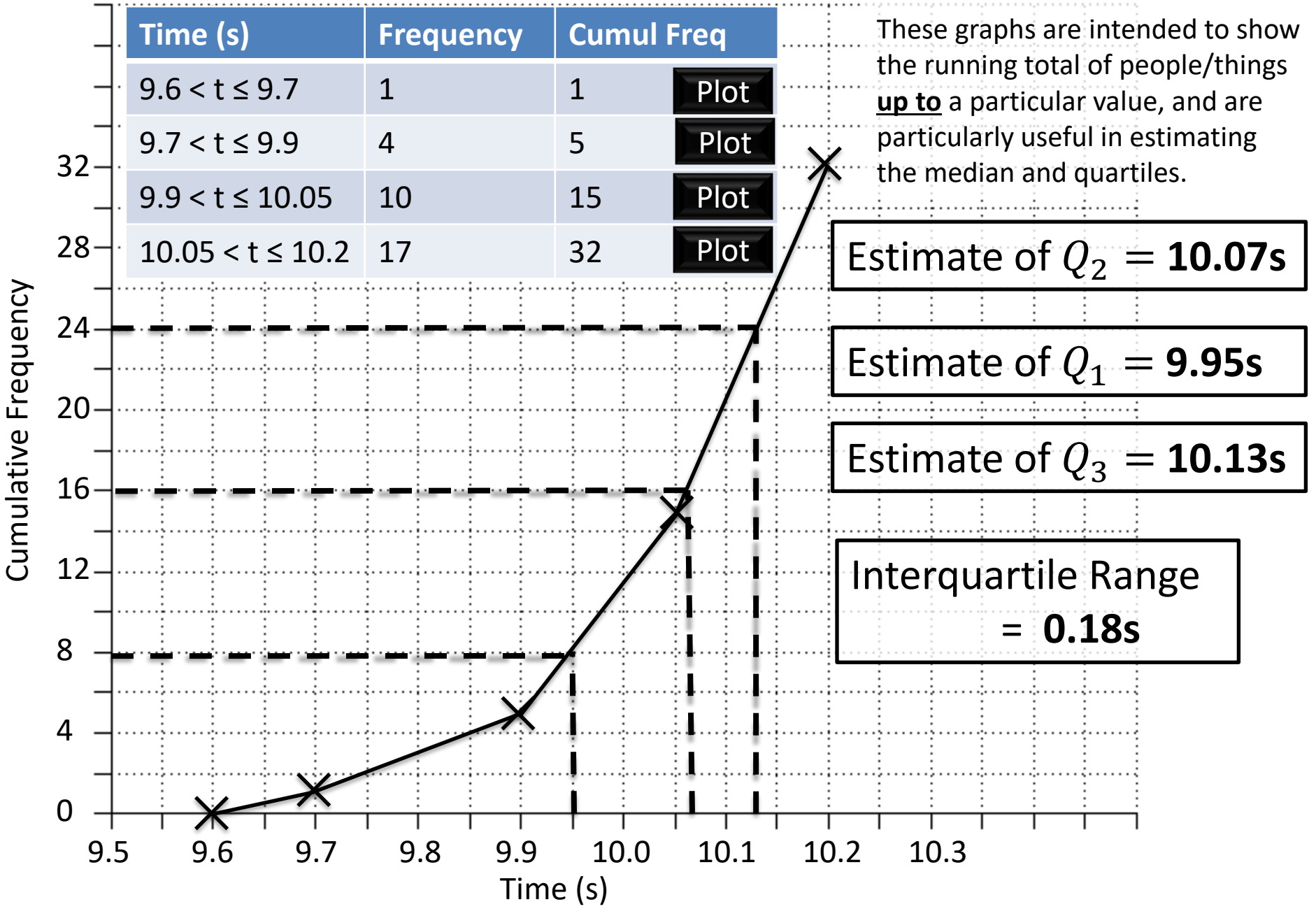
S1 Chapter 3: Data Representations

Cumulative Frequency

Cumulative Frequency Diagrams

Time (s)	Frequency	Cumul Freq	
9.6 < t ≤ 9.7	1	1	Plot
9.7 < t ≤ 9.9	4	5	Plot
9.9 < t ≤ 10.05	10	15	Plot
10.05 < t ≤ 10.2	17	32	Plot

These graphs are intended to show the running total of people/things **up to** a particular value, and are particularly useful in estimating the median and quartiles.



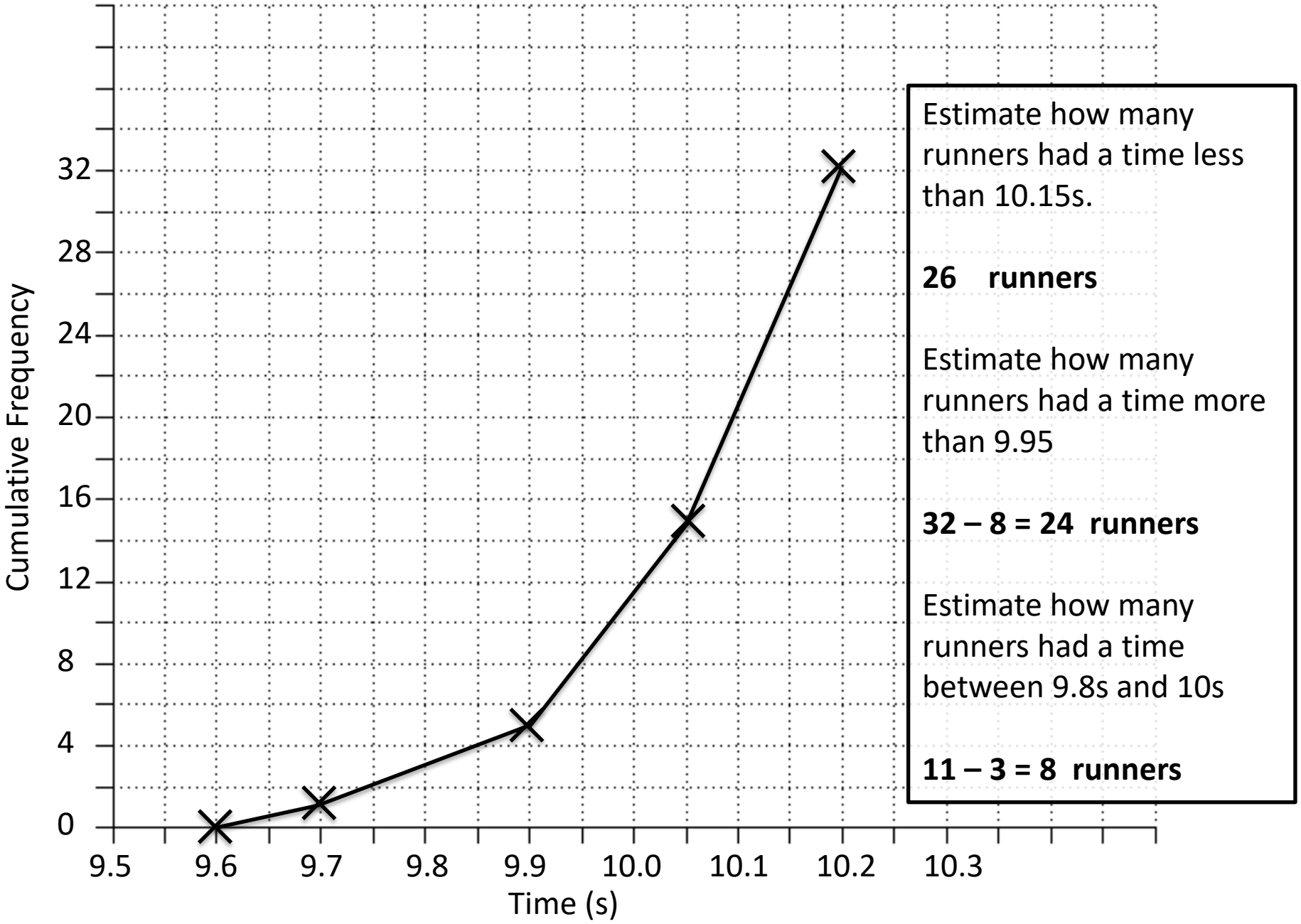
Estimate of Q_2 = **10.07s**

Estimate of Q_1 = **9.95s**

Estimate of Q_3 = **10.13s**

Interquartile Range = **0.18s**

Cumulative Frequency Diagrams



Estimate how many runners had a time less than 10.15s.

26 runners

Estimate how many runners had a time more than 9.95

32 – 8 = 24 runners

Estimate how many runners had a time between 9.8s and 10s

11 – 3 = 8 runners

Exercise 3.3

Pearson Pure Mathematics Year 1/AS
Pages 19-20

Homework Exercise

1 The table shows the masses, in kilograms, of 120 Coulter pine cones.

a Draw a cumulative frequency diagram for this data.

b Estimate the median mass.

c Find the interquartile range and the 10th to 90th interpercentile range.

d Draw a box plot to show this data.

Mass, m (kg)	Frequency
$1.0 \leqslant m < 1.2$	7
$1.2 \leqslant m < 1.4$	18
$1.4 \leqslant m < 1.6$	34
$1.6 \leqslant m < 1.8$	41
$1.8 \leqslant m < 2.0$	15
$2.0 \leqslant m < 2.2$	5

2 The table shows the lengths, in cm, of 70 earthworms.

a Draw a cumulative frequency diagram for this data.

b Estimate the median and quartiles.

c Estimate how many earthworms are

i longer than 8.2 cm **ii** shorter than 7.3 cm.

d Draw a box plot to show this data.

Length, l (cm)	Frequency
$6.0 \leqslant l < 6.5$	3
$6.5 \leqslant l < 7.0$	13
$7.0 \leqslant l < 7.5$	14
$7.5 \leqslant l < 8.0$	26
$8.0 \leqslant l < 8.5$	10
$8.5 \leqslant l < 9.0$	4

Homework Exercise

3 The table shows the times taken by 80 men and 80 women to complete a crossword puzzle.

Time, t (min)	Frequency (men)	Frequency (women)
$5 \leqslant t < 6$	2	3
$6 \leqslant t < 7$	14	15
$7 \leqslant t < 8$	17	21
$8 \leqslant t < 9$	40	35
$9 \leqslant t < 10$	7	6

a Draw cumulative frequency diagrams for both sets of data on the same axes.

b Which gender had the lower median time?

c Which gender had the bigger spread of times?

d The qualifying time for the next round of a national competition is 7.5 minutes. Estimate the numbers of men and women who qualified for the competition.

Problem-solving

To compare spread you could use the interquartile range or the 10th to 90th percentile range.

4 A vet measures the masses, in kg, of male and female domestic shorthair cats. Her results are given in the table.

Mass, w (kg)	Frequency (male)	Frequency (female)
$2.5 \leqslant w < 3.0$	1	5
$3.0 \leqslant w < 3.5$	12	17
$3.5 \leqslant w < 4.0$	20	32
$4.0 \leqslant w < 4.5$	27	12
$4.5 \leqslant w < 5.0$	7	4
$5.0 \leqslant w < 5.5$	3	0

a Draw cumulative frequency diagrams for both sets of data on the same axes.

b Which gender has the greater spread of masses?

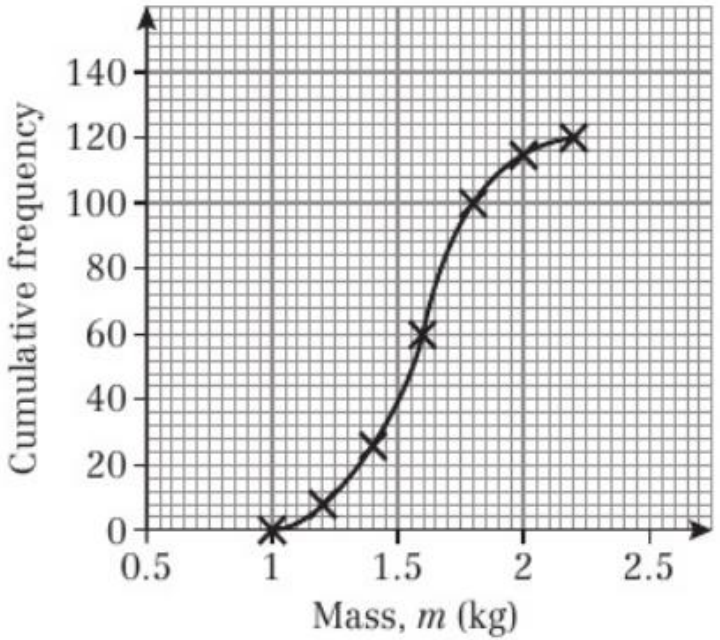
A female domestic shorthair cat is considered underweight if its mass is below 3.2 kg.

A male domestic shorthair cat is considered underweight if its mass is below 3.8 kg.

c Which gender has fewer underweight cats?

Homework Answers

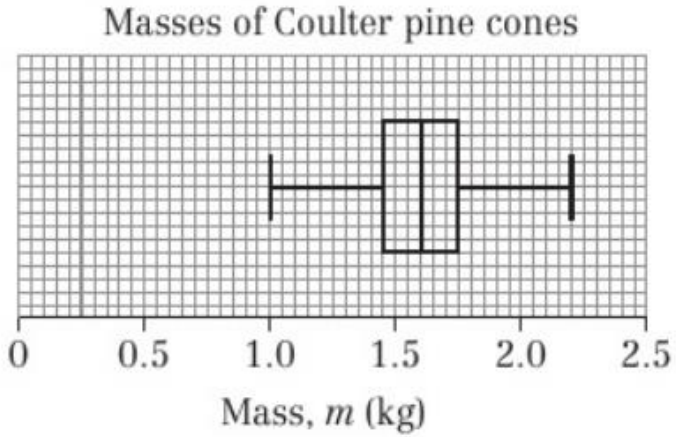
1 a



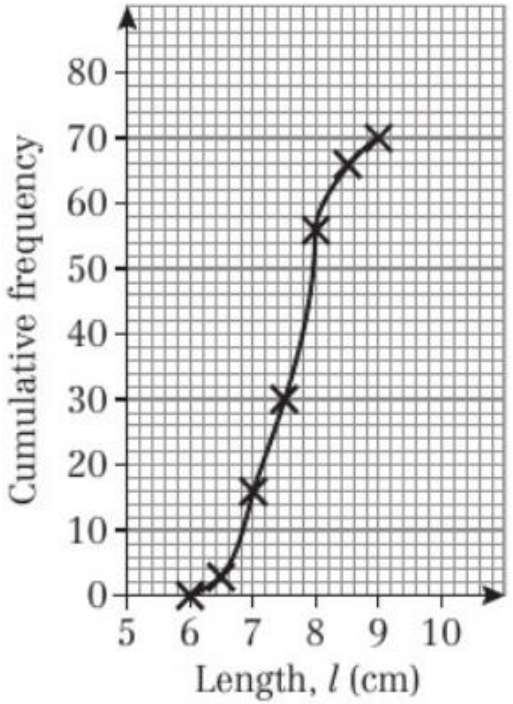
b ≈ 1.6 kg

c IQR ≈ 0.3, 10th to 90th interpercentile range ≈ 0.65

d



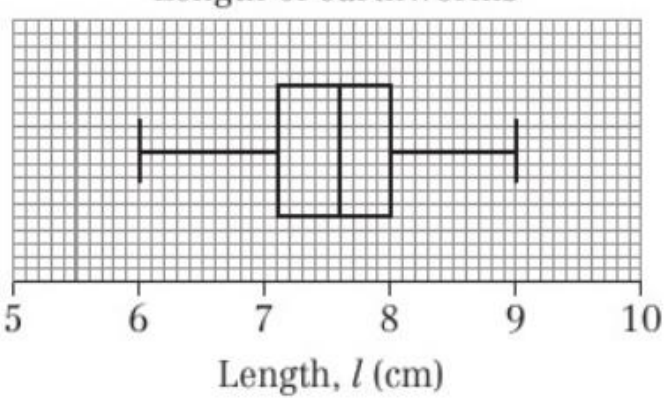
2 a



b Median ≈ 7.6, $Q_1 \approx 7.1$, $Q_3 \approx 8$

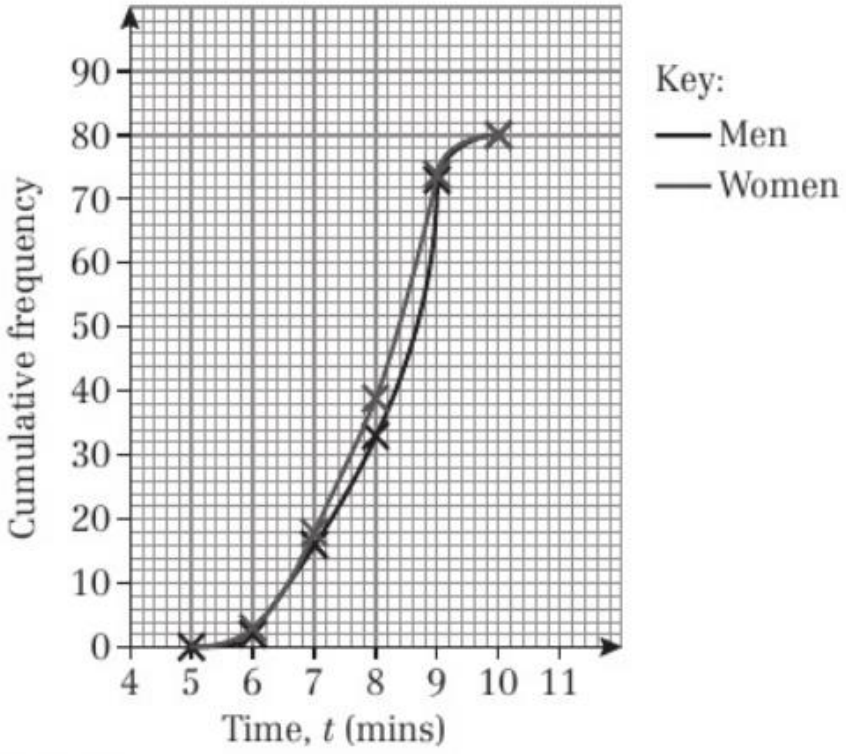
c **i** ≈ 8 **ii** ≈ 24

d



Homework Answers

3 a

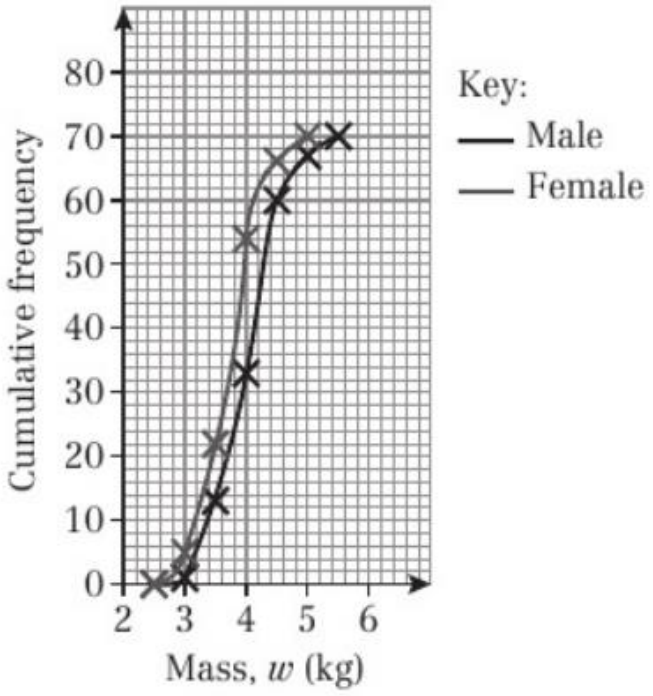


b Women

c Men

d Men ≈ 24, women ≈ 28

4 a



b Male **c** Female