<table>
<tr><th>Code</th><th>Objective</th></tr>
<tr><td>I2.1</td><td>
Use the division operation, including formal written methods, applied to integers, decimals, all both positive and negative.
Work out 42 ÷ 0.06

Multiply both numbers by 100 to make the divisor a whole number.

4200 ÷ 6

Complete the calculation, the answer to this is the same answer as the original question.

4200 ÷ 6 = 700
</td></tr>
<tr><td>I2.2</td><td>
Change recurring decimals into their corresponding fractions and vice versa
Write $0.\dot{3}\dot{2}$ as a fraction
Step 1 – Set up an equation
Let x = $0.\dot{3}\dot{2}$
Step 2 – Multiply both sides of the equation by 100
100x = $32.\dot{3}\dot{2}$
Step 3 – Subtract the first equation from the second
99x = 32
Step 4 – Write the solution to this equation as a fraction
$x = \frac{32}{99}$
</td></tr>
<tr><td>I2.3</td><td>
Simplify and manipulate algebraic expressions to maintain equivalence by multiplying a single term over a bracket, taking out common factors and collecting like terms (where there are two single brackets in one expression).
Expand $5x(6x^2 – 3)$
Multiply everything inside the bracket by 5x
$5x(6x^2 – 3) = 30x^3 – 15x$

Expand and simplify $3(8x-1) – 6(7 – 5x)$
Multiply out the brackets (think carefully about negative number rules!) and then collect together like terms
$3(8x-1) – 6(7 – 5x) = 24x – 3 – 42 + 30x$
$= 54x – 45$

Factorise $20x^3y^2 – 16xy^3$
Take out the highest common factor and place it in front of the brackets. Then the expression inside the brackets is obtained by dividing each term by the highest common factor.

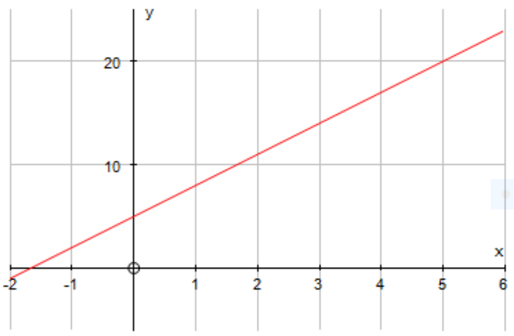
$20x^3y^2 – 16xy^3 = 4xy^2(5x^2 – 4y)$
</td></tr>
<tr><td>I2.4</td><td>
Generate terms of a sequence from either a term-to-term or a position-to-term rule.
The first term of a sequence is 1, the term to term rule is square the previous term and add 1. What are the first 6 terms?

The first term is 1, to find the second term we do $1^2 + 1 = 2$, to find the third term we do $2^2 + 1 = 5$, to find the fourth term we do $5^2 + 1 = 26$ and continue.

The first 6 terms are 1, 2, 5, 26, 677, 458330.
</td></tr>
<tr><td>I2.5</td><td>
Produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
Understand gradient and intercept from y=mx+c
Plot the graph $y = 3x + 5$ for the values $-2 \geq x \geq 6$

Step 1 – Draw a table of values
<table>
<tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>2</td><td>4</td><td>6</td></tr>
<tr><td>y</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Step 2 – Substitute the values of x into the equation and calculate the y values.
<table>
<tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>2</td><td>4</td><td>6</td></tr>
<tr><td>y</td><td>-1</td><td>2</td><td>5</td><td>11</td><td>17</td><td>23</td></tr>
</table>
</td></tr>
</table>

Step 3 – Plot the x and y values as coordinates on a set of axis



What is the gradient and y-intercept of the line with equation 2y = 6 – 3x?

Step 1 – Rearrange the equation to make y the subject

$$y = 3 - \frac{3}{2}x$$

Step 2 – the number in front of x represents the gradient, the constant is the y-intercept

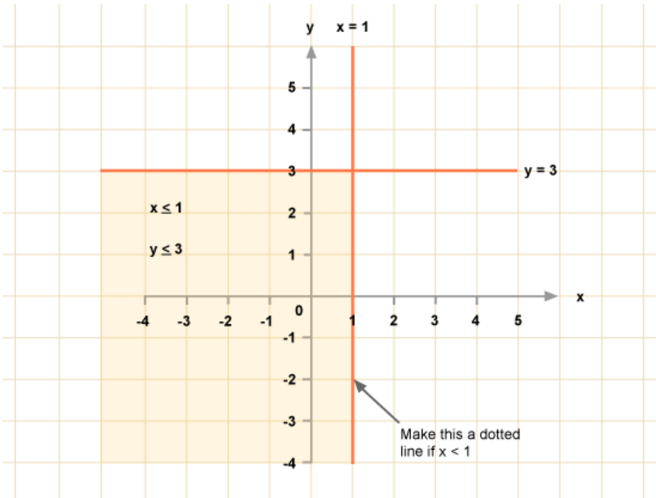
Gradient = $-\frac{3}{2}$ y-intercept = 3

I2.6

Produce graphs of linear inequality of one variable with appropriate scaling, using equations in *x* and *y* and the Cartesian plane and shade the feasible region.

On a graph, show the region where x≤1 and y≤3

Step 1 – Draw the lines x = 1 and y = 3 on the same grid (use a complete line for ≤, a dotted line for <)
Step 2 – Read the inequalities to decide which side of the lines satisfy the inequality
x is less than or equal to 1 and y is less than or equal to 3.
Step 3 – Shade in on the grid the area which satisfies the inequalities.

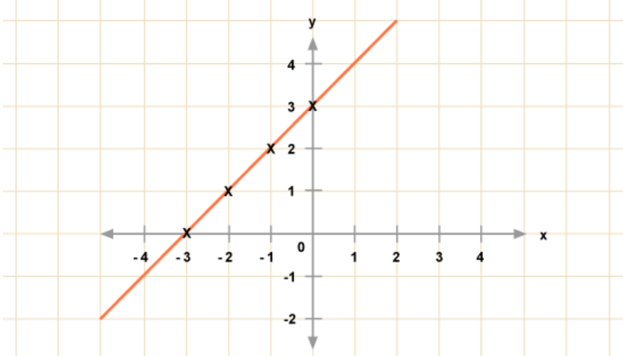


I2.7

Use linear graphs to estimate values of y for given values of x and vice versa.
Graph of y = x +3. These points can be plotted on on a graph. Each pair of values in the table is an (x, y) coordinate - eg (-3, 0) (-2, 1) (-1, 2) (0, 3) etc.

x	-3	-2	-1	0	1	2	3
y= x +3	0	1	2	3	4	5	6

Take a look at the graph y = x + 3 and see how the values are plotted.



If the question does not ask you to complete a table of values first, you can still create one by making up your own values for **x**. You should work out a minimum of 3 points for a straight-line graph, in case one of them is wrong.

I2.8

Use algebraic methods to solve linear equations involving brackets in one variable, for equations in the forms n(x ± a) = b, where n can be a fraction.

If an equation has brackets in it, one method of solving it is to multiply out the brackets first, for example:

Solve the equation: **3(b + 2) = 15**

- 3(b + 2) = 15
- Multiply out the brackets. Remember, everything inside the brackets gets multiplied by 3.
- 3 × b + 3 × 2 = 15
- When you have multiplied out the brackets you get: 3b + 6 = 15
- Next, undo the + 6. In other words, do the inverse and subtract 6 from both sides.
- 3b + 6 - 6 = 15 - 6
- So 3b = 9

Therefore, to find out what **b** is you need to do the inverse of multiplying by 3 which is dividing by 3.

So **b = 3**

I2.9

Use algebraic methods to solve linear equations in one variable, including all forms that need rearrangement. For equations in the forms nx ± a = mx ± b, where n and m can be a fraction.

Sometimes you will be asked to solve an equation with unknowns on both sides of the equation.

Remember that whatever you do to one side you must also do to the other.

Solve the equation 3b + 4 = b + 12, and find the value of b.

First, you need to get all the **b** terms on the same side of the equation.

Subtract b from both sides.

3b - b + 4 = 12

Then simplify.

2b + 4 = 12

Subtract 4 from both sides.

2b = 8

To find the value of b, divide both sides by 2.

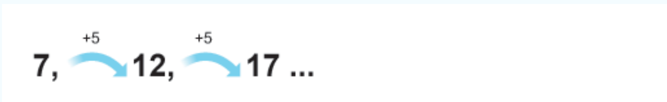
b = 4

I2.10

Recognise arithmetic sequences and find the nth term.

So the sequence of numbers in the 5 times table has a common difference of 5 and an n^{th} term of 5n.

But what happens if things get more complicated?



The common difference is still 5, but it's not the 5 times table.

The 5 times table is 5, 10, 15, ...
The sequence is 7, 12, 17, ...

Each term in the sequence is 2 more than the corresponding term in the 5 times table, so the n^{th} term is 5n + 2.

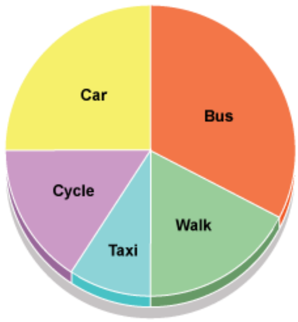
I2.11

Problem solving – Interpreting data with pie charts
This pie chart shows the results of a survey that was carried out to find out how students travel to school.

The most common method of travel is **bus** as this has the largest sector on the pie chart.

$^1/_4$ of the students travel by car.

6 students travel by car, and this is $^1/_4$ of the total. Therefore, **24** people were questioned for the survey



I2.12

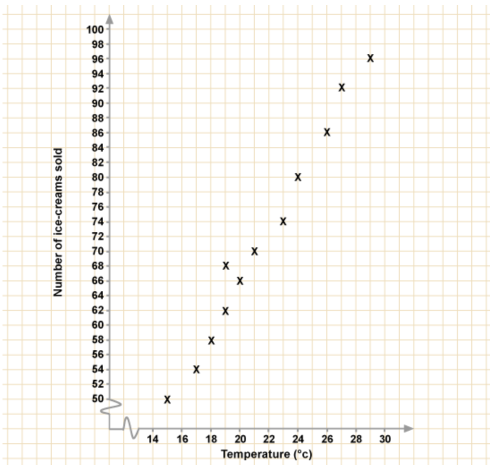
Draw a scatter graph and interpret relationships.

Temperature (°C)	21	26	15	24	18	29	20	27	23	17	30	19
Number of ice-creams sold	70	86	50	80	58	96	66	92	74	54	100	62

When the temperature is low, the number of ice-creams sold is also low. When the temperature is high, the number of ice-creams sold is high.

It is much easier to judge the results by looking at a **scatter diagram**.

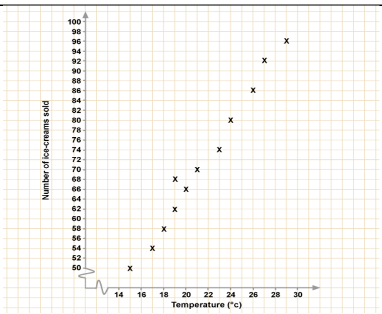
The axes have been drawn so that the temperature is on the horizontal axis and number of ice-creams sold on the vertical. We therefore plot the points (21, 70), (26, 86), (15, 50) etc.



Types of correlation

Positive correlation

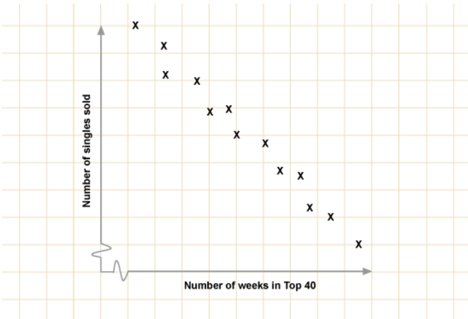
If there is a **correlation** between two sets of data, it means they are connected in some way.



We have seen that as the temperature **increases**, the number of ice-creams sold **increases**. The results are approximately in a straight line, with a positive gradient. We therefore say that there is **positive correlation**.

Negative correlation

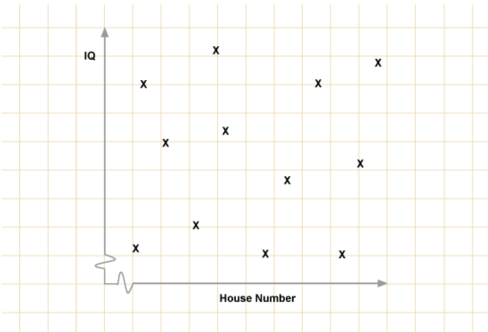
Look at the following scatter diagram. It shows the connection between the number of weeks a song has been in the Top 40 and sales of the single for that week.



There is a definite a connection between the two sets of data, as the results are approximately in a straight line. As the number of weeks **increases**, sales **decrease**. The line therefore has a negative gradient, and we say there is **negative correlation**.

No correlation

The following scatter diagram shows the connection between a person's house number and their IQ (one measure of intelligence).



It is obvious that there is no connection between these values, and this is shown by the scatter diagram. We say there is **no correlation**.