

# Knowledge Organiser: Mathematics

## Year 8 Autumn 2

### Big Idea:

#### Key Vocabulary

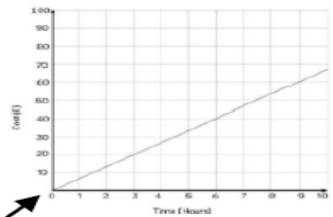
Quadrant, Vertical, Horizontal, Coordinate, Origin, Parallel, Gradient, Intercept

## What do I need to be able to do?

By the end of this unit you should be able to:

- Label and identify lines parallel to the axes
- Recognise and use basic straight lines
- Identify positive and negative gradients
- Link linear graphs to sequences
- Plot  $y = mx + c$  graphs

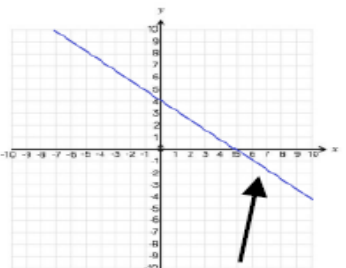
## Direct Proportion using $y=kx$



The line must be straight to be directly proportional – variables increase at the same rate  $k$

Direct proportion graphs always start at (0,0) as they are describing relationships between two variables

## Lines with negative gradients

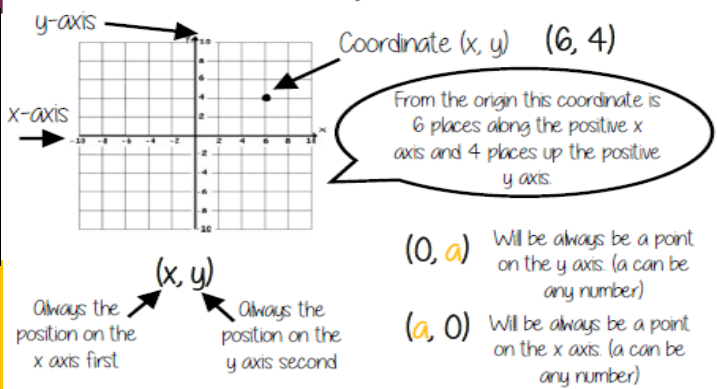


Any straight-line graph with a negative  $x$  value has a negative gradient.

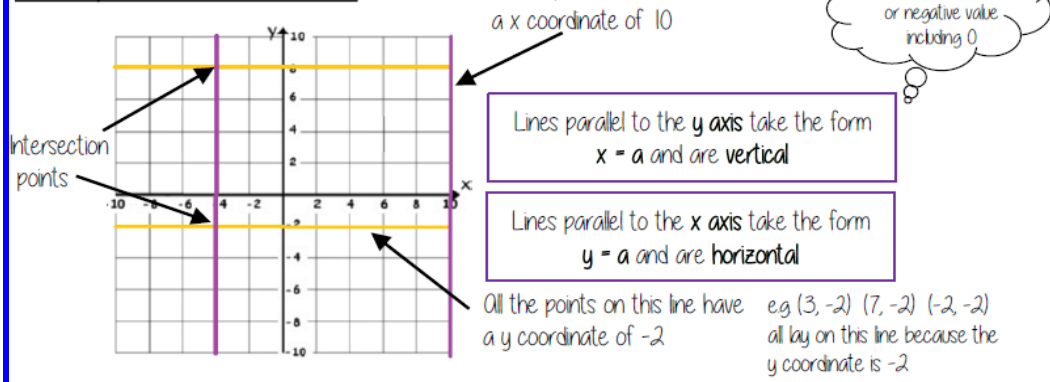
Eg  $y = -2x$   
 $y = -x$     $y + x = 12$

Direction of all negative gradients

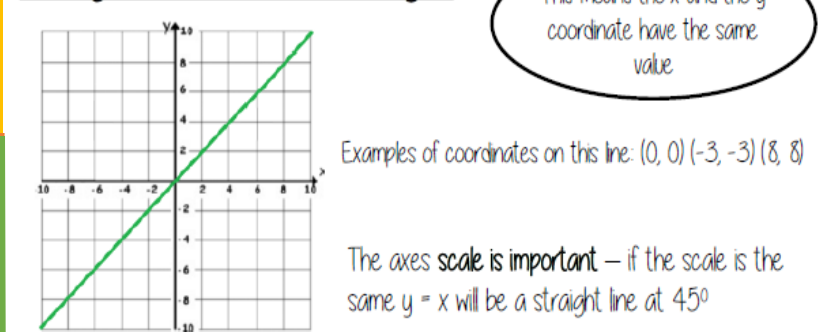
## Coordinates in four quadrants



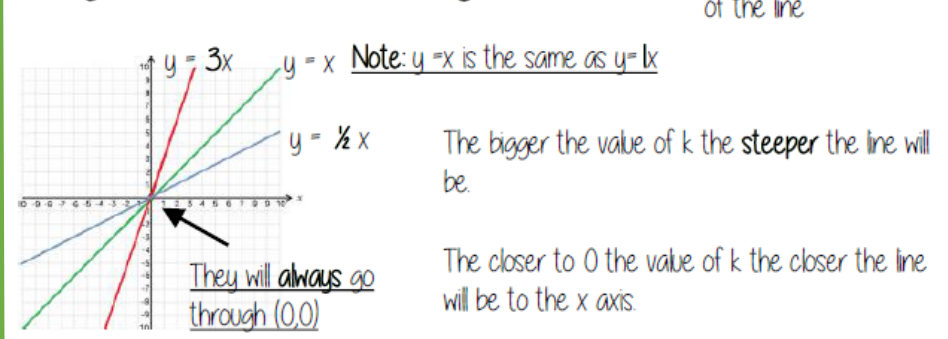
## Lines parallel to the axes



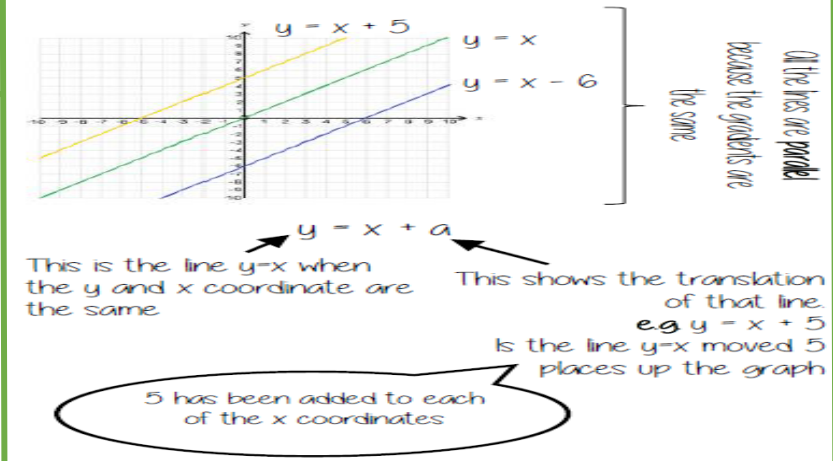
## Recognise and use the line $y=x$



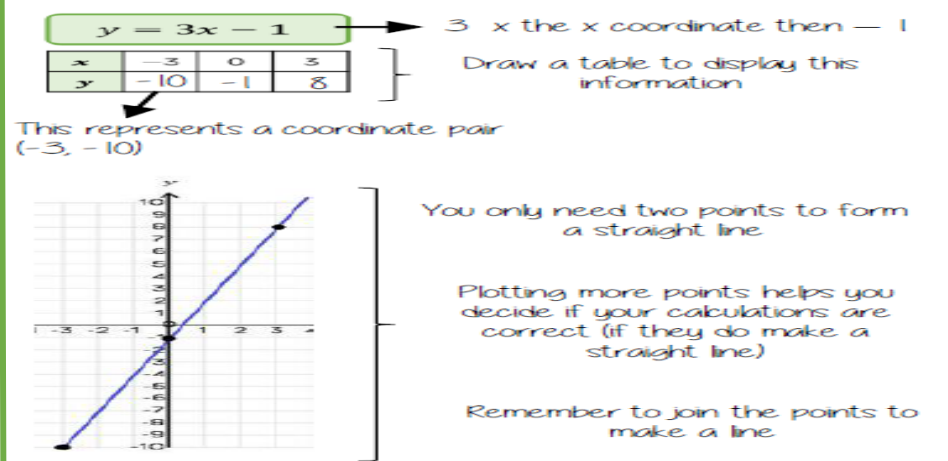
## Recognise and use the lines $y=kx$



## Lines in the form $y = x + a$



## Plotting $y = mx + c$ graphs





### Big Idea: Statistics and Probability

**Key Vocabulary:** Variable, Relationship, Correlation, Origin, Line of Best Fit, Outlier, Quantity, Qualitative, Continuous, Discrete, Frequency, Outcome, Probability, Set, Chance, Event Bias, Union.

#### Construct sample space diagrams



Sample space diagrams provide a systematic way to display outcomes from events

The possible outcomes from rolling a die

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

This is the set notation to list the outcomes  $S = \{1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T\}$

In between the  $\{ \}$  are a, the possible outcomes

#### Probability from sample space

The possible outcomes from rolling a die

	1	2	3	4	5	6
H	1H	2H	3H	4H	5H	6H
T	1T	2T	3T	4T	5T	6T

What is the probability that an outcome has an even number and a tails?

This is the set notation that represents the question P

In between the  $( )$  is the event asked for

There are three even numbers with tails

There are twelve possible outcomes

Numerator: the event

Denominator: the total number of outcomes

$P(\text{Even number and Tails}) = \frac{3}{12}$

#### What do I need to be able to do?

- By the end of this unit you should be able to:
- Draw and interpret scatter graphs
  - Describe correlation and relationships.
  - Identify different types of non-linear relationships.
  - Design and complete an ungrouped frequency table.
  - Read and interpret grouped tables (discrete and continuous data)
  - Represent data in two way tables.

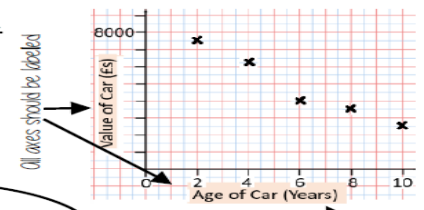
#### What do I need to be able to do?

- By the end of this unit you should be able to:
- Construct a sample space diagram
  - Systematically list outcomes.
  - Find the probability from two-way tables
  - Find the probability from Venn diagrams

#### Draw and interpret a scatter graph

Age of Car (Years)	2	4	6	8	10
Value of Car (£s)	7500	6250	4000	3500	2500

- This data may not be given in size order
- The data forms information pairs for the scatter graph
- Not all data has a relationship



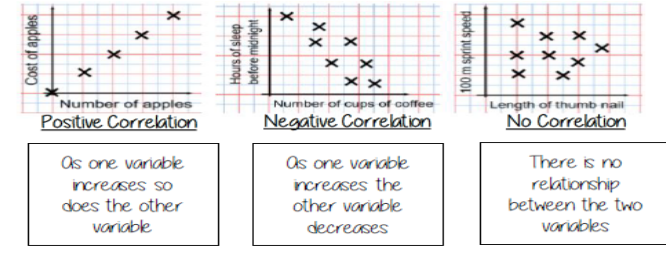
All axes should be labelled

The axis should fit all the values on and be equally spread out

This scatter graph shows as the age of a car increases the value decreases

The link between the data can be explained verbally

#### Linear Correlation



As one variable increases so does the other variable

As one variable increases the other variable decreases

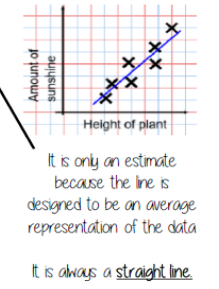
There is no relationship between the two variables

#### The line of best fit

The Line of best fit is used to make estimates about the information in your scatter graph

**Things to know:**

- The line of best fit **DOES NOT** need to go through the origin (The point the axes cross)
- There should be approximately the same number of points above and below the line (It may not go through any points)
- The line extends across the whole graph



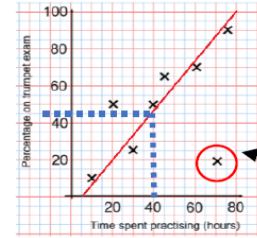
It is only an estimate because the line is designed to be an average representation of the data

It is always a straight line

#### Using a line of best fit

Interpolation is using the line of best fit to estimate values inside our data point

e.g 40 hours revising predicts a percentage of 45



Extrapolation is where we use our line of best fit to predict information outside of our data

\*\*This is not always useful - in this example you cannot score more than 100% So revising for longer can not be estimated\*\*

This point is an "outlier" It is an outlier because it doesn't fit this model and stands apart from the data

#### Probability from two-way tables

	Car	Bus	Walk	Total
Boys	15	24	14	53
Girls	6	20	21	47
Total	21	44	35	100

$P(\text{Girl walk to school}) = \frac{21}{100}$

The event

The total in the set

The total number of items

#### Probability

You do not need to simplify a probability

It can be represented as a fraction, decimal or a percentage

#### Ungrouped Data

The number of times an event happened

The table shows the number of siblings students have. The answers were 3, 1, 2, 2, 0, 3, 4, 1, 1, 2, 0, 2

Number of siblings	Frequency
0	2
1	3
2	4
3	2
4	1

2 people had 0 siblings. This means there are 0 siblings to be counted here

2 people have 3 siblings so there are 6 siblings in total

Best represented by discrete data (Not always a number)

OVERALL there are  $0 \cdot 2 + 1 \cdot 3 + 2 \cdot 4 + 3 \cdot 2 + 4 \cdot 1$  Siblings = 21 siblings

#### Grouped Data

If we have a large spread of data it is better to group it. This is so it is easier to look for a trend. Form groups of equal size to make comparison more valid and spread the groups out from the smallest to the largest value.

Discrete Data: The groups do not overlap

Cost of TV (£)	Tally	Frequency
101 - 150		7
151 - 200		11
201 - 250		5
251 - 300		3

We do not know the exact value of each item in a group - so an estimate would be used to calculate the overall total (Mid Point)

Continuous Data: To make sure all values are included requires represent the intervals

Weight (g)	Frequency
$40 < x \leq 50$	1
$50 < x \leq 60$	3
$60 < x \leq 70$	5

e.g. this group includes every weight bigger than 60g up to and including 70g

#### Representing data in two-way tables

Two way tables represent discrete information in a visual way that allows you to make conclusions, find probability or find totals of sub groups

There are 2 green squares

There are 5 green shapes

	Squares	Circles	Total
Green	2	3	5
Red	2	1	3
Total	4	4	8

Using your two way table

There are 8 items in total

To find a fraction e.g. What fraction of the items are red? 3 red items but 8 items in total =  $\frac{3}{8}$

Interchange: Use your fraction, decimal percentage, equivalence knowledge.

#### Probability from Venn diagrams

