Birmingham City Council

Birmingham
Resources for
Understanding
Mathematics

C if U can

Handling data

Birmingham City Council

Displaying data 2			
I can draw and interpret pie charts			
I can design a data collection sheet			
I can draw and interpret frequency polygons			

Mixed problems			
I can find the probability of combined events			
I can find averages of grouped data			
I can interpret graphs and diagrams to make comparisons			

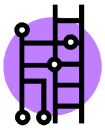
Displaying data 1	I am **confident** I can do this	I am **close** to being able to do this	I am **clueless** and need more help
I can design suitable questions for use in a survey			
I can draw and interpret ordered stem and leaf diagrams			
I can draw and interpret scatter graphs			

Probability			
I can draw and calculate from two way tables			
I can draw and use probability tree diagrams to find probabilities			
I can draw and use relative frequency tables			

Averages			
I can find the mode, median, mean and range of data			
I can find the modal class for grouped data and the class interval in which the median lies			
I can find an estimate of the mean for grouped data			

How will this booklet help you to get a grade C in maths?

- This booklet is one of four covering number, algebra, shape, space and measures and handling data.
- Each booklet contains work on the topics you need to understand to get a grade C
- Each topic starts off with a 'warm up' with some easier grade E questions followed by a harder D grade question where you get a bit of help
- There are then some (harder still) C grade questions, where you are given clues if you need them (try on your own first) and finally a C grade question for you to try on your own.

Look for  to indicate grade E/D questions,

to indicate harder D grade questions

and  to indicate C grade work

At the end of each topic, go to the <u>back</u> of the booklet and keep a record of your progress

Displaying data 1

Easy E/D grade questions

1. The pictogram shows the number of houses with two, three and four bedrooms built on a housing estate

   (a) How many houses with three bedrooms were built?

represents 10 houses

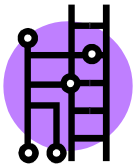
Two bedrooms	
Three bedrooms	
Four bedrooms	
Five bedrooms	

There were also 15 houses with five bedrooms built

(b) Complete the pictogram to show this information

(c) How many houses were built altogether on this housing estate?

2. The table shows the favourite milk shakes of fifty students



Flavour	Tally	Frequency
Strawberry (S)		
Banana (B)		
Raspberry (R)		
Chocolate (C)		

(a) Complete the frequency column

(b) Draw a bar chart to show these results

Frequency

Flavour

(c) Which is the least popular flavour?

Are you feeling more **C**onfident?

C if you can ..... cope on your own!

The number of minutes that trains arrived late at a station is shown in the table below

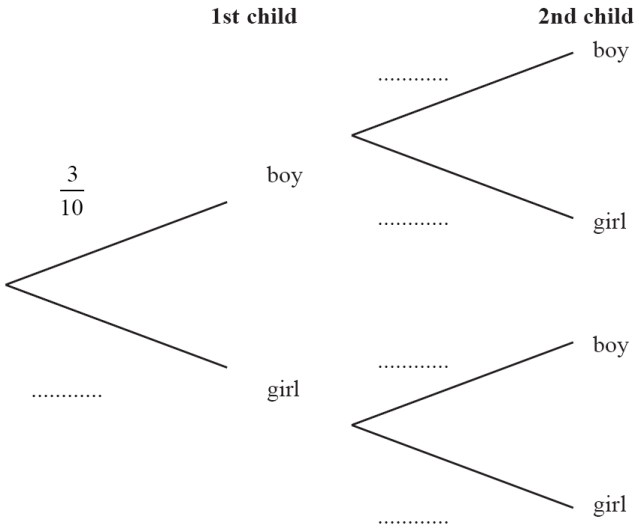
Number of minutes late, t	Frequency	Midpoint
$0 < t \leqslant 10$	16	
$10 < t \leqslant 20$	10	
$20 < t \leqslant 30$	11	
$30 < t \leqslant 40$	8	
$40 < t \leqslant 50$	5	

(a) Complete the midpoint column and use it to calculate an estimate of the mean number of minutes that trains arrived late

(b) Which class interval contains the median number of minutes that trains arrived late?

There are 3 boys and 7 girls at a playgroup.
Mrs Gold selects two children at random

(a) Complete the probability tree diagram below



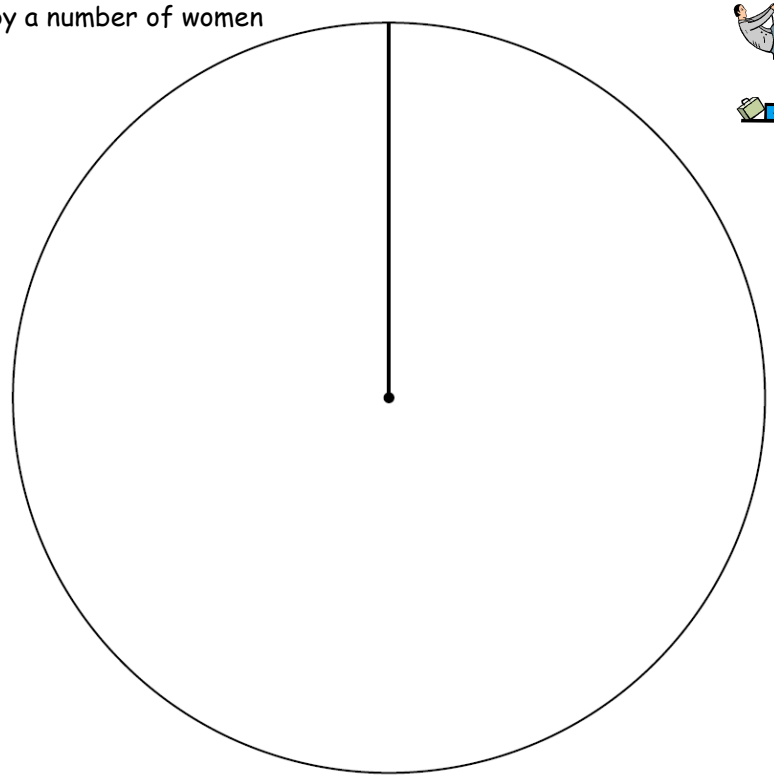
(b) Work out the probability that Mrs Gold selects two girls

You will need to multiply the probabilities, then simplify the fraction if you can

Definitely D grade questions

The table shows the colour of car chosen by a number of women

Colour	Number of women
White	42
Blue	35
Silver	25
Red	10
Other	8



Draw and label a pie chart to represent this information

First you need to work out how many degrees will represent one woman

C if U can……. answer the rest! (With a few **C**lues)

George wants to find out how many text messages people send.
He uses this question on a questionnaire

How many text messages have you sent on your mobile phone?

0 – 10	10 – 20	20 – 30	30 or more

(a) Write down **two** things wrong with this question

1.

2.

Look at the response boxes and imagine you are answering. What difficulties might there be?

George also wants to find out how much time people spend talking on their mobile phones

(b) Design a suitable question George could use for his questionnaire
You must include some response boxes

Use the example as a model but don't make the same mistakes!

Twenty pupils each shuffle a pack of coloured cards and choose a card at random.
The colour of the card is recorded for each pupil

(R = Red B = Blue G = Green Y = Yellow)

B	Y	Y	G	R
G	R	Y	B	B
Y	R	B	B	Y
B	B	G	R	Y

(a) Use these results to calculate the relative frequency of each colour

Colour	Red	Blue	Green	Yellow
Relative frequency				

Write the frequencies as fractions first

(b) Use the results to calculate how many times you would expect a blue card if 100 pupils each chose a card at random

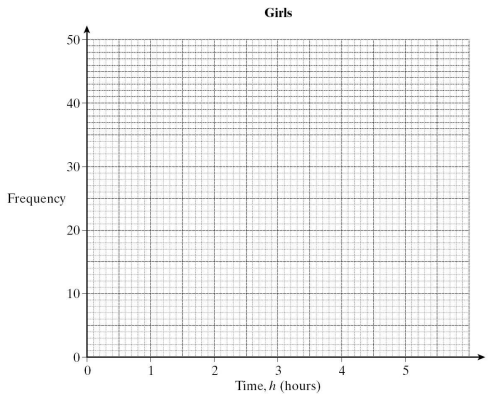
C if U can……. answer the rest! (With a few **C**lues)

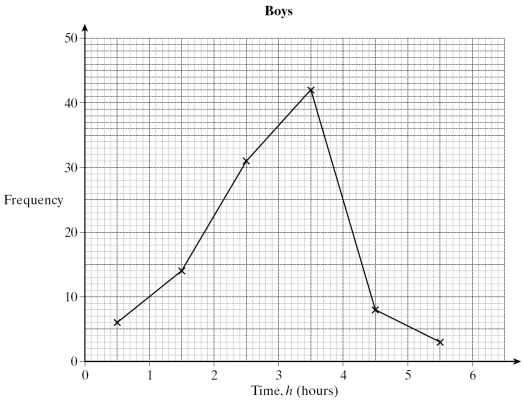
The year 9 girls in a school were asked how long they spent using a computer one day.
The results are shown in the table

(a) Draw a frequency polygon for this data

Use the MID POINT to draw the frequency polygon.
To compare, think about where the graph peaks and the range of times

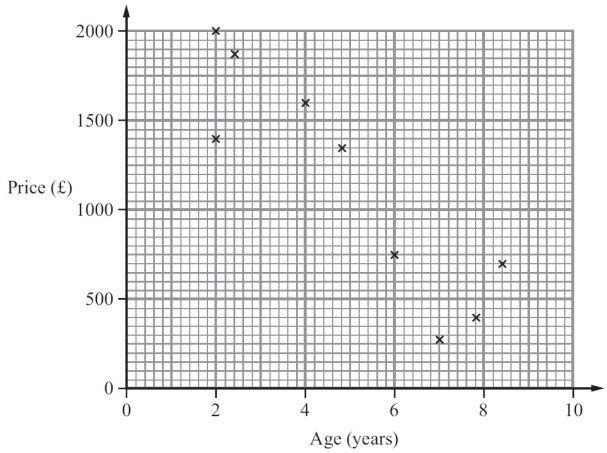
Time, h (hours)	Number of girls
$0 \leqslant h < 1$	30
$1 \leqslant h < 2$	46
$2 \leqslant h < 3$	14
$3 \leqslant h < 4$	5





(b) Look at the frequency polygon showing the boys data. Write down **two** comparisons between the time spent using a computer by the boys and the girls

A garage sells motorcycles
The scatter graph shows information about the price and age of the motorcycles



The table shows the age and price of four more motorcycles

Age (years)	6	9	3	5
Price (£)	1000	200	1700	1000

What different types of correlation are there?

(a) On the scatter graph, plot the information from the table
(b) What type of correlation does the scatter graph show?
(c) Draw a line of best fit on the scatter graph

Remember, a line of best fit should have about the same number of crosses on either side. Your line will be slightly different to your friend's

Jane buys a motorcycle from this garage for £1500
(d) Use your line of best fit to estimate the age of the motorcycle

The number of cars passing through a set of traffic lights each time they are on green is recorded

12 15 23 20 18 16 27 9 10

19 22 26 14 11 8 4 12 23

(a) Complete the stem and leaf diagram, including the key, to represent the data

Key | ..... | ..... represents .....

0	.....
1	.....
2	.....

Cross off each number as you go to make sure you don't miss any. Then put the values in order.

(b) The number of lorries passing through a different set of traffic lights is shown on the ordered stem and leaf diagram below

Key | 1 | 7 represents 17 lorries

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

Use the ordered stem and leaf diagram to find the median number of lorries that passed through the traffic lights

Definitely D grade questions

A number of people were asked how many driving lessons they had taken.

The results are shown in the stem and leaf diagram

Key: | 4 | 1 represents 41 lessons

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

The numbers are already in order, so finding the median is easy

(a) How many people were asked?

(b) What was the median number of driving lessons?

(c) Work out the range of the number of driving lessons

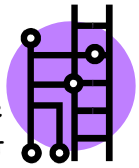
Mixed problems

Easy E/D grade questions

1. The boxes show some events
   Write one of the following words below each box to describe the chance of the event happening

IMPOSSIBLE, UNLIKELY, EVENS, LIKELY, CERTAIN

A person living to the age of 100 years	An ordinary six sided dice landing on a number less than 7	There will be eight Sundays next month



2. Nadia delivers a questionnaire to every house on her street.
   One of the questions on the questionnaire is 'Do you agree that under-16s should not be allowed outdoors after 9 pm?'
   (a) Write down one criticism of this question

   (b) Explain why Nadia's method of collecting data is not suitable

   (c) Write a suitable question asking parents what they think is the latest time that under -16s should be indoors.
   Include a response section

Are you feeling more **C**onfident?

C if you can ..... cope on your own!

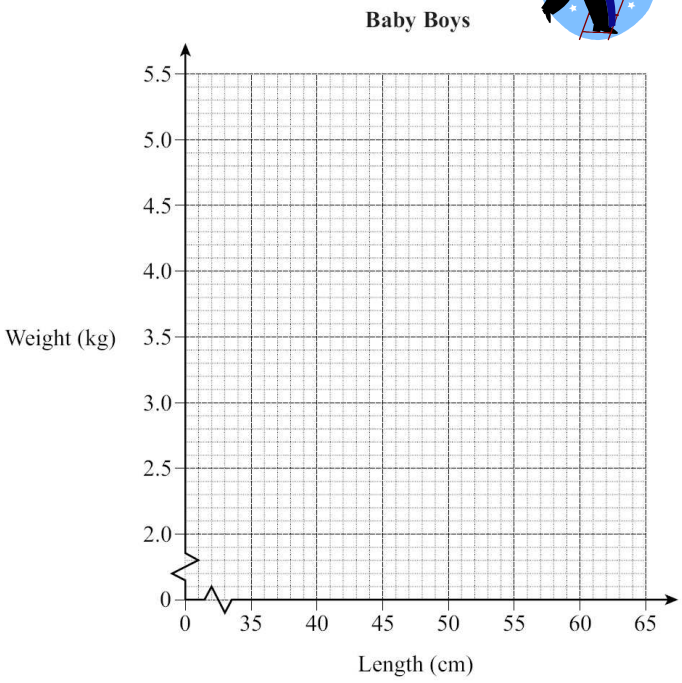
The table shows the lengths, in centimetres (cm), and weights, in kilograms (kg), of eight newborn baby boys in a town

Length (cm)	40	44	48	50	52	56	57	58
Weight (kg)	2.0	2.6	3.1	3.7	3.5	4.5	4.2	4.9

(a) Draw a scatter graph to show this information
(b) Draw a line of best fit on your scatter graph
(c) Describe the relationship shown by your scatter graph

(d) Use your line of best fit to estimate the weight of a newborn baby boy whose length is 54cm

(e) Explain why this sample of babies may **not** be representative of the babies born in the town



Probability

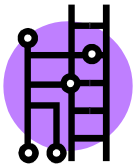
Easy E/D grade questions

1. Sunita plays a game of chess.
She can win, lose or draw the game.

The table shows each of the probabilities that she will win, lose or draw the game

Result	Win	Draw	Lose
Probability	0.6	0.3	

Work out the probability that she will lose the game



2. A bag contains red, green, yellow and blue marbles.
A marble is taken from the bag at random.
The table shows some of the probabilities of choosing each colour

Colour	Probability
Red	0.41
Green	0.15
Yellow	
Blue	0.32

(a) Calculate the probability that the marble is
(i) yellow

(ii) not blue

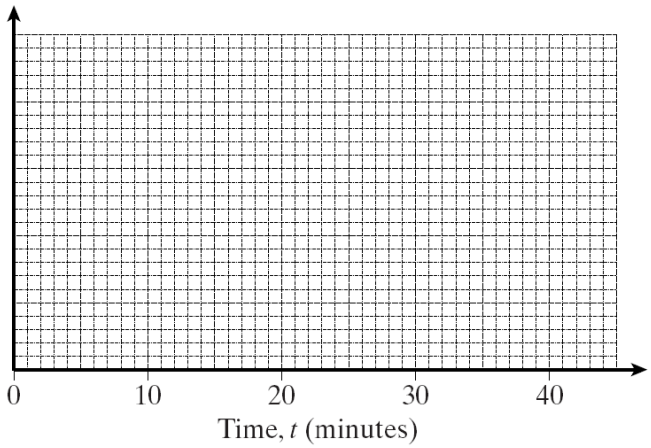
(b) There are 200 marbles in the bag.
Calculate the number of red marbles in the bag.

Confident?

C if you can ..... cope on your own!

A manager recorded how much time people spent in his shop
The table shows his results

Time, t (minutes)	Frequency
$0 < t \leqslant 10$	4
$10 < t \leqslant 20$	22
$20 < t \leqslant 30$	18
$30 < t \leqslant 40$	12



(a) Draw a frequency polygon to represent this data

(b) Which class interval is the modal class?

The number of hours of sunshine and the maximum temperature at a seaside resort were measured on seven days in June

You should describe this in terms of correlation

(a) Plot this data as a scatter graph

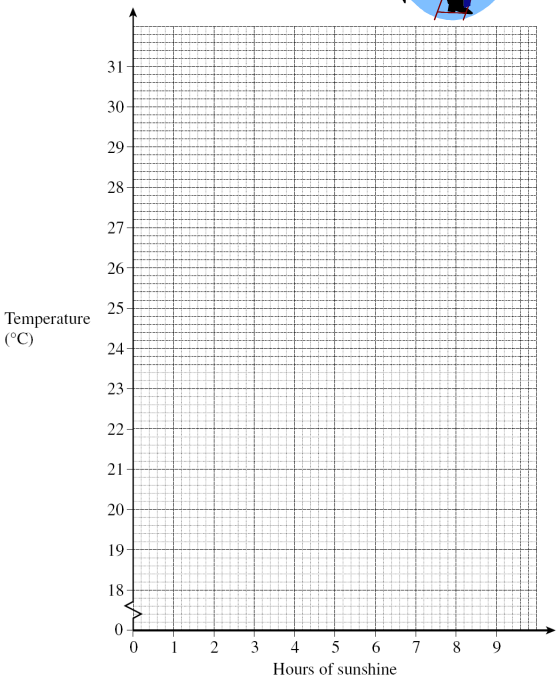
Hours of sunshine	5	9	8	6	5	2	4
Temperature (°C)	26	30	29	26	24	19	23

(b) Draw a line of best fit on your scatter graph

(c) Use your line of best fit to estimate the maximum temperature on a day in June when there are 7 hours of sunshine

(d) Describe the relationship shown by your scatter graph

(e) Explain why this data may **not** be representative of the temperatures in June at this seaside resort



Definitely D grade questions

90 adults chose one drink.
The drinks were lemonade, fruit juice or cola.

The two way table shows some information about their choices

	Lemonade	Fruit juice	Cola	Total
Male	13			
Female	11	9		34
Total			20	90

(a) Complete the two way table

Start where you have only one gap in a row or a column

One of the females is picked at random

(b) Find the probability that she will choose fruit juice

Think carefully here about how many this is out of

C if U can……. answer the rest! (With a few **C**lues)

The two way table shows the possible total scores when two fair dice are thrown.

		Dice 1					
	+	**1**	**2**	**3**	**4**	**5**	**6**
	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
Dice 2	**3**	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

(a) Write down the probability of scoring more than 8

How many options, out of how many possibilities?

(b) If two fair dice are thrown 360 times, how many times would you expect to score 11?

Scale up from the information in the table

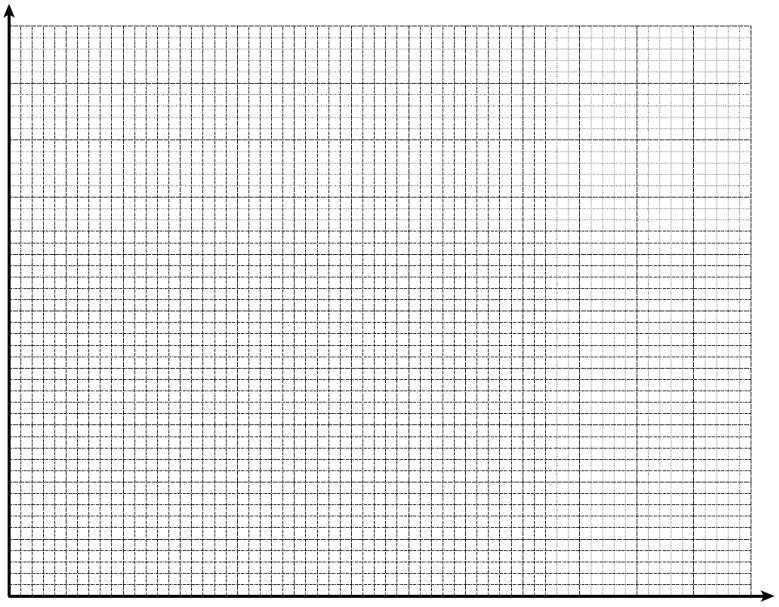
The frequency table shows the cost of car insurance premiums paid by 200 people

Insurance premium, £x	Frequency
$200 < x \leqslant 400$	34
$400 < x \leqslant 600$	52
$600 < x \leqslant 800$	76
$800 < x \leqslant 1000$	26
$1000 < x \leqslant 1200$	12

Draw a frequency diagram to represent this data

Use the MID POINT

Remember to label the axes



C if U can……. answer the rest! (With a few **C**lues)

Rajan wants to find out how students travel to his school.

At his school students travel by bus, by bicycle, by car or they walk.

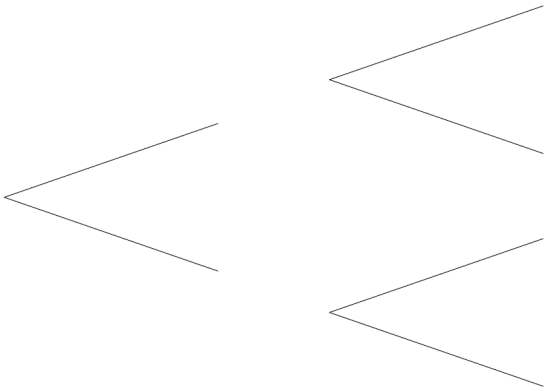
Design a data collection sheet that he can use to carry out a survey

Imagine you are carrying out the survey. What question(s) would you ask? Think how you could record responses easily

Weather records are kept in a town called Snowville.
They show that in a typical April it snows on 20 days out of the 30 days in the month

(a) Complete a fully labelled tree diagram showing the probabilities of it snowing or not snowing on the first two Sundays in April in Snowville

First Sunday **Second Sunday**



Write in the outcomes in words first, then write in the probabilities as fractions

(b) Calculate the probability that it snows on only one of these two Sundays.
You **must** show your working

So here you will need to MULTIPLY the two probabilities

Phil wants to test if a six-sided dice is biased.
He rolls the dice 20 times.
Here are his results

2 3 5 6 1 2 4 5 6 2

3 4 2 1 2 3 5 6 2 1

(a) Complete the relative frequency table

Write these as fractions out of 20

Number	1	2	3	4	5	6
Relative frequency						

(b) Phil concludes that the dice is biased towards a number.
Write down the number you think the dice is biased towards

Explain your answer

(c) Phil decides to roll the dice 100 times.
Calculate an estimate of the number of times that the dice will land on 4

Think about what number you need to multiply up by

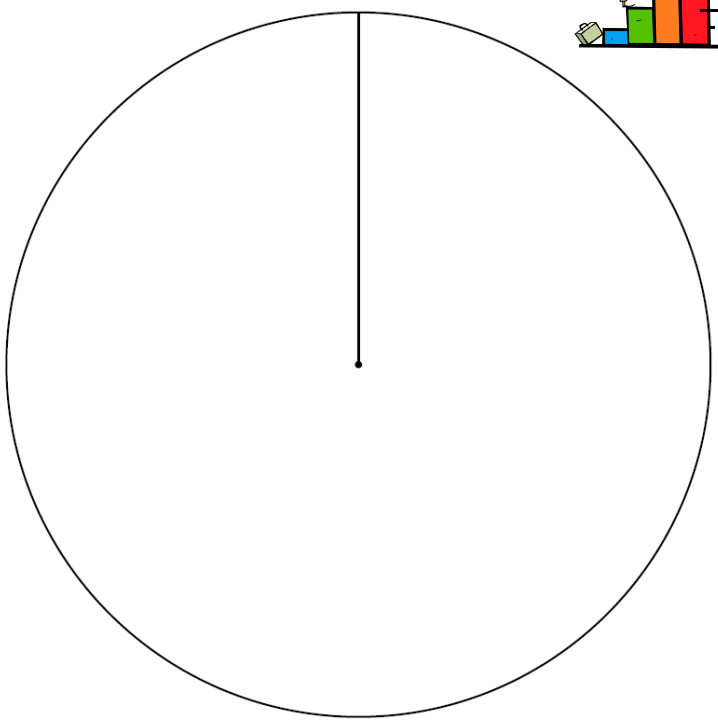
Definitely D grade questions

The total profit from a school play was £720
The table shows how the profit was raised

	Profit (£)
Tickets	320
Refreshments	250
Car park	150
Total	720

Draw and label a pie chart to show this information

Profit from school play

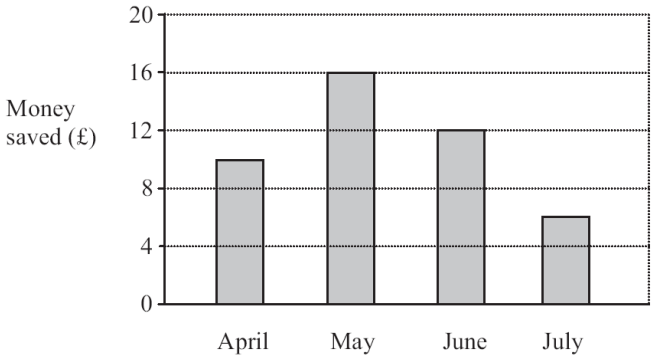


How many degrees will represent £1?

Displaying data 2

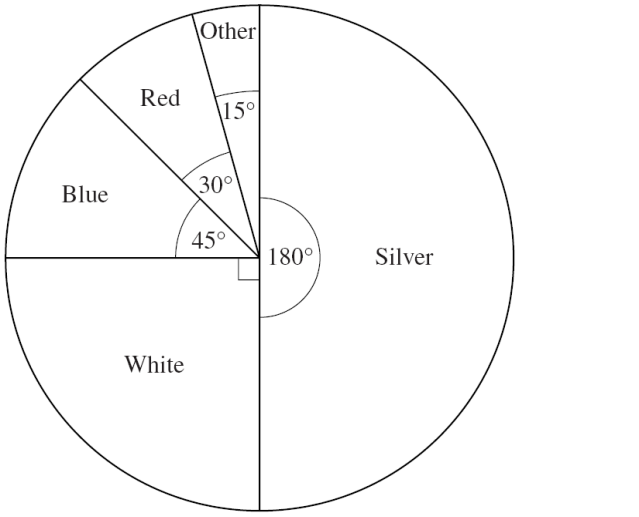
Easy E/D grade questions

1. Last year Haroon saved some money each month from April to July.



Haroon saved more money in May than in July.
Work out how much more money.

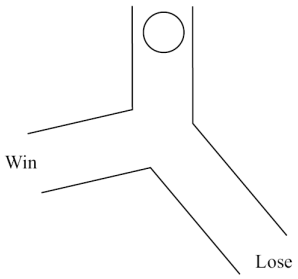
2. 120 men were asked what colour car they own.
The pie chart shows the results



Work out the number of men who own a blue car

C Are you feeling more **C**onfident?
C if you can ..... cope on your own!

In a game a ball is dropped down a chute as shown in the diagram.



The ball falls into either the Win slot or the Lose slot

The probability that the ball falls into the Win slot is always $\frac{3}{10}$

Andrea plays the game twice

(a) Draw a tree diagram to show the outcomes and probabilities

(b) Calculate the probability that Andrea loses both times

Averages

Easy E/D grade questions

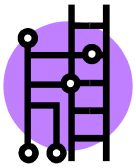
1. Here are the weights, in kg, of 8 people.

   63 65 65 70 72 86 90 97

   a. Write down the mode of the 8 weights

   b. Work out the range of the weights

2. Here are four cards



8	5	6	5

James says that the mean of the numbers on the cards is higher than the mode

Show that James is correct

Are you feeling more **C**onfident?

C if you can ….. cope on your own!

The number of magazines sold each day by a shop is recorded for on month

Number of magazines	Frequency	
0	6	
1	7	
2	9	
3	4	
4	3	
5	1	
Total	30	

Calculate the mean number of magazines sold each day

A student recorded the time, in minutes, that 50 people spent in the library

Time, t (minutes)	Frequency
$0 < t \leqslant 10$	2
$10 < t \leqslant 20$	8
$20 < t \leqslant 30$	20
$30 < t \leqslant 40$	12
$40 < t \leqslant 50$	8

You may find it helpful to add two more columns to the table, one for the mid interval and the other for the mid interval value multiplied by the frequency

Calculate an estimate of the mean number of minutes spent in the library

Definitely D grade questions

The sizes of shoes sold in a shoe shop one lunchtime are shown below

6 5 7 9 7 6 11 7 9 9 9 8 10

What should you do to these numbers to find the median?

(a) What was the median shoe size sold?

(b) Write down the mode

(c) Which average would be most useful to the shopkeeper when buying more stock?
Tick a box.

☐ Median ☐ Mode

Give a reason for your answer

C if U can……. answer the rest! (With a few **C**lues)

Each day the number of pupils who were late for school was recorded.
The stem and leaf diagram shows the results for 15 days

Key 3 | 4 represents 34 pupils

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

(a) On how many days were more than 10 pupils late?

(b) Work out the median

(c) On the next day 11 pupils were late.
Tick the box to show the effect this value would have on the range

☐ Range would increase ☐ Range would stay the same ☐ Range would decrease

Think how you work out the range from the stem and leaf diagram, then think where the 11 would be written

80 people work in Joe's factory
The table shows some information about the annual pay of these 80 workers

Annual pay (£x)	Number of workers
$10\,000 < x \leqslant 14\,000$	32
$14\,000 < x \leqslant 16\,000$	24
$16\,000 < x \leqslant 18\,000$	16
$18\,000 < x \leqslant 20\,000$	6
$20\,000 < x \leqslant 40\,000$	2

(a) Write down the modal class interval

(b) Find the class interval that contains the median

The workers are already in order of pay in the table. Where are the 'middle paid' workers?