Exam Ready: Foundation Knowledge

ALGEBRA INSTRUCTIONS	
Solve	**Find the value** of an unknown or variable
Rearrange	**Changing the subject** of a formula
Evaluate	In maths, this means **find the value of**
Form	To **write** or **produce**
Substitute	**Replacing letters with numbers** to calculate the **numerical value**
Expand	**Multiply** terms inside a bracket by those outside the bracket
Factorise	Reverse of **expand**, write using **brackets**

INDEX LAWS: MULTIPLICATION AND DIVISION	
Multiplying	**Add** the powers *E.g.* $a^m \times a^n = \boldsymbol{a^{m+n}}$
Dividing	**Subtract** powers *E.g.* $a^m \div a^n = \boldsymbol{a^{m-n}}$
Raising	**Multiply** powers *E.g.* $(a^m)^n = \boldsymbol{a^{mn}}$
p^0	Anything to the power of 0 is **1**
p^1	Anything to the power of 1 is **itself**
Negative indices	**Reciprocal** *E.g.* $a^{-m} = \frac{\mathbf{1}}{\boldsymbol{a^m}}$

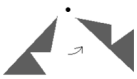
LINEAR GRAPHS	
y = mx + c	**m** is the **gradient** and **c** is the **y-intercept**
Gradient	How **steep** a line is. Can be positive or negative **(Change in y) / (Change in x)**
y- intercept	Where the line **crosses** the **y-axis**
Parallel lines	Lines with the same **gradient** (same 'm')

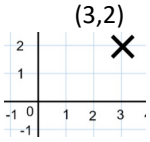
MULTIPLES AND FACTORS	
Multiple	*E.g. The 3rd multiple of 7 is **21***
Factor	*E.g. factors of 8 are **1, 2, 4 and 8***

PROBABILITY NOTATION	
P(A) =	**Probability of an event A**
P(A') =	**Complement**: event A **will not occur**
P(A ∩ B) =	**Intersection: both events A and B** will occur
P(A ∪ B) =	**Union**: **event A or B or both** will occur

2D REPRESENTATIONS OF 3D SHAPES	
Plan	A **2D view** of a 3D solid as viewed from **above (birds-eye view**)
Elevation	The **2D view** of a 3D solid from the **front** or the **side.**

ANGLE RULES	
Angles around a point	Add to **360°** (as they make a full turn)
Angles on a straight line	Add to **180°**
Vertically opposite angles	Are **equal**
Angles in a triangle	Add to **180°**
Angles in a quadrilateral	Add to **360°**

TRANSFORMATIONS	
Translation 	To **move** a shape The shape does not change (**congruent**) To translate a shape you need a **vector** in the form $\begin{pmatrix} x \\ y \end{pmatrix}$
Rotation 	To turn a shape The shape does not change (**congruent**) To rotate a shape you need a **centre of rotation**, the **number of degrees** to turn, and a **direction of turn** (clockwise or anticlockwise)
Reflection 	To **flip** a shape over a **mirror line**. The shape does not change (**congruent**) To reflect a shape you need a **mirror line**
Enlargement	To **change the size** of a shape The shape does change size **(similar)** To enlarge a shape you need a **centre of enlargement** and a **scale factor of enlargement**

COORDINATES	
Coordinate 	The first number (**x**) moves **left** (-) or **right** (+) The second number (**y**) moves **up** (+) or **down** (-) (**x**, **y**) *e.g. (3,2) means the **point** that is 3 to the right and 2 up from the origin*

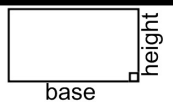
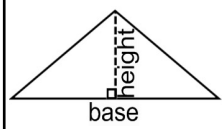
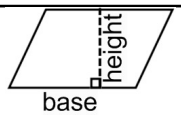
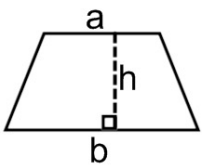
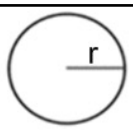
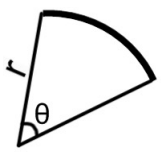
AVERAGES AND SPREAD	
Mean	**Add** up all the amounts, and then **divide** the total by the number of amounts
Mode	The value which **occurs the most**
Median	Put the data in numerical **order,** and state the **middle** value
Range	The largest value **subtract** the smallest value
Comparing Data	Compare **averages** to say who is **better**/faster Compare **ranges** to say who is more **consistent**

Exam Ready: Foundation Formulae

ANGLES IN POLYGONS: FACTS

Sum of interior angles	**(n – 2) x 180°** Where n is the number of sides
Sum of exterior angles	**360°**
Interior angle + exterior angle = **180°**	

AREA

Area of a rectangle	$A = bh$ Area = **base x height**	
Area of a triangle	$A = \frac{bh}{2}$ Area = $\frac{\text{base x height}}{2}$	
Area of a parallelogram	$A = bh$ Area = **base x height**	
Area of a trapezium	$A = \frac{1}{2}(a+b)h$ Area = **half the sum of the parallel sides, multiplied by the distance between them**	
Area of a circle	$A = \pi r^2$ Area = **pi x radius²**	
Area of a sector	$A = \frac{\theta}{360}\pi r^2$ Area = **the fraction of the full circle x pi x radius²**	

CONVERSIONS

Length conversions	1cm = **10mm** 1m = **100cm** 1km = **1000m**
Capacity conversions	1 litre = **1000ml**
Metric mass conversions	1kg = **1000g** 1 tonne = **1000kg**
Time conversions	1 minute = **60 seconds** 1 hour = **60 minutes** 1 day = **24 hours** 1 week = **7 days** 1 year = **365 days** (a leap year is **366**)
Hours to minutes	Half an hour = **0.5 hours** = **30mins** Quarter of an hour = **0.25 hours** = **15mins**

COMMON FDP CONVERSIONS

Fraction	Decimal	Percentage
1/2	0.5	50%
1/4	0.25	25%
3/4	0.75	75%
1/10	0.1	10%

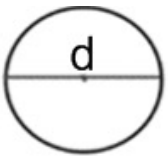
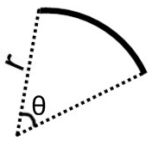
Pythagoras's Theorem

Pythagoras' Theorem	$a^2 + b^2 = c^2$

TRIGONOMETRIC RATIOS

Sin	$sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$
Cos	$cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$
Tan	$tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

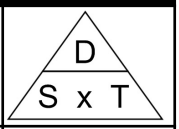
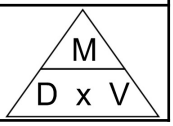
CIRCUMFERENCE

Circumference of a circle	Circumference = **pi x diameter** $C = \pi d$ OR $C = 2\pi r$	
Arc length	Arc length = **the fraction of the full circle x pi x diameter** $L = \frac{\theta}{360}\pi d \quad OR$ $L = \frac{\theta}{360}2\pi r$	

VOLUME

Prism	Volume = **area of cross section x length**
Pyramid	Volume = $\frac{1}{3}$ **x base area x length**

COMPOUND UNITS

Speed formula	Speed = **Distance ÷ Time** Distance = **Speed × Time** Time = **Distance ÷ Speed**	
Density formula	Density = **Mass ÷ Volume** Mass = **Density × Volume** Volume = **Mass ÷ Density**	

PERCENTAGE CALCULATIONS

Percentage increase	**Adding** a percentage to the original amount	
Percentage decrease	**Subtracting** a percentage from the original amount	
Percentage Change	The change between the **old value** and the **new value** as a percentage	$\frac{Difference}{Original} \times 100$
Reverse Percentage	Working **backwards** to find **100%**	