Exmouth Community College
Academy Trust

Topic/Skill	Definition/Tips	Example
1. Types of Data	**Qualitative** Data – **non-numerical** data **Quantitative** Data – **numerical** data **Continuous** Data – data that can take **any numerical value** within a given range. **Discrete** Data – data that can take **only specific values** within a given range.	Qualitative Data – eye colour, gender etc. Continuous Data – weight, voltage etc. Discrete Data – number of children, shoe size etc.
2. Grouped Data	Data that has been **bundled in to categories**. Seen in grouped frequency tables, histograms, cumulative frequency etc.	<table><tr><td>Foot length, *l*, (cm)</td><td>Number of children</td></tr><tr><td>$10 \leqslant l < 12$</td><td>5</td></tr><tr><td>$12 \leqslant l < 17$</td><td>53</td></tr></table>
3. Primary /Secondary Data	**Primary** Data – **collected yourself** for a specific purpose. **Secondary** Data – **collected by someone else** for another purpose.	Primary Data – data collected by a student for their own research project. Secondary Data – Census data used to analyse link between education and earnings.
4. Mean	**Add** up the values and **divide** by how many values there are.	The mean of 3, 4, 7, 6, 0, 4, 6 is $$\frac{3+4+7+6+0+4+6}{7} = 5$$
5. Mean from a Table	1. Find the midpoints (if necessary) 2. Multiply Frequency by values or midpoints 3. Add up these values 4. Divide this total by the Total Frequency If **grouped** data is used, the answer will be an **estimate**.	<table><tr><td>Height in cm</td><td>Frequency</td><td>Midpoint</td><td>F × M</td></tr><tr><td>$0 < h \leq 10$</td><td>8</td><td>5</td><td>8×5=40</td></tr><tr><td>$10 < h \leq 30$</td><td>10</td><td>20</td><td>10×20=200</td></tr><tr><td>$30 < h \leq 40$</td><td>6</td><td>35</td><td>6×35=210</td></tr><tr><td>Total</td><td>24</td><td>Ignore!</td><td>450</td></tr></table> **Estimated** Mean height: $450 \div 24 =$ 18.75cm
6. Median Value	The **middle** value. Put the data in order and find the middle one. If there are **two middle values**, find the number half way between them by **adding them together and dividing by 2**.	Find the median of: 4, 5, 2, 3, 6, 7, 6 Ordered: 2, 3, 4, **5**, 6, 6, 7 Median = 5
7. Median from a Table	Use the formula $\frac{(n+1)}{2}$ to find the position of the median. n is the total frequency.	If the total frequency is 15, the median will be the $\left(\frac{15+1}{2}\right) = 8th$ position
8. Mode /Modal Value	**Most** frequent/common. Can have more than one mode (called bi-modal or multi-modal) or no mode (if all values appear once)	Find the mode: 4, 5, 2, 3, 6, 4, 7, 8, 4 Mode = 4
9. Range	**Highest value subtract the Smallest value** Range is a 'measure of spread'. The smaller the range the more <u>consistent</u> the data.	Find the range: 3, 31, 26, 102, 37, 97. Range = 102-3 = 99
10. Outlier	A value that **'lies outside'** most of the other values in a set of data. An outlier is **much smaller or much larger** than the other values in a set of data.	

11. Lower Quartile	**Divides** the **bottom half** of the data into **two halves**. $LQ = Q_1 = \frac{(n+1)}{4} th$ **value**	Find the lower quartile of: 2, **3**, 4, 5, 6, 6, 7 $Q_1 = \frac{(7+1)}{4} = 2nd$ value → 3
12. Lower Quartile	**Divides** the **top half** of the data into **two halves**. $UQ = Q_3 = \frac{3(n+1)}{4} th$ **value**	Find the upper quartile of: 2, 3, 4, 5, 6, **6**, 7 $Q_3 = \frac{3(7+1)}{4} = 6th$ value → 6
13. Interquartile Range	The **difference** between the **upper quartile and lower quartile**. $$IQR = Q_3 - Q_1$$ The **smaller** the **interquartile range**, the **more consistent** the data.	Find the IQR of: 2, 3, 4, 5, 6, 6, 7 $$IQR = Q_3 - Q_1 = 6 - 3 = 3$$

Try these …

1. Here is a list of the numbers of bags some shoppers were carrying when leaving a supermarket.

   1 2 5 4 0 5 4

   a) Find the median.

   b) Work out the mean.

   c) Work out the range.

2. Here are the lengths of some lines measured with a ruler.

   4 cm 7 cm 11 cm 7 cm 1 cm

   a) Work out the mean.

   b) Work out the range.

3. Here are the ages in years of some people in a sports club.

   8 12 25 18 30 23 35 33 28 18

   9 18 22 10 21 15 29 31 20 23

   Complete this grouped frequency table using intervals of equal width.

   The first interval has been done for you.

Age (years)	Tally	Frequency
0–9		

4. Students in two classes did a test.

   The mean for class A was 56 and the range was 28.

   The mean for class B was 75 and the range was 10.

   Make two comparisons between class A and Class B.

Topic/Skill	Definition/Tips	Example
1. Integer	A **whole number** that can be positive, negative or zero.	$-3, 0, 92$
2. Decimal	A number with a **decimal point** in it. Can be positive or negative.	$3.7, 0.94, -24.07$
3. Negative Number	A number that is **less than zero**. Can be decimals.	$-8, -2.5$
4. Addition	To find the **total**, or **sum**, of two or more numbers. 'add', 'plus', 'sum'	$3 + 2 + 7 = 12$
5. Subtraction	To find the **difference** between two numbers. To find out how many are left when some are taken away. 'minus', 'take away', 'subtract'	$10 - 3 = 7$
6. Multiplication	Can be thought of as **repeated addition**. 'multiply', 'times', 'product'	$3 \times 6 = 6 + 6 + 6 = 18$
7. Division	Splitting into equal parts or groups. The process of calculating the **number of times one number is contained within another one**. 'divide', 'share'	$20 \div 4 = 5$ $\frac{20}{4} = 5$
8. Remainder	The amount **'left over'** after dividing one integer by another.	The remainder of $20 \div 6$ is 2, because 6 divides into 20 exactly 3 times, with 2 left over.
9. Multiple	The result of multiplying a number by an integer. The **times tables** of a number.	The first five multiples of 7 are: $7, 14, 21, 28, 35$
10. Factor	A number that **divides exactly** into another number without a remainder. It is useful to write factors in pairs	The factors of 18 are: $1, 2, 3, 6, 9, 18$ The factor pairs of 18 are: $1, 18$ $2, 9$ $3, 6$
11. Lowest Common Multiple (LCM)	The **smallest** number that is in the **times tables** of each of the numbers given.	The LCM of 3, 4 and 5 is 60 because it is the smallest number in the 3, 4 and 5 times tables.
12. Highest Common Factor (HCF)	The **biggest** number that **divides exactly** into two or more numbers.	The HCF of 6 and 9 is 3 because it is the biggest number that divides into 6 and 9 exactly.

13. Prime Number	A number with **exactly two factors**. A number that can only be divided by itself and one. The number **1 is not prime**, as it only has one factor, not two.	The first ten prime numbers are: $2, 3, 5, 7, 11, 13, 17, 19, 23, 29$
14. Prime Factor	A factor, which is a prime number.	The prime factors of 18 are: $2, 3$
15. Product of Prime Factors	Finding out which **prime numbers multiply together** to make the **original** number. Use a **prime factor tree**. Also known as 'prime factorisation'.	 $36 = 2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$

Try these

1. Find 48 × 100

2. Work out 384 ÷ 4

3. Work out £38 + £2.16 + 42p.

4. Write all the factor pairs of 18

5. Find the lowest common multiple (LCM) of 15 and 20

6. Write down the value of

    a) 7^2

    b) $\sqrt{100}$

7. The height of the highest mountain in Scotland is 1344 metres.

    The height of the highest mountain in England is 978 metres.

    Work out the difference between these two heights.

8. Some of the factors of 182 are prime numbers.

    Find one of these numbers.

Topic/Skill	Definition/Tips	Example
1. Expression	A mathematical statement written using **symbols**, **numbers** or **letters**,	$3x + 2$ or $5y^2$
2. Equation	A statement showing that **two expressions are equal**	$2y - 17 = 15$
3. Identity	An equation that is **true for all values** of the variables An identity uses the symbol: $\equiv$	$2x \equiv x+x$
4. Formula	Shows the **relationship** between **two or more variables**	Area of a rectangle = length x width or A= LxW
5. Simplifying Expressions	Collect 'like terms'. Be careful with negatives. x^2 and x are not like terms.	$2x + 3y + 4x - 5y + 3 = 6x - 2y + 3$ $3x + 4 - x^2 + 2x - 1 = 5x - x^2 + 3$
6. x times x	The answer is x^2 not $2x$.	Squaring is multiplying by itself, not by 2.
7. $p \times p \times p$	The answer is p^3 not $3p$	If p=2, then p^3=2x2x2=8, not 2x3=6
8. $p + p + p$	The answer is 3p not p^3	If p=2, then 2+2+2=6, not $2^3 = 8$
9. Expand	To expand a bracket, **multiply** each term **in the bracket** by the expression **outside** the bracket.	$3(m + 7) = 3x + 21$
10. Factorise	The **reverse** of **expanding**. Factorising is writing an expression as a product of terms by 'taking out' a common factor.	$6x - 15 = 3(2x - 5)$, where 3 is the common factor.
11. Solve	To find the **answer/value** of something **Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter.	Solve $2x - 3 = 7$ Add 3 on both sides $\qquad 2x = 10$ Divide by 2 on both sides $\qquad x = 5$
12. Inverse	**Opposite**	The inverse of addition is subtraction. The inverse of multiplication is division.
13. Writing Formulae	**Substitute letters for words** in the question.	Bob charges £3 per window and a £5 call out charge. $C = 3N + 5$ Where N=number of windows and C=cost

14. Substitution	Replace letters with numbers.	$a = 3, b = 2$ and $c = 5$. Find:
	Be careful of $5x^2$. You need to square first, then multiply by 5.	1. $2a = 2 \times 3 = 6$
		2. $3a - 2b = 3 \times 3 - 2 \times 2 = 5$
		3. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$

Try these ...

1 Complete the function machine.

a

input   output

4

? → +5 → 15

x
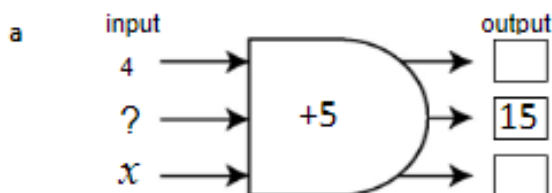
2 Jim thinks of a number. He adds 4 and then multiplies by 2. His answer is 24.

What number did Jim think of?

3 Simplify

   a $4x + 3x$ ....

   b $5y - y$ ....

   c $2 \times 6n$ ....

4 Simplify $4t - 6t + 3t$

5 Tahir is h cm tall. Sienna is 4 cm shorter than Tahir.

Write an expression in terms of h for Sienna's height in centimetres.

6 A bag of sugar has a mass of 2 kg.

Write an expression in terms of n for the total mass in kilograms of n bags of sugar.

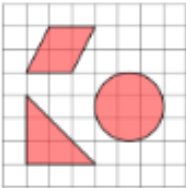**7** Multiply out the brackets.

   a $6(x + 2)$

   b $2(y - 3)$

8 Expand the brackets and simplify.

   a $4(y + 1) + 3(y + 2)$

Topic/Skill	Definition/Tips	Example
1. Place Value	The **value** of where a **digit** is within a number.	In 726, the value of the 2 is 20, as it is in the 'tens' column.
2. Place Value Columns	The names of the columns that **determine the value of each digit.** The 'ones' column is also known as the 'units' column.	PLACE VALUE CHART Millions, Hundred Thousands, Ten Thousands, Thousands, Hundreds, Tens, Ones, Decimal Point, Tenths, Hundredths, Thousandths, Ten-Thousandths, Hundred-Thousandths, Millionths
3. Rounding	To make a number simpler but keep its value close to what it was. If the **digit to the right** of the rounding digit is **less than 5, round down.** If the **digit to the right** of the rounding digit is **5 or more, round up.**	74 rounded to the nearest ten is 70, because 74 is closer to 70 than 80. 152,879 rounded to the nearest thousand is 153,000.
4. Decimal Place	The **position** of a digit to the **right of a decimal point.**	In the number 0.372, the 7 is in the second decimal place. 0.372 rounded to two decimal places is 0.37, because the 2 tells us to round down. Careful with money - don't write £27.4, instead write £27.40
5. Metric System	A system of measures based on: - the metre for length - the kilogram for mass - the second for time Length: mm, cm, m, km Mass: mg, g, kg Volume: ml, cl, l	$1 kilometres = 1000\ metres$ $1\ metre = 100\ centimetres$ $1\ centimetre = 10\ millimetres$ $1\ kilogram = 1000\ grams$
6. Imperial System	A system of weights and measures originally developed in England, usually based on human quantities: Length: inch, foot, yard, miles Mass: lb, ounce, stone Volume: pint, gallon	$1 lb = 16\ ounces$ $1\ foot = 12\ inches$ $1\ gallon = 8\ pints$
7. Metric and Imperial Units	Use the **unitary method** to convert between metric and imperial units.	$5\ miles \approx 8\ kilometres$ $1\ gallon \approx 4.5\ litres$ $2.2\ pounds \approx 1\ kilogram$ $1\ inch = 2.5\ centimetres$

1. Perimeter	The **total distance** around the **outside** of a shape. Units include: mm, cm, m etc.	**8 cm** **5 cm** [rectangle] $P = 8 + 5 + 8 + 5 = 26cm$
2. Area	The amount of **space inside** a shape. Units include: mm^2, cm^2, m^2	[grid with shapes]
3. Area of a Rectangle	**Length x Width**	9 cm 4 cm [rectangle] $A = 36cm^2$

Try these ...

1 Round each of these numbers correct to 1 decimal place.

    a) 6.47 ....

    b) 4.849 ....

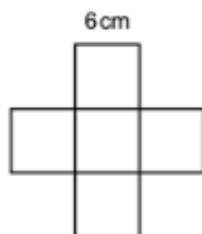   **c)** 3.060 ....

2 **a)** Change 4 metres to centimetres.

    b) Change 6.3 kilometres to metres.

    c) Change 7030 grams to kilograms

3 This shape is made from five identical square cards.

    The side of each card has length 6 cm.

    Work out   6 cm

    a) the perimeter of the shape

    b) the area of the shape.

4 In July, the mass of a rabbit was 1.9 kg.

    The mass of the rabbit increased by 280 grams in August.

    Work out the mass of the rabbit by the end of August.