

# S1-1 - Data Displays 1

- reading varied data displays
- reading and drawing tables, picture graphs, dot plots, bar graphs, scatter graphs and line graphs

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## Summary

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Data is often processed into a display in order to make it easy to get an overall impression of what it is telling us.

When looking at a data display, the first thing to do is to work out how the display works and how to read it. Then you can go ahead and read it.

There are some types of displays which are commonly used and you should be able to produce these as well as read them. In this module you will learn to produce picture graphs, dot plots, bar graphs, scatter graphs and line graphs.

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## Learn

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### Reading varied data displays

When data has been collected, it is often processed into a **display** in order to make it easy to get an overall impression of what it is telling us. Data displays are commonly tables, graphs or maps.

Data can be displayed in all sorts of ways. Although there are some ways which are particularly common, there are lots of less common ways and people can make up new ways to present data that you will never have seen before.

So when you see a data display, the first thing to do is to look at how it is presented. If you recognise the type of presentation and remember how to read it, then you can go ahead and do so. But if you don't recognise the type of presentation or you don't remember how to read it, then you have to look at it and figure out how it works. This will often take longer than actually reading it.

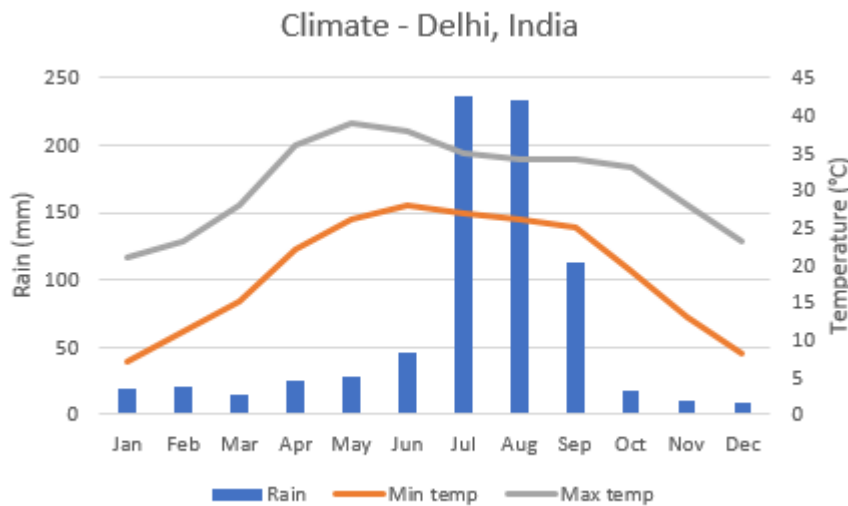


The best way to get good at reading data displays is to practise. Nine displays are presented below. For each one, look at it until you understand what it is about and how to read it. Then answer the questions below it.



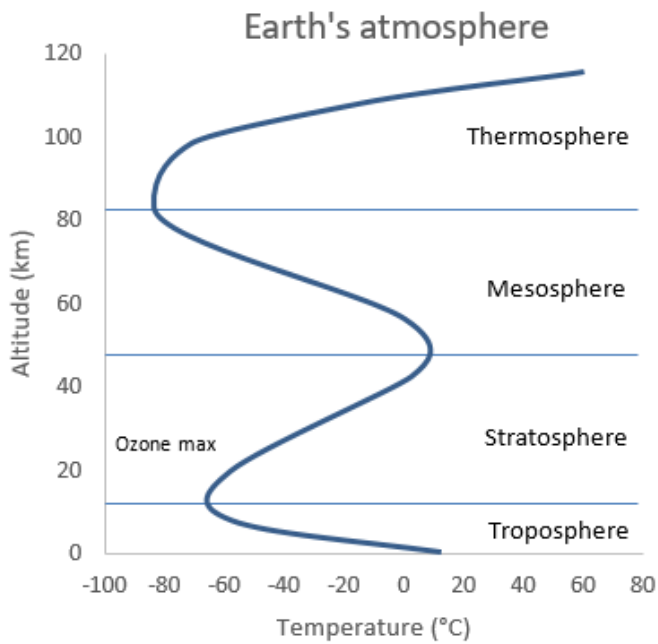
### Practice

- Q1
- How much did Katie earn in 2011?
  - In which year did she earn the most? How much did she earn?
  - In which year(s) did she earn less than the previous year?
  - In what way might this graph give a false impression?



### Practice

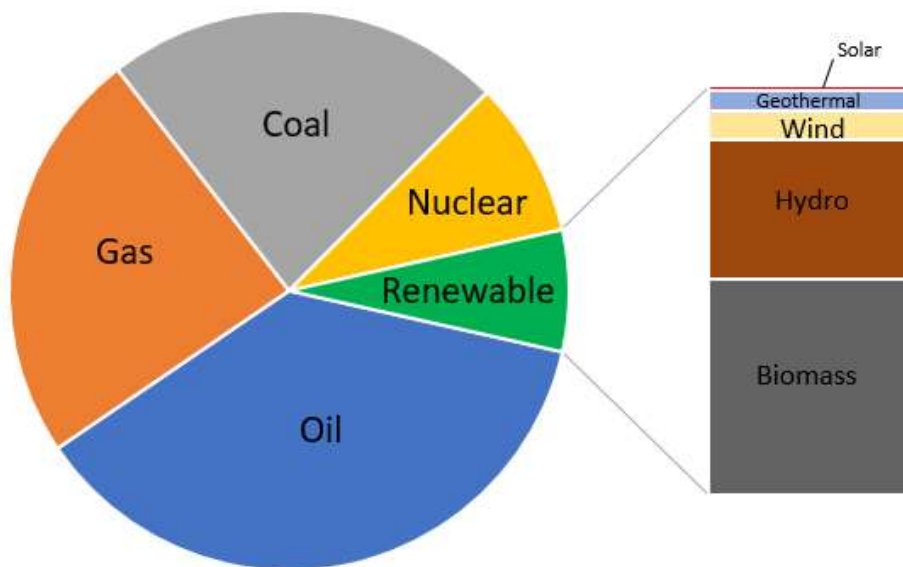
- Q2
- What is the graph about?
  - What does the orange line represent?
  - What do the vertical blue bars represent?
  - Which are the three months of the wet season?
  - How much rain falls in February?
  - Which month has the hottest days?
  - What is the normal day-night temperature range in November?



### Practice

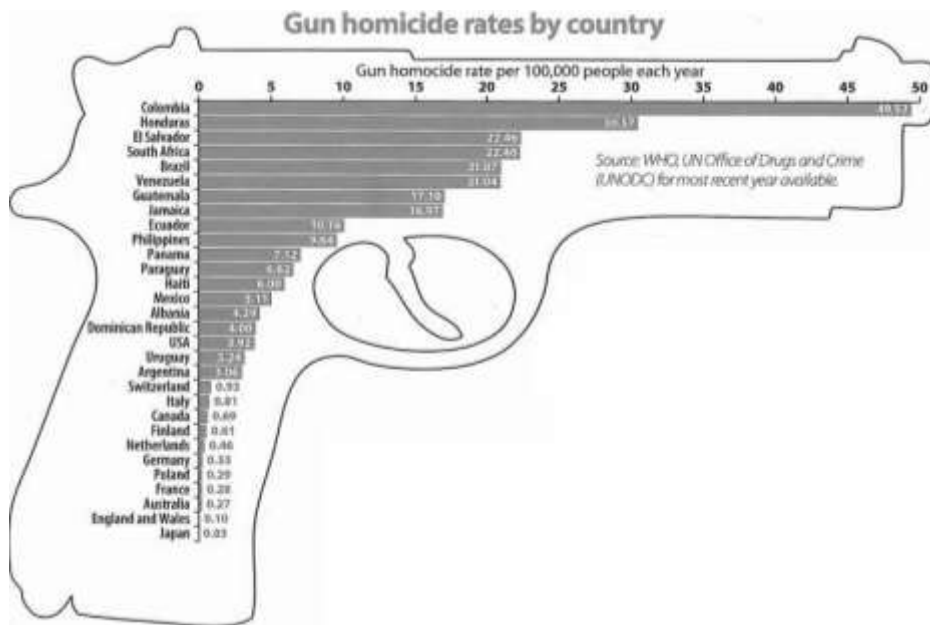
- Q3 (a) What is this a graph of?  
 (b) At what height is the atmosphere coldest?  
 (c) What is the temperature there?  
 (d) How thick is the stratosphere?  
 (e) Does it get warmer or colder as you go up through the stratosphere?  
 (f) According to the graph, what is the temperature at ground level?

**US Energy Sources 2008**



## Practice

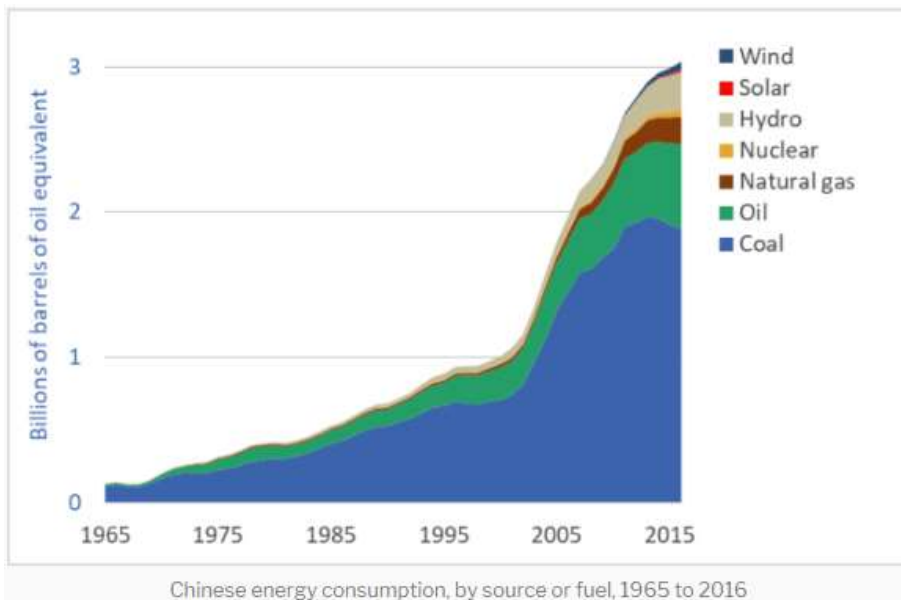
- Q4 (a) Roughly what fraction of energy production in the US in 2008 came from gas?  
 (b) Roughly what percentage came from renewables?  
 (c) What does the rectangle on the right tell us?  
 (d) Roughly what percentage of energy came from biomass?  
 (e) Roughly what percentage of energy came from solar?



Graphic by Infer Trust ([www.infertrust.org](http://www.infertrust.org)), used under Creative Commons licence CC BY-ND 3.0

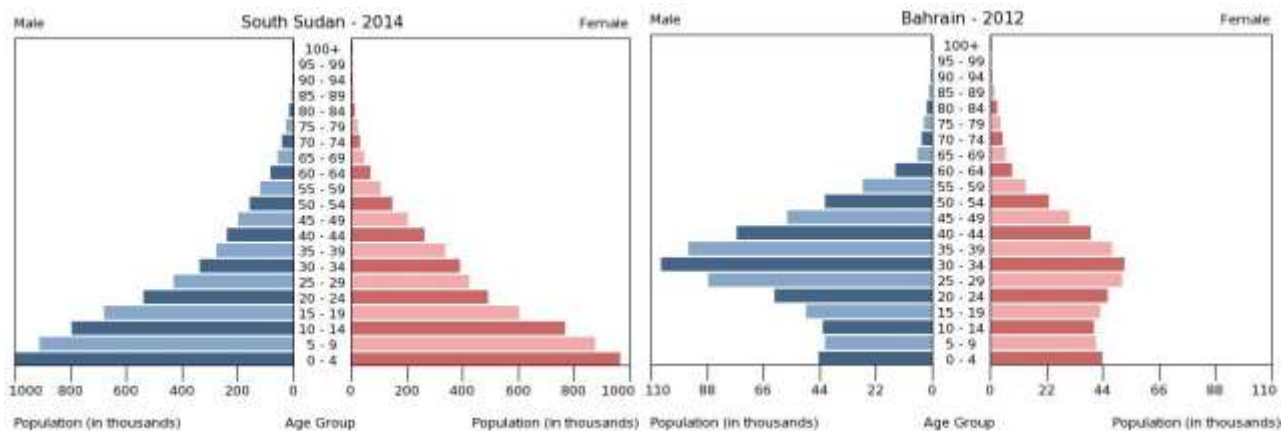
## Practice

- Q5 (a) What does this graph tell us?  
 (b) According to the graph, does the Dominican Republic have more gun homicides than the USA?  
 (c) If the population of the USA is 300 million, how many gun homicides occur there each year?  
 (d) If the population of the Dominican Republic is 11 million, how many gun homicides occur there each year?



## Practice

- Q6 (a) What is China's main source of energy?  
 (b) Did coal consumption increase or decrease between 2012 and 2015?  
 (c) Did oil consumption increase or decrease between 2012 and 2015?  
 (d) In which years was total energy consumption increasing fastest?  
 (e) Roughly how many barrels of oil were used in 2015?  
 (f) Roughly how many times greater was energy consumption in 2015 than in 1965?

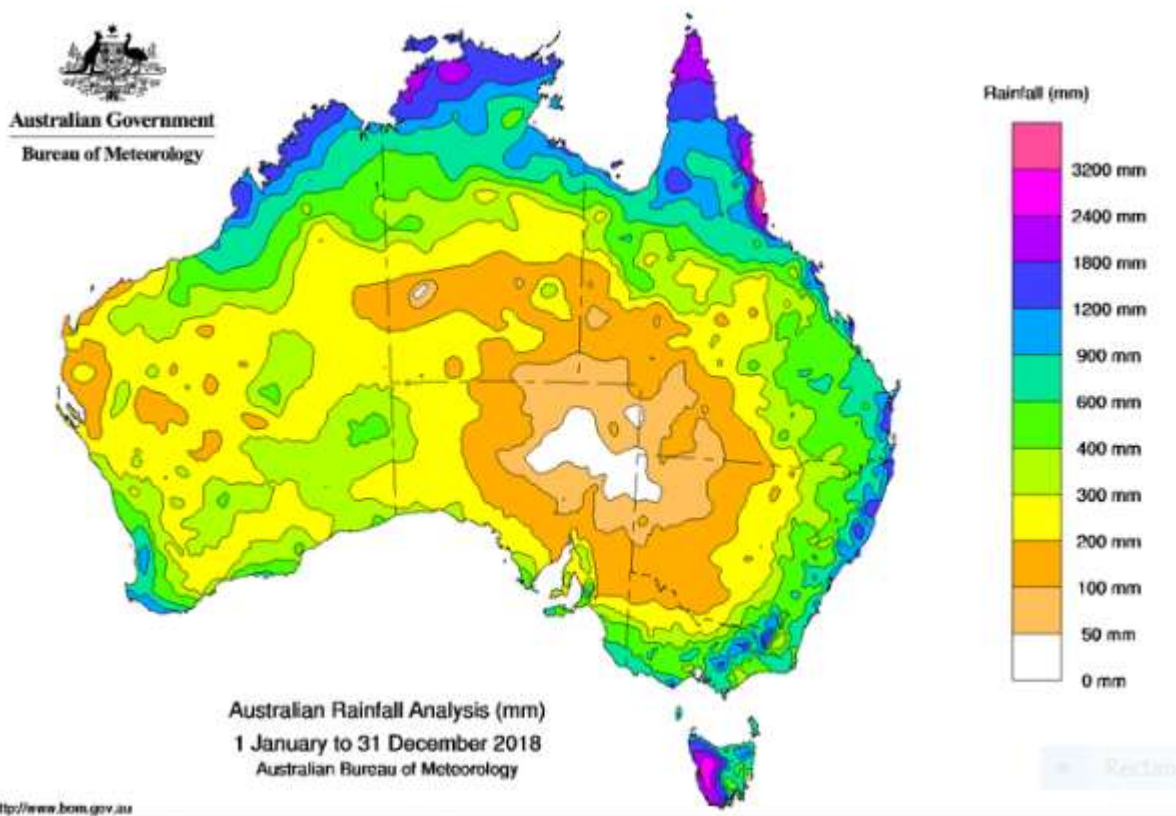


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Public domain [https://commons.wikimedia.org/wiki/File:Bahrain\\_population\\_pyramid\\_2012.jpg](https://commons.wikimedia.org/wiki/File:Bahrain_population_pyramid_2012.jpg)

## Practice

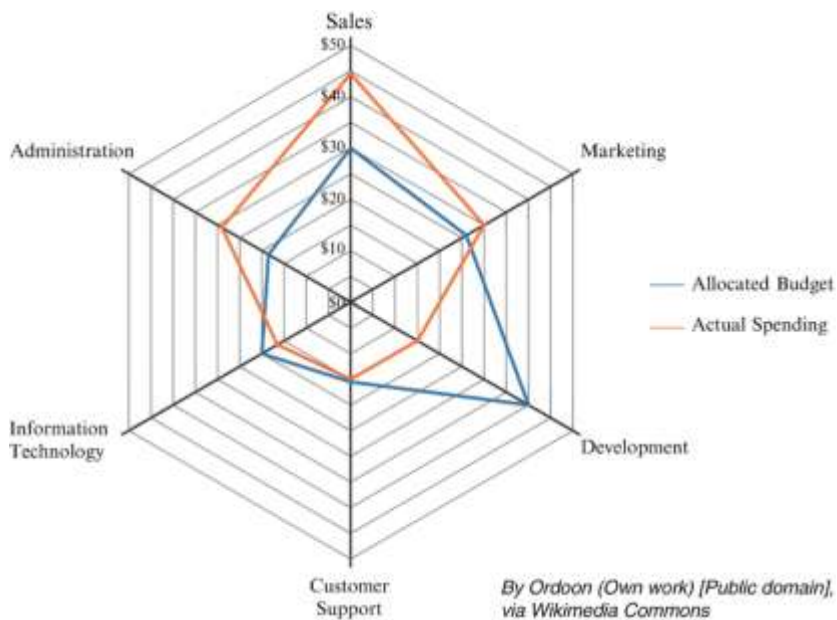
- Q7
- What do these graphs show?
  - Which of the two countries has the highest proportion of children?
  - In South Sudan, are there roughly equal numbers of males and females?
  - In Bahrain, at which ages is there a marked gender imbalance?
  - Any idea why this might be?
  - What is the significance of the alternation of light and dark bars?



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## Practice

- Q8
- What data does this map contain?
  - What was the highest rainfall anywhere in Australia in 2018?
  - Does the map show that some places had no rain in 2018?
  - Does there tend to be more rain inland or near the coast?
  - Which state had the wettest weather overall?



## Practice

- Q9
- What is this graph about?
  - According to the graph, how much was spent on marketing?
  - How much was allocated in the budget to development?
  - Are these amounts realistic for a company?
  - In which areas was more money spent than was allocated in the budget?
  - In which area was the amount spent the same as that budgeted?

## Reading and Drawing Common Types of Data Display

The commonly used types of data display that you should be familiar with at this level are:

- tables
- picture graphs
- dot plots
- bar graphs
- scatter graphs
- line graphs.

You need to be able to read these and also to present data in these forms. You also need to remember all the things that need to be included. These might include:

- title
- axis labels
- scales
- any necessary legends or explanations.

When a reader looks at your data display, they should be able to work out exactly what it is about and how to read it. They shouldn't need any help other than what is on the graph or table.

## Tables

A table usually has rows and columns with row headers and column headers. You find data by looking at the place which is in the right row and in the right column. A sample table is shown below.

**Tuck Shop Prices**

	<b>1992</b>	<b>2005</b>	<b>2019</b>
<b>Ham Roll</b>	\$1.80	\$3.25	\$4.95
<b>Chips</b>	\$2.00	\$3.50	\$3.00
<b>500 mL Orange Juice</b>	95c	\$1.55	\$2.70
<b>300 mL Flavoured Milk</b>	60c	\$1.00	\$1.60

To find the price of orange juice in 2005, we look in the orange juice row and 2005 column and find that it was \$1.55.

## Practice

Q10 From the table above, find:

- (a) the price of a ham roll in 2019
- (b) which was the cheapest of the four items in 1992
- (c) how much orange juice went up between 1992 and 2005

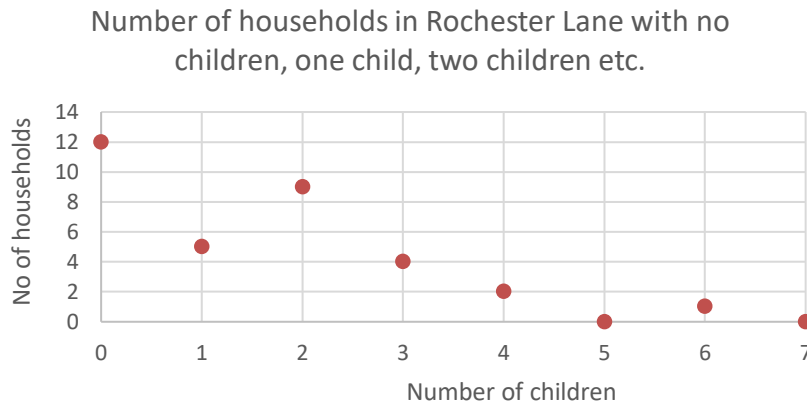
Q11 (a) Use the following table to find the area of a circle with diameter 5 m.

Diameter (m)	0	1	2	3	4	5	6	7
Area (m <sup>2</sup> )	0	0.785	3.14	7.07	12.56	19.6	28.3	38.5

- (b) Find the diameter of a circle whose area is 7.07 m<sup>2</sup>.
- (c) How much does the area of a circle increase when its diameter changes from 5 cm to 6 cm?



Q12 Draw a table to show the data in the following graph.



Q13 Draw a table to display the following data:

A polyhedron with 6 faces has 12 edges and 8 vertices; an icosahedron (20 faces) has 30 edges and 12 vertices; a 4-faced tetrahedron has 4 vertices.

Octahedrons and dodecahedrons have, respectively, 8 and 12 faces, 12 and 30 edges and 6 and 20 vertices. A shape with 4 faces has 6 edges.

## Picture Graphs

A picture graph shows the number of various things by the number of pictures on the graph. As an example, the number of times five students in 8HT had been sent to the office could be shown as a picture graph like this:

**Numbers of times students in 8HT have been sent to the office**

Student	Number of times sent to the office
Pamela Ayers	☞ ☞ ☞ ☞ ☞
Robert Dylan	☞ ☞ ☞ ☞ ☞ ☞ ☞ ☞ ☞ ☞ ☞
Henry Lawson	☞ ☞
Andrew Patterson	☞
Sylvia Plath	☞ ☞ ☞ ☞ ☞ ☞

This shows that Pamela was sent 5 times and that Robert was sent most – he was sent 11 times.

If some of the students had been sent hundreds of times, we would probably make one picture represent a number of times sent. Then we would put a legend explaining this.

Student	Number of times sent to the office
Bob Slay	☛
Herman Rose	☛ ☛ ☛ ☛ ☛
Chris Cross	☛ ☛
Marg Arena	☛
Kat Mandu	☛ ☛ ☛ ☛

☛ = sent to the office 50 times

This shows that Bob was sent 50 times and Herman was sent 250 times (5 lots of 50).

Chris was sent about 75 times (1½ pictures means 1½ lots of 50, which is 75). Marg was sent about 40 times (a bit less than 50).



Picture graphs can run up the page instead of across.

## Practice

- Q14 (a) Use the first picture graph of students sent to the office to find how many times Henry was sent.  
 (b) Use the second picture graph to find how many times Kat was sent.

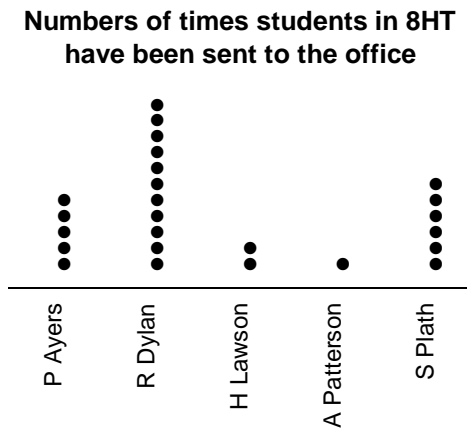
- Q15 The following table shows the numbers of crimes committed by the students in 8PZ

Student	Crimes
Robyn Banks	7
R. Sunn	3
A.T.M. van der Lisom	1
Sigmund Fraud	4
Vaye Grant	0
Sultan Battery	6

Present this data as a picture graph.

## Dot plots

Dot plots are simplified picture graphs where the pictures are replaced by dots. Dot plots are usually arranged with the dots going upwards. The first picture graph above would look like this as a dot plot.

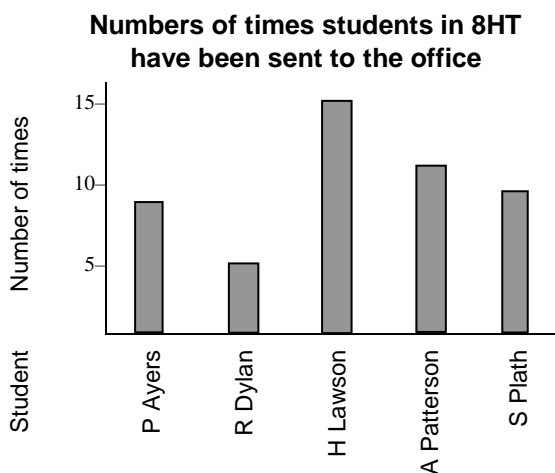


## Practice

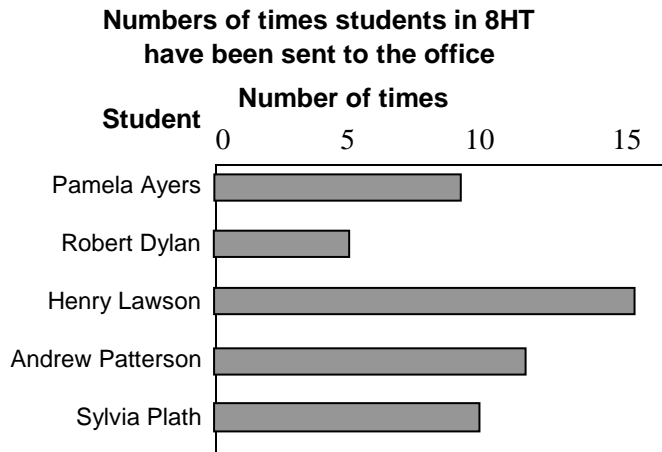
- Q16 (a) Use the dot plot above to find how many times A Patterson was sent.  
(b) Use the same dot plot to find how many more times R Dylan was sent than S Plath.
- Q17 Draw a dot plot to show the information in the table in Q15.

## Bar Graphs

Bar graphs are also like picture graphs and dot plots except that the numbers are shown by the length of a bar or column instead of by the number of pictures or dots. Of course, they must have a scale because we cannot just count pictures or dots. Here is a bar graphs showing similar information to the dot plot above.



Bar graphs can be round the other way too – like this:



Bar graphs with the bars pointing upwards (as in the first one above) are sometimes called column graphs.

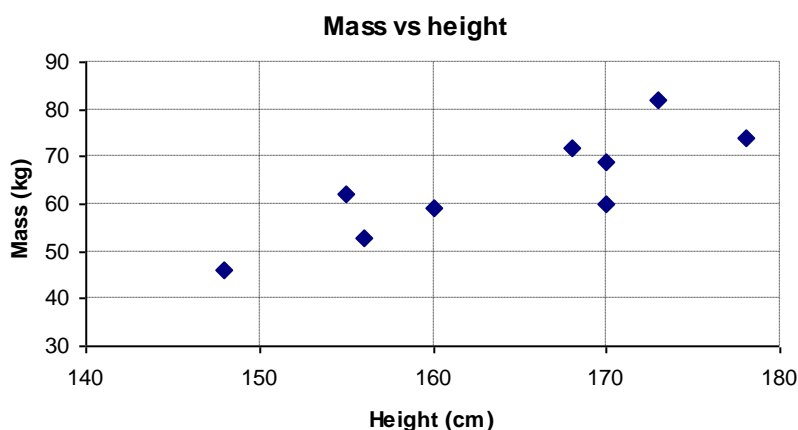
## Practice

- Q18 Use either of the bar graphs above to find how many times P Ayers was sent to the office.
- Q19 Draw a column graph to show the data in the table in question P15.

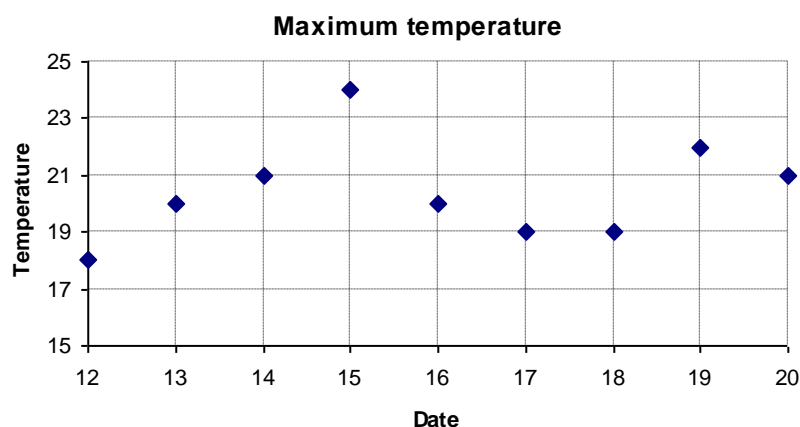
## Scatter Graphs

Scatter plots are sometimes called scatter plots or scattergrams. They are used to show the value of one quantity for various values of another quantity.

For example, if we took 9 students and recorded their height and their mass, we could plot this data on a scatter graph like this.



In the same way, if the maximum temperature was recorded on different days in the month, temperature could be plotted against date like this.



We read a scatter graph by taking a point, then reading the value of each quantity for that point. For instance, the third point on the temperature graph above shows that when the date was 14<sup>th</sup>, the maximum temperature was 21°.

## Practice

- Q20 (a) Use the scatter plot of mass against height above to find the mass of the student who was 168 cm tall.
- (b) What was the height of the heaviest student?
- (c) Use the scatter graph of maximum temperatures to find the maximum temperature on the 16<sup>th</sup> of the month.
- (d) Which day was the hottest?
- Q21 Plot the following data as a scatter plot.

English mark	64	88	59	70	64	32
Maths mark	65	67	70	52	80	12

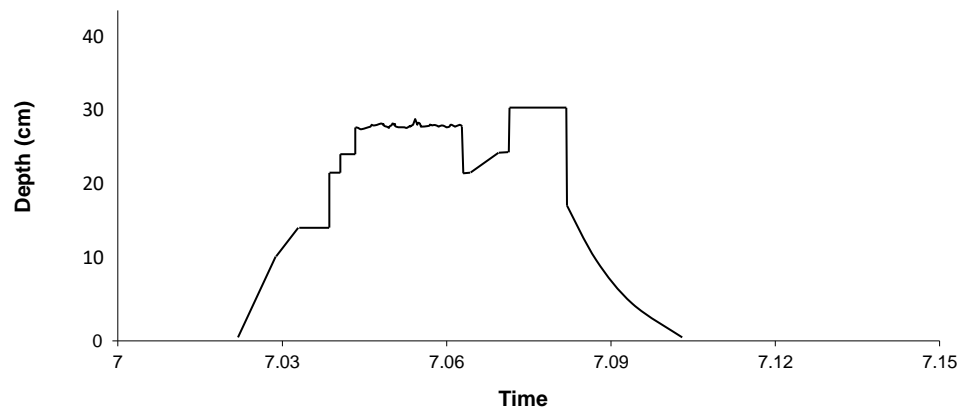
## Line Graphs

Like a scatter graph, a line graph is used to show the value of one quantity for a range of values of another quantity. The difference is that on a line graph, the readings are taken continuously rather than just at certain points. So the points join together to form a line.

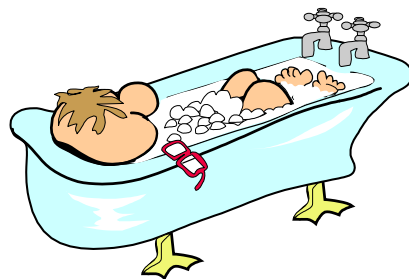
A line graph might be used to show the temperature at a range of times (temperature is one quantity; time is the other). But unlike a scatter graph, it shows the temperature at all times within the range.

It could be used to show the cost for various numbers of litres of petrol.

The line graph below is a plot of bath water depth against time while Albert had his bath.



We read it like this. Suppose we want to know the depth of his bath water at 7:04. We move along the time axis to 7:04, then we move upwards until we hit the graph, then we move left until we hit the depth axis. Then we read the scale on the depth axis. In this case it is about 12 cm.

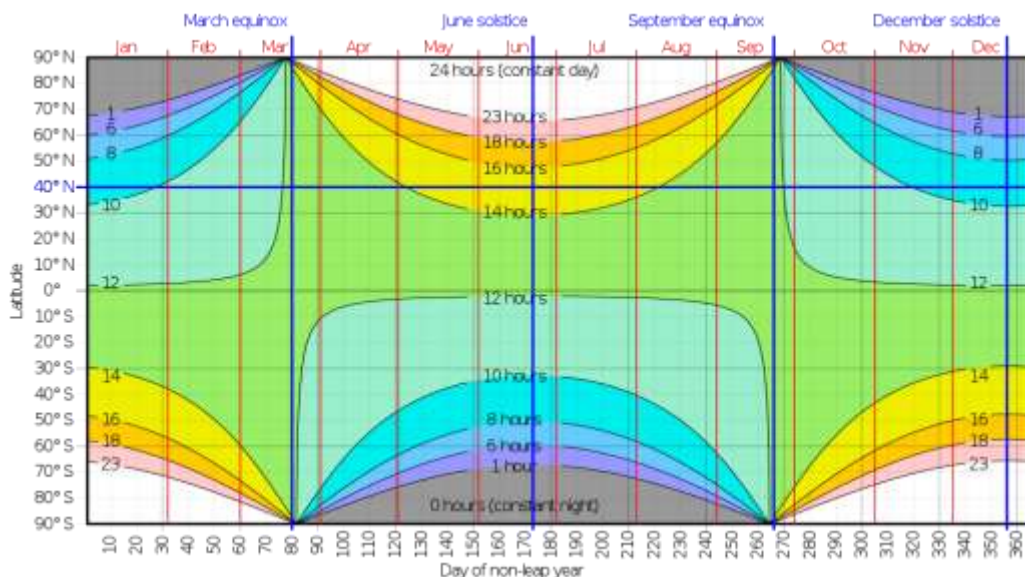


## Practice

- Q22 (a) Use the line graph of the depth of Albert's bath water to find the depth at 7:06.
- (b) At what time did Albert start to run water into the bath?
- Q23 (a) Draw a rough line graph of height versus age from age 0 to 25 for a typical person.
- (b) Draw a line graph of temperature vs time for a typical summer day where you live.

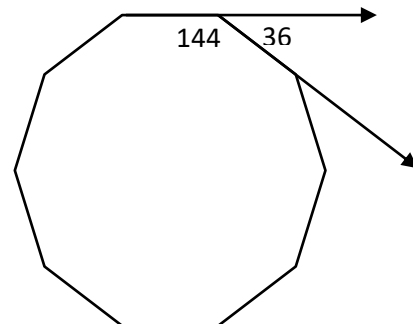
## Solve

- Q51 Use the graph below to answer these questions:
- What does the graph show?
  - How long is the day in London ( $51^{\circ}\text{N}$ ) on August 5?
  - Because of daylight saving, the time half way between sunrise and sunset in Melbourne ( $38^{\circ}\text{S}$ ) on Jan 30 is 1:20 pm. What time is sunrise there?



By Cmglee - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=30611313>

- Q52 We can work out the internal angles in a regular polygon like this: imagine walking along the perimeter of the polygon, turning a bit to the right at each vertex. By the time we get back to where we started, we will have turned  $360^{\circ}$ . If there are say 10 vertices, then we must turn one tenth of  $360$  at each vertex, i.e.  $36^{\circ}$  ( $360^{\circ} \div 10$ ). That angle and the internal angle make a straight angle and thus add to  $180$ . So the internal angle is  $180^{\circ} - 36^{\circ} = 144^{\circ}$ . In the same way, if the polygon had 12 sides, the internal angle would be  $180^{\circ} - 360^{\circ} \div 12 = 150^{\circ}$ .



Draw a table showing the internal angle size for regular polygons with 3 to 12 sides. Then display the data in a suitable graph.

- Q53 By multiplying the internal angle by the number of angles, we can get the sum of the internal angles of the polygons. For instance, the sum of the internal angles for a regular polygon with 12 sides is  $150 \times 12 = 1800^{\circ}$ .

Draw a table showing both the size of the internal angles of regular polygons with up to 10 sides and their sum. Also, use a suitable graph to show this data. You may have to invent a graph type different from any that you have met so far.

## Revision Set 1

Q61 Use the following table to find the area of a circle with diameter 6 m.

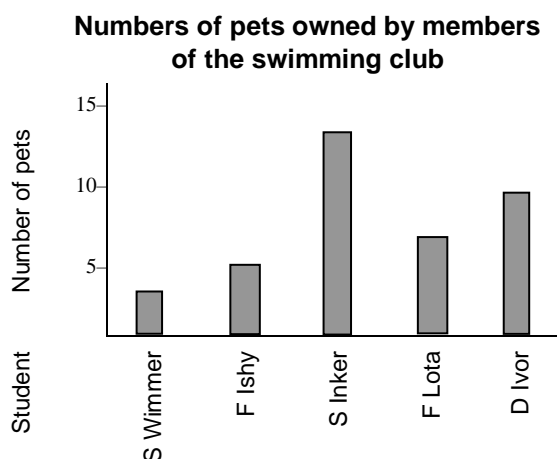
Diameter (m)	0	1	2	3	4	5	6	7
Area (m <sup>2</sup> )	0	0.785	3.14	7.07	12.56	19.6	28.3	38.5

Q62 The following table shows the numbers of hours homework done in the last week by students in 8F.

Student	Hours
Dee Klein	5
Barb Dwyer	12
Dwayne Pipe	8
Evan Zabuv	17
Ellie Fant	0
Ali Mentery	10

Present this data as: (b) a picture graph (c) a bar graph (d) a dot plot

Q63 Use the bar graph below to find how many pets F Lota has.



Q64 (a) Present the data in the table below as a line graph. Draw the line as a smooth curve through the points

Circle diameter (m)	0	1	2	3	4	5	6	7
Area (m <sup>2</sup> )	0	0.785	3.14	7.07	12.56	19.6	28.3	38.5

(b) Use the line graph from part (a) to find the area of a circle with diameter 4.5 m.



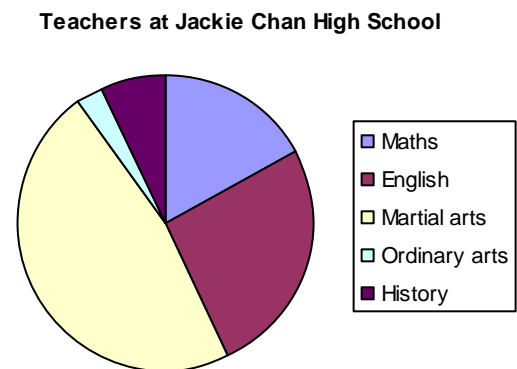
Q65 Plot the following data as a scatter graph:

Hours spent on study	7	14	0	9	7
Score on test	62	90	14	48	59

Q66 In an election,  
 25% of voters voted for the National Democrats  
 22% voted for the Social Disaster Party  
 11% voted for the Two-Nations Party  
 42% voted for the Zombie Liberation Movement

Present this data as a suitable graph.

Q67 Use this pie graph to estimate what percentage of the teachers at Jackie Chan High School are English teachers.



## Answers

- Q1 (a) \$40 000 (b) 2016, \$90 000 (c) 2014  
 (d) A bag of money twice the height would contain 8 times the volume of money.
- Q2 (a) Minimum and maximum temperatures and rainfall in Delhi through the year  
 (b) The lowest temperature each night  
 (c) Rainfall during the month  
 (d) July, August and September  
 (e) 20 mm  
 (f) May  
 (g) 13-28°
- Q3 (a) Temperature at different heights in the atmosphere  
 (b) 85 km  
 (c) -85°  
 (d) 37 km  
 (e) Warmer  
 (f) 12°
- Q4 (a)  $\frac{1}{4}$   
 (b) 7%  
 (c) The break-down of renewable sources  
 (d) 4%  
 (e) 0.1%
- Q5 (a) The number of gun homicides per 100 000 people each year in various countries  
 (b) No, just more per 100 000 people  
 (c) 11 760  
 (d) 440
- Q6 (a) Coal (b) Decrease (c) Increase (d) 2002-2006

(e) 600 000 000 (f) 20

- Q7 (a) The number of people of each age and sex in South Sudan and Bahrain  
 (b) South Sudan  
 (c) Yes  
 (d) 20-65  
 (e) Bahrain has a lot of foreign workers, most of whom are male  
 (f) Just to make it easier to read

- Q8 (a) Rainfall for different places on Australia in 2018  
 (b) Somewhere between 2400 and 3200 mm  
 (c) No, just that some had less than 50 mm  
 (d) Near the coast  
 (e) Tasmania

- Q9 (a) Money budgeted and spent by different departments  
 (b) \$30  
 (c) \$40  
 (d) Not really. They are too low.  
 (e) Administration, sales and marketing  
 (f) Customer support

- Q10 (a) \$4.95  
 (b) Flavoured milk  
 (c) 60c

- Q11 (a) 19.6m<sup>2</sup>  
 (b) 3 m

Q12

No of children	0	1	2	3	4	5	6	7
No of households	12	5	9	4	2	0	1	0

Q13

Faces	4	6	8	12	20
Edges	6	12	12	30	30
Vertices	4	8	6	20	12

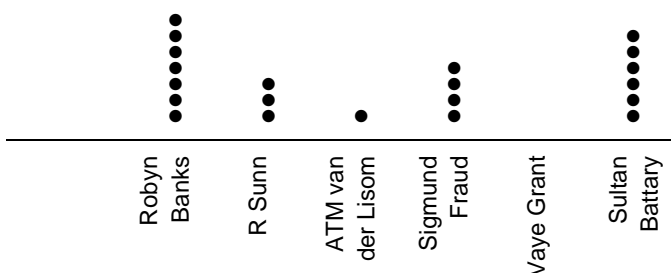
- Q14 (a) 2 (b) About 160

Q15

Student	Number of crimes committed
Robyn Banks	
R Sunn	
A.T.M. van der Lisom	
Sigmund Fraud	
Vaye Grant	
Sultan Battery	

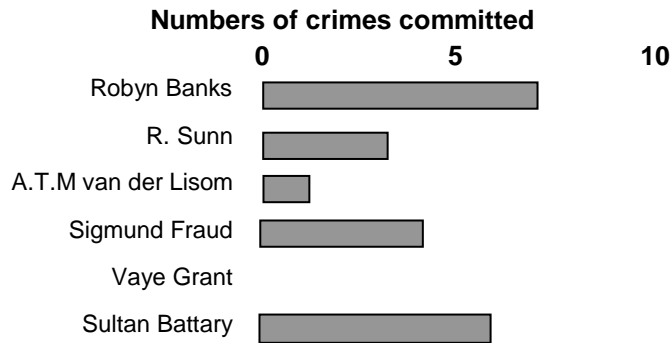
- Q16 (a) 1 (b) 5

Q17 **Numbers of crimes committed**



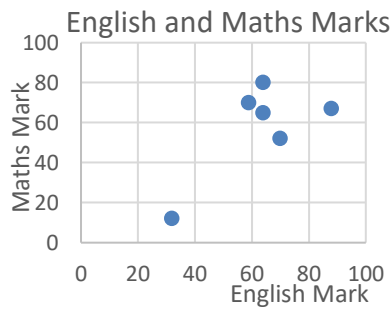
Q18 9

Q19

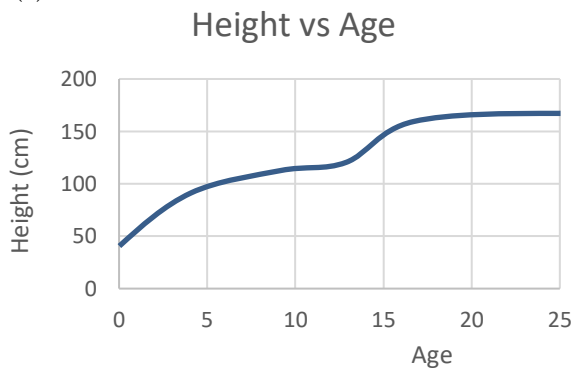


Q20 (a) 72 kg (b) 173 cm (c) 20° (d) 15<sup>th</sup>

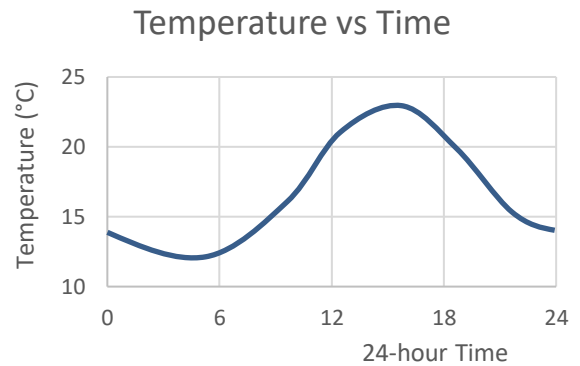
Q21



Q22 (a)  
Q23 (a)



(b)

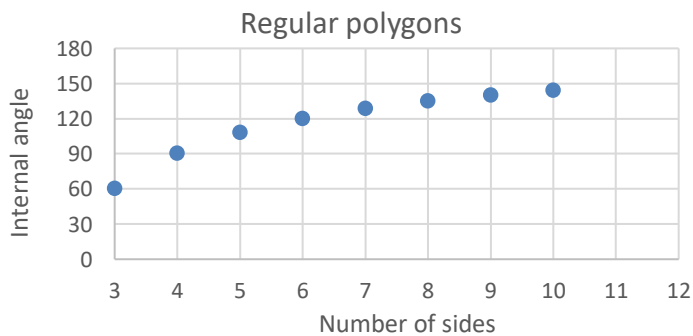


Q51 (a) The number of hours for which the sun is up at different latitudes and times of the year.  
(b) About 15.2 hours  
(c) 6:20 am

Q52

(a) Sides	3	4	5	6	7	8	9	10	11	12
Internal angle (°)	60	90	108	120	128.6	135	140	144	147.3	150

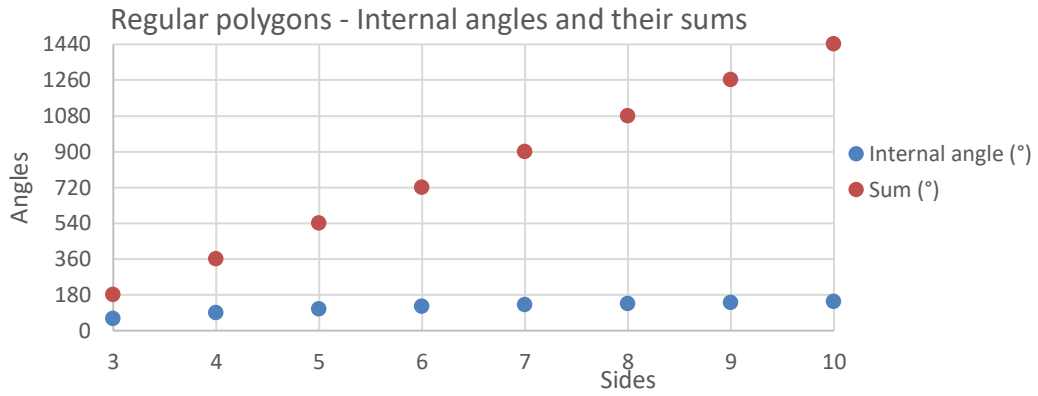
(b) Various possibilities including this:



Q53

(a) Sides	3	4	5	6	7	8	9	10
Internal angle (°)	60	90	108	120	128.6	135	140	144
Sum of internal angles (°)	180	360	540	720	900	1080	1260	1440

(b) Various possibilities including this:

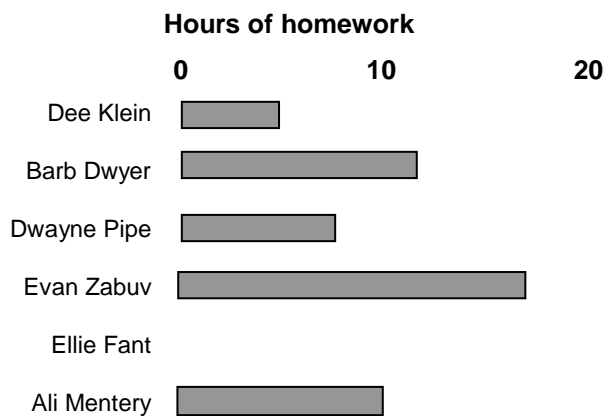


Q61 28.3 m<sup>2</sup>

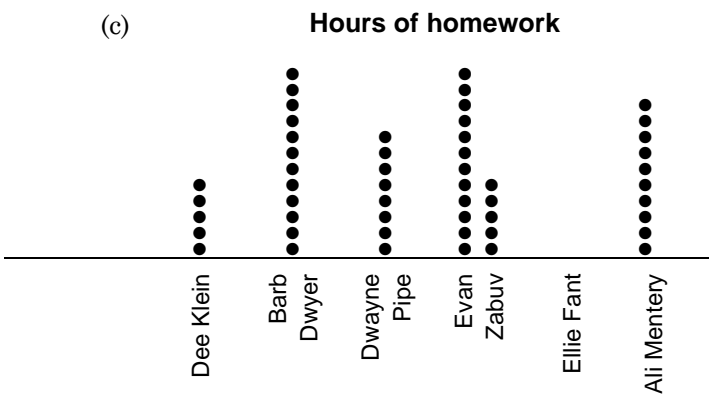
Q62 (a)

Student	Hours of homework
Dee Klein	
Barb Dwyer	
Dwayne Pipe	
Evan Zabuv	
Ellie Fant	
Ali Mentery	

(b)

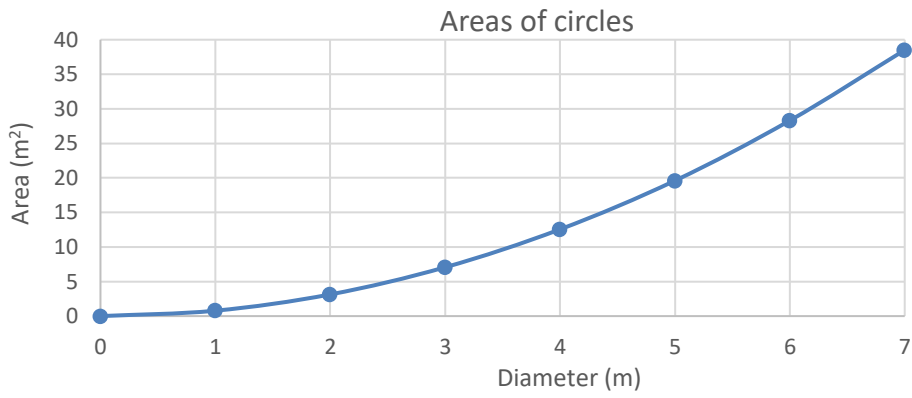


(c)



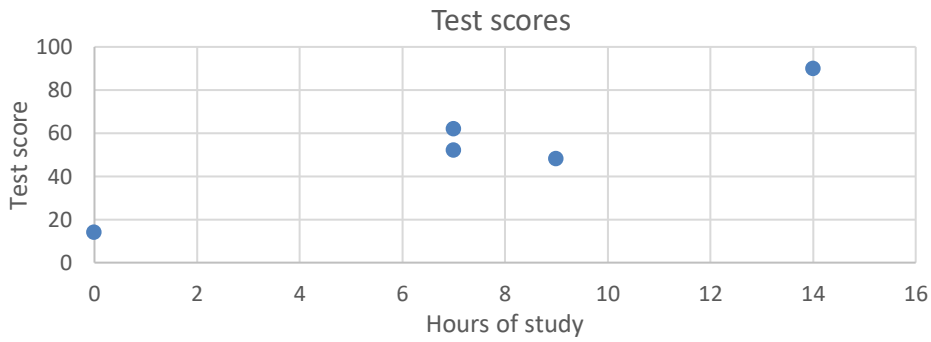
Q63 7

Q64 (a)

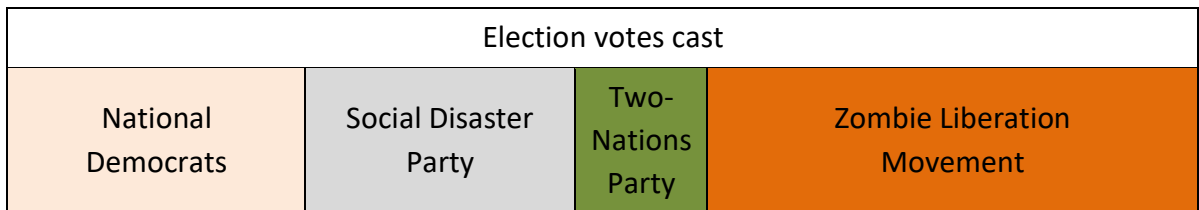


(b) 16 m<sup>2</sup>

Q65



Q66 Many possibilities including this:



Q67 26%