

(a) Draw a cumulative frequency graph to illustrate the data. [4]



(b) For 30% of these journeys the distance travelled is d km or more.

Use your graph to estimate the value of d. [2]

.....

.....

.....

.....

.....

.....

.....

(c) Calculate an estimate of the mean distance travelled for the 150 journeys. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6 **(a)** Find the total number of different arrangements of the 11 letters in the word CATERPILLAR. [2]

.....

.....

.....

.....

.....

.....

(b) Find the total number of different arrangements of the 11 letters in the word CATERPILLAR in which there is an R at the beginning and an R at the end, and the two As are not together. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Find the total number of different selections of 6 letters from the 11 letters of the word CATERPILLAR that contain both Rs and at least one A and at least one L. [4]

7 There are 400 students at a school in a certain country. Each student was asked whether they preferred swimming, cycling or running and the results are given in the following table.

	Swimming	Cycling	Running
Female	104	50	66
Male	31	57	92

A student is chosen at random.

(a) **(i)** Find the probability that the student prefers swimming. [1]

.....

.....

.....

.....

.....

(ii) Determine whether the events 'the student is male' and 'the student prefers swimming' are independent, justifying your answer. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

On average at all the schools in this country 30% of the students do not like any sports.

(b) **(i)** 10 of the students from this country are chosen at random.

Find the probability that at least 3 of these students do not like any sports. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) 90 students from this country are now chosen at random.

Use an approximation to find the probability that fewer than 32 of them do not like any sports. [5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....