

11 Statistical Diagrams

Name: Class: Date:

11.1 DOT DIAGRAMS

Key Skills Checklist	Confidence Level					Related Questions
	1	2	3	4	5	
Represent a set of data using a dot diagram						3, 4
Solve problems involving dot diagrams						1, 2, 5, 6, 7

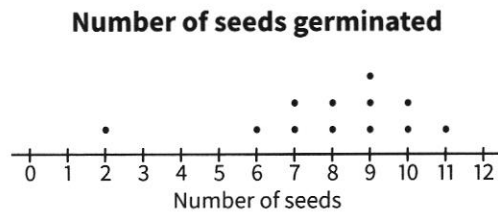
WORD TOOLBOX

dot diagrams
distribution
clusters
outlier

The table of values shows the number of seeds germinated in 12 pots.

7	6	8	9	10	7
9	10	11	2	8	9

The table of values can also be represented using a **dot diagram**.



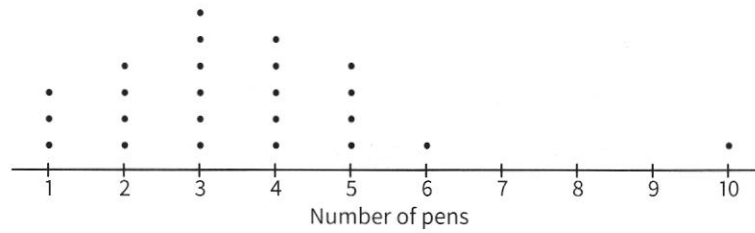
The dot diagram shows the **distribution** of data from the table.

We observe the following.

- The data **clusters** around 9 seeds.
- The lowest value is 2 seeds, which deviates considerably from other values in the distribution. Hence 2 is an **outlier**.

- 1 The dot diagram shows the number of pens some students have in their pencil case.

Number of pens students have



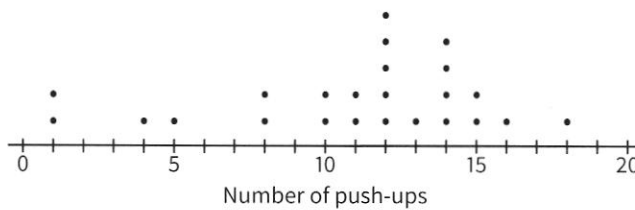
- (a) Write down the number of students that were surveyed.

- (b) Let x be the number of pens each student has.
Write as an inequality, the range of values of x .

- (c) Write down the outlier value.

- 2 The dot diagram shows the number of push-ups completed by the boys in Class A.

Number of push-ups by Class A boys



- (a) Write down the number of boys in Class A.

- (b) Describe briefly the distribution of the number of push-ups completed.

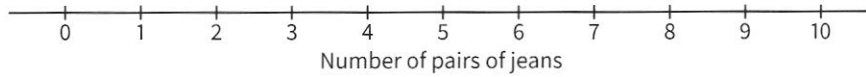
- (c) Write down the number of boys who did more than 10 push-ups.

- 3 The table of values shows the number of pairs of jeans owned by 14 adults.

5	2	3	8	2	6	1
7	5	4	3	3	5	2

Represent the data on a dot diagram.

Number of pairs of jeans owned



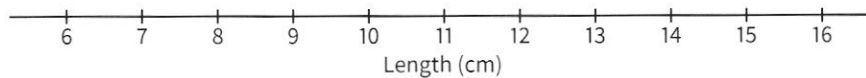
INTERMEDIATE

- 4 The length of 20 potatoes, in cm, were recorded in the table below.

12	8	7	10	11	15	14	8	6	11
13	12	11	10	14	16	7	9	8	12

- (a) Represent the data on a dot diagram.

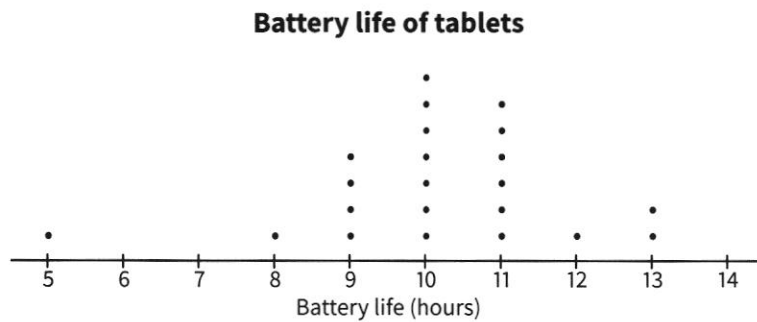
Length of potatoes



- (b) Find the ratio of the number of potatoes longer than 10 cm to the number of potatoes shorter than or equal to 10 cm.

- (c) The farmer who produced the potatoes claims that 70% of the potatoes are longer than 9 cm. Determine if the claim is true.

- 5 The dot diagram represents the battery life (correct to the nearest hour) of 22 tablets.

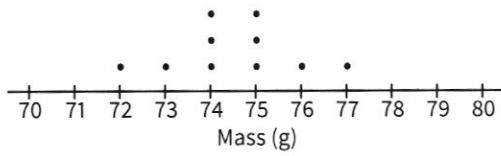


- (a) Describe briefly the distribution of the battery life of the 22 tablets.
- (b) According to a magazine, a tablet has an 'excellent battery life' if its battery lasts more than 10 hours. Find the percentage of the 22 tablets that have 'excellent battery life'.
- (c) A tablet with a 5-hour battery life has a capacity of 4800 mAh. Calculate the battery life of the same tablet if its battery is upgraded to a capacity of 7000 mAh. State your assumptions.

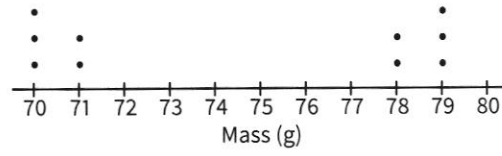


There are 10 apples in a packet. The dot diagrams show the mass (in grams) of each apple in packet *A* and packet *B*.

Masses of apples (packet *A*)



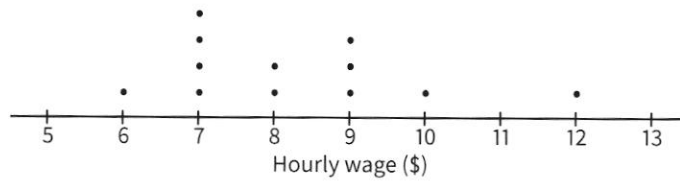
Masses of apples (packet *B*)



- (a) Briefly describe the distribution of the masses of apples in packets *A* and *B*.
- (b) Find the total mass of apples in packets *A* and *B*.
- (c) Determine whether packet *A* or packet *B* is a better purchase. Give reasons to support your answer.

7 The hourly wages (in dollars) of 12 workers are presented in the dot diagram.

Hourly wages of workers



(a) Find the percentage of workers who receive an hourly wage of more than \$8.

(b) Find the average hourly wage of the 12 workers.

(c) Describe changes, if any, to the distribution of the dot diagram when the hourly wage of each worker increases by

(i) \$2,

(ii) 50%.

11.2 HISTOGRAMS

Key Skills Checklist	Confidence Level					Related Questions
	1	2	3	4	5	
Represent a set of data using a histogram						3, 6
Solve problems involving histograms						1, 2, 3, 4, 5, 6
Identify the misuse of histograms and misinterpretation of data						7, 8

WORD TOOLBOX

histogram

grouped numerical data

class intervals

frequency density

The table shows the heights of 18 boys in centimetres.

172	166	182	177	162	173
161	168	173	175	181	166
169	167	179	174	179	184

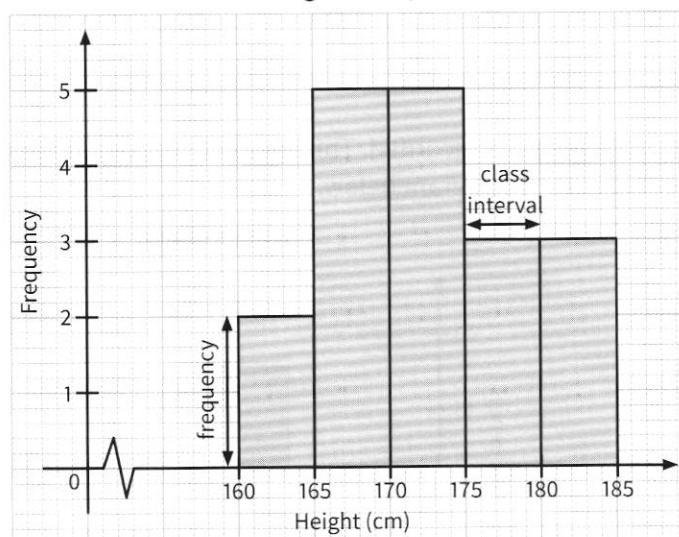
We can represent the data using a frequency table.

Height (x cm)	Tally	Frequency
$160 < x \leq 165$	//	2
$165 < x \leq 170$	###	5
$170 < x \leq 175$	###	5
$175 < x \leq 180$	///	3
$180 < x \leq 185$	///	3
Total		18

In the frequency table, **grouped numerical data** are shown.

We can represent the grouped data using a **histogram**.

Heights of boys

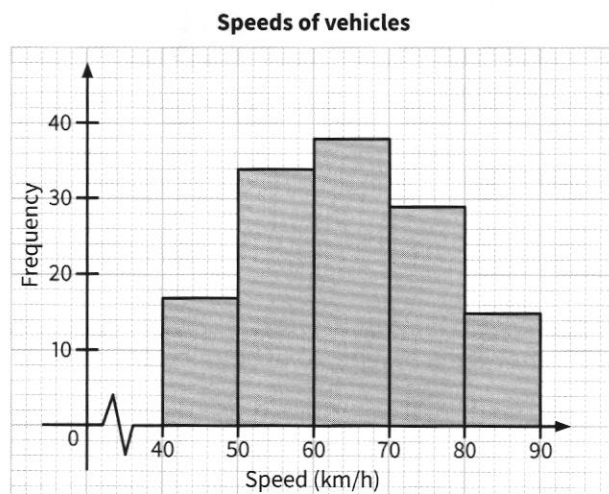


The histogram has uniform **class intervals** of 5 cm.

The height of each rectangle shows the frequency of the interval.

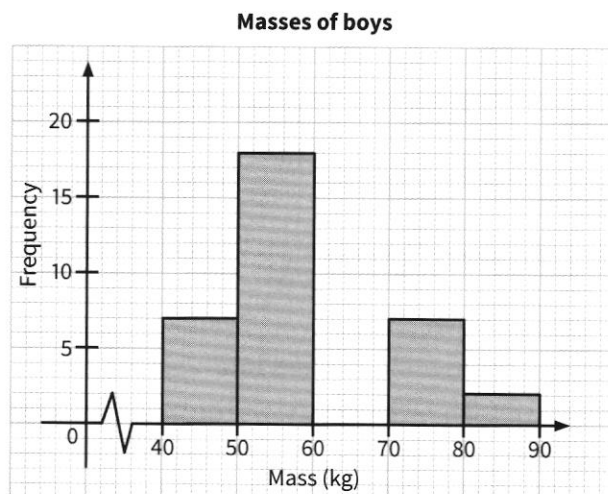
The **frequency density** of each rectangle is the frequency divided by the width of a class interval (e.g., frequency density for $160 < x \leq 165$ is 0.4).

- 1 The histogram shows the speeds of some vehicles that drove past a certain stretch of the Marina Coastal Expressway (MCE) in a particular time period.



- (a) Find the total number of vehicles represented in the histogram.
- (b) Write down the class interval of the histogram.
- (c) The speed limit along this stretch of the MCE is 80 km/h. Find the percentage of vehicles that were speeding.

- 2 The masses of 40 boys are recorded. The boys with masses not more than 60 kg or more than 70 kg are represented in the histogram below.



(a) Find the number of boys who have a mass of more than 60 kg and not more than 70 kg. Represent this data on the histogram.

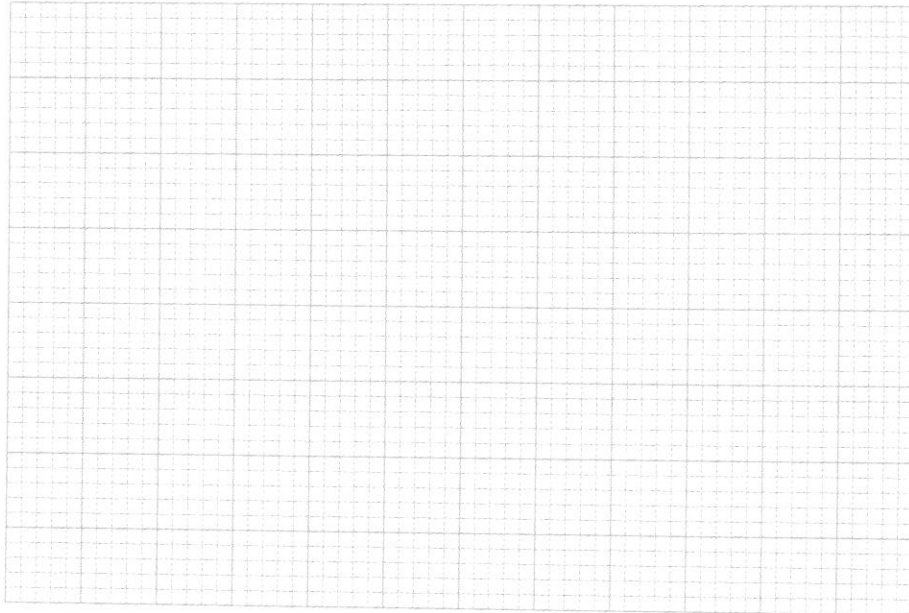
(b) Find the percentage of boys who weigh more than 40 kg and not more than 60 kg.

3 The frequency table shows the utility bills of 40 families in a particular month.

Utility bill (\$ x)	Frequency
$0 < x \leq 10$	3
$10 < x \leq 20$	7
$20 < x \leq 30$	16
$30 < x \leq 40$	8
$40 < x \leq 50$	n
Total	40

(a) Find the value of n .

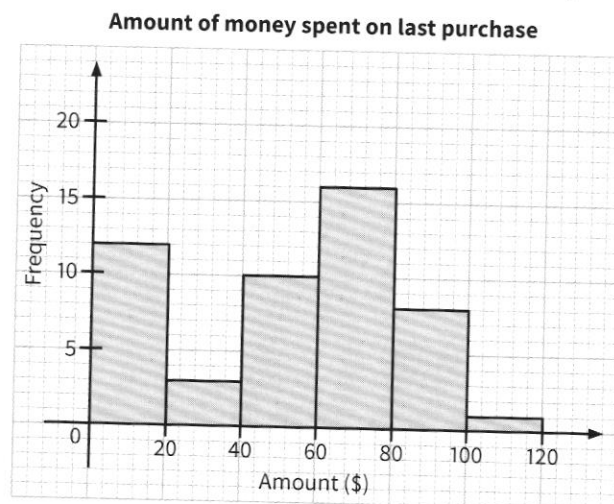
- (b) Using data from the frequency table, represent the data on a histogram on the grid provided. Use a scale of 2 cm to represent 10 units on the horizontal axis and 2 cm to represent 5 units on the vertical axis.



- (c) Find the ratio of the number of families who spent less than \$20 on utilities to the number of families who spent \$20 or more but less than \$30 on utilities.

- (d) Describe the shape of the histogram.

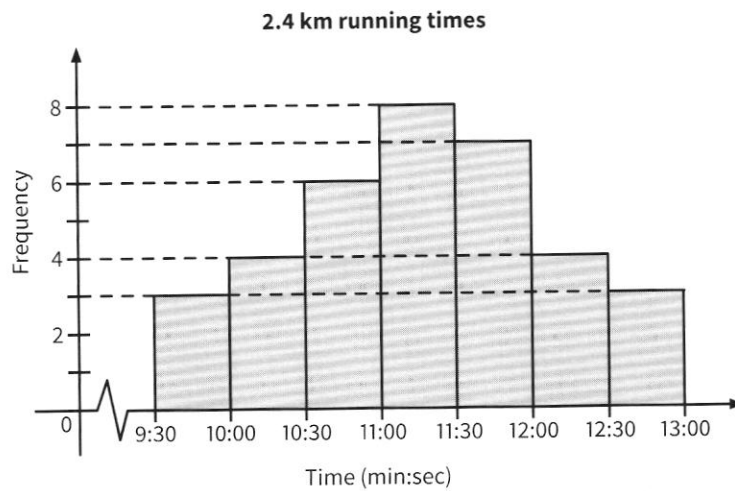
- 4 The histogram shows the survey results of 50 adults on the amount spent on their last purchase.



(a) Find the percentage of adults who spent \$20 or less on their last purchase.

(b) The histogram is represented as a pie chart. Find the angle of the sector that represents the number of adults who spent more than \$100 on their last purchase.

5 The histogram shows the times taken by a group of students to run 2.4 km.



(a) Find the number of students in the group.

(b) To clear a test, the students have to complete the 2.4 km run in at most 12 minutes. Find the percentage of students who did not clear the test.

6 The table shows the Mathematics quiz results of 30 students.



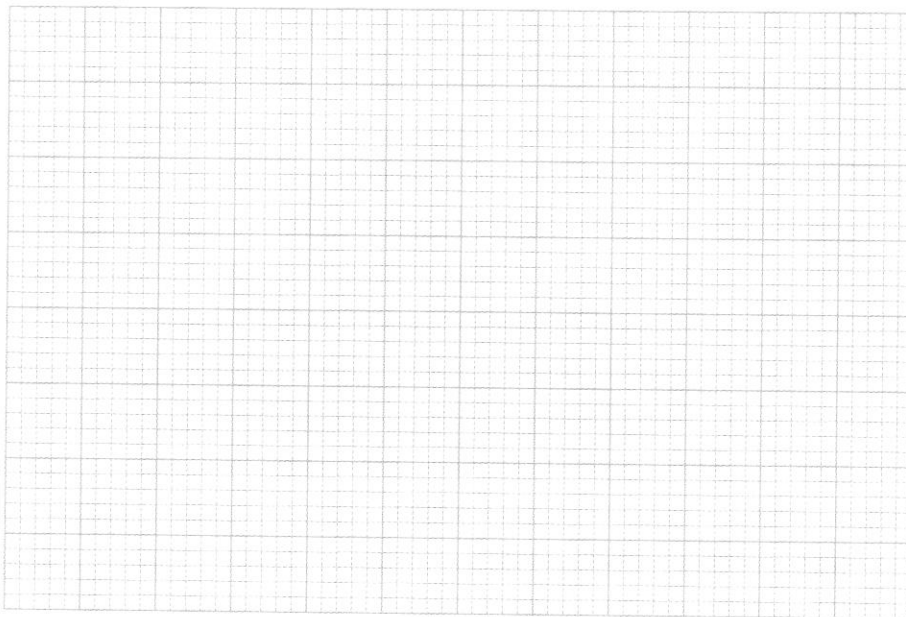
22	27	21	17	19	20	30	26	24	16
15	19	12	23	22	20	17	19	27	30
29	25	17	21	18	16	17	20	23	24

(a) Using the data from the above table, complete the frequency table.

Quiz score (x)	Frequency
$10 < x \leq 15$	
$15 < x \leq 20$	
$20 < x \leq 25$	
$25 < x \leq 30$	
Total	30

(b) Hence represent the data on a histogram on the grid provided.

Use a scale of 2 cm to represent 5 units on the horizontal axis and 2 cm to represent 5 units on the vertical axis.



(c) The quiz has a passing mark of 15. Find the percentage of students who did not pass the quiz.

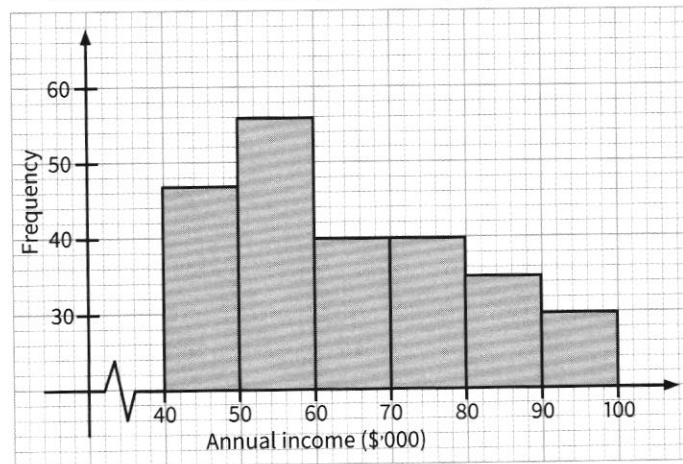
(d) (i) Using the table in (a), find the largest possible difference in the marks between any two students.

(ii) A distinction is awarded to students with marks above 21. Would it be possible to use the histogram to determine the number of students who achieved a distinction score?

7 The histogram shows the annual incomes of some employees in the year 2020.



Annual incomes of employees at Company A in year 2020

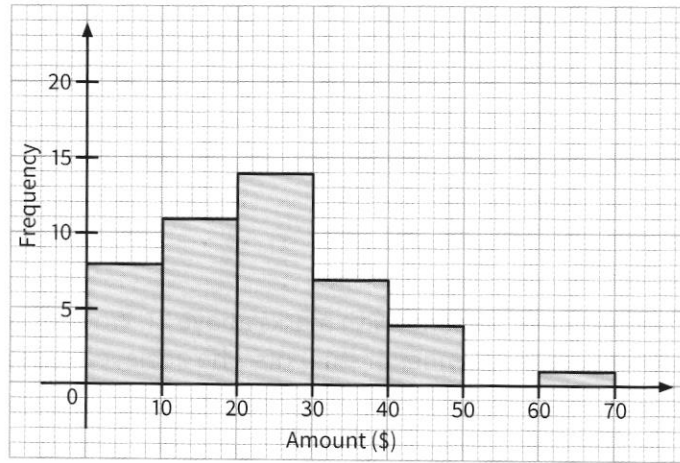


Explain why the diagram may be misleading.

8 The histogram shows the amount of money spent by 45 people at a food fair.



Amount of money spent at food fair



(a) Suzannah claims that the total amount of money spent by people with expenditures between \$20 and \$30 was more than the total amount of money spent by people with expenditures between \$40 and \$70. Do you agree with the statement? Explain your answer.

(b) If all the customers used a \$20 voucher, describe how the distribution would change.

(c) What will the histogram look like if the class width is changed from 10 to 20? Will this new representation be meaningful?