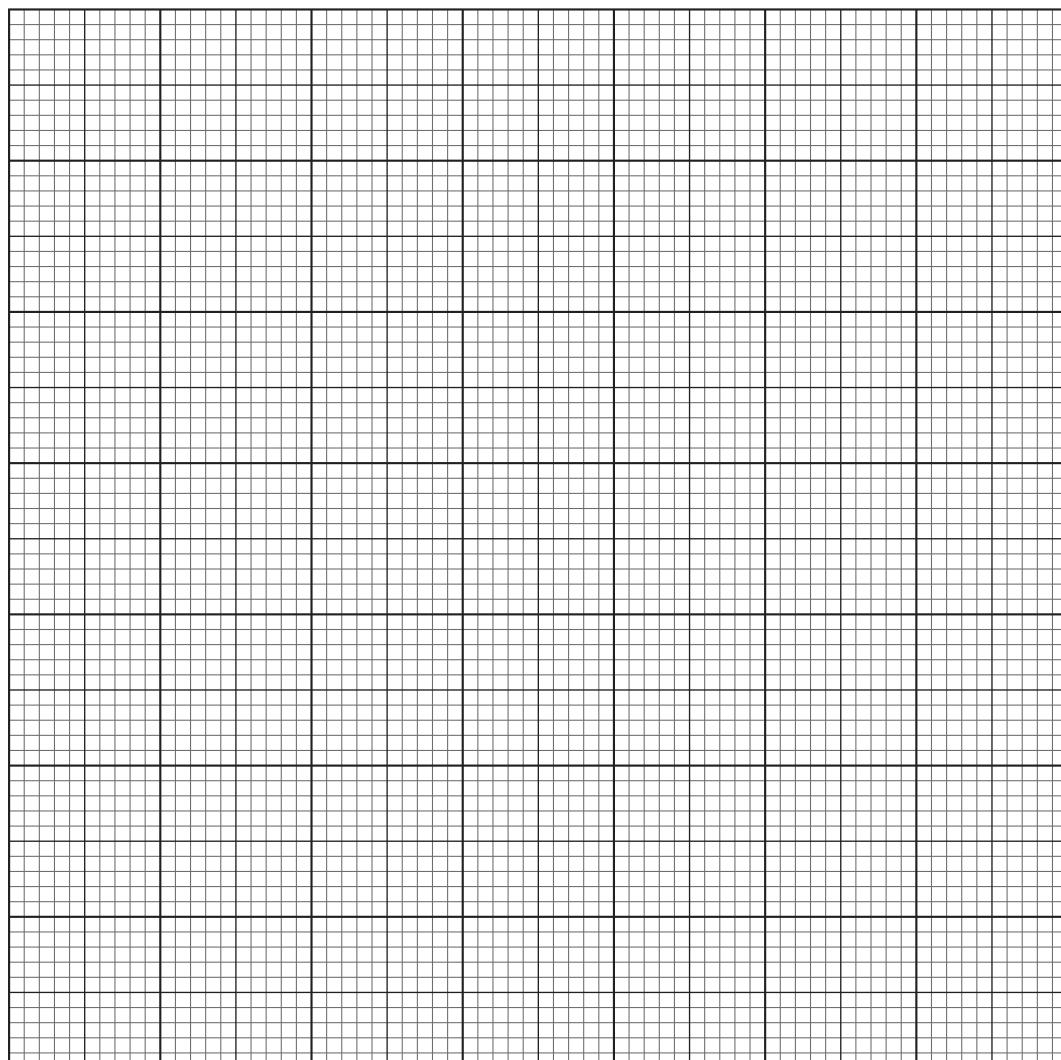


- 1 Each year the total number of hours,  $x$ , of sunshine in Kintoo is recorded during the month of June. The results for the last 60 years are summarised in the table.

$x$	$30 \leq x < 60$	$60 \leq x < 90$	$90 \leq x < 110$	$110 \leq x < 140$	$140 \leq x < 180$	$180 \leq x \leq 240$
Number of years	4	8	14	25	7	2

- (a) Draw a cumulative frequency graph to illustrate the data.

[3]



- (b) Use your graph to estimate the 70th percentile of the data.

[2]

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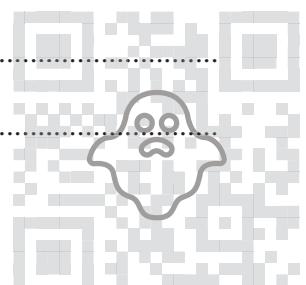
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- (c) Calculate an estimate for the mean number of hours of sunshine in Kintoo during June over the last 60 years. [3]

[3]



- 2** Alisha has four coins. One of these coins is biased so that the probability of obtaining a head is 0.6. The other three coins are fair. Alisha throws the four coins at the same time. The random variable  $X$  denotes the number of heads obtained.

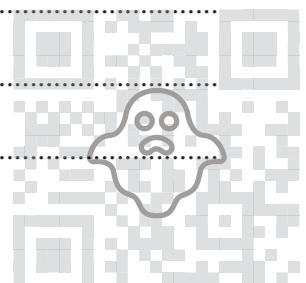
- (a) Show that the probability of obtaining exactly one head is 0.225.

[3]

- (b) Complete the following probability distribution table for  $X$ .

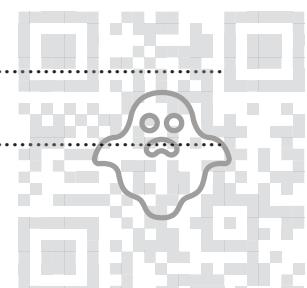
[2]

$x$	0	1	2	3	4
$P(X = x)$	0.05	0.225			0.075



- (c) Given that  $E(X) = 2.1$ , find the value of  $\text{Var}(X)$ .

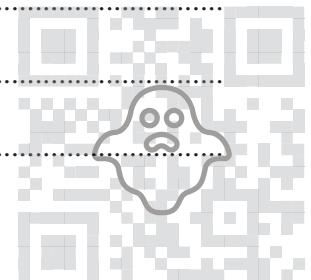
[2]



- 3** 80% of the residents of Kinwawa are in favour of a leisure centre being built in the town.

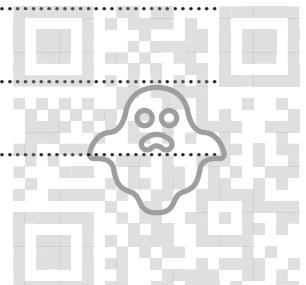
20 residents of Kinwawa are chosen at random and asked, in turn, whether they are in favour of the leisure centre.

- (a) Find the probability that more than 17 of these residents are in favour of the leisure centre. [3]



- (b) Find the probability that the 5th person asked is the first person who is **not** in favour of the leisure centre. [1]

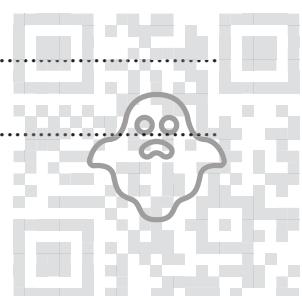
- (c) Find the probability that the 7th person asked is the second person who is **not** in favour of the leisure centre. [2]



- 4 The probability that it will rain on any given day is  $x$ . If it is raining, the probability that Aran wears a hat is 0.8 and if it is not raining, the probability that he wears a hat is 0.3. Whether it is raining or not, if Aran wears a hat, the probability that he wears a scarf is 0.4. If he does not wear a hat, the probability that he wears a scarf is 0.1. The probability that on a randomly chosen day it is not raining and Aran is not wearing a hat or a scarf is 0.36.

Find the value of  $x$ .

[3]



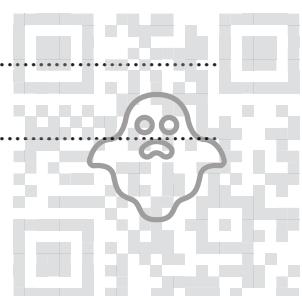
- 5 Marco has four boxes labelled  $K$ ,  $L$ ,  $M$  and  $N$ . He places them in a straight line in the order  $K$ ,  $L$ ,  $M$ ,  $N$  with  $K$  on the left. Marco also has four coloured marbles: one is red, one is green, one is white and one is yellow. He places a single marble in each box, at random. Events  $A$  and  $B$  are defined as follows.

A: The white marble is in either box  $L$  or box  $M$ .

*B:* The red marble is to the left of both the green marble and the yellow marble.

Determine whether or not events  $A$  and  $B$  are independent.

[3]



- 6 In a cycling event the times taken to complete a course are modelled by a normal distribution with mean 62.3 minutes and standard deviation 8.4 minutes.

(a) Find the probability that a randomly chosen cyclist has a time less than 74 minutes. [2]

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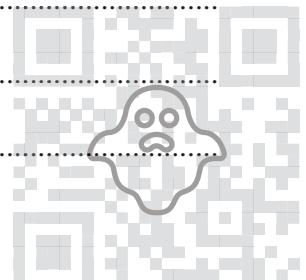
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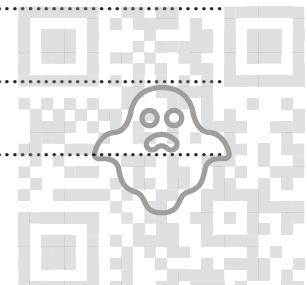
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- (b) Find the probability that 4 randomly chosen cyclists all have times between 50 and 74 minutes. [4]



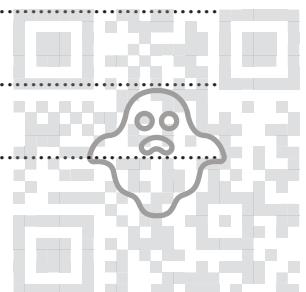
In a different cycling event, the times can also be modelled by a normal distribution. 23% of the cyclists have times less than 36 minutes and 10% of the cyclists have times greater than 54 minutes.

- (c) Find estimates for the mean and standard deviation of this distribution. [5]



- 7 (a) Find the number of different arrangements of the 9 letters in the word DELIVERED in which the three Es are together and the two Ds are **not** next to each other. [4]

- (b) Find the probability that a randomly chosen arrangement of the 9 letters in the word DELIVERED has exactly 4 letters between the two Ds. [5]



Five letters are selected from the 9 letters in the word DELIVERED.

- (c) Find the number of different selections if the 5 letters include at least one D and at least one E. [3]

