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| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Basic Number and Decimals**  |
| 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’ | $$3×6=6+6+6=18$$ |
| 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’ | $$20÷4=5$$$$\frac{20}{4}=5$$ |
| 8. Remainder | The amount ‘**left over**’ after dividing one integer by another. | The remainder of $20÷6$ is $2$, because 6 divides into 20 exactly 3 times, with 2 left over. |
| 9. BIDMAS | An acronym for the **order** you should do calculations in.BIDMAS stands for **‘Brackets, Indices, Division, Multiplication, Addition and Subtraction’**.Indices are also known as ‘powers’ or ‘orders’.With strings of division and multiplication, or strings of addition and subtraction, and no brackets, work from left to right. | $$6+3×5=21, not 45$$$5^{2}=25$, where the 2 is the index/power.$$12÷4÷2=1.5,not 6$$ |
| 10. Recurring Decimal | A decimal number that has **digits that repeat forever**.The part that repeats is usually shown by placing a dot above the digit that repeats, or dots over the first and last digit of the repeating pattern. | $$\frac{1}{3}=0.333…=0.\dot{3}$$$$\frac{1}{7}=0.142857142857…=0.\dot{1}4285\dot{7}$$$$\frac{77}{600}=0.128333…=0.128\dot{3}$$ |

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| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Factors and Multiples**  |
| 1. Multiple | The result of multiplying a number by an integer.The **times tables** of a number. | The first five multiples of 7 are:$$7, 14, 21, 28, 35$$ |
| 2. 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:$$1, 18$$$$2, 9$$$$3, 6$$ |
| 3. 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. |
| 4. 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. |
| 5. 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:$$2, 3, 5, 7, 11, 13, 17, 19, 23, 29$$ |
| 6. Prime Factor | A factor which is a prime number. | The prime factors of 18 are: $$2, 3$$ |
| 7. 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’. |  |

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| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Indices**  |
| 1. Square Number | The number you get when you **multiply a number by itself**. | **1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225…**$$9² = 9 × 9 = 81$$ |
| 2. Square Root | The **number you multiply by itself** to get another number.The reverse process of squaring a number. | $$\sqrt{36}=6$$because $6×6=36$ |
| 3. Solutions to $x^{2}= ….$ | **Equations** involving **squares** have **two solutions**, one **positive** and one **negative**. | Solve $x^{2}=25$$$x=5 or x=-5$$This can also be written as $x=\pm 5$ |
| 4. Cube Number | The number you get when you **multiply a number by itself and itself again**. | 1, 8, 27, 64, 125…$$2^{3}=2×2×2=8$$ |
| 5. Cube Root | The **number you multiply by itself and itself again** to get another number.The reverse process of cubing a number. | $$\sqrt[3]{125}=5$$because $5×5×5=125$ |
| 6. Powers of… | The powers of a number are that **number raised to various powers**. | The powers of 3 are:$3^{1}=3$ $3^{2}=9$ $3^{3}=27$ $3^{4}=81$ etc. |
| 7. Multiplication Index Law | When **multiplying** with the same base (number or letter), **add the powers**.$$a^{m}×a^{n}=a^{m+n}$$ | $$7^{5}×7^{3}=7^{8}$$$$a^{12}×a=a^{13}$$$$4x^{5}×2x^{8}=8x^{13}$$ |
| 8. Division Index Law | When **dividing** with the same base (number or letter), **subtract the powers**.$$a^{m}÷a^{n}=a^{m-n}$$ | $$15^{7}÷15^{4}=15^{3}$$$$x^{9}÷x^{2}=x^{7}$$$$20a^{11}÷5a^{3}=4a^{8}$$ |
| 9. Brackets Index Laws | When raising a power to another power, multiply the powers together.$$(a^{m})^{n}=a^{mn}$$ | $$(y^{2})^{5}=y^{10}$$$$(6^{3})^{4}=6^{12}$$$$(5x^{6})^{3}=125x^{18}$$ |
| 10. Notable Powers | $p=p^{1}$ $p^{0}=1$  | $$99999^{0}=1$$ |
| 11. Negative Powers | A negative power performs the reciprocal.$$a^{-m}=\frac{1}{a^{m}}$$ | $$3^{-2}=\frac{1}{3^{2}}=\frac{1}{9}$$ |
| 12. Fractional Powers | The denominator of a fractional power acts as a ‘root’.The numerator of a fractional power acts as a normal power.$$a^{\frac{m}{n}}=\left(\sqrt[n]{a}\right)^{m}$$ | $$27^{\frac{2}{3}}=\left(\sqrt[3]{27}\right)^{2}=3^{2}=9$$$$\left(\frac{25}{16}\right)^{\frac{3}{2}}=\left(\frac{\sqrt{25}}{\sqrt{16}}\right)^{3}=\left(\frac{5}{4}\right)^{3}=\frac{125}{64}$$ |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Standard Form**  |
| 1. Standard Form | $$A × 10^{b}$$$$where 1\leq A<10, b=integer$$ | 8400 = 8.4 x $10^{3}$0.00036 = 3.6 x $10^{-4}$ |
| 2. Multiplying or Dividing with Standard Form | Multiply: **Multiply the numbers** and **add the powers**.Divide: **Divide the numbers** and **subtract the powers**. | $$\left(1.2×10^{3}\right)×\left(4×10^{6}\right)=8.8×10^{9}$$$$\left(4.5×10^{5}\right)÷\left(3×10^{2}\right)=1.5×10^{3}$$ |
| 3. Adding or Subtracting with Standard Form | **Convert** in to **ordinary** numbers, **calculate** and then **convert back** in to standard form | $$2.7×10^{4}+4.6×10^{3}$$$$=27000+4600=31600$$$$=3.16×10^{4}$$ |

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| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Accuracy**  |
| 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. | Image result for place value columns |
| 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. Significant Figure | The significant figures of a number are the digits which **carry meaning** (ie. are significant) to the size of the number.The **first significant figure** of a number **cannot be zero**.In a number with a decimal, trailing zeros are not significant. | In the number 0.00821, the first significant figure is the 8.In the number 2.740, the 0 is not a significant figure.0.00821 rounded to 2 significant figures is 0.0082.19357 rounded to 3 significant figures is 19400. We need to include the two zeros at the end to keep the digits in the same place value columns. |
| 6. Truncation | A method of approximating a decimal number by **dropping all decimal places** past a certain point **without rounding**. | 3.14159265… can be truncated to 3.1415 (note that if it had been rounded, it would become 3.1416) |
| 7. Error Interval | A **range of values** that a number could have taken before being rounded or truncated.An error interval is written using inequalities, with a **lower bound** and an **upper bound**.Note that the lower bound inequality can be ‘equal to’, but the upper bound cannot be ‘equal to’. | 0.6 has been rounded to 1 decimal place. The error interval is:$$0.55\leq x<0.65$$The lower bound is 0.55The upper bound is 0.65 |
| 8. Estimate | To find something **close to the correct answer**. | An estimate for the height of a man is 1.8 metres. |
| 9. Approximation | When using approximations to estimate the solution to a calculation, **round each number in the calculation to 1 significant figure**.$≈ $means ‘approximately equal to’ | $$\frac{348+692}{0.526}≈\frac{300+700}{0.5}=2000$$‘Note that dividing by 0.5 is the same as multiplying by 2’ |
| 10. Rational Number | A number of the form $\frac{p}{q}$**,** where $p$ **and** $q$ **are integers** and $q\ne 0.$A number that cannot be written in this form is called an ‘irrational’ number | $\frac{4}{9}, 6, -\frac{1}{3}, \sqrt{25}$ are examples of rational numbers.$π, \sqrt{2}$ are examples of an irrational numbers. |
| 11. Surd | The **irrational number** that is a **root of a positive integer,** whose value cannot be determined exactly.Surds have **infinite non-recurring decimals**. | $\sqrt{2}$ is a surd because it is a root which cannot be determined exactly.$\sqrt{2}=1.41421356…$ which never repeats. |
| 12. Rules of Surds | $$\sqrt{ab}=\sqrt{a}×\sqrt{b}$$$$\sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}}$$$$a\sqrt{c}\pm b\sqrt{c}=\left(a\pm b\right)\sqrt{c}$$$$\sqrt{a}×\sqrt{a}=a$$ | $$\sqrt{48}=\sqrt{16}×\sqrt{3}=4\sqrt{3}$$$$\sqrt{\frac{25}{36}}=\frac{\sqrt{25}}{\sqrt{36}}=\frac{5}{6}$$$$2\sqrt{5}+7\sqrt{5}=9\sqrt{5}$$$$\sqrt{7}×\sqrt{7}=7$$ |
| 13. Rationalise a Denominator | The process of rewriting a fraction so that the **denominator contains only rational numbers**. | $$\frac{\sqrt{3}}{\sqrt{2}}=\frac{\sqrt{3}×\sqrt{2}}{\sqrt{2}×\sqrt{2}}=\frac{\sqrt{6}}{2}$$$$\frac{6}{3+\sqrt{7}}=\frac{6\left(3-\sqrt{7}\right)}{\left(3+\sqrt{7}\right)\left(3-\sqrt{7}\right)}=\frac{18-6\sqrt{7}}{9-7}=\frac{18-6\sqrt{7}}{2}=9-3\sqrt{7}$$ |

**Knowledge Organiser**