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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 | $$2.7×10^{4}+4.6×10^{3}$$$$=27000+4600=31600$$$$=3.16×10^{4}$$ |

**Knowledge Organiser**