Knowledge Organiser: Year 11 – Higher (Spring Term)

2

Find Averages from Grouped Frequency Tables

Add extra columns for 'mid-interval value' and 'frequency × mid-interval value'. Add up the values in the 4th column to estimate the total weight of the 60 children.

Weight (w kg)	Frequency	Mid-interval value	Frequency × mid-interval value
30 < w ≤ 40	8	35	280
40 < w ≤ 50	16	45	720
50 < w ≤ 60	18	55	990
60 < w ≤ 70	12	65	780
70 < w ≤ 80	6	75	450
Total	60	—	3220

$$\text{Mean} \approx \frac{\text{total weight}}{\text{number of children}}$$

total weight ← 4th column total

number of children ← 2nd column total

$$= \frac{3220}{60} = 53.7 \text{ kg (3 s.f.)}$$

3

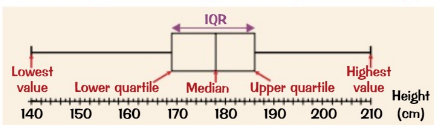
Box Plots show the Spread of a Data Set

1) The lower quartile Q_1, the median Q_2 and the upper quartile Q_3 are the values 25% (¼), 50% (½) and 75% (¾) of the way through an ordered set of data. So if a set of data has n values, you can work out the positions of the quartiles using these formulas:

Q_1: $(n + 1)/4$ Q_2: $(n + 1)/2$ Q_3: $3(n + 1)/4$

2) The INTERQUARTILE RANGE (IQR) is the difference between the upper quartile and the lower quartile and contains the middle 50% of values.

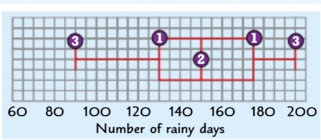
3) A box plot shows the minimum and maximum values in a data set and the values of the quartiles. But it doesn't tell you the individual data values.



EXAMPLE:

This table gives information about the numbers of rainy days last year in some cities. On the grid below, draw a box plot to show the information.

Minimum number	90
Maximum number	195
Lower quartile	130
Median	150
Upper quartile	175



1. Mark on the quartiles and draw the box.
2. Draw a line at the median.
3. Mark on the minimum and maximum points and join them to the box with horizontal lines.

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1

Cumulative Frequency

Cumulative frequency just means adding it up as you go along — i.e. the total frequency so far. You need to be able to draw a cumulative frequency graph and make estimates from it.

EXAMPLE:

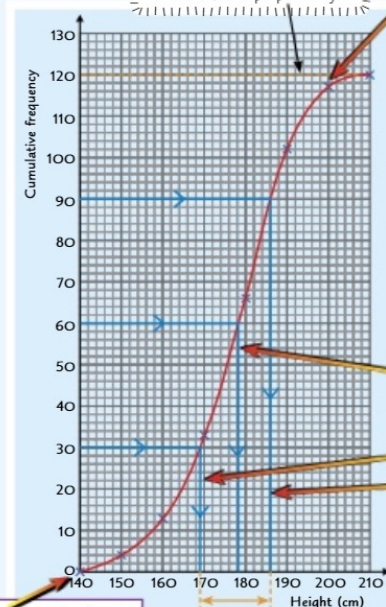
The table below shows information about the heights of a group of people.

a) Draw a cumulative frequency graph for the data.

b) Use your graph to estimate the median and interquartile range of the heights.

Height (h cm)	Frequency	Cumulative Frequency
140 < h ≤ 150	4	4
150 < h ≤ 160	9	4 + 9 = 13
160 < h ≤ 170	20	13 + 20 = 33
170 < h ≤ 180	33	33 + 33 = 66
180 < h ≤ 190	36	66 + 36 = 102
190 < h ≤ 200	15	102 + 15 = 117
200 < h ≤ 210	3	117 + 3 = 120

Total number of people surveyed



Plot zero at the lowest value in the first class.

The values you read from the graph are estimates because they're based on grouped data — you don't know how the actual data values are spread within each class.

To Draw the Graph...

1) Add a 'CUMULATIVE FREQUENCY' COLUMN to the table — and fill it in with the RUNNING TOTAL of the frequency column.

2) PLOT points using the HIGHEST VALUE in each class and the CUMULATIVE FREQUENCY. (150, 4), (160, 13), etc.

3) Join the points with a smooth curve or straight lines.

To Find the Vital Statistics...

1) MEDIAN — go halfway up the side, across to the curve, then down and read off the bottom scale.

2) LOWER AND UPPER QUARTILES — go ¼ and ¾ up the side, across to the curve, then down and read off the bottom scale.

3) INTERQUARTILE RANGE — the distance between the lower and upper quartiles.

1) The halfway point is at ½ × 120 = 60. Reading across and down gives a median of 178 cm.

2) ¼ of the way up is at ¼ × 120 = 30. Reading across and down gives a lower quartile of 169 cm. ¾ of the way up is at ¾ × 120 = 90. Reading across and down gives an upper quartile of 186 cm.

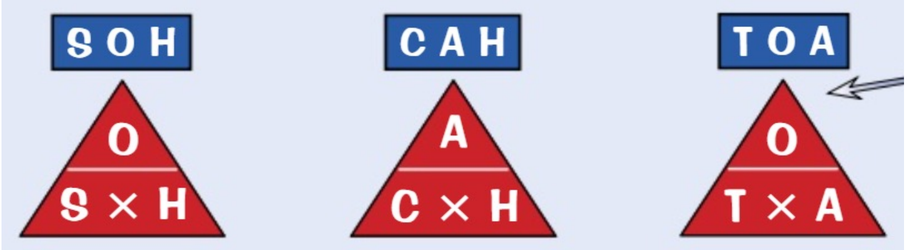
3) The interquartile range = 186 – 169 = 17 cm.

More Estimating...

To use the graph to estimate the number of values that are less than or greater than a given value:

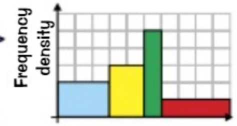
Go along the bottom scale to the given value, up to the curve, then across to the cumulative frequency.

(See the question below for an example.)



Histograms Show Frequency Density

1) The vertical axis on a histogram is always called frequency density. You work it out using this formula:



Frequency Density = Frequency ÷ Class Width

Remember... 'frequency' is just another way of saying 'how much' or 'how many'.

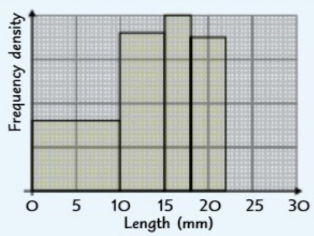
2) You can rearrange it to work out how much a bar represents.

Frequency = Frequency Density × Class Width = AREA of bar

4

EXAMPLE: This table and histogram show the lengths of beetles found in a garden.

Length (mm)	Frequency
$0 < x \le 10$	32
$10 < x \le 15$	36
$15 < x \le 18$	
$18 < x \le 22$	28
$22 < x \le 30$	16

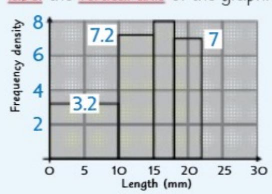


a) Use the histogram to find the missing entry in the table.

1) Add a frequency density column to the table and fill in what you can using the formula.

Frequency density
32 ÷ 10 = 3.2
36 ÷ 5 = 7.2
28 ÷ 4 = 7
16 ÷ 8 = 2

2) Use the frequency densities to label the vertical axis of the graph.

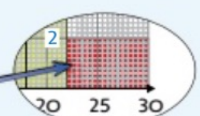


3) Now use the 3rd bar to find the frequency for the class "$15 < x \le 18$".

Frequency density = 8 and class width = 3.
So frequency = frequency density × class width = 8 × 3 = 24

b) Use the table to add the bar for the class "$22 < x \le 30$" to the histogram.

Frequency density = Frequency ÷ Class Width = $\frac{16}{8}$ = 2



c) Estimate the number of beetles between 7.5 mm and 12.5 mm in length.

Use the formula frequency = frequency density × class width — multiply the frequency density of the class by the width of the part of that class you're interested in.

3.2 × (10 – 7.5) + 7.2 × (12.5 – 10)
= 3.2 × 2.5 + 7.2 × 2.5
= 26

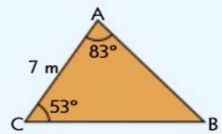
The Sine and Cosine Rules

There are four main question types where the sine and cosine rules would be applied. So learn the exact details of these four examples and you'll be laughing. WARNING: if you laugh too much people will think you're crazy.

The Four Examples

1 **TWO ANGLES given plus ANY SIDE — SINE RULE needed.**

Find the length of AB for the triangle below.



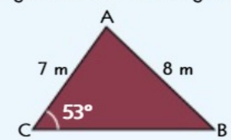
1) Don't forget the obvious... $B = 180° - 83° - 53° = 44°$

2) Put the numbers into the sine rule. $\frac{b}{\sin B} = \frac{c}{\sin C} \Rightarrow \frac{7}{\sin 44°} = \frac{c}{\sin 53°}$

3) Rearrange to find c. $\Rightarrow c = \frac{7 \times \sin 53°}{\sin 44°} = 8.05$ m (3 s.f.)

2 **TWO SIDES given plus an ANGLE NOT ENCLOSED by them — SINE RULE needed.**

Find angle ABC for the triangle shown below.



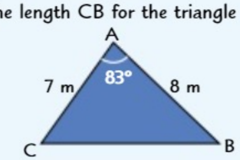
1) Put the numbers into the sine rule. $\frac{b}{\sin B} = \frac{c}{\sin C} \Rightarrow \frac{7}{\sin B} = \frac{8}{\sin 53°}$

2) Rearrange to find sin B. $\Rightarrow \sin B = \frac{7 \times \sin 53°}{8} = 0.6988...$

3) Find the inverse. $\Rightarrow B = \sin^{-1}(0.6988...) = 44.3°$ (1 d.p.)

3 **TWO SIDES given plus the ANGLE ENCLOSED by them — COSINE RULE needed.**

Find the length CB for the triangle shown below.



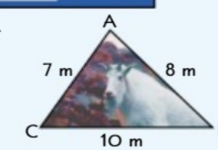
1) Put the numbers into the cosine rule. $a^2 = b^2 + c^2 - 2bc \cos A$
$= 7^2 + 8^2 - 2 \times 7 \times 8 \times \cos 83°$
$= 99.3506...$

2) Take square roots to find a. $a = \sqrt{99.3506...}$
$= 9.97$ m (3 s.f.)

You might come across a triangle that isn't labelled ABC — just relabel it yourself to match the sine and cosine rules.

4 **ALL THREE SIDES given but NO ANGLES — COSINE RULE needed.**

Find angle CAB for the triangle shown.



1) Use this version of the cosine rule. $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

2) Put in the numbers. $= \frac{49 + 64 - 100}{2 \times 7 \times 8}$

3) Take the inverse to find A. $= \frac{13}{112} = 0.11607...$
$\Rightarrow A = \cos^{-1}(0.11607...)$
$= 83.3°$ (1 d.p.)

5

Manipulating Surds — 6 Rules to Learn (GRADE 7)

There are 6 rules you need to learn for dealing with surds...

1. $\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$ e.g. $\sqrt{2} \times \sqrt{3} = \sqrt{2 \times 3} = \sqrt{6}$ — also $(\sqrt{b})^2 = \sqrt{b} \times \sqrt{b} = \sqrt{b \times b} = b$
2. $\dfrac{\sqrt{a}}{\sqrt{b}} = \sqrt{\dfrac{a}{b}}$ e.g. $\dfrac{\sqrt{8}}{\sqrt{2}} = \sqrt{\dfrac{8}{2}} = \sqrt{4} = 2$
3. $\sqrt{a} + \sqrt{b}$ — DO NOTHING — in other words it is definitely NOT $\sqrt{a+b}$
4. $(a + \sqrt{b})^2 = (a + \sqrt{b})(a + \sqrt{b}) = a^2 + 2a\sqrt{b} + b$ — NOT just $a^2 + (\sqrt{b})^2$ (see p.18)
5. $(a + \sqrt{b})(a - \sqrt{b}) = a^2 + a\sqrt{b} - a\sqrt{b} - (\sqrt{b})^2 = a^2 - b$ (see p.19).
6. $\dfrac{a}{\sqrt{b}} = \dfrac{a}{\sqrt{b}} \times \dfrac{\sqrt{b}}{\sqrt{b}} = \dfrac{a\sqrt{b}}{b}$ This is known as 'RATIONALISING the denominator' — it's where you get rid of the $\sqrt{\ }$ on the bottom of the fraction. For denominators of the form $a \pm \sqrt{b}$, you always multiply by the denominator but change the sign in front of the root (see example 3 below).

Use the Rules to Simplify Expressions (GRADE 8)

EXAMPLES:

1. Write $\sqrt{300} + \sqrt{48} - 2\sqrt{75}$ in the form $a\sqrt{3}$, where a is an integer.

Write each surd in terms of $\sqrt{3}$:

$\sqrt{300} = \sqrt{100 \times 3} = \sqrt{100} \times \sqrt{3} = 10\sqrt{3}$

$\sqrt{48} = \sqrt{16 \times 3} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$

$2\sqrt{75} = 2\sqrt{25 \times 3} = 2 \times \sqrt{25} \times \sqrt{3} = 10\sqrt{3}$

Then do the sum (leaving your answer in terms of $\sqrt{3}$):

$\sqrt{300} + \sqrt{48} - 2\sqrt{75} = 10\sqrt{3} + 4\sqrt{3} - 10\sqrt{3} = 4\sqrt{3}$

6

2. A rectangle with length $4x$ cm and width x cm has an area of 32 cm². Find the exact value of x, giving your answer in its simplest form.

Area of rectangle = length × width = $4x \times x = 4x^2$

So $4x^2 = 32$

$x^2 = 8$

$x = \pm\sqrt{8}$

You can ignore the negative square root (see p.22) as length must be positive.

'Exact value' means you have to leave your answer in surd form, so get $\sqrt{8}$ into its simplest form:

$\sqrt{8} = \sqrt{4 \times 2} = \sqrt{4}\sqrt{2}$

$= 2\sqrt{2}$ So $x = 2\sqrt{2}$

3. Write $\dfrac{3}{2 + \sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are integers. (GRADE 9)

To rationalise the denominator, multiply top and bottom by $2 - \sqrt{5}$:

$\dfrac{3}{2+\sqrt{5}} = \dfrac{3(2-\sqrt{5})}{(2+\sqrt{5})(2-\sqrt{5})}$

$= \dfrac{6 - 3\sqrt{5}}{2^2 - 2\sqrt{5} + 2\sqrt{5} - (\sqrt{5})^2}$

$= \dfrac{6 - 3\sqrt{5}}{4 - 5} = \dfrac{6 - 3\sqrt{5}}{-1} = -6 + 3\sqrt{5}$

(so a = –6 and b = 3)

Compound Growth and Decay

One more sneaky % type for you... Unlike simple interest, in compound interest the amount added on (or taken away) changes each time — it's a percentage of the new amount, rather than the original amount.

The Formula (GRADE 5)

This topic is simple if you LEARN THIS FORMULA. If you don't, it's pretty well impossible:

$$N = N_0 \times (\text{multiplier})^n$$

- Amount after n days/hours/years
- Number of days/hours/years
- Initial amount
- Percentage change multiplier
  E.g. 5% increase is 1.05 (= 1 + 0.05)
  26% decrease is 0.74 (= 1 – 0.26)

3 Examples to show you how EASY it is: (GRADE 5)

Compound interest is a popular context for these questions — it means the interest is added on each time, and the next lot of interest is calculated using the new total rather than the original amount.

EXAMPLE: Daniel invests £1000 in a savings account which pays 8% compound interest per annum. How much will there be after 6 years?

'Per annum' just means 'each year'.

Use the formula: Amount = $1000(1.08)^6$ = £1586.87

initial amount — 8% increase — 6 years

Depreciation questions are about things (e.g. cars) which decrease in value over time.

EXAMPLE: Susan has just bought a car for £6500.

a) If the car depreciates by 9% each year, how much will it be worth in 3 years' time?

Use the formula: Value = $6500(0.91)^3$ = £4898.21

b) How many complete years will it be before the car is worth less than £3000?

Use the formula again but this time you know don't know n. Value = $6500(0.91)^n$

Use trial and error to find how many years it will be before the value drops below £3000.

If n = 8, $6500(0.91)^8$ = 3056.6414...

n = 9, $6500(0.91)^9$ = 2781.5437...

It will be 9 years before the car is worth less than £3000.

7

Inverse Functions (GRADE 8)

The inverse of a function f(x) is another function, $f^{-1}(x)$, which reverses f(x). Here's the method to find it:

1) Write out the equation $x = f(y)$
2) Rearrange the equation to make y the subject.
3) Finally, replace y with $f^{-1}(x)$.

f(y) is just the expression f(x), but with y's instead of x's

EXAMPLE: If $f(x) = \dfrac{12 + x}{3}$, find $f^{-1}(x)$.

So here you just rewrite the function replacing f(x) with x and x with y.

1) Write out $x = f(y)$: $x = \dfrac{12 + y}{3}$
2) Rearrange to make y the subject: $3x = 12 + y$
   $y = 3x - 12$
3) Replace y with $f^{-1}(x)$: $f^{-1}(x) = 3x - 12$

You can check your answer by seeing if $f^{-1}(x)$ does reverse f(x): e.g. $f(9) = \frac{21}{3} = 7$, $f^{-1}(7) = 21 - 12 = 9$

8

9

Where There's a Sign Change, There's a Solution

GRADE 7

If you're trying to solve an equation that equals 0, there's one very important thing to remember:

> If there's a sign change (i.e. from positive to negative or vice versa) when you put two numbers into the equation, there's a solution between those numbers.

Think about the equation $x^3 - 3x - 1 = 0$. When $x = -1$, the expression gives $(-1)^3 - 3(-1) - 1 = 1$, which is positive, and when $x = -2$ the expression gives $(-2)^3 - 3(-2) - 1 = -3$, which is negative. This means that the expression will be 0 for some value between $x = -1$ and $x = -2$ (the solution).

Use Iteration When an Equation is Too Hard to Solve

GRADE 7

Not all equations can be solved using the methods you've seen so far in this section (e.g. factorising, the quadratic formula etc.). But if you know an interval that contains a solution to an equation, you can use an iterative method to find the approximate value of the solution.

EXAMPLE: Use the iteration machine below to find a solution to the equation $x^3 - 3x - 1 = 0$ to 1 d.p. Use the starting value $x_0 = -1$.

Look back at p.32 for more on the x_n notation.

1. Start with x_n →
2. Find the value of x_{n+1} by using the formula $x_{n+1} = \sqrt[3]{1 + 3x_n}$. →
3. If $x_n = x_{n+1}$ rounded to 1 d.p. then stop. If $x_n \neq x_{n+1}$ rounded to 1 d.p. go back to step 1 and repeat using x_{n+1}.

Put the value of x_0 into the iteration machine:

$x_0 = -1$ $\quad$ $x_1 = -1.25992... \neq x_0$ to 1 d.p.

$x_2 = -1.40605... \neq x_1$ to 1 d.p. $\quad$ $x_3 = -1.47639... \neq x_2$ to 1 d.p.

$x_4 = -1.50798... = x_3$ to 1 d.p.

x_3 and x_4 both round to -1.5 to 1 d.p. so the solution is $x = -1.5$ to 1 d.p.

This is the same example as above so the solution is the same.

10

Percentages

Type 6 — Finding the Original Value

GRADE 4

This is the type that most people get wrong — but only because they don't recognise it as this type, and don't apply this simple method:

1) Write the amount in the question as a percentage of the original value.
2) Divide to find 1% of the original value.
3) Multiply by 100 to give the original value (= 100%).

EXAMPLE: A house increases in value by 10% to £165 000. Find what it was worth before the rise.

Note: The new, not the original value is given.

1) An increase of 10% means £165 000 represents 110% of the original value.
2) Divide by 110 to find 1% of the original value.
3) Then multiply by 100.

÷110	£165 000	= 110%
×100	£1500	= 1%
	£150 000	= 100%

If it was a decrease of 10%, then you'd put '£165 000 = 90%' and divide by 90 instead of 110.

So the original value was £150 000

Always set them out exactly like this example. The trickiest bit is deciding the top % figure on the right-hand side — the 2nd and 3rd rows are always 1% and 100%.

11

Show Things Are Odd, Even or Multiples by Rearranging

Before you get started, there are a few things you need to know — they'll come in very handy when you're trying to prove things.

This can be extended to multiples of other numbers too — e.g. to prove that something is a multiple of 5, show that it can be written as 5 × something.

- Any even number can be written as 2n — i.e. 2 × something.
- Any odd number can be written as 2n + 1 — i.e. 2 × something + 1.
- Consecutive numbers can be written as n, n + 1, n + 2 etc. — you can apply this to e.g. consecutive even numbers too (they'd be written as 2n, 2n + 2, 2n + 4). (In all of these statements, n is just any integer.)
- The sum, difference and product of integers is always an integer.

EXAMPLE: Prove that the sum of any three odd numbers is odd.

So what you're trying to do here is show that the sum of three odd numbers can be written as (2 × integer) + 1.

GRADE 6

Take three odd numbers:
2a + 1, 2b + 1 and 2c + 1
(they don't have to be consecutive)

Add them together:
2a + 1 + 2b + 1 + 2c + 1 = 2a + 2b + 2c + 2 + 1
= 2(a + b + c + 1) + 1
= 2n + 1 where n is an integer (a + b + c + 1)

You'll see why I've written 3 as 2 + 1 in a second.

So the sum of any three odd numbers is odd.

EXAMPLE: Prove that $(n + 3)^2 - (n - 2)^2 \equiv 5(2n + 1)$.

GRADE 5

Take one side of the equation and play about with it until you get the other side:

LHS: $(n + 3)^2 - (n - 2)^2 \equiv n^2 + 6n + 9 - (n^2 - 4n + 4)$
$\equiv n^2 + 6n + 9 - n^2 + 4n - 4$
$\equiv 10n + 5$
$\equiv 5(2n + 1) = \text{RHS}$ ✓

≡ is the identity symbol, and means that two things are identically equal to each other. So a + b ≡ b + a is true for all values of a and b (unlike an equation, which is only true for certain values).

Adding/Subtracting Algebraic Fractions

GRADE 8

For the common denominator, find something both denominators divide into.

Adding or subtracting is a bit more difficult:

1) Work out the common denominator (see p.6).
2) Multiply top and bottom of each fraction by whatever gives you the common denominator.
3) Add or subtract the numerators only.

Fractions		
$\frac{1}{x} + \frac{1}{3x}$	$\frac{1}{x+1} + \frac{1}{x-2}$	$\frac{1}{x} + \frac{1}{x(x+1)}$
$3x$	$(x + 1)(x - 2)$	$x(x + 1)$
Common denominator		

EXAMPLE: Write $\frac{3}{(x+3)} + \frac{1}{(x-2)}$ as a single fraction.

1st fraction: × top & bottom by $(x - 2)$

2nd fraction: × top & bottom by $(x + 3)$

$$\frac{3}{(x+3)} + \frac{1}{(x-2)} = \frac{3(x-2)}{(x+3)(x-2)} + \frac{(x+3)}{(x+3)(x-2)}$$

Add the numerators

$$= \frac{3x-6}{(x+3)(x-2)} + \frac{x+3}{(x+3)(x-2)} = \frac{4x-3}{(x+3)(x-2)}$$

Common denominator will be $(x + 3)(x - 2)$

12

Solving Equations Using Graphs

13

You can plot graphs to find approximate solutions to simultaneous equations or other awkward equations. Plot the equations you want to solve and the solution lies where the lines intersect.

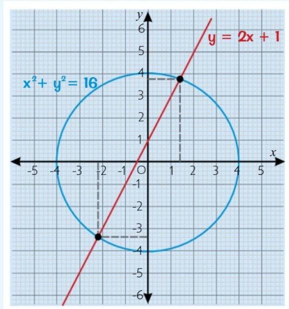
Plot Both Graphs and *See Where They Cross*

Grade 7

EXAMPLE: By plotting the graphs, solve the simultaneous equations $x^2 + y^2 = 16$ and $y = 2x + 1$.

1) DRAW BOTH GRAPHS.
$x^2 + y^2 = 16$ is the equation of a circle with centre (0, 0) and radius 4 (see p.49).
Use a pair of compasses to draw it accurately.

2) LOOK FOR WHERE THE GRAPHS CROSS.
The straight line crosses the circle at two points.
Reading the x and y values of these points gives the solutions $x = 1.4$, $y = 3.8$ and $x = -2.2$, $y = -3.4$ (all to 1 decimal place).



Inverse Proportion

Grade 4

14

1) Two quantities, C and D, are in inverse proportion if increasing one quantity causes the other quantity to decrease proportionally. So if quantity C is doubled (or tripled, halved, etc.), quantity D is halved (or divided by 3, doubled etc.).
2) The rule for finding inverse proportions is:

TIMES for ONE, then DIVIDE for ALL

EXAMPLE: 4 bakers can decorate 100 cakes in 5 hours.

a) How long would it take 10 bakers to decorate the same number of cakes?

100 cakes will take 1 baker: $5 \times 4 = 20$ hours

So 100 cakes will take 10 bakers: $20 \div 10 = 2$ hours for 10 bakers

b) How long would it take 11 bakers to decorate 220 cakes?

100 cakes will take 1 baker: 20 hours
1 cake will take 1 baker: $20 \div 100 = 0.2$ hours
220 cakes will take 1 baker: $0.2 \times 220 = 44$ hours
220 cakes will take 11 bakers: $44 \div 11 = 4$ hours

The number of bakers is inversely proportional to number of hours — but the number of cakes is directly proportional to the number of hours.

Evaluating Functions

Grade 6

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This is easy — just shove the numbers into the function and you're away.

EXAMPLE: $f(x) = x^2 - x + 7$. Find a) f(3) and b) f(–2)

a) $f(3) = (3)^2 - (3) + 7 = 9 - 3 + 7 = 13$ b) $f(-2) = (-2)^2 - (-2) + 7 = 4 + 2 + 7 = 13$

Combining Functions

Grade 8

1) You might get a question with two functions, e.g. f(x) and g(x), combined into a single function (called a composite function).
2) Composite functions are written e.g. fg(x), which means 'do g first, then do f' — you always do the function closest to x first.
3) To find a composite function, rewrite fg(x) as f(g(x)), then replace g(x) with the expression it represents and then put this into f.

Watch out — usually fg(x) ≠ gf(x). Never assume that they're the same.

EXAMPLE: If $f(x) = 2x - 10$ and $g(x) = -\frac{x}{2}$, find: a) fg(x) and b) gf(x).

a) $fg(x) = f(g(x)) = f(-\frac{x}{2}) = 2(-\frac{x}{2}) - 10 = -x - 10$

b) $gf(x) = g(f(x)) = g(2x - 10) = -\left(\frac{2x - 10}{2}\right) = -(x - 5) = 5 - x$

Direct Proportion

Grade 4

1) Two quantities, A and B, are in direct proportion (or just in proportion) if increasing one increases the other one proportionally. So if quantity A is doubled (or trebled, halved, etc.), so is quantity B.
2) Remember this golden rule for direct proportion questions:

DIVIDE for ONE, then TIMES for ALL

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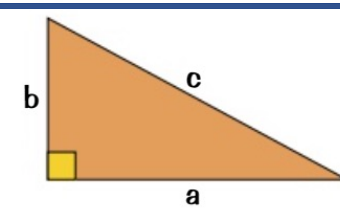
EXAMPLE: Hannah pays £3.60 per 400 g of cheese.
She uses 220 g of cheese to make 4 cheese pasties.
How much would the cheese cost if she wanted to make 50 cheese pasties?

In 1 pasty there is: $220 \text{ g} \div 4 = 55$ g of cheese
So in 50 pasties there is: $55 \text{ g} \times 50 = 2750$ g of cheese

1 g of cheese would cost: $£3.60 \div 400 = 0.9$p
So 2750 g of cheese would cost: $0.9 \times 2750 = 2475\text{p} = £24.75$

There will often be lots of stages to direct proportion questions — keep track of what you've worked out at each stage.

$$a^2 + b^2 = c^2$$



How do we use Knowledge Organisers in Mathematics

How can you use knowledge organisers at home to help us?

- **Retrieval Practice**: Read over a section of the knowledge organiser, cover it up and then write down everything you can remember. Repeat until you remember everything.
- **Flash Cards:** Using the Knowledge Organisers to help on one side of a piece of paper write a question, on the other side write an answer. Ask someone to test you by asking a question and seeing if you know the answer.
- **Mind Maps:** Turn the information from the knowledge organiser into a mind map. Then reread the mind map and on a piece of paper half the size try and recreate the key phrases of the mind map from memory.
- **Sketch it:** Draw an image to represent each fact; this can be done in isolation or as part of the mind map/flash card.
- **Teach it:** Teach someone the information on your knowledge organiser, let them ask you questions and see if you know the answers.

How will we use knowledge organisers in Mathematics?

Knowledge organisers will be used before I complete a Learning Check or Common Assessment. I will spend part of the lesson looking over each of the key topics of the half term before completing the Learning Check or Common Assessment.
I will also use these at home to complete my own independent learning and revision of these key topics.

GLUE HERE

Year 11 Mathematics (Higher): Low Stake Test scores (Spring)

Tudor Values
Character Habits
Learning Habits

Topics	Date	Score
Mixed numbers (4 operations), Negative Indices, Fractional Indices, Surds, Adding and Subtracting algebraic fractions. Cumulative Frequency, Box Plots, Histograms, Direct Proportion and Inverse Proportion.		
Vectors, Iteration, Simultaneous linear equations, Equation of a line, Functions, Solving Simultaneous Equations Graphically, Algebraic Proof, Compound Interest and Reverse Percentages.		
Pythagoras, Trigonometry, Area of a segment, Sine Rule, Cosine Rule, Simultaneous Equations (Quadratic), Completing the Square, changing the subject of a formula, Quadratic formula and quadratic nth term.		
Mixed numbers (4 operations), Negative Indices, Fractional Indices, Surds, Adding and Subtracting algebraic fractions. Cumulative Frequency, Box Plots, Histograms, Direct Proportion and Inverse Proportion.		
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