

Student Name

Mathematics Stage 4

DATA CLASSIFICATION AND VISUALISATION

Book 2 Display data using graphical representations
relevant to the purpose of the data

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OVERVIEW

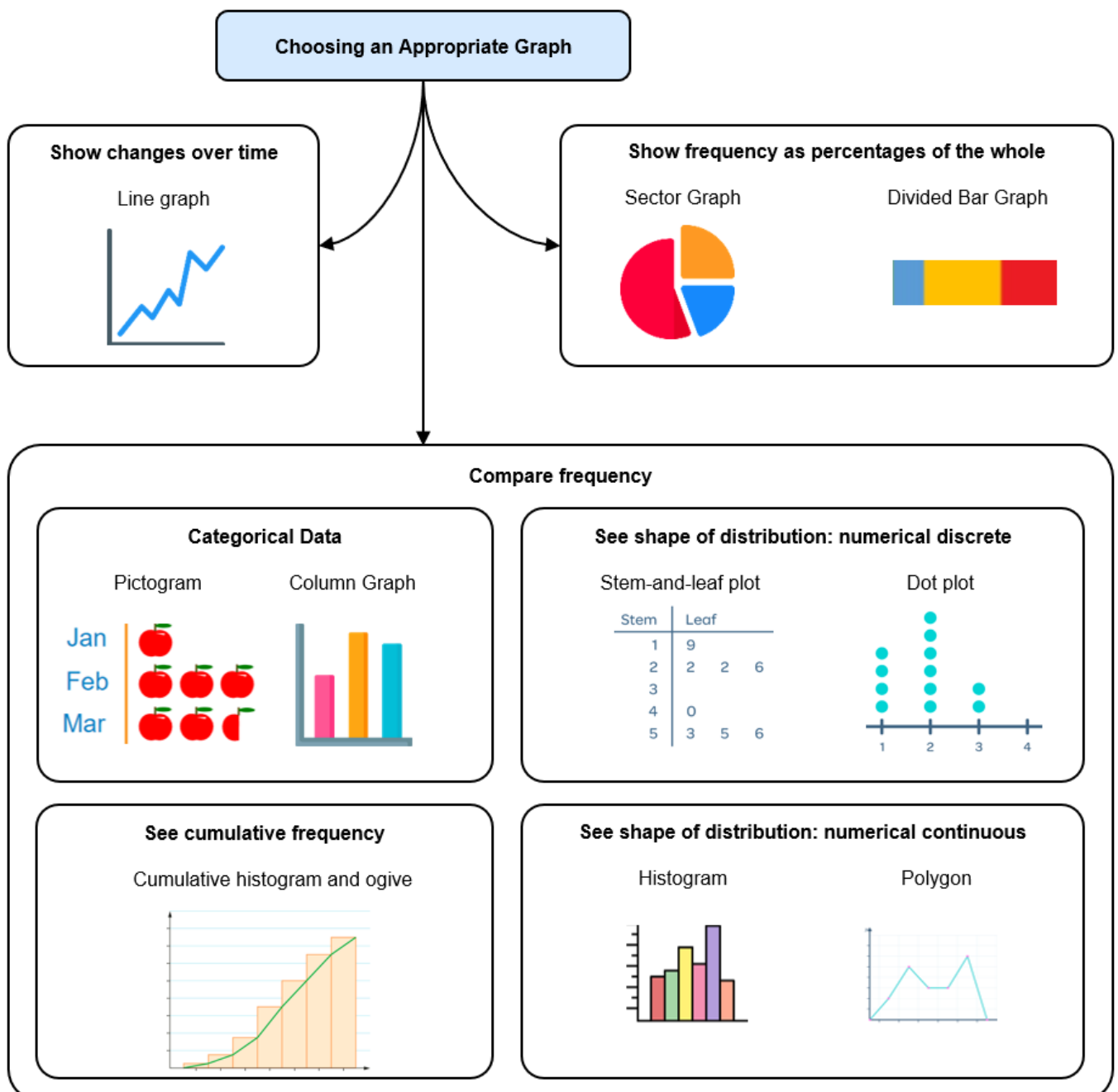
SYLLABUS CONTENT

MA4-DAT-C-01 classifies and displays data using a variety of graphical representations

Display data using graphical representations relevant to the purpose of the data

- Represent single datasets using graphs, including frequency histograms and polygons, dot plots, stem-and-leaf plots, divided bar graphs, column graphs, line graphs, sector graphs and pictograms, with or without digital tools
- Include sources, titles, labels and scales when displaying data in a graph
- Select the type of graph best suited to represent various single datasets and justify the choice of graph
- Represent a dataset using a statistical infographic and justify the choice of graphical representation used

SUMMARY



REVIEW OF PRIOR KNOWLEDGE

1 Express the following as percentages.

a $\frac{14}{50}$

b $\frac{17}{20}$

c $\frac{45}{60}$

d $\frac{5}{15}$

e $\frac{70}{420}$

f $\frac{150}{200}$

2 Find these percentages of 360.

a 10%

b 50%

c 70%

d 25%

e 5%

f 1%

g 3%

h 20%

i 35%

3 Use the unitary method to calculate these percentages.

a 50% is 30.
What is 100%?

b 25% is 35.
What is 100%?

c 35% is 77.
What is 5%?

d 40% is 32.
What is 10%?

e 12% is 60.
What is 100%?

f 75% is 225.
What is 21%?

FREQUENCY DISTRIBUTION TABLES

- **Frequency** is how often a data value occurs.
- Frequency distribution tables organise data.

white, black, white, black, black, blue, blue, white, red, white,
white, blue, orange, blue, white, white, orange, red, blue, red



Car colour	Frequency
Red	3
Black	3
White	7
Orange	2
Blue	5

Example Construct and interpret a frequency distribution table

Data on the colour of cars in a parking lot was collected:

Red, Red, White, Red, Orange, Black, Black, White, Black, Yellow, Red, Blue

Colour	Frequency
Red	4
Orange	1
Yellow	1
Green	0
Blue	1
Black	3
White	2
	$\Sigma f = 12$

How many cars were there?

12

What is the most frequent colour?

Red

What was the least frequent?

Green

What does Σf mean?

.....

A student surveys her class about the number of cars in their household:

2, 2, 1, 2, 0, 3, 2, 1, 1, 4
1, 1, 1, 2, 2, 0, 3, 2, 1, 2

Number of Cars	Frequency
0	
1	
2	
3	
4	
5	
	$\Sigma f =$

How many cars were there?

What was the highest number of cars in a household?

What was the most frequent number of cars in a household?

33

4

2

1 Construct the frequency tables below. A tally row has been given to make it easier.

a 0, 3, 2, 6, 5, 3, 4, 5, 1, 6, 3, 4, 2, 5, 3, 2, 0, 5, 1, 2, 3, 5, 4, 3, 2, 4, 5, 2, 1, 5, 2, 3, 2, 5, 6, 1, 4, 3, 2, 2.

Score	Tally	Frequency
0		2
1		4
2		10
3		8
4		5
5		8
6		3
		$\Sigma f = 40$

Count the numbers in the data, does it equal Σf ?

b 15, 17, 12, 17, 16, 17, 12, 18, 13, 16, 17, 15, 11, 13, 13, 14, 12, 15, 17, 17, 15, 14, 13, 15, 16, 17, 12, 16, 14, 13, 15, 17, 17, 17, 16, 12, 14.

Score	Tally	Frequency
11		1
12		5
13		5
14		4
15		6
16		5
17		10
18		1
		$\Sigma f = 37$

2 A student surveys her class on how many people are in their family. The results are:

6, 3, 3, 2, 4, 5, 4, 5, 8, 5, 4, 8, 6, 7, 6, 5, 8, 4,

a Construct a frequency distribution table.

b How many students have exactly five people in their family?

c How many students have at least six people in their family?

Family Members	Frequency
2	1
3	2
4	4
5	4
6	3
7	1
8	3

3 The ages of students on an excursion are given:

15, 17, 12, 17, 16, 17, 12, 18, 13, 16, 17, 15, 12, 13, 13, 14, 12, 15, 17, 17, 15, 14, 13, 15, 16, 17, 12, 16, 14, 13, 15, 17, 17, 17, 16, 12, 14

a Construct a frequency distribution table.

b What age was the most frequent?

c How many students were older than 14?

d What percentage of students were 16 or older?

Age	Frequency
12	6
13	5
14	4
15	6
16	5
17	10
18	1

- 4 A student surveyed a group of people to find out how much time they waste on Tik Tok each week. They gave their answers in a range of hours.

Hours	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 +
Tally						
Frequency	8	12	15	9	4	2

- a How many people spent 15 – 19 hours on Tik Tok last week?
- b How many people were surveyed in total?
- c How many people watched Tik Tok for less than 5 hours?

9

50

8

- 5 Darius records the colours of cars that pass his house.

- a How many cars passed his house in total?

- b What colour car is the most popular?

- c Why do you think there is an “other” row?

Too many other colours to list

- d Darius says “This is numerical data because I have used numbers” Explain why he is incorrect.

Darius is collecting information on car colours, this is categorical nominal.

- e How many fewer silver cars passed Darius's house than black cars?

$31 - 15 = 16$

Car colour	Frequency
red	9
silver	15
white	28
black	31
other	7

90

white

- 6 A tennis player records the number of aces they serve per match in a month.

Aces per match	0	1	2	3	4	5
Matches	4	2	1	0	2	1

- a In how many matches did they serve exactly 1 ace?

2

- b In how many matches did they not serve any aces?

4

- c How many matches did they play in the month?

10

- d How many aces did they serve in total during the month?

17

7 The table shows the number of passengers in each car entering a car park.
Ed says, "There are 44 passengers in total."

- a Explain why Ed is wrong.
- b Work out the total number of passengers in the cars.
Explain your method to a partner.

Number of passengers	Frequency
1	7
2	21
3	11
4	5

44 is the number of cars

102

Multiply number of passengers by the frequency, then add them all up to get total passengers

8 A class records how many pens each student has.

- a How many students do not have a pen?
- b How many pens do the class have in total?

Number of pens	Frequency
0	1
1	4
2	7
3	12
4	0
5	3

1

70

9 Beth and Sven each collect some data about how many pets are owned by people in their classes. Here are their results.

Beth's results

Number of pets	Frequency
0	3
1	19
2	1
3	7

Sven's results

Number of pets	Frequency
0	10
1	13
2	5
3	2

- a How many students are in each class?
- b Show that Sven's class has 29 pets in total.

30

$(0 \times 10) + (1 \times 13) + (2 \times 5) + (3 \times 2) = 29$

- c Whose class has more pets? Show working to support your answer.

Beth: $(0 \times 3) + (1 \times 19) + (2 \times 1) + (3 \times 7) = 42$

Beth's class

10 NAPLAN A

The table shows results of a survey for gym memberships.

In total, how many people over the age of 60 have a monthly bill less than \$40?

Monthly bill			
Age	\$35 or less	Greater than \$35 & less than 40	\$40 or more
Under 40	18	10	8
40 - 60	6	14	11
Over 60	16	12	4

28

11 NAPLAN A

The school canteen collected data on the number of lunches that students ordered from the canteen in one given week.

Number of lunches ordered	1	2	3	4	5
Number of students	8	6	26	4	15

What was the total number of lunches ordered for one week?

189

12 A football team plays 20 games. The team scores 31 goals in total. Complete the table.

Number of goals scored	Number of games
0	
1	7
2	
3	4

Missing numbers are 3 and 6

13 Find the total number of goals for each table.

Number of goals scored	Frequency
1	4
2	6
3	5

Player	Number of goals scored
Ryan	4
Jenny	6
Saif	5

Left: 31 and Right: 15

PICTOGRAMS

- **Pictograms** show **frequency distributions** visually.
- A **symbol** represents a specific number.
- Always include a **key**.
- Pictograms usually display **categorical** data.

Name	Goals
Flo	 
Benji	   
Jakub	    

Key
 = 2 goals

Example Construct and interpret pictograms

Worked Example

Show this table as a pictogram.

Month	Frequency of Sunny Days
January	24
February	16
March	14
April	8

Month	Frequency of Sunny Days
January	     
February	   
March	   
April	 

Key:  = 4 days

Your Turn

Show this table as a pictogram.

Name	Frequency of Goals
Kat	8
Sophie	7
Ava	10
Maddy	8

Name	Frequency of Goals
Kat	
Sophie	
Ava	
Maddy	

Key:  = 2 goals

1 This picture shows the preferred sports of Year 7 students.

a How many students prefer:

i Soccer?

ii Basketball?

iii Football?

iv Cricket?

b Which sport did only 5 students prefer?

c How many more students selected football than cricket?

Sport	Number of students
Soccer	   
Football	    
Netball	   
Basketball	  
Cricket	  
Swimming	 
Golf	
Tennis	 
Other	  

35

30

50

25

Golf

25

Key:  represents 10 students.

2 Identify two things wrong with this pictogram.

football	   
netball	   
dance	   
rounders	 

No key

Different spacing for football

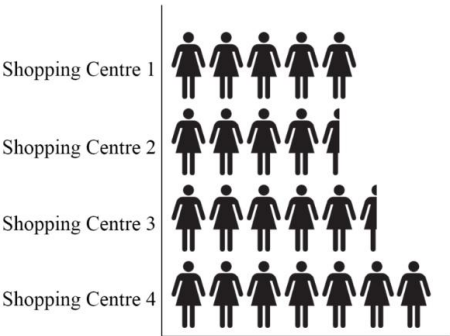
3 Draw a pictogram to show this data. Remember to include a key.

	People on Bus	Key:  = 10 people
Monday	60	     
Tuesday	20	 
Wednesday	50	    
Thursday	50	    
Friday	90	        

4 Mitty did a survey of the number of female toilets in four shopping centres.

The total number of toilets was 44. How many toilets does each  represent?

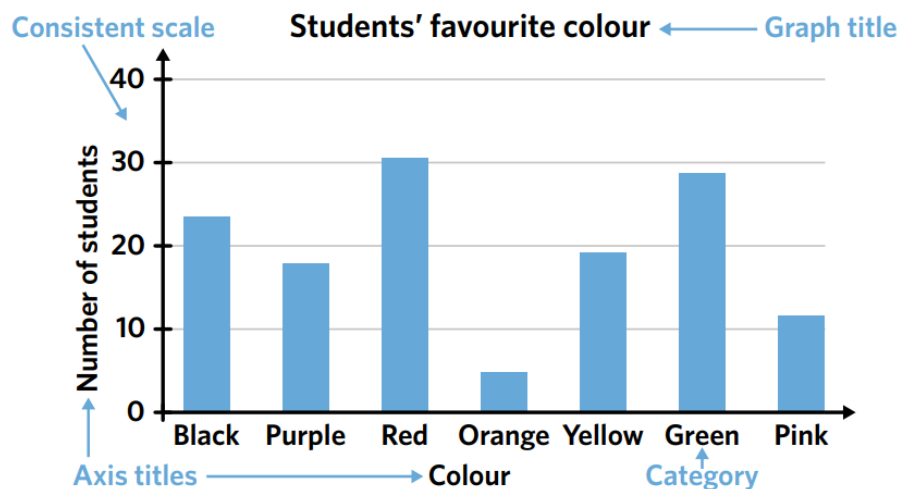
Female Toilets in Shopping Centres



2 toilets

COLUMN GRAPHS

- **Column graphs** show **categorical** or **numerical** data.
- They help compare different **categories**.

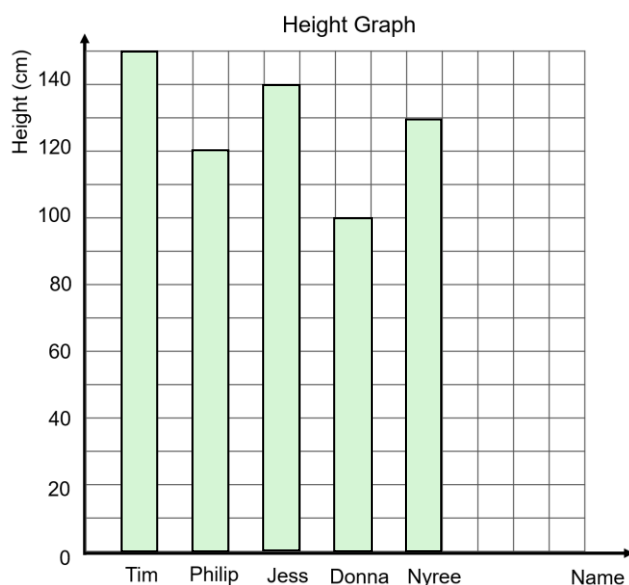


Example Construct and interpret column graphs

Worked Example

Draw a column graph of this data.

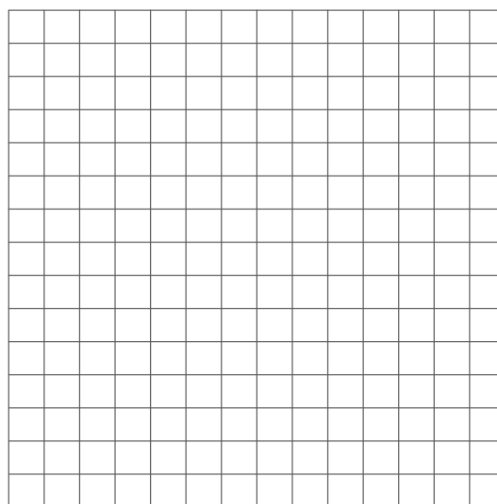
Name	Tim	Philip	Jessica	Donna	Nyree
Height (cm)	150	120	140	100	130



Your Turn

Draw a column graph of this data.

Colour	Frequency
red	5
green	2
orange	7
blue	3

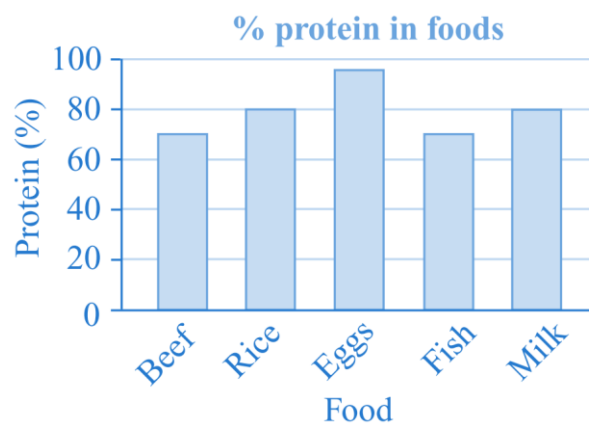


Key ideas

1. Column graphs show a table in a visual way.
Both are most suited to show data.
2. Column graphs are useful for different categories.

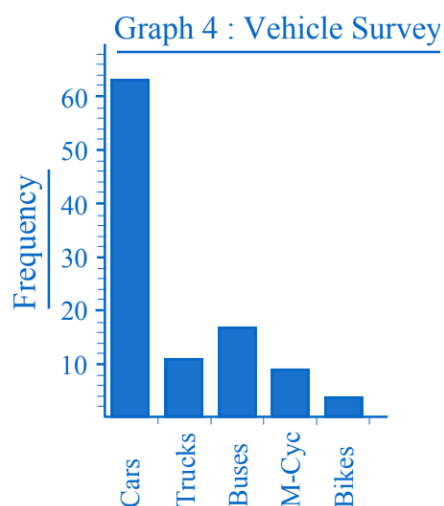
- 1 The table shows the percentage protein in certain foods.
Complete the column graph to visualise this information.

Food	% protein
Beef	70
Rice	80
Eggs	95
Fish	70
Milk	80



- 2 A survey was conducted to see what vehicles passed an intersection in 10 minutes.
Graph the result.

Vehicle	Frequency
Cars	63
Trucks	11
Buses	17
Motorcycles	9
Bikes	15



- 3 Consider the column graph to the right.
a Come up with a relevant title for the graph

Students' method of transport

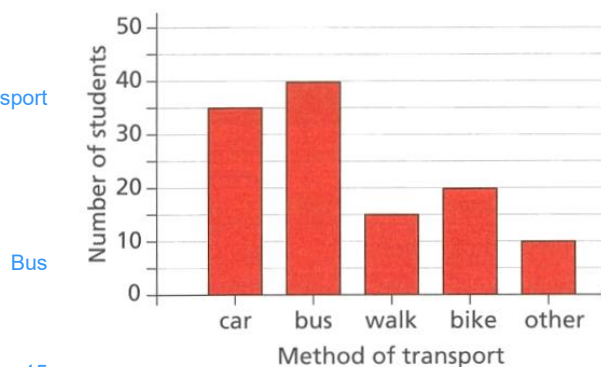
- b What was the most frequent method of transport?

- c How many students walk to school?

Bus

15

- d How many more students take the bus compared to the car?

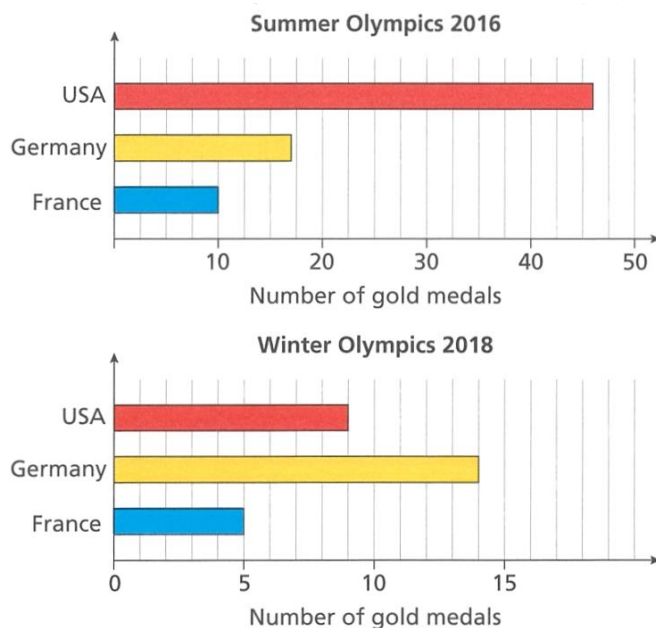


4 Consider the graph of Olympic medals to the right.

a How many gold medals did USA win at the Winter Olympics?

b Ali says, "France won more gold medals at the Winter Olympics than at the Summer Olympics. Do you agree? Explain your answer."

9



No the axis scales are different. France won 10 in Summer and 5 in Winter

5 Match each table to the correct graph.

Class A	
dog	8
cat	2
rabbit	7
snake	12

Class B	
dog	4
cat	1
rabbit	3
snake	4

Class C	
dog	4
cat	1
rabbit	6
snake	8

Class D	
dog	8
cat	2
rabbit	7
snake	3

Chart 1

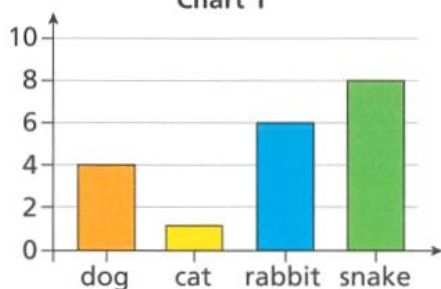


Chart 2

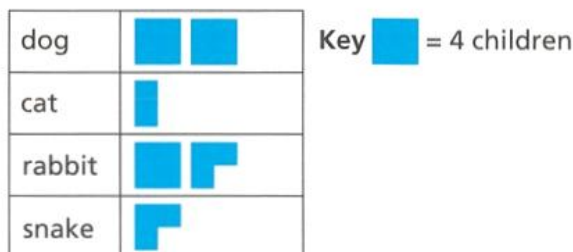


Chart 3

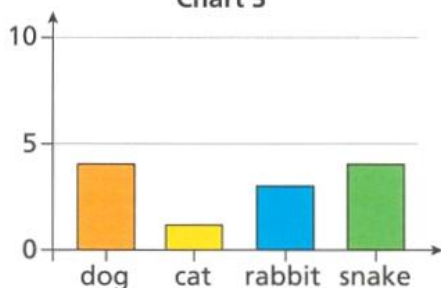
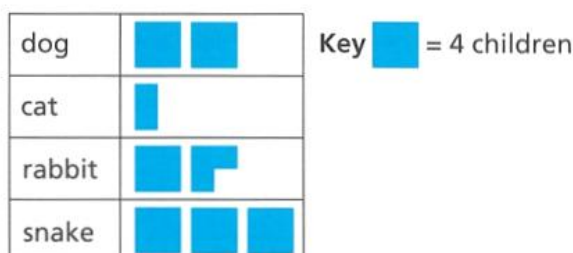
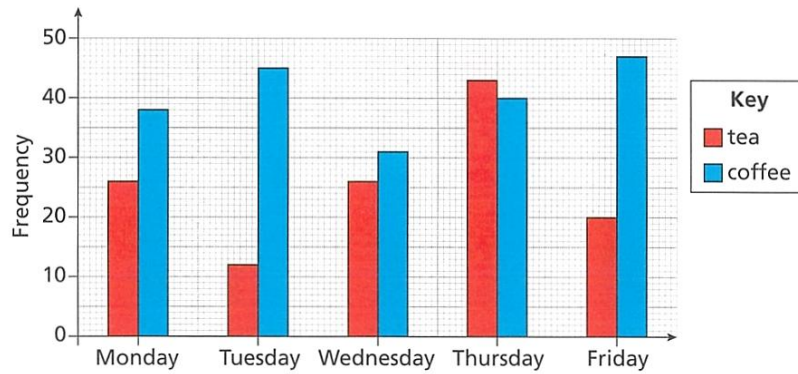


Chart 4



1 – C, 2 – D, 3 – B, 4 – A

- 6 The column graph shows sales of tea and coffee on five different days at a café.



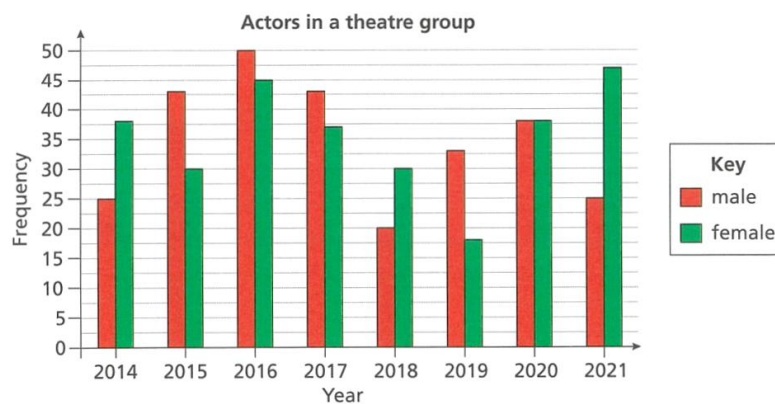
- a How many teas were sold on Friday?
- b How many coffees were sold on Tuesday?
- c Did the café sell more teas or coffees over the week? Explain how you know.

20

45

Coffee. On each day except Thursday, coffee was significantly higher than tea.

- 7 The column chart shows the number of actors in each theatre group each year. In which year did the group have:



- a The same number of male and female actors?
- b The most actors overall?
- c How many actors were there in 2018?
- d What percentage of actors were female in 2018?
- e What percentage of actors were male in 2018?

2020

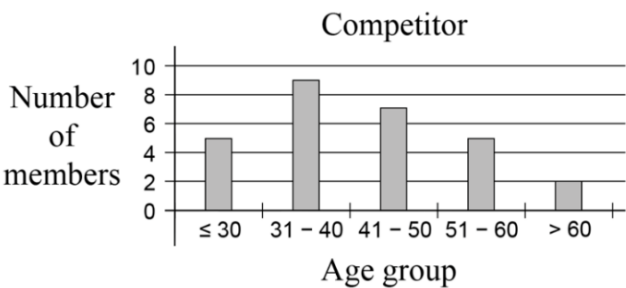
2016

20 male + 30 female = 50 total

60%

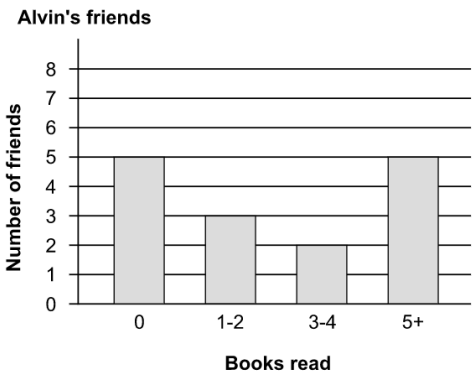
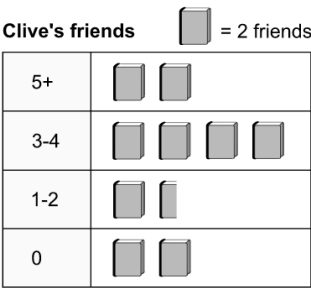
40%

8 How many members of the triathlon club are 50 or younger?



21

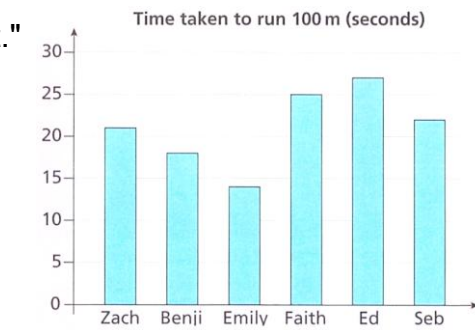
9 How many more of Clive's friends read 3 – 4 books in the last month than Alvin's friends?



6

10 The bar chart shows the times taken by a group of students to run 100m

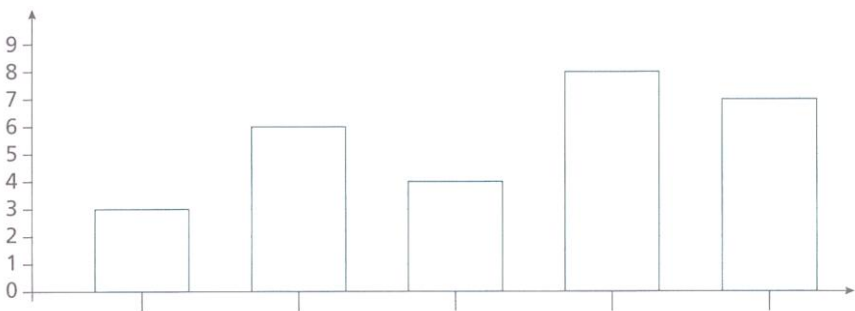
Lydia says, "Ed is the best runner because his bar is the tallest." Explain why Lydia is incorrect.



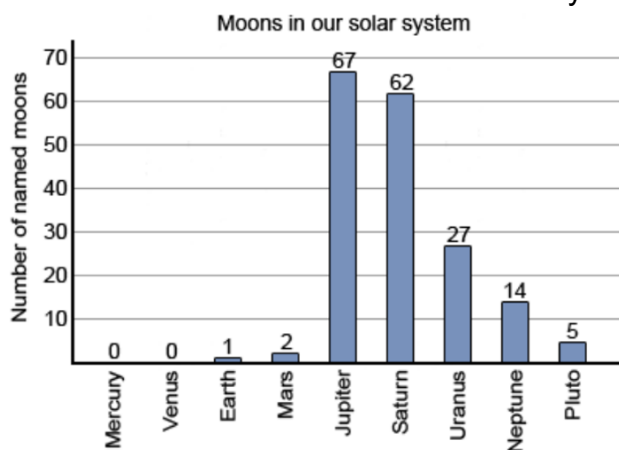
Ed is the worse because he took the longest time.

11 Use these clues to work out the labels on the x axis of this column chart.

- The number of people who own a cat is half of the number of people who own a dog.
- More people own a dog than any other animal.
- More people own a horse than a rabbit.
- One fewer person owns a hamster than a cat.



- 12 The graph below shows the number of moons for each celestial body in our Solar System.



- a How many moons are there total?
- b What percentage of moons are found around Jupiter?
- c Does Earth have more or less than 1% of the moons in our Solar System? Explain how you know without calculations.

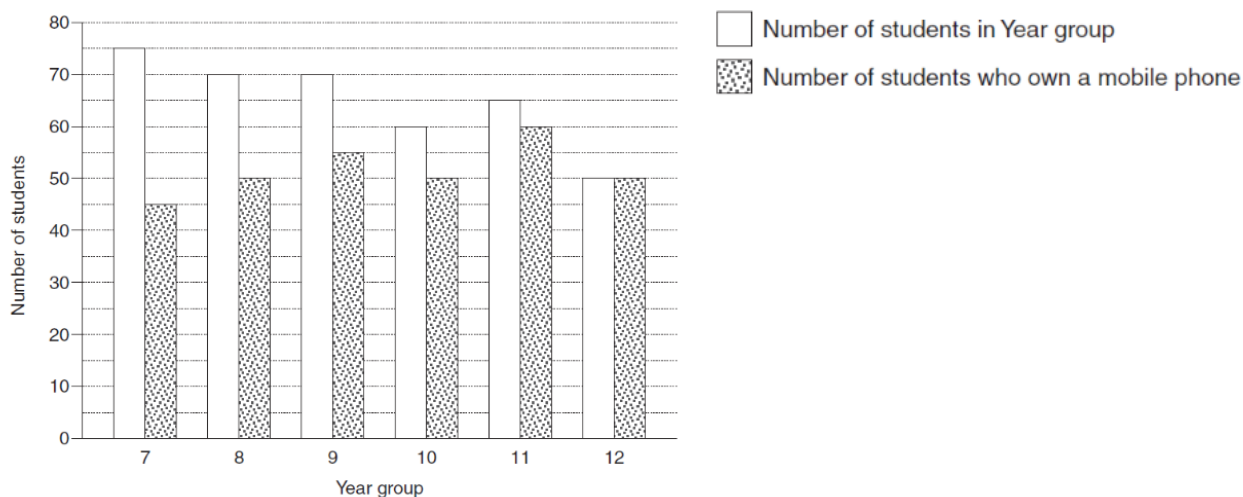
178

37.64%

Earth has 1/178 which is less than 1%

13 2011 HSC Standard 2 Band 4

The graph below displays data collected at a school on the number of students in each Year group, who own a mobile phone.



- a Which Year group has the highest percentage of students with mobile phones?
- b Two students are chosen at random, one from Year 9 and one from Year 10. Which student is more likely to own a mobile phone? Justify your answer with suitable calculations

Year 12

Year 9: $55/70 = 79\%$ chance

Year 10: $50/60 = 83\%$ chance

Year 10 more likely

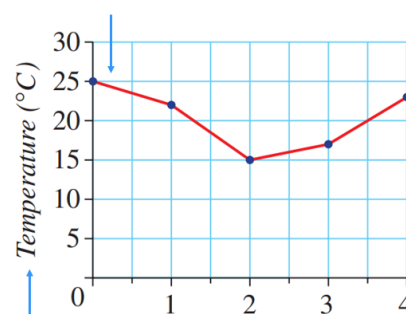
- c Identify a trend in the data shown in the graph.

As students get older, they are more likely to have a phone.

LINE GRAPHS

- **Line graphs** display changes over time.
- They always use **continuous numerical data**.
- Line graphs let us **estimate** values between data points.

Lines joining data points



Data on both axes are numerical continuous

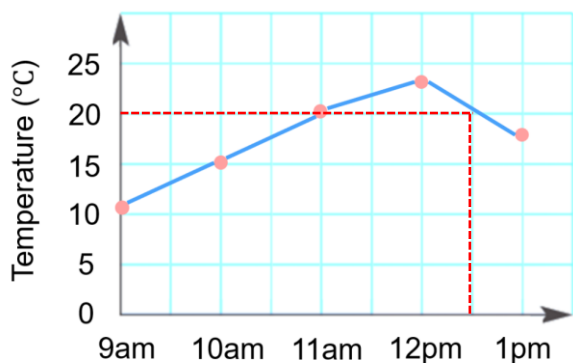
Example Construct and interpret line graphs.

Worked Example

Draw a line graph of this data.

Time	9 a.m.	10 a.m.	11 a.m.	12 p.m.	1 p.m.
Temperature (°C)	10	15	20	23	18

Temperature over Time



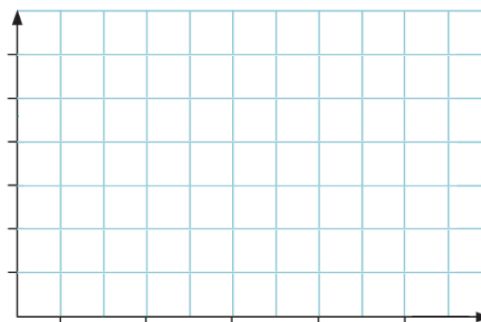
Estimate the temperature at 12:30 pm

20°C

Your Turn

Draw a line graph of this data.

Day of the week	Mon	Tue	Wed	Thu	Fri
Price (cents)	44	48	55	52	46



Estimate the price halfway through Tuesday.

What makes a line graph useful?

.....

Why would it not make sense for there to be categorical variables on a line graph?

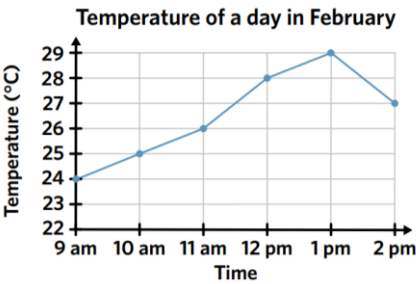
.....

Key ideas

1. A line graph is used to show changes over
2. A line graph is useful as you can use it to make between existing data points.
3. Line graphs must always be used to display numerical variables.

1 Fill in the missing numbers on the table of values.

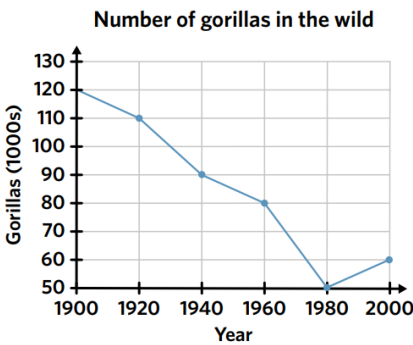
a



Time	9 am	10 am	11 am	12 pm	1 pm	2 pm
Temperature (°C)	24				29	

25, 26, 28, 27

b



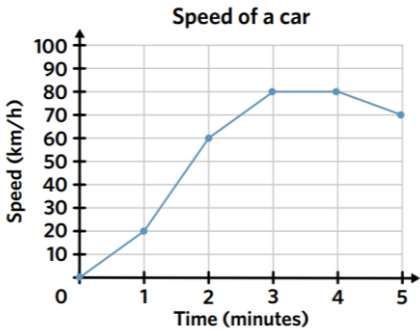
Year		1920	1940			2000
Gorillas (1000's)	120			80	50	

1900, 1960, 1980

110, 90, 60

2 Estimate the data value and fill in the missing value.

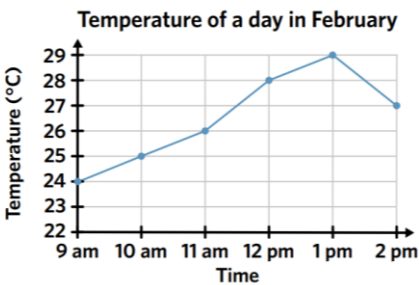
a



The speed of the car was km/h at 2 minutes and 30 seconds.

70

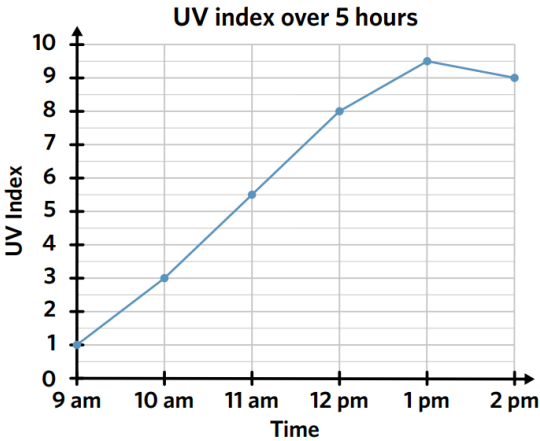
b



The temperature at 12:30pm was degrees.

28.5

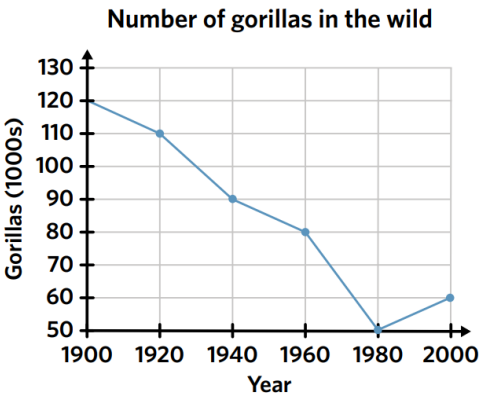
c



At , the UV index was 2.

9:30

d



In , there were 85 000 gorillas.

1950

- 3 The table shows the mass of a foal at the end of each week for the first 8 weeks of its life. Complete the graph to show the data on the table.

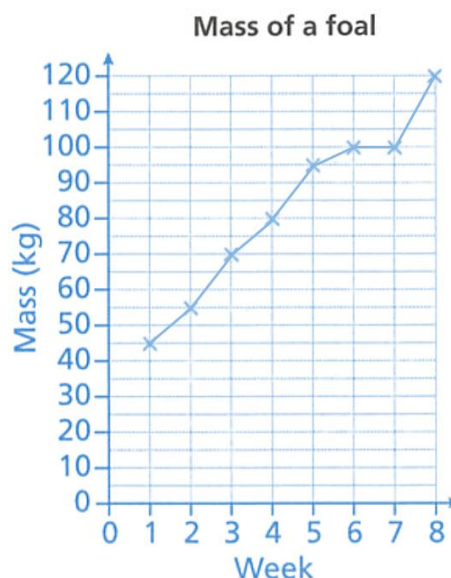
Week	1	2	3	4	5	6	7	8
Mass (kg)	45	55	70	80	95	100	100	120

- a Estimate its mass halfway between week 3 and 4.

75 kg

- b Between which two weeks did it grow the most?

Weeks 7 and 8. Look for the steepest section of the graph.



- 4 Consider the line graph to the right.

- a How tall was the grass on day 4?

6 cm

- b On what day did the grass reach 10 cm?

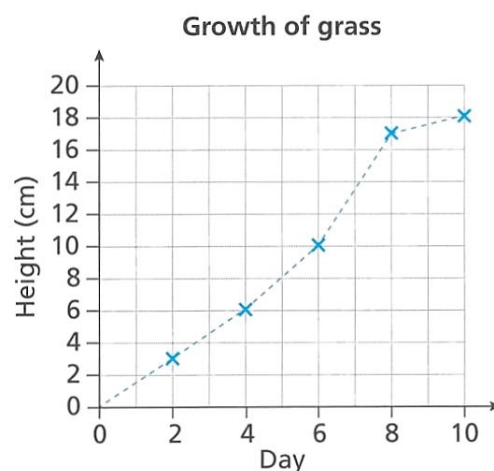
Day 6

- c Estimate the height of the grass on day 3.

4.5 cm

- d Estimate when the grass reached 14 cm.

Day 7



- 5 The graph shows Lillian's height over a 10-year period from when she was born.

- a What was Lillian's height when she was born?

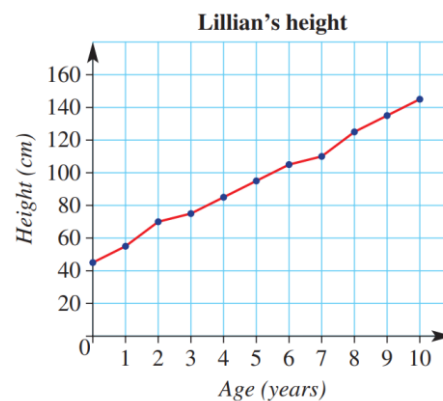
44 cm

- b At what age did she first reach 130 cm tall?

During her 8th year

- c How much did Lillian grow in the year when she was 7 years old?

14 cm



- 6 Consider the following graph, which shows the outside temperature over a 24-hour period that starts at midnight.

a When was the hottest time of the day?

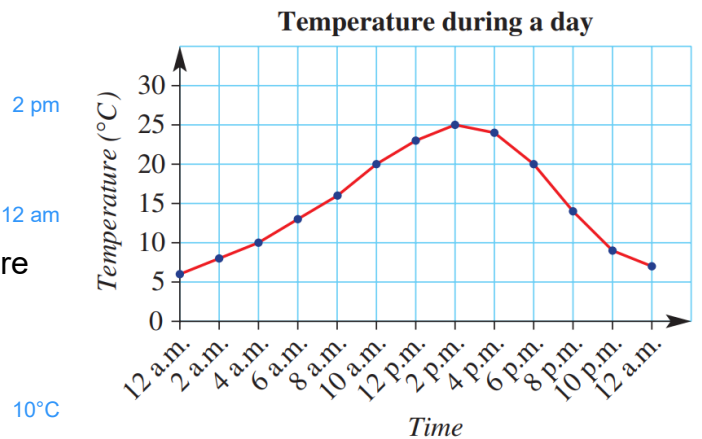
b When was the coolest time of the day?

c Use the graph to estimate the temperature at these times of the day.

i 4 am

ii 9 am

iii 1 pm



18°C

24°C

- 7 Draw a line graph of this information:

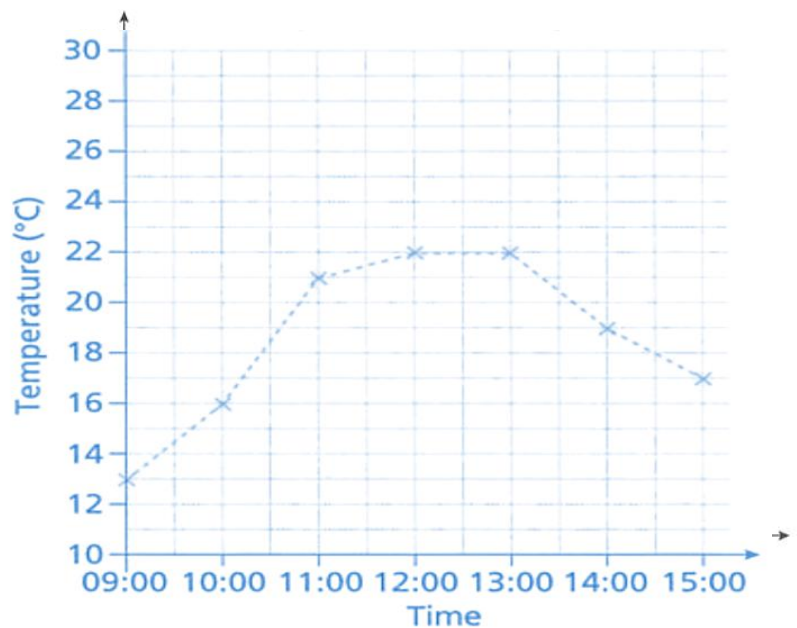
Time	09:00	10:00	11:00	12:00	13:00	14:00	15:00
Temperature (°C)	13	16	21	22	22	19	17

a Between which times did the temperature increase the most?

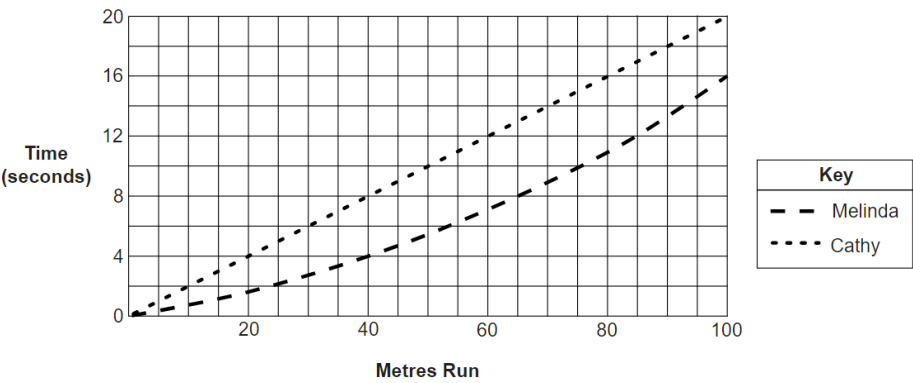
10:00 to 11:00

b How would you answer part a if you didn't have the y axis?

Look for the steepest increasing line.



8 Melinda and Cindy are running a 100 m sprint.
They wear smartwatches to track their distance over time.



- a How long did it take Melinda to finish the race?
16 s
- b How long did it take Cathy to finish the race?
20 s
- c How long after Melinda did Cathy pass the 75 metre mark in the race?
5 s

9 The temperature in a lounge room is measured frequently throughout a particular day.
The results are presented in a line graph, as shown.
The individual points are not indicated on this graph to reduce clutter.

- a Twice during the day the heating was switched on.
At what times do you think this happened?
Explain your reasoning.

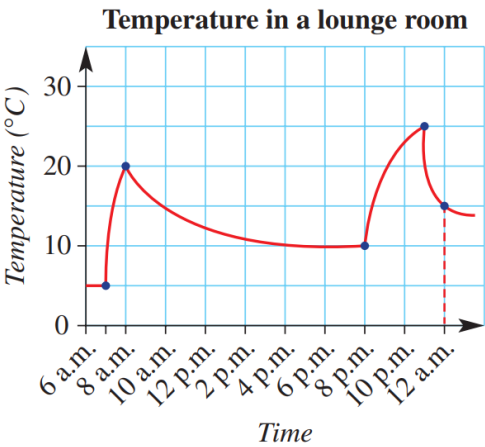
7 am and 8 pm, this is when the temperature increased

- b When was the heating switched off?
Explain your reasoning.

8 am and 11 pm. This is when the temperature started decreasing

- c The house has a single occupant, who works during the day. Identify when you think that person is:

- i waking up
- ii going to work
- iii coming home
- iv going to bed

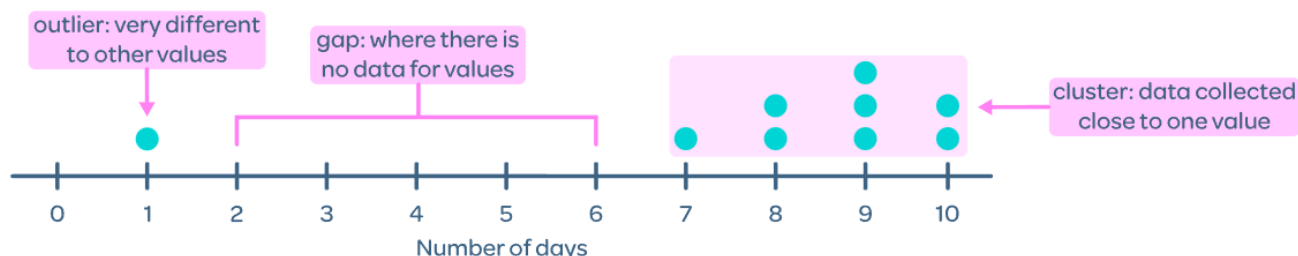


- d If a burglar somehow got this information, how do you think they might use it?

They'll use it to see when you are out of the house to steal your stuff!

DOT PLOTS

- A **dot plot** uses a **number line** showing all numbers in the **range**.
- Each **dot** represents a **frequency**.
- Dots line up evenly above the line.
- Dot plots reveal **clusters**, **outliers**, and **gaps**.



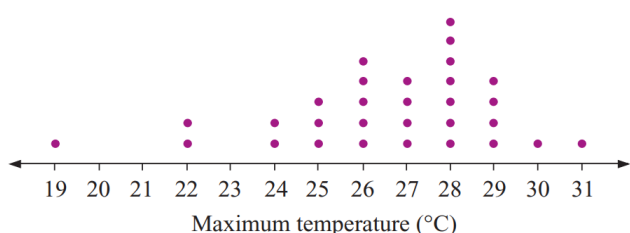
Example Construct a dot plot

Worked Example

The maximum temperature ($^{\circ}\text{C}$) in a town for each day in November is:

27 28 26 25 26 24 27 29
 28 26 24 22 28 19 25 26
 29 28 27 27 22 30 28 29
 26 29 29 26 28 28 31 25

Draw a dot plot of this data.



Identify where data is clustered. **24 – 29**

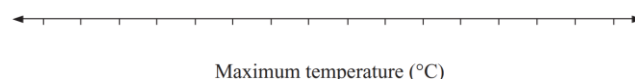
Identify an outlier. **19 $^{\circ}\text{C}$**

Your Turn

The maximum temperature ($^{\circ}\text{C}$) in a town for each day in May is:

20 21 25 21 18 19 18 17
 17 16 17 25 21 15 16 18
 17 23 27 16 18 21 25 28
 18 19 18 17 21 23 26 18

Draw a dot plot of this data.



Identify where data is clustered.

Are there any outliers?

What type of data do we plot on a dot plot?

.....

How is a dot plot useful?

.....

1 Complete the table for the dot plot.

a

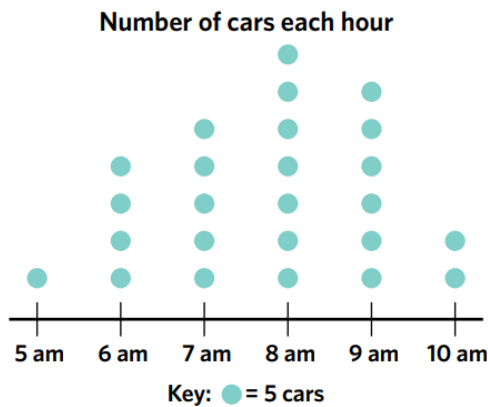
Shoe size	Number sold
5	1
6	
7	
8	6
9	8
10	
11	1
Total	28



2, 6, 4

b

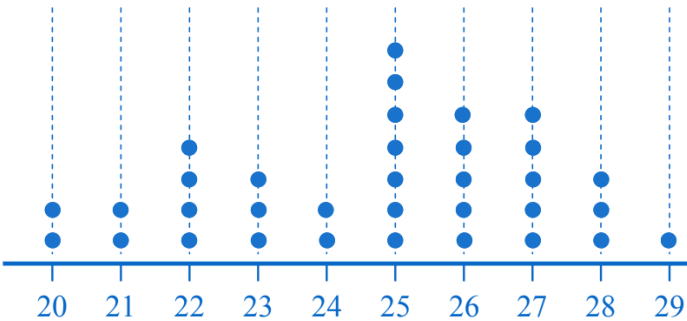
Time	Number of cars
5 am	5
	20
7 am	
8 am	35
9 am	
	10
Total	125



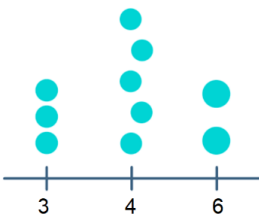
6 am, 25, 30, 10 am

2 Display this data as a dot plot.

25, 28, 23, 24, 23, 24, 27, 26, 25, 25, 22, 22, 20, 29, 26, 25, 27, 26, 28,
21, 25, 25, 27, 21, 25, 27, 26, 27, 22, 26, 23, 20, 22, 28.



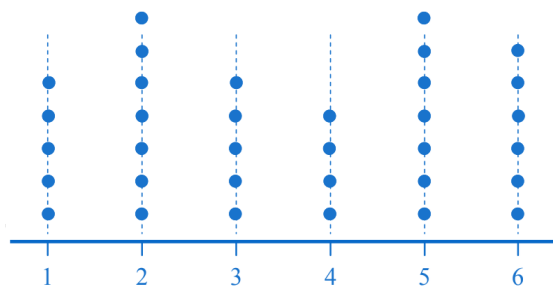
3 What are three things wrong with this dot plot?



- Dots different sizes
- Dots not lined up
- Number line missing 5

- 4 A die was rolled, and these were the results. Display this data as a dot plot.

3, 1, 5, 6, 3, 4, 2, 2, 1, 5, 3, 6, 2, 3, 2, 5, 5,
6, 4, 5, 2, 3, 6, 1, 1, 6, 5, 4, 1, 6, 2, 2, 4, 5.



- a How many times was a number less than 3 rolled?
b How many times was an even number rolled?
c How many times was a prime number rolled?

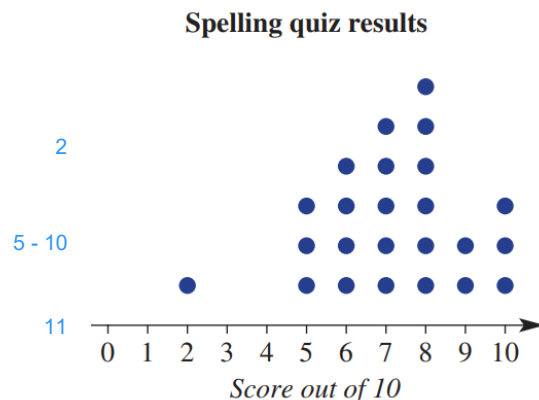
12

17

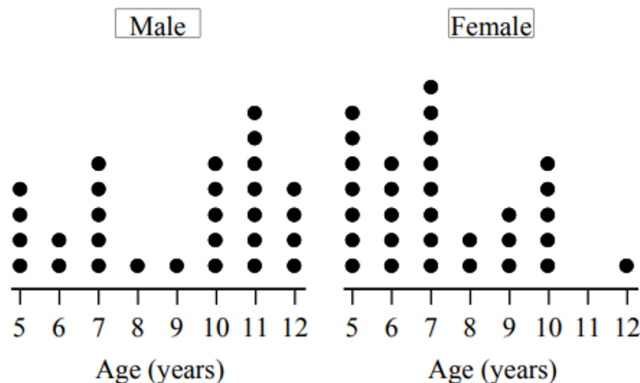
12

- 5 Consider the dot plot to the right.

- a Identify the outlier.
b Where is most of the data clustered?
c How many students scored at least 8?



- 6 The waterslide at a theme park records the ages of the first 60 children who use the slide.



- a How many children were male?
b How many children were 7 years old?
c How many children were 11 or older?
d How many more 10-year-olds used the slide compared to 6-year-olds?
e What percentage of 9-year-olds were male?
f What percentage of 5-year-olds were female?
g What percentage of females were 10 years old?

29

13

12

3

25%

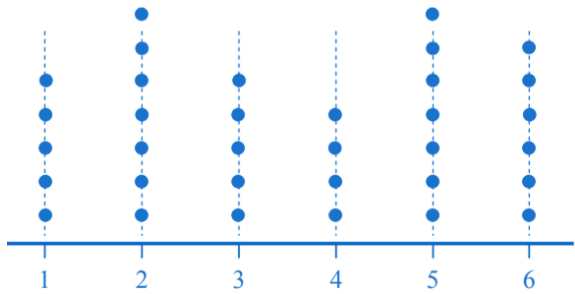
63.6%

16.1%

7 A die was rolled and the results are shown below.

3, 1, 5, 6, 3, 4, 2, 2, 1, 5, 3, 6, 2, 3, 2,
5, 5, 6, 4, 5, 2, 3, 6, 1, 1, 6, 5, 4, 1, 6, 2, 2, 4, 5.

a Complete the dot plot and frequency table.



Score	Frequency
1	5
2	7
3	5
4	4
5	7
6	6
$\Sigma f = 34$	

b How many times was a number less than 3 rolled?

c How many times was an even number rolled?

d What percentage of the rolls was a multiple of 3?

e What percentage of the rolls was a factor of 12?

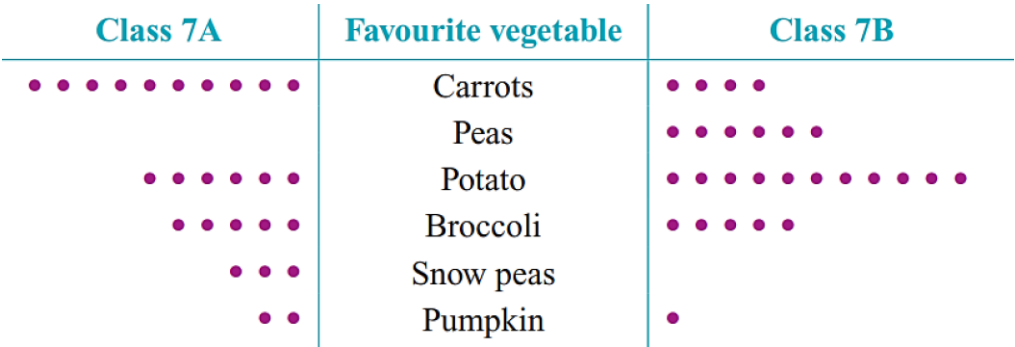
12

17

32.35%

67.65%

8 A back-to-back dot plot can be used to compare two data sets.
7A and 7B were surveyed about their favourite vegetable.



a Which vegetable is most popular in 7A?

b Which vegetable is most popular in class 7B?

c Which vegetable is the most popular overall?

d Explain why it wouldn't make sense to talk about outliers, clustering, gaps for this data set.

carrots

potato

potato

This is categorical data

STEM-AND-LEAF PLOTS

- A **stem-and-leaf plot** groups data by **place value**.
- The **stem** is made up of all digits except the last.
- The **leaf** is the final digit.
- On the stem-and-leaf plot to the right,
 - The least number of laps is 19.
 - The most is 56.
 - No one swum laps in the 30s.

Laps swum

Stem	Leaf
1	9
2	2 2 6 8
3	
4	0
5	3 5 6

Key: 1 | 9 means 19

Example Construct a stem-and-leaf plot

Worked Example	Your Turn												
Average daily temperatures for some different countries are recorded: 13, 16, 16, 20, 20, 21, 22, 25, 25, 26, 28, 29, 30, 32 Construct a stem-and-leaf plot. <table> <tr> <th>Stem</th><th>Leaf</th></tr> <tr> <td>1</td><td>3 6 6</td></tr> <tr> <td>2</td><td>0 0 1 2 5 5 6 8 9</td></tr> <tr> <td>3</td><td>0 2</td></tr> </table> Key: 1 3 means 13	Stem	Leaf	1	3 6 6	2	0 0 1 2 5 5 6 8 9	3	0 2	The number of sit ups completed by 10 people in a gym are recorded. 18, 24, 27, 30, 34, 34, 39, 41, 43, 50 Construct a stem-and-leaf plot. <table> <tr> <th>Stem</th><th>Leaf</th></tr> <tr> <td></td><td></td></tr> </table> Key:	Stem	Leaf		
Stem	Leaf												
1	3 6 6												
2	0 0 1 2 5 5 6 8 9												
3	0 2												
Stem	Leaf												

Key ideas

1. Dot plots and stem-and-leaf plots both show the “shape”, or distribution, of the data.
2. Dot plots and stem-and-leaf plots are used to display numerical variables.
3. Stem-and-leaf plots group the data based on

1 Complete the missing information in the dataset from the stem-and-leaf plot.

a List of numbers: 5, 7, 8, , 12, 17, 19, , 33, 34, 36

Stem	Leaf	Key
0	5 7 8	1 5 = 15
1	0 2 7 9	
2	1	
3	3 4 6	

10, 21

b List of numbers: 12, 12, 17, , 25, 26, 41, , 44, 49, 58

Stem	Leaf	Key
1	2 2 7	1 2 = 12
2	3 5 6	
3		
4	1 1 4 9	
5	8	

23, 41

c List of numbers: 113, 115, , 119, 120, , 121, 133, 136, , 145, 145, 145

Stem	Leaf	Key
11	3 5 7 9	11 3 = 113
12	0 1 1	
13	3 6 9	
14	5 5 5	

117, 121, 139

2 Construct a stem-and-leaf plot from this data.

3, 6, 8, 9, 11, 11, 13, 17, 17, 21, 21, 23, 24, 30, 32, 35

Stem	Leaf
0	3 6 8 9
1	1 1 3 7 7
2	1 1 3 4
3	0 2 5

Key: 1 | 3 means

1 | 3 means 13

3 Construct a stem-and-leaf plot from this data.

70, 74, 79, 83, 85, 85, 86, 90, 91, 92, 95, 97, 97, 100, 101, 103, 106, 110

Stem	Leaf
7	0 4 9
8	3 5 5 6
9	0 1 2 5 7 7
10	0 1 3 6
11	0

Key: 10 | 1 means

10 | 1 means 101

a How many data values were in the 80s?

4

b How many data values are at least 90?

11

4 Consider the stem-and-leaf plot to the right.

a What was the highest score?

b Which score occurs only twice?

c Which score has the highest frequency?

d Suggest two possible scores that could be represented by the digit in the box in the second row.

Stem	Leaf
0	2 7
1	4 8 8
2	5
3	4 7 7 7
4	0 3

8 or 9

5 Consider the stem-and-leaf plot to the right.

a What was the highest score?

b Which score has the highest frequency?

c Suggest three possible scores that could be represented by the missing digit in the fifth row.

d How many scores are above 100?

e How many scores are greater than 90 and less than 110?

Tens	Units
8	5 8
9	3 3 7 9
10	2 2 5
11	0 0 0
12	7

5

7

6 Sort these stem and leaf plots so that the leaves are in order.

a

Tens	Units		Tens	Units
9	7 7 2	IN → ORDER	9	2 7 7
10	4 0 7 2		10	0 2 4 7
11	0 9 1		11	0 1 9
12	8 8 3 2		12	2 3 8 8

b

Stem	Leaf		Stem	Leaf
0	8 2 7 3	IN → ORDER	0	2 3 7 8
1	0 5 2 7		1	0 2 5 7
2	3 7 1		2	1 3 7
3	0 9 1 7		3	0 1 7 9

7 Display the data in the stem-and-leaf plot.

a Data: 6, 14, 28, 39, 17, 12, 5, 28, 36, 21, 15, 19, 27, 30, 2, 22, 38, 24.

RAW			ORDERED	
Tens	Units		Tens	Units
0	6 5 2	IN → ORDER	0	2 5 6
1	4 7 2 5 9		1	2 4 5 7 9
2	8 8 1 7 2 4		2	1 2 4 7 8 8
3	9 6 0 8		3	0 6 8 9

b Data: 95, 106, 117, 128, 100, 121, 104, 93, 112, 93, 114, 101, 105, 115, 94, 114.

RAW			ORDERED	
Tens	Units		Tens	Units
9	5 3 3 4	IN → ORDER	9	3 3 4 5
10	6 0 4 1 5		10	0 1 4 5 6
11	7 2 4 5 4		11	2 4 4 5 7
12	8 1		12	1 8

8 Display the data in the stem-and-leaf plot.

a Data: 74, 97, 70, 106, 92, 100, 86, 91, 97, 85, 110, 83, 101, 95, 79, 90, 103, 85.

RAW			ORDERED	
Stem	Leaf		Stem	Leaf
7	4 0 9		7	0 4 9
8	6 5 3 5		8	3 5 5 6
9	7 2 1 7 5 0		9	0 1 2 5 7 7
10	6 0 1 3		10	0 1 3 6
11	0		11	0

b Data: 220, 195, 206, 212, 184, 177, 209, 195, 191, 204, 173, 168, 188, 228, 219, 176, 192, 213, 201, 180, 171.

Stem	Leaf		Stem	Leaf
16	8	→	16	8
17	7 3 6 1		17	1 3 6 7
18	4 8 0		18	0 4 8
19	5 5 1 2		19	1 2 5 5
20	6 9 4 1		20	1 4 6 9
21	2 9 3		21	2 3 9
22	0 8		22	0 8

9 This stem-and-leaf plot shows ages of people in a group. Answer true or false:

a The youngest person is 10.

b Someone in the group is 17.

c Nobody listed is 20.

d The oldest person is 4.

	Stem	Leaf
F	0	8 9
T	1	0 1 3 5 7 8
T	2	1 4

F

10 A company recorded the amount of time that visitors spent on the website's home page.

Stem	Leaf
0	2 4 6 8 9
1	0 0 1 2 8
2	2 7 9
3	
4	
5	8

a How many visitors spent less than 20 seconds on the home page?

10

b How many visitors spent more than half a minute?

1

c How many visitors spent between 10 and 30 seconds?

8

d What is the outlier for this stem-and-leaf plot?

58

11 Use the stem and leaf plot to complete the frequency table.

	Leaf
1	1 5 9
2	2 3 5 6 7 9
3	0 1 2 4 6 7
4	1 3 4 6 8 9
5	1 4 7
6	2 4 5 6 7

Age	Frequency
10 – 19	3
20 – 29	6
30 – 39	6
40 – 49	6
50 – 59	3
60 – 69	5
Total	29

12 Two radio stations poll their audience. They construct a back-to-back stem and leaf plot. It allows them to compare two data sets.

Station 1	Stem	Station 2
0	1	2 3 3 4 5 6 8 9
8 7	2	0 0 1 2 4 5 8 8
9 7 5 4 3 3	3	1 1 2
7 6 5 5 4 4 1	4	8
9 3 2 0	5	

- a Find the age difference between the oldest and youngest listener polled for
- i Station 1
- ii Station 2

49

36

- b One of the radio stations plays contemporary music that is designed to appeal to teenagers, and the other plays classical music and broadcasts the news. Which radio station is most likely to be the one that plays classical music and news?

Station 2, as its listeners are clustered in the younger years

13 The average rainfall in millimetres for Adelaide and Melbourne are shown in the table.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Adelaide	17	19	22	38	59	52	65	50	43	38	24	23
Melbourne	48	48	52	58	58	50	49	51	59	68	60	59

- a Complete the back-to-back stem-and-leaf plot for the rainfall data.

Melbourne Leaf	Stem	Adelaide Leaf
	1	— —
	2	2 3 4
	3	— —
— 8 8	4	3
— — — — — — — —	5	0 2 —
8 0	6	—

7 9

8 8

9

9 9 8 8 2 1 0 | 9

5

- b Which city receives more rainfall overall?

Melbourne

- 14 The back-to-back stem-and-leaf plot compares the marks of 7L and 7R.

Class 7L		Class 7R
Leaf	Stem	Leaf
3	2	0 7 9 9
9 8 5 4 4 4 4 3 2 1 1 1 1 0 0	3	0 1 1 3 5 7
9 8 5 4 4 4 4 3 2 1 1 1 1 0 0	4	2 4 4 4 8 8 9
4 3 3 3 2 2 1 1 1	5	2 4 4 4 8 8 9
	6	2 3 4

Describe the test scores in class 7L, using the terms 'cluster' and 'outlier'

7L are clustered around 30 – 54.

23 is an outlier

- 15 This data shows the average winter temperatures in 15 different cities.

a What are the lowest and highest temperatures listed?

Lowest: -29, Highest: 23

b How many cities were between -10°C and 10°C ?

5

c How many cities were between -25°C and 5°C ?

10

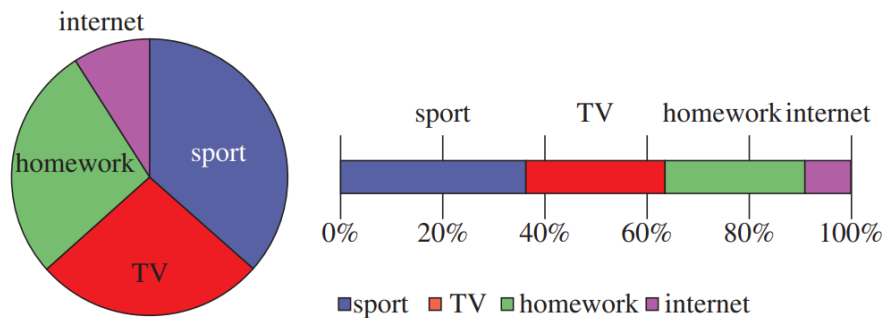
d How many cities were less than 5°C ?

11

Stem	Leaf
-2	4 4 9
-1	2 3 5 7
-0	5 8
0	3 4 6
1	5 8
2	3
-1	5 means -15°C

SECTOR GRAPHS

- **Divided bar graphs** and **sector graphs** show parts of a whole.
- Divided bar graphs use parts of a rectangle.
- Sector graphs use sectors of a circle.



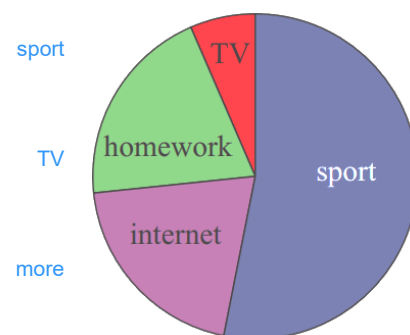
Example Interpreting sector graphs.

Worked Example	Your Turn
A car owner graphs the amount of money spent per year on car expenses. What percentage was spent on petrol? 50% The owner spends \$3000 on petrol. How much does he spend in total? $50\% = \\$3000$ $\times 2 \quad \times 2$ $100\% = \\$6000$ How much does he spend on maintenance? $50\% = \\$3000$ $\div 2 \quad \div 2$ $25\% = \\$1500$	The sector graph shows one person's spending in a month. What percentage was spent on food? 25% If \$600 was spend on food, how much was spent on rent? $\\$1200$ How much money was spent overall? $\\$3600$

Key ideas

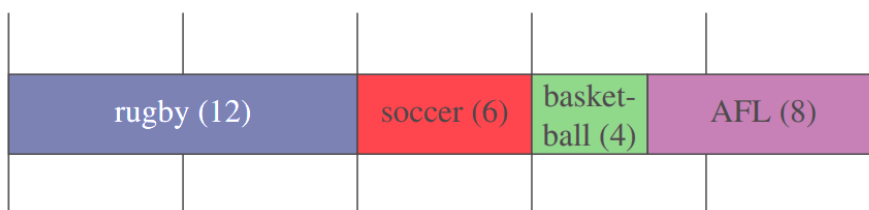
1. Sector graphs and divided bar graphs show of the whole.

- 1 Jason graphs how he spends his leisure time.
a What does he spend the most time doing?



- b What does he spend the least time doing?
c Does he spend more or less than half the time doing sport?

- 2 Thirty students are surveyed to find out their favourite sport.



- a What is the most popular sport for this group of students?

rugby

- b What is the least popular sport for this group of students?

basketball

- c What fraction of the students has chosen soccer as their favourite sport?

$$\frac{6}{20} = \frac{3}{10}$$

- d What fraction of the students has chosen either rugby or AFL?

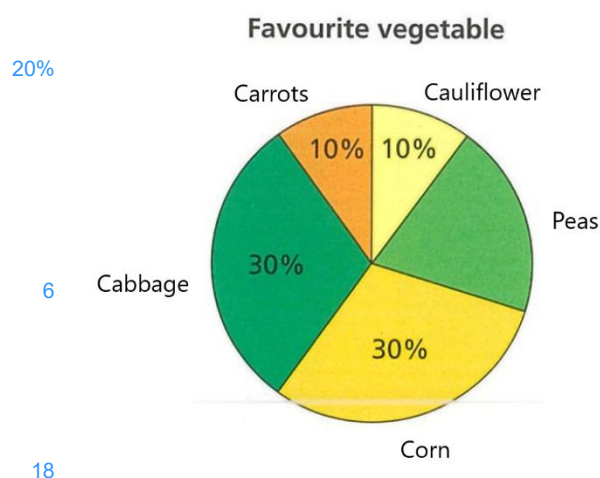
$$\frac{1}{2}$$

- 3 60 people were asked to choose their favourite vegetable.

- a What percentage of people chose peas?

- b How many people chose
i Carrots?

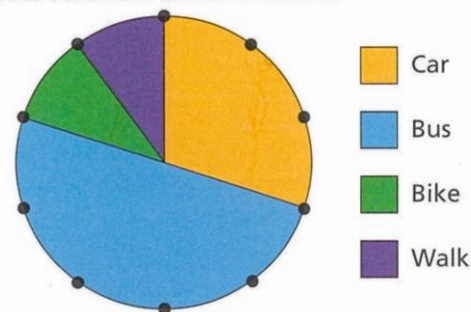
- ii Cabbage?



- 4 Some students were asked how they travel to school. The results are shown in the pie chart. The pie chart has markings on the circumference at intervals of 10%.

- a What is the most common way to travel to school?
What proportion of the students use this method?
Give your answer as a fraction, a decimal and a percentage.

How students travel to school



50%, $\frac{1}{2}$, 0.5

- b Benji says that three students travel to school by car. Do you agree with Benji? Explain your answer.

30%, not 3.

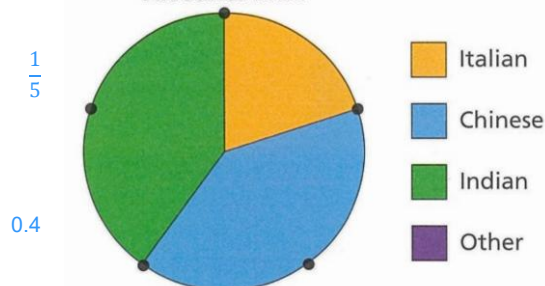
- c What does the pie chart tell you about the number of students who travel by bike and the number of students who walk to school?

Equal number of people

- 5 A group of people were asked their favourite type of food. Their results are shown in the pie chart. The markings around the circumference of the pie chart are equally spaced.

- a What proportion of people chose Italian?
Give your answer as a fraction.

Favourite food



- b What proportion of people chose Chinese?
Give your answer as a decimal.

- c What proportion of people chose Indian?
Give your answer as a percentage.

40%

- d What proportion of people chose other?

0

- 6 The staff from an office were asked whether or not they have a driving licence. The results are shown in the pie chart. The markings on the circumference are equally spaced.

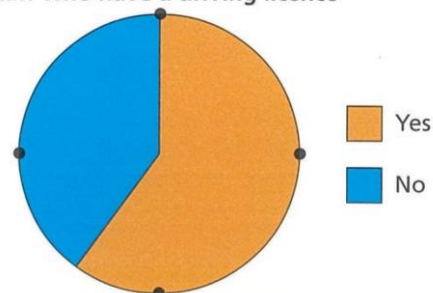
- a Estimate the percentage of the staff who have a driving licence.
Explain why your answer is only an estimate.

60%, no angles so can't be sure.

- b Rachel estimates that 43% of the staff do have a driving licence and 47% do not. Give three criticisms of Rachel's estimates.

1. More staff have drivers' licenses than not
- The percentages don't sum to 100%
- More than 50% should have a driver's license

Staff who have a driving licence



- 7 A group of Year 7 students was polled on their favourite foods.
If 40 students participated in the survey, find how many of them chose:

a Chocolate

b Fruit

c Chips

d Pies

e Another 20 students were surveyed.
10 chose chocolate and 10 chose chips.

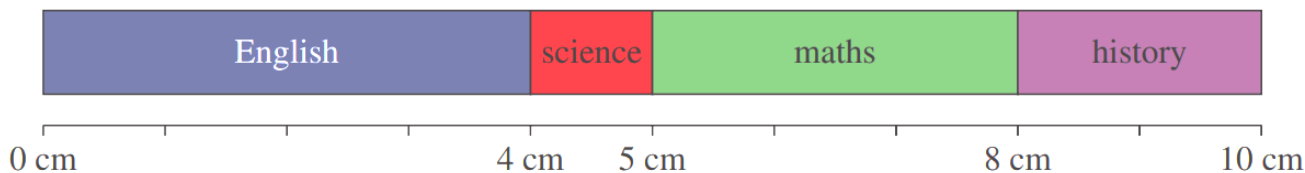
i Will the chips sector become larger or smaller? Explain your reasoning.

Chips will be $\frac{20}{50}$, which is more than $\frac{1}{4}$ so larger.

ii Will the chocolate sector become larger or smaller? Explain your reasoning.

Stays the same. $\frac{30}{60} = \frac{1}{2}$

- 8 A Year 7 class' favourite subjects were surveyed.



a Calculate the percentage of the whole represented by:

i English

40%

ii Maths

30%

iii History

20%

b If there were 30 students in the class, how many of like:

i Maths best?

9

ii History best?

4

iii Science best?

3

- 9 Year 8 were asked to choose one of five elective subjects. The results of this survey are shown.

Art	Photography	Music	Dance	Computers
24	36	18	15	27

- a Total students:

120

- b A bar 12 cm long is shown below. Why do you think the bar is 12 cm long?

120 can be easily represented by 12 cm

- c The calculations below show how the lengths for the first two subjects were calculated. Continue the calculations for the remaining three subjects.

$$\text{Art} = \frac{24}{120} \times 12 \text{ cm}$$

$$= 2.4 \text{ cm}$$

$$\text{Photography} = \frac{36}{120} \times 12 \text{ cm}$$

$$= \dots\dots\dots$$

Music =

3.6 cm

1.8 cm

Dance =

1.5 cm

Computers =

2.7 cm

Use your calculations to complete the divided bar graph.



- 10 A table shows Australian energy sources in 2010.

- a Calculate the percentage of the 'renewables' category.

Oil	Coal	Natural Gas	Renewables
36%	35%	25%	4%

- b What would be a suitable length for the bar?

10 cm

- c Draw a divided bar graph to represent the information above.



- d Australia's energy mix in 2020 is:

Oil	Coal	Natural Gas	Renewables
36%	29%	27%	8%

- e Draw a divided bar graph to represent the information above.



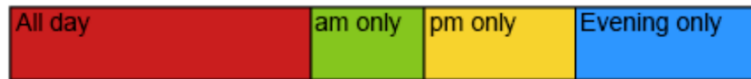
- f Describe some changes between 2010 and 2020.

Proportion of coal decreased, proportion of renewables increased

- g Jeff says: "The electricity generated by renewables doubled between 2010 and 2020." Explain why this is not necessarily correct.

The total amount of electricity is likely a lot higher in 2020 compared to 2010, so the electricity from renewables probably more than doubled.

- 11** This bar represents the 500 000 visitors to the Royal Easter Show in Sydney. The bar is 10 cm long. Using a ruler, estimate how many people visited during which times.



All day: 200 000, AM only: 75 000, PM only: 100 000, Evening only: 125 000

- 12** Kody sorted her Spotify playlist into categories. She had 300 rock songs, 100 country songs, 150 pop and 50 classical.

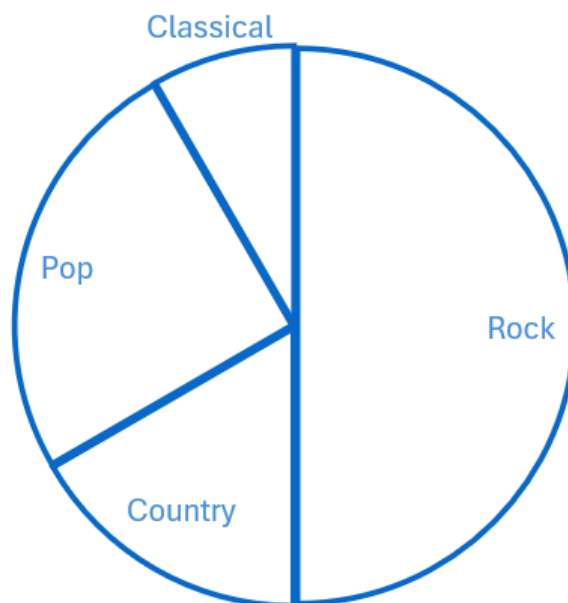
a How many songs does she have in total?

600

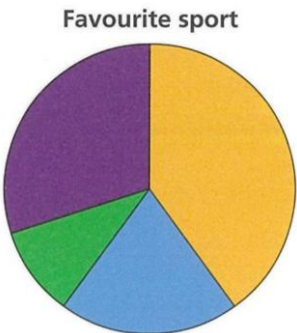
b Fill in the table to determine the angle for each sector.

Genre	Number of Songs	Calculation	Angle
Rock	300	$\frac{300}{600} \times 360^\circ$	180°
Country			60°
Pop			90°
Classical			30°

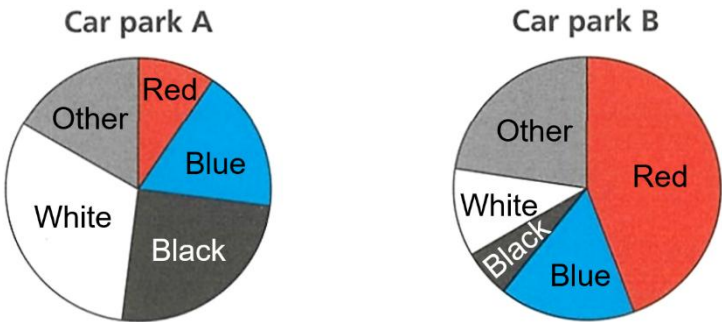
c Complete the sector graph (you can use a protractor, or estimate the angles).



- 13 The pie chart shows the favourite sports of a group of people. The key is missing.
- Twice as many people chose football as chose netball.
 - Twice as many people chose netball as chose rugby.
 - 30% of the people surveyed chose other.



- 14 The sector graphs show information about different coloured cars in two car parks.



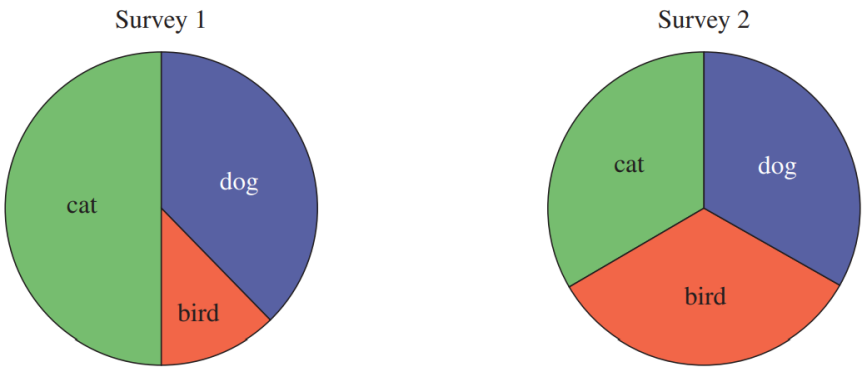
- a Marty says: “There are more red cards in car park B than in car park A.” Explain why he might not be correct.

Sector graphs show proportion, not actual number.
Car park A may have many more cars compared to B

- b What other information do you need to be able to confirm whether Marty is correct?

The total number of cars in each carpark

- 15 In two surveys, people were asked which pet animal they preferred.

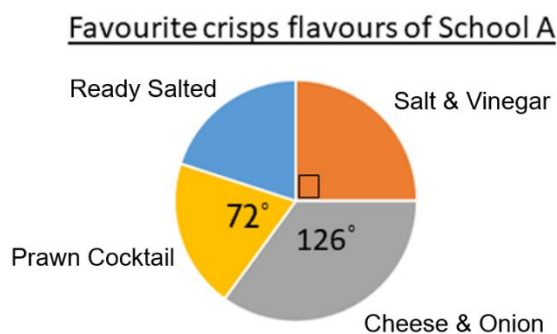


- a If 16 people participated in survey 1, how many chose a dog?
- b If 30 people participated in survey 2, how many chose a bird?
- c Explain why it's not possible that 20 people participated in survey 1.
- d Explain why it's not possible that 40 people participated in survey 2.

One eighth are birds, and 20 is not divisible by 8

40 is no divisible by 3

16 Consider this sector graph.



a What percentage of people liked Prawn Cocktail crisps the best?

20%

b 45 people liked Salt and Vinegar crisps the best.
How many people like Cheese and Onion?

63

c What fraction of people chose Ready Salted?

$\frac{1}{5}$

17 The sector graph represents 20 big cats in a zoo.

a What percentage of animals are cheetahs?

25%

b If the tigers are represented by a sector with angle 144° and the lions represented by a sector with angle 54° , what is the angle of the sector representing jaguars?

72°

c How many lions are in the zoo?

3



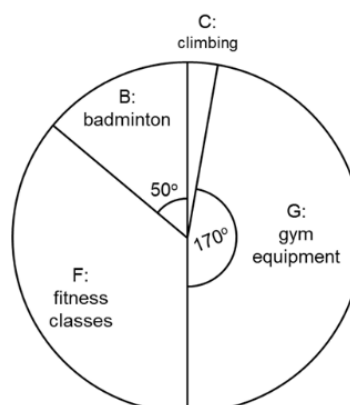
18 After a season, a hockey team had won 17 matches, drawn 10 and lost 13.
What angles would you draw on a pie chart to show this information?

Won: 153° , Draw: 90° , Lose: 117°

19 A fitness centre manager counts the number of people involved in activities on one day and showed the information in a pie chart.

20 people were playing badminton.

How many students were there altogether?



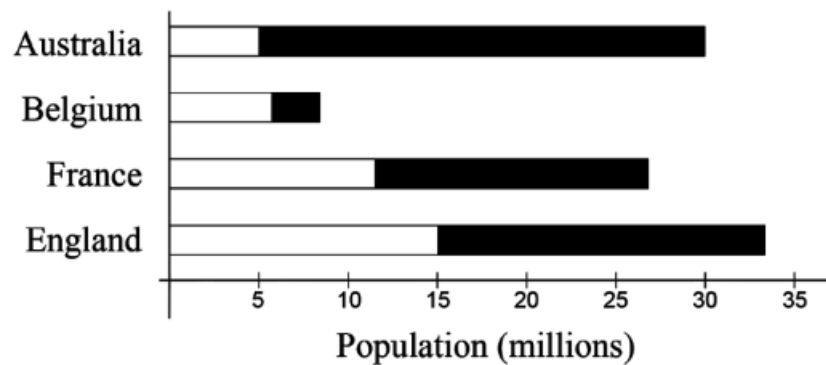
$50^\circ = 20$

$1^\circ = 20/50$

$360^\circ = 144$

144 people

20 A stacked column graph combines a column graph and a divided bar graph.



a Describe how the graph is similar to a column graph.

Frequency is shown using columns

b Describe how the graph is similar to a divided bar graph.

You can see proportions

c Each bar on the graph shows the population of a country and the population of its capital city.

The unshaded region is the population that lives in the capital.

The shaded region is the population that lives outside the capital.

i Which city has the highest percentage of its population living in the capital?

Belgium

ii Which city has more people living in the capital? England or Australia?

England: 15 m, Australia: 5 m

So, England

21 Consider the bar chart.

a Which sport had the highest frequency?

football

b What percentage of students prefer tennis?

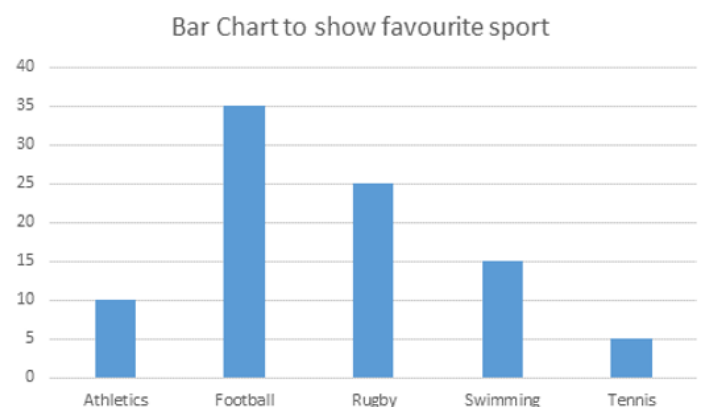
5.5%

c What is the probability that a person chosen at random prefers swimming?

$\frac{1}{6}$

d How many degrees in a sector graph would Rugby represent?

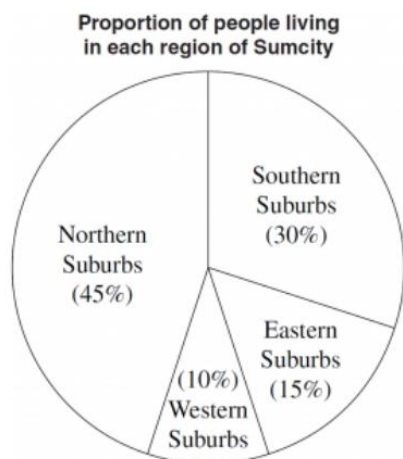
100°



22 2005 HSC Standard 2 Band 4

The graph shows the proportion of people, as a percentage, living in each region of Sumcity. There are 24 000 people living in the Eastern Suburbs.

a Show that the total number of people in Sumcity is 160 000.

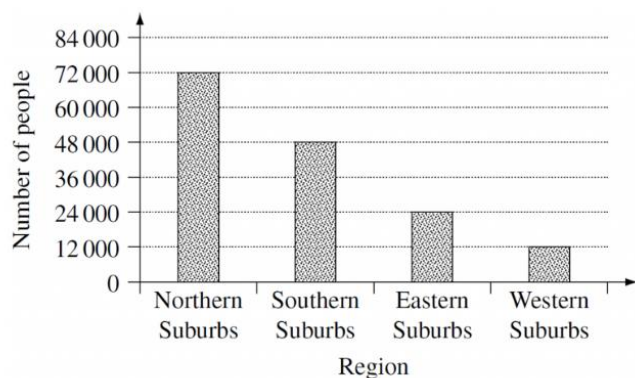


$$15\% = 24\,000$$

$$1\% = 1600$$

$$100\% = 160\,000$$

b Jake used the information above to draw a column graph. The column graph height is incorrect for one region. Identify this region and justify your answer.



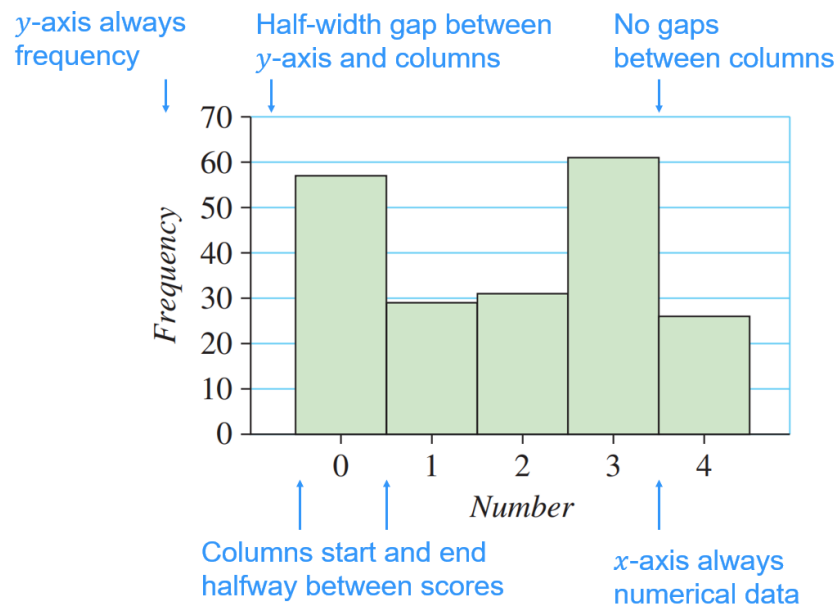
Western suburbs should have 10% of 160 000

Which is 16 000 people, not 12 000

FREQUENCY HISTOGRAMS AND POLYGONS

FREQUENCY HISTOGRAMS

- A **frequency histogram** is a special type of column graph.

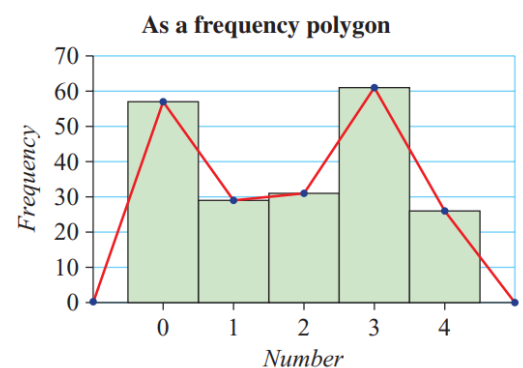
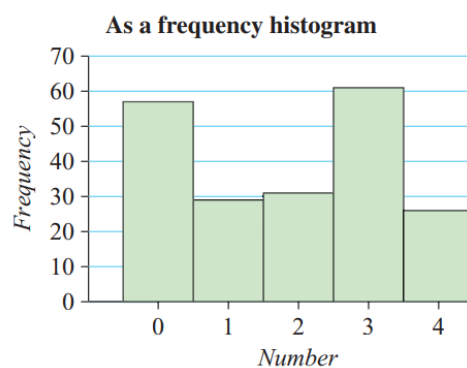


FREQUENCY POLYGONS

- A **frequency polygon** is a line graph that represents the data of a frequency histogram.
- They are useful for comparing sets of data.
- To construct a frequency polygon, connect the column centres and the x axis.

As a table

Number	Frequency
0	57
1	29
2	31
3	61
4	26

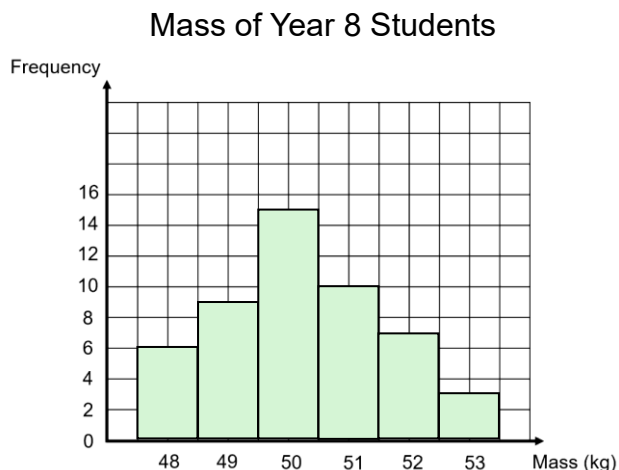


Example Constructing histograms and polygons.

Worked Example

Construct a frequency histogram and polygon from this data showing the mass of Year 8 students.

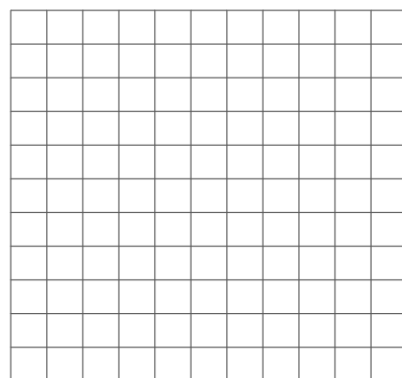
Mass (kg)	48	49	50	51	52	53
Frequency	6	9	15	10	7	3



Your Turn

Construct a frequency histogram and polygon from this data.

Number of siblings	Frequency
0	15
1	20
2	13
3	2

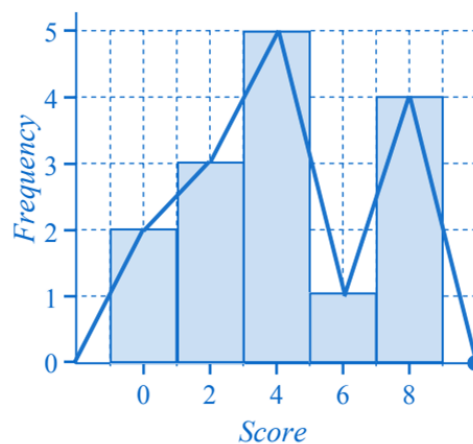


Key ideas

1. Histograms are similar to graphs and are always used to display data.
2. The ...-axis is always frequency.
3. There is a gap between the y -axis and the first and last
4. The columns start and end between scores.
5. A connects the centres of each column and the ends of the columns at the axis.

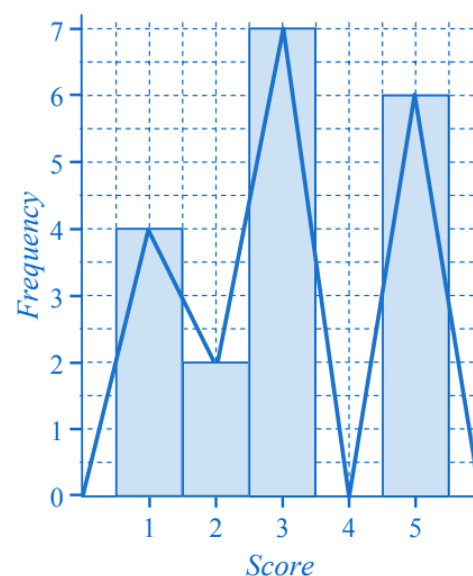
- 1 Complete the frequency histogram and polygon for this table.

Score	Frequency
0	2
2	3
4	5
6	1
8	4



- 2 Complete the frequency histogram and polygon for this table.

Score	Frequency
1	4
2	2
3	7
4	0
5	6



- 3 A survey is conducted of the number of people in different families.
Use the histogram to answer the questions.



- a What is the most frequent number of people in a family?
- b How many people responding to the survey said they had a family of 6?
- c What is the least likely number of people in a family?

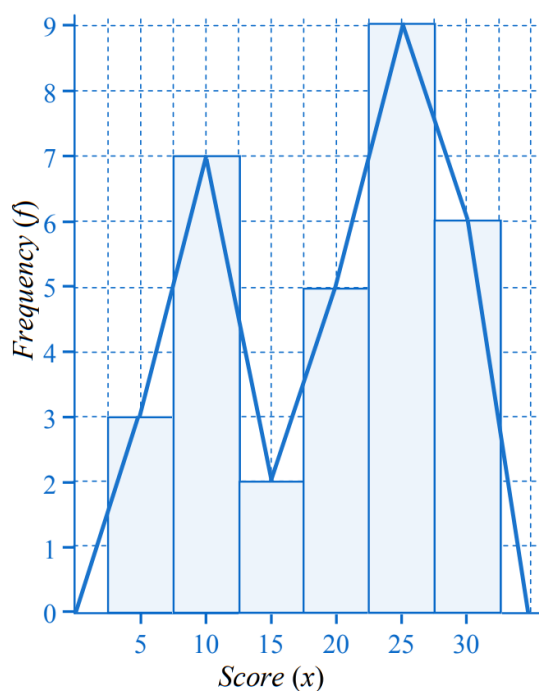
4

4

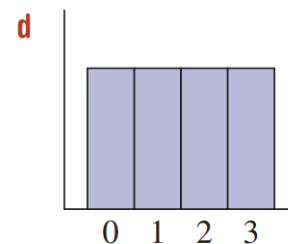
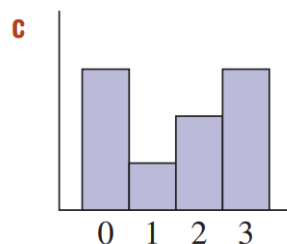
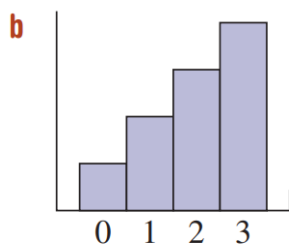
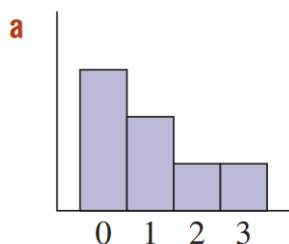
8

- 4 Graph a histogram and polygon of these results:

x	f
5	3
10	7
15	2
20	5
25	9
30	6



- 5 Some tennis players count the number of aces served in different matches. Match up the histograms with the descriptions



Often serves aces.

Generally serves 3 aces or 0 aces.

Serves a different number of aces in each match.

Rarely serves aces.

b

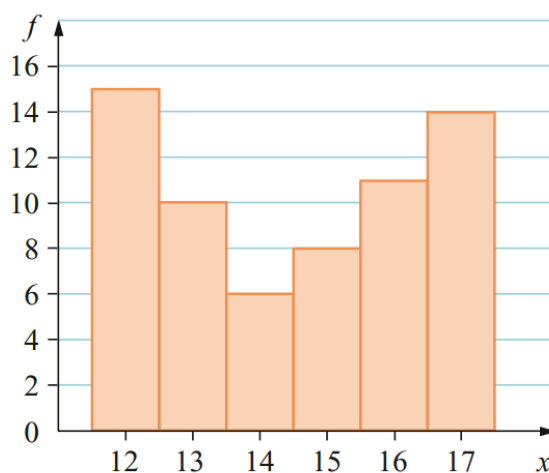
c

d

a

- 6 Complete the table given the histogram.

Score	Frequency
12	15
13	10
14	6
15	8
16	11
17	14



CUMULATIVE FREQUENCY HISTOGRAMS AND OGIVES

CUMULATIVE FREQUENCY

- Cumulative frequency** is the total count of data values up to and including a value.

Example Calculate cumulative frequency.

A class of students is surveyed about how many children are in their family. The results are shown in the frequency table.

Number of Children	Frequency	Cumulative Frequency
1	3	3
2	9	12
3	7	19
4	4	23
5	2	25

How many families had 3 or fewer children? 19

How many families had fewer than 5 children? 23

a Determine the cumulative frequency.

Score	Frequency	Cumulative frequency
4	4	
5	6	
6	7	
7	10	
8	5	

How many students:
scored 8?

5

scored less than 6?

10

scored less than 7?

17

completed the test?

32

b The number of times an ambulance was called out each day is recorded.

Number of calls	Frequency	Cumulative frequency
20	4	
21	3	
22	10	
23	12	
24	6	
25	5	

On how many days was the ambulance called out:

fewer than 22 times?

7

fewer than 24 times?

29

24 times or fewer?

35

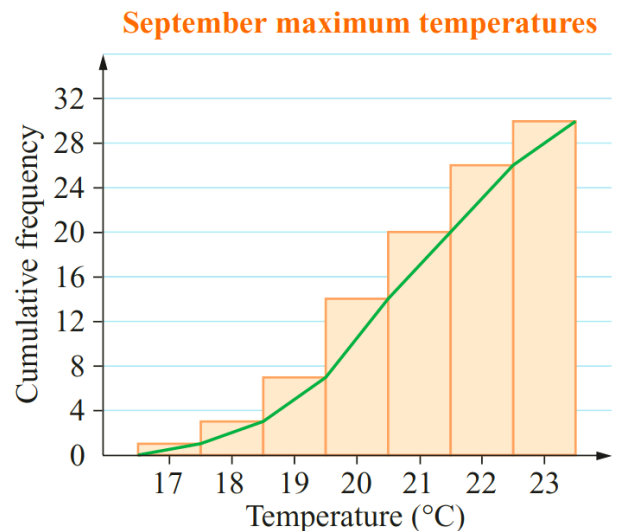
CUMULATIVE HISTOGRAM AND OGIVE

- A **cumulative frequency histogram** shows **cumulative frequency** on the vertical axis.
- An **ogive**, or **cumulative frequency polygon**, is a line graph joining the upper right corners of these histogram columns.

Example Construct a cumulative frequency histogram and ogive.

The maximum temperature, in °C, on each day in September, is shown in the table below. Draw a cumulative frequency histogram and a cumulative frequency polygon for this data.

Temperature	Frequency	Cumulative Frequency
17	1	1
18	2	3
19	4	7
20	7	14
21	6	20
22	6	26
23	4	30



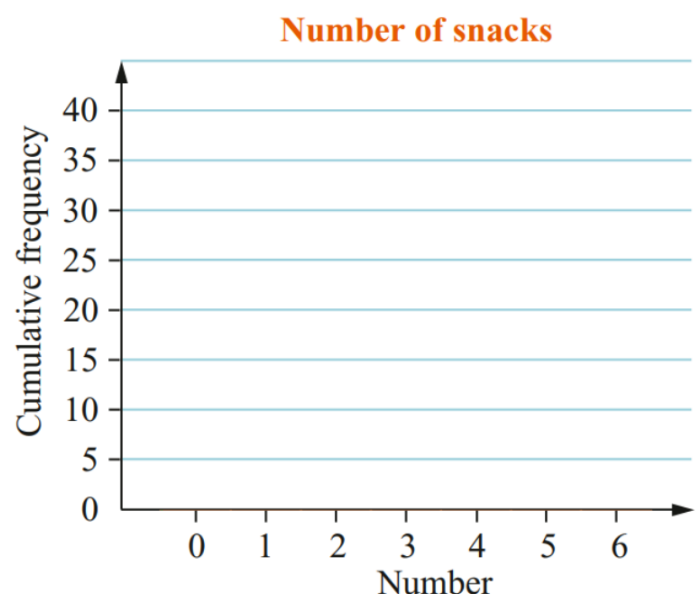
How is an ogive similar and different to a frequency polygon?

Similar: both are graphs.

Different: In a polygon, the lines start and end on the-axis and join the of the columns. In an ogive, the lines join the of each column and does not return to the-axis.

Draw a cumulative frequency histogram and ogive for this data.

Number of snacks	Frequency	Cumulative Frequency
0	5	
1	7	
2	9	
3	7	
4	6	
5	4	
6	2	



1 Complete these cumulative frequency tables.

a

Score	f	$c.f.$
0	6	6
2	5	11
4	3	14
6	7	21
8	4	25
10	2	27

b

Score	f	$c.f.$
0	2	2
1	5	7
2	6	13
3	0	13
4	8	21
5	5	26
6	4	30
7	3	33

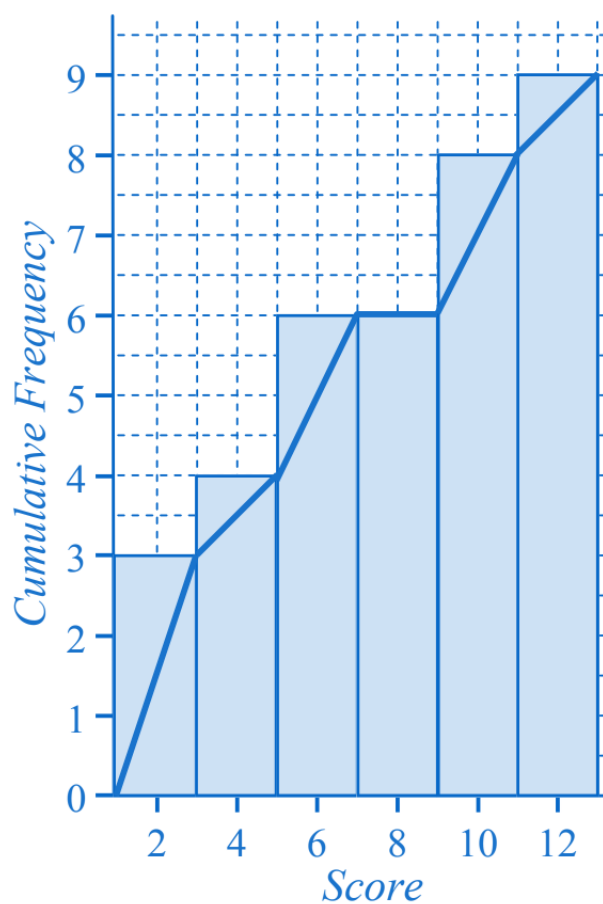
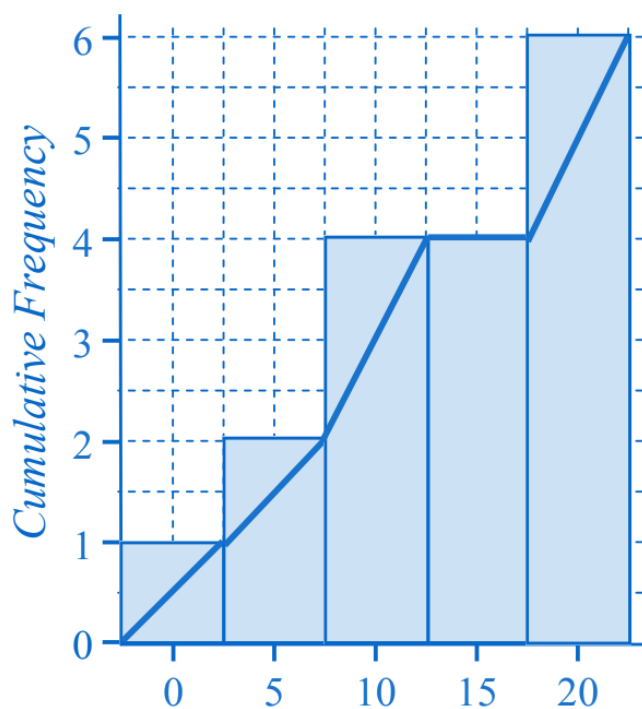
2 Complete the tables then construct a cumulative histogram and ogive.

a

Score	f	$c.f.$
0	1	1
5	1	2
10	2	4
15	0	4
20	2	6

b

Score	f	$c.f.$
2	3	3
4	1	4
6	2	6
8	0	6
10	2	8
12	1	9



- 3 The number of goals scored in a season by the goal shooter in a netball team is shown in this frequency distribution table.

a Add a cumulative frequency column.

Cf column: 4, 7, 14, 19, 19, 22, 24, 25

b In how many games did the goal shooter score:

i 7 or fewer goals?

ii Fewer than 7 goals?

iii Fewer than 10 goals?

iv 10 or fewer goals?

14

7

19

22

Goals per match	Frequency
5	4
6	3
7	7
8	5
9	0
10	3
11	2
12	1

- 4 The maximum daily temperature (in °C) was recorded over the month of April and the results are in the frequency distribution table on the right.

a Add a cumulative frequency column.

Cf column: 3, 7, 15, 21, 26, 30

b How many days in April had a maximum daily temperature of less than 20°C?

c How many days in April had a maximum daily temperature of 21°C or less?

d What percentage of days in April had a maximum daily temperature of 19°C or less?

15

26

50%

Maximum daily temperature (°C)	Frequency
17	3
18	4
19	8
20	6
21	5
22	4

- 5 Determine the frequency from the cumulative frequency.

a

Score	Frequency	C. F.
3	4	4
4	2	6
5	4	10
6	5	15
7	3	18

b

Score	Frequency	C. F.
12	5	5
13	6	11
14	8	19
15	10	29
16	5	34
17	2	36

c

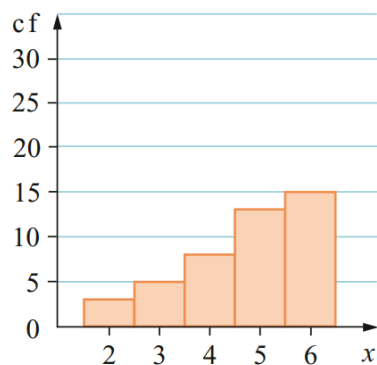
Score	Frequency	C. F.
8	11	11
9	6	17
10	10	27
11	0	27
12	5	32
13	8	40

d

Score	Frequency	C. F.
87	23	23
88	25	48
89	30	78
90	28	106
91	21	127
92	11	138

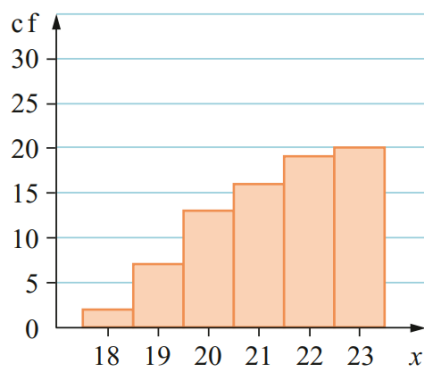
6 Complete frequency distribution tables given these cumulative frequency histograms.

a



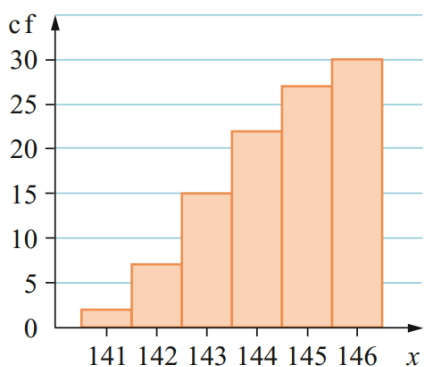
Score	Frequency	C. F.
2	3	3
3	2	5
4	3	8
5	5	13
6	2	15

b



Score	Frequency	C. F.
18	2	2
19	5	7
20	6	13
21	3	16
22	3	19
23	1	20

c



Score	Frequency	C. F.
141	2	2
142	5	7
143	8	15
144	7	22
145	5	27
146	3	30

CHOOSING AN APPROPRIATE GRAPH

Investigation Appropriateness of a graph.

- 1 Before selling a product, it is helpful to know where your potential customers are. Imagine you were thinking of selling fancy mugs in the USA, one way to find customers would be to look for places with lots of cafes. You find an online database of US Starbucks stores: (this is only part of the ≈ 16500 locations)

Store Number	State	City
10123-98419	WI	Hudson
63063-297183	NV	North Las Vegas
29817-255233	TN	Greeneville
57479-290566	CA	Monterey
21355-210584	SD	Rapid City
72792-83341	WA	Vancouver
26710-243205	IL	Peoria
74672-95989	CA	Riverside
52138-280449	WI	Hudson
9327-96152	CA	Santa Fe Springs
15947-155025	WA	Seattle
5278-736	NV	Las Vegas
76493-97488	PA	Philadelphia
8830-93513	CO	Colorado Springs
73747-107559	NY	West Hempstead
63039-296686	MO	Lee's Summit
13258-105758	NC	Kitty Hawk
10723-288511	CO	Loveland
24937-228204	OR	Portland

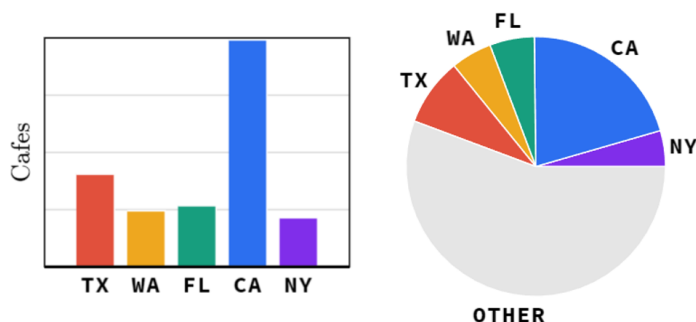
Store Number	State	City
3055-142044	TN	Thompson's Stat
5345-398	CA	Antioch
48132-261244	CA	Bakersfield
10997-102687	CA	Escalon
6187-149664	CO	Broomfield
5987-151304	CA	Atascadero
54178-272166	CA	Sacramento
74873-96290	CA	Victorville
2342-93979	MI	Ann Arbor
321-153984	WA	Bellingham
75461-103858	IL	Hoffman Estates
20271-202065	AL	Florence
23119-224627	TX	Lubbock
63837-297863	IL	Chicago
7941-95812	WA	Seattle
6861-83040	CA	Santa Monica
28688-237571	NC	Candler
13710-108121	IL	Chicago

Store Number	State	City
14042-108068	OR	Portland
50758-227124	MO	Columbia
14047-108074	OR	Portland
24568-236524	OH	Springdale
26654-238724	GA	Johns Creek
3268-289808	WA	Longview
74574-79834	CA	Culver City
9695-271184	FL	Davie
9512-95867	CA	Hayward
76560-96841	OR	Keizer
20920-199724	MO	Hollister
26924-237046	FL	Naples
70018-114085	PA	Clarion
14099-108265	TX	Pflugerville
76864-117425	MA	Haverhill
51096-253106	CA	Santa Clara
10525-68001	SC	Greenville
75668-93672	WI	Milwaukee
75320-100079	VA	Fort Belvoir

- a How useful is this table in deciding where to look for customers? Why?

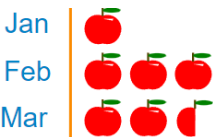
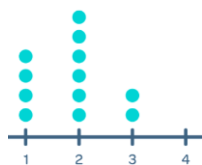
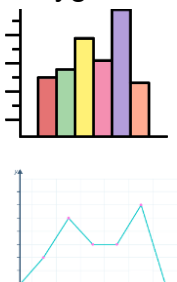
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You can represent the same data as a bar chart and pie chart.



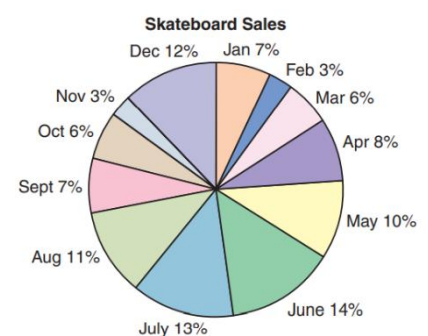
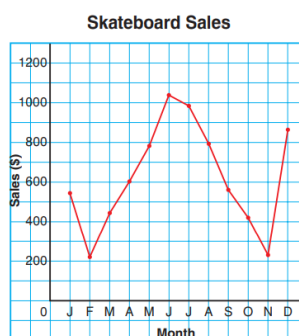
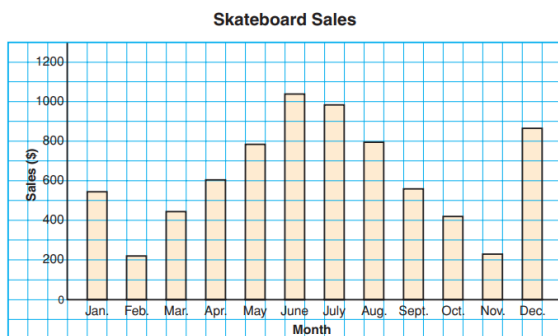
- b Which state has the most Starbucks cafes?
- c Which state has more Starbucks cafes, Florida (FL) or Washington (WA)?
Which graph is more useful for determining this?
.....
- d Approximately what percentage of Starbucks cafes are in California (CA)?
Which graph is more useful for determining this?
.....
- e Complete the statement:
Column graphs are more useful for comparing s..... quantities, while pie charts are more useful for comparing one quantity to the w.....

APPROPRIATE GRAPHS

Type of graph	Type of variable	Uses and Limitations												
Pictogram 	Categorical Numerical Discrete	Length of rows allow easy comparison. Difficult to draw when there is a lot of data.												
Column Graph 	Categorical Numerical Discrete	Length of columns allow easy comparison. Easy to draw when there is a lot of data.												
Line Graph 	Numerical Continuous	Shows changes over time. Used to estimate values between data points.												
Dot Plot 	Numerical Discrete	Used to see clusters and outliers. Difficult to draw when there is a lot of data.												
Stem-and-Leaf <table border="1" data-bbox="98 1196 300 1375"><thead><tr><th>Stem</th><th>Leaf</th></tr></thead><tbody><tr><td>1</td><td>9</td></tr><tr><td>2</td><td>2 2 6</td></tr><tr><td>3</td><td></td></tr><tr><td>4</td><td>0</td></tr><tr><td>5</td><td>3 5 6</td></tr></tbody></table>	Stem	Leaf	1	9	2	2 2 6	3		4	0	5	3 5 6	Numerical Discrete	Used to see clusters and outliers. Groups data together when there is a large range. Difficult to draw when there is a lot of data.
Stem	Leaf													
1	9													
2	2 2 6													
3														
4	0													
5	3 5 6													
Divided Bar Graph Sector Graph 	Categorical Numerical Discrete	Used to show categories as a percentage of the whole. Information about the frequency of data values is lost.												
Histograms Polygons 	Numerical Discrete Numerical Continuous	Shows the “shape” of the data. Polygons are used to compare the shape of many data sets.												

Example Identify most appropriate graph.

A shop owner graphed monthly skateboard sales for a year.



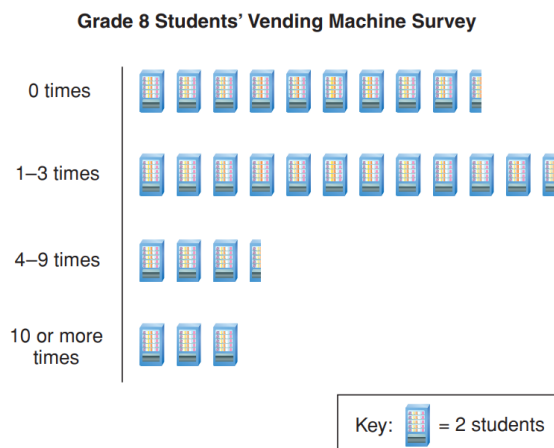
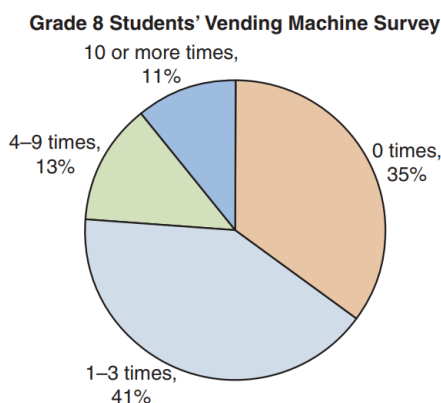
Which graph is most appropriate if the owner wanted to know sales over time?

The line graph. Line graphs show changes over time.

Which graph is most appropriate for showing the percentage of skateboards sold in December?

The sector graph. Sector graphs show percentages.

A student surveyed year 8 students on how often they use vending machines in a week and graphed the data:



Which graph is more appropriate to show percentage of students who did not use a vending machine?

sector graph

Which graph is more appropriate to show frequency of students who did not use a vending machine?

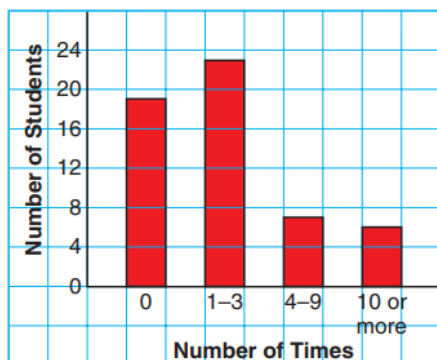
pictogram

Would a histogram have been appropriate for this data?

Yes, histograms are suitable for numerical data.

- 1 The two graphs below display the same data. Explain which one is more appropriate, and why. (Hint: how much time would it take to draw each vending machine?)

Grade 8 Students' Vending Machine Survey



Grade 8 Students' Vending Machine Survey



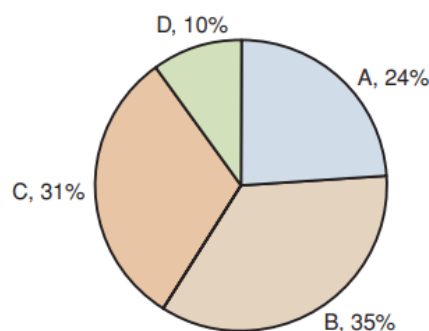
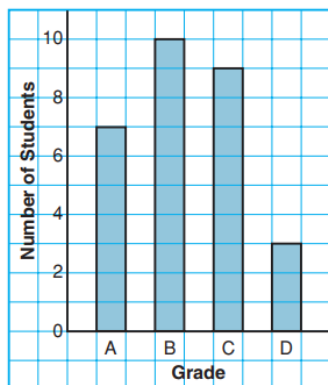
Key: = 2 students

The column graph.

It takes too long to draw the vending machines.

Also it would take longer to interpret the vending machine survey.

- 2 The principal wants to see how many of Mr Ding's class get an A. Give reasons why he would look at either of the graphs.



Column graph to see actual number of people.

Sector graph for percentage of people.

- 3 The table shows the colours of the cars in a car park.

Colour	red	blue	silver	black	white	grey	other
Frequency	43	71	120	101	142	17	6

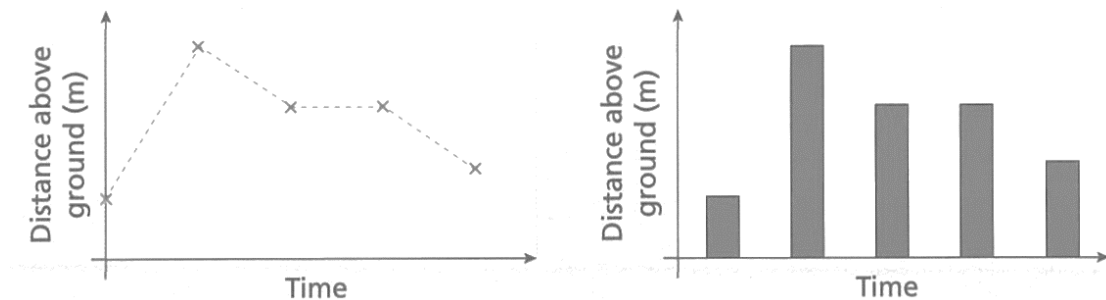
- a Explain why a pictogram would not be suitable for this data

Dataset has very large frequencies.

- b Why would a pie chart be difficult to draw for this data?

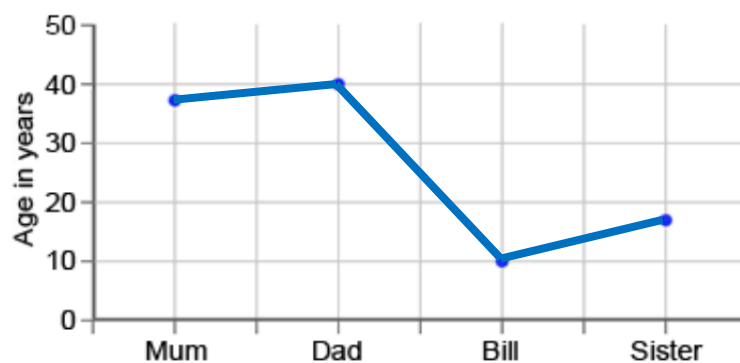
The angles for each sector would be difficult to draw accurately.

- 4 A tracking device was fitted to a bird. The device records the bird's height every minute. Which graph is more appropriate to display the data, and why?



Line graph, as time is continuous data

- 5 Explain why a line graph is not appropriate for this data.



The line connecting datapoints is meaningless, since you can't have data halfway between "Bill" and "Sister"

- 6 Would a dot plot be appropriate for this data? Explain why.

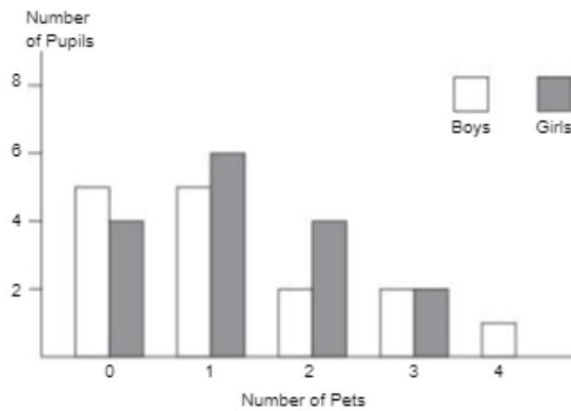
Data Value	Frequency
5	19
6	21
7	45
8	105
9	88

No, there are too many dots to draw.

CHECK YOUR UNDERSTANDING

Column graphs

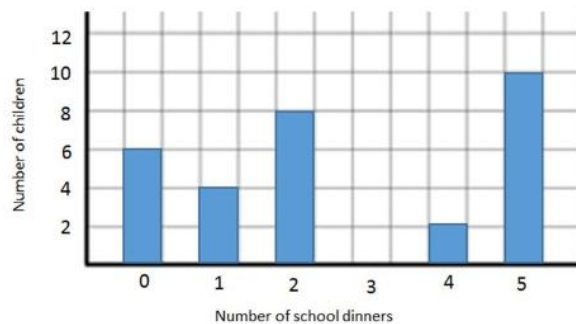
- 1 The column chart shows the pets owned by students in a class.



How many girls own 1 pet?

- a 4 b 6 c 5 d 11

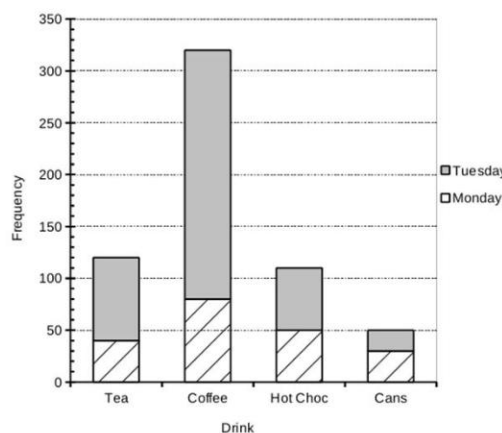
- 2 The column chart shows the number of school dinners eaten in a week.



How many children total are represented in the bar chart?

- a 30 b 15 c 5 d 12

- 3 The column chart shows drinks sold in Caroline's Café in Monday and Tuesday.



Around how many hot chocs were sold on Tuesday?

- a 60 b 110 c 50 d 51

Pictograms

1 Class 2A's favourite fruit.

Apple	   
Pear	  
Strawberry	   
Orange	  

Key
 = 2 children

How many people chose apples as their favourite fruit?

- a 3 and a half b 4 c 6 and a half d 7

2 Netball game attendees.

Game 1	   
Game 2	 
Game 3	  
Game 4	 

 = 12 people

How many people went to game 4?

- a 15 b 12 c 1.25 d 24

3 Fans of genres of music

<u>Type of Music</u>	 = 20 people
Classical	  
Dance	   
Pop	 
Rock	 

How many more people like dance music than rock music?

- a 45 b 15 c 75 d 20

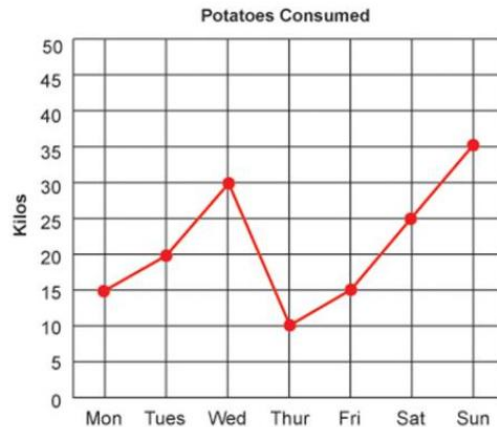
4 Which key is correct?

<u>Type of Music</u>	<u>Pictogram</u>	<u>Number of Fans</u>
Classical	 	45
Dance	  	90
Pop		15
Rock	 	60

- a  = 30 fans b  = 10 fans c  = 15 fans d  = 20 fans

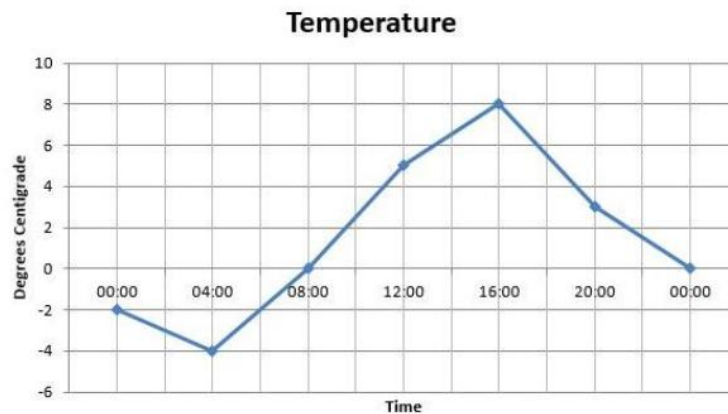
Line graphs

- 1 This graph shows the amount of potatoes consumed by a restaurant in a week.



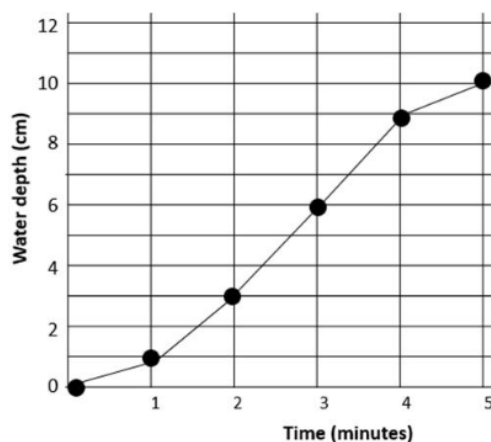
How many potatoes were consumed on Friday?

- a 3 kg b 10 kg c 15 kg d 25 kg
- 2 This graph shows the temperature in Summer's garden in a 24 hour period.



At what time was the temperature -4°C ?

- a 04:00 b 11:00 c 19:00 d Never
- 3 This graph shows how much a block of ice melted over time.

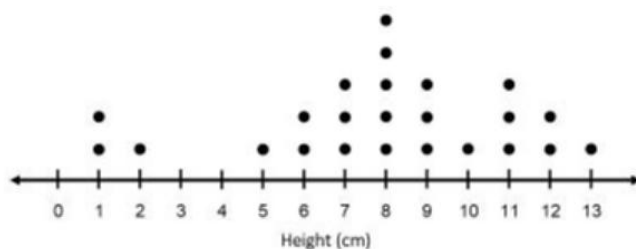


What was the difference between the second minute and fourth minute?

- a 3 cm b 6 cm c 9 cm d 2 cm

Dot plots

- 1 This is a dot plot showing the height that seedlings grew up to. What is the most common height seedlings grew up to?

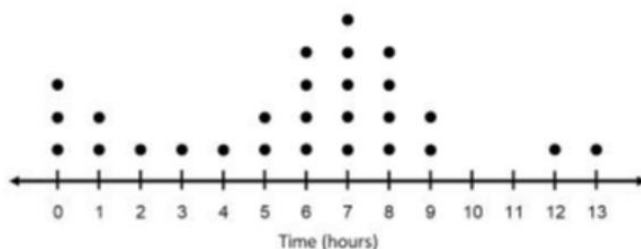


- a 5 b 1 c 13 d 8

- 2 Referring to the dot plot above, how many seedlings grew to exactly 2 cm tall?

- a 1 b 2 c 3 d 1, 6 and 12

- 3 This is a dot plot showing the amount of time students spent studying for their test. What is the most common number of hours spent studying?

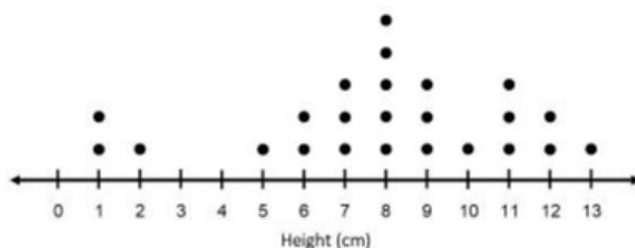


- a 5 b 7 c 1 d 13

- 4 Referring to the dot plot above, how many students spent 4 hours on the project?

- a 7 b 2 c 1 d 6 and 8

- 5 The dot plot shows height of seedlings. Which sentence best describes the dot plot?



- a There is a gap between 2 cm and 5 cm
 b Most seedlings grew taller than 10 cm
 c The tallest seedling is 8 cm.
 d The shortest seedling was 0 cm.

Stem-and-leaf plots

- 1 The stem and leaf diagram shows the scores of class 7N in a recent maths test. What does the circled number represent?

stem	leaf
5	6
6	7, 7, 9
7	2, 4, 7, 7, 8
8	1, 2, 2, 3, 4, 8
9	0, 2, 3, 4

Key: 5 | 6 = 56%

- a One student scored 9% b Nine students scored 6% c One student scored 69% d One student scored 6.9%
- 2 Referring to the stem-and-leaf plot above, what was the highest score?

- a 94% b 56% c 9.4% d 90%

- 3 The stem-and-leaf plot shows the ages of people in a shop. How many people were 20 or over?

1	1 2 2 3 3 5
2	0 0 1 4 9
3	1 5 8 9
4	2 2 2 5 5

Key: 4 | 2 = 42 years old

- a 19 b 14 c 12 d 9
- 4 What is the highest data value shown in this stem-and-leaf plot?

3	0
9 8	1
6 5 1 1	2
4 1 0	3
2	4

Key:

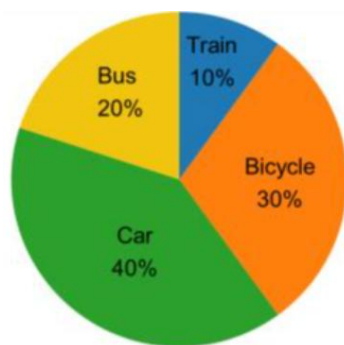
0 | 4 means 4.0

- a 2.4 b 3.0 c 4.2 d 9.1

Sector graphs

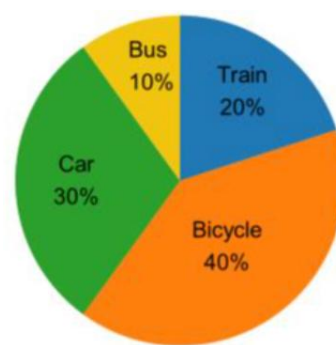
1 50 people were asked how they travel to work. How many travel by car?

- a 40
- b 20
- c 5
- d 25



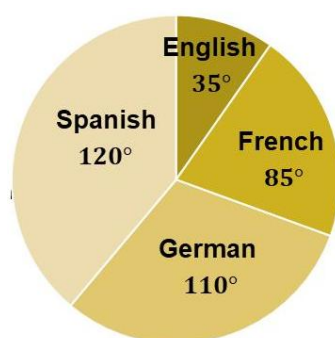
2 60 people were asked how they travel to work. How many travel by train?

- a 20
- b 15
- c 12
- d 6



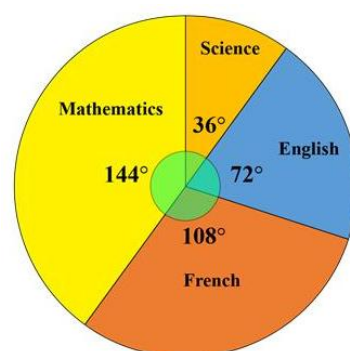
3 The sector graph shows the favourite subjects of children at a school. What fraction chose Spanish?

- a $\frac{1}{120}$
- b $\frac{120}{100}$
- c $\frac{1}{3}$
- d $\frac{1}{4}$

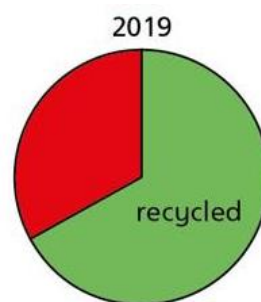
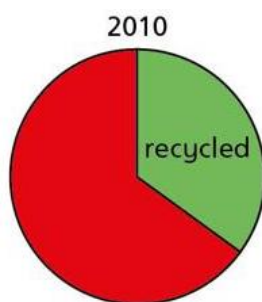


4 The sector graph shows the favourite subjects of children at a school. What fraction chose mathematics?

- a $\frac{1}{144}$
- b $\frac{2}{5}$
- c $\frac{1}{3}$
- d $\frac{1}{4}$



5 The two sector graphs show the amount of rubbish recycled in a city over time.
Tom says a greater amount was recycled in 2019 than 2010.
Katie says a greater proportion was recycled in 2019 than 2010
Who is definitely correct?



- a Only Tom
- b Only Katie
- c Both
- d Neither

6 The sector graph shows the favourite subjects of children at a school.
If 18 students chose science, how many chose French?

- a 36
- b 54
- c 108
- d 216

