Exam Ready: Higher Knowledge

ALGEBRA INSTRUCTIONS

Solve	**Find the value** of an unknown or variable
Iterate	**Repeatedly** carry out a process
Rearrange	**Changing the subject** of a formula
Evaluate	In maths, this means **find the value of**
Form	To **write** or **produce**
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.* $a^m \times a^n = a^{m+n}$
Dividing	**Subtract** powers *E.g.* $a^m \div a^n = a^{m-n}$
Raising	**Multiply** powers *E.g.* $(a^m)^n = a^{mn}$
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.* $a^{-m} = \frac{1}{a^m}$
Fractional indices	**Root** *E.g.* $a^{\frac{1}{n}} = \sqrt[n]{a}$ The power $\frac{1}{2}$ = **square root** The power $\frac{1}{3}$ = **cube root**

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')
Perpendicular lines	The product of the two gradients is always **-1,** use the **negative reciprocal**

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

PROPORTION

Direct Proportion	**y ∝ x** Equation of the form **y=kx**
Inverse proportion	**y** $\propto \frac{1}{x}$ Equation of the form $y = \frac{k}{x}$

SIMILARITY

Length scale factor: x
Area scale factor: x^2
Volume scale factor: x^3

HISTOGRAMS

Histogram	Frequency = **Area** of the bars (No gaps)
Frequency density	The **heights** of the bars on a histogram $Frequency\ Density = \dfrac{frequency}{class\ width}$

COMPARING DATA

Comparing Data	Compare **averages** to say who is **better**/faster Compare **ranges (IQR)** to say who is more **consistent**

REAL LIFE GRAPHS

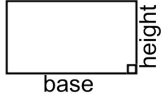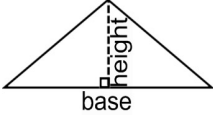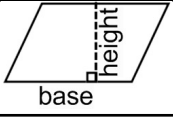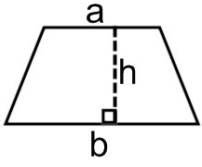|	
Distance-Time Graphs	The gradient of the line is the **speed**
Velocity-Time Graphs	The gradient of the line is the **acceleration** The area under the graph is the **distance**
Gradient of a Curve	Find the gradient of the **tangent** at that point
Area under a curve	To **estimate** the area under a curve, **split it up** into rectangles, triangles and trapeziums
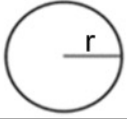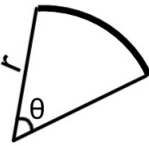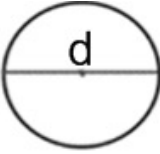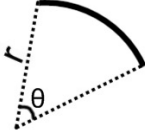
CIRCLE THEOREMS

The angle in a semicircle is **90°**	
Angles in the same segment are **equal**	
The angle subtended at the centre of a circle is **twice** the angle subtended at the circumference	
Opposite angles in a cyclic quadrilateral add to **180°**	
Alternate segment theorem: Angles in **alternate segments** are **equal**	
A tangent meets a radius at **90°**	
Tangents from an external point are **equal in length**	

Exam Ready: Higher Formulae

ANGLES IN POLYGONS: FACTS

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

AREA

Area of a rectangle	$A = bh$ Area = **base x height**	
Area of a triangle	$A = \dfrac{bh}{2}$ Area = $\dfrac{\text{base x height}}{2}$	
Area of a parallelogram	$A = bh$ Area = **base x height**	
Area of a trapezium	$A = \dfrac{1}{2}(a+b)h$ 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	$A = \dfrac{\theta}{360}\pi r^2$ Area = **the fraction of the full circle x pi x radius²**	

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** $L = \dfrac{\theta}{360}\pi d$ OR $L = \dfrac{\theta}{360}2\pi r$	

VOLUME

Prism	Volume = **area of cross section x length**
Pyramid	Volume = $\dfrac{1}{3}$ x base area x length
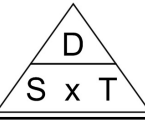
SOLVING QUADRATIC EQUATIONS

The quadratic formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Pythagoras's Theorem

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

TRIGONOMETRIC RATIOS

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

EXACT TRIG VALUES

	0º	30º	45º	60º	90º
sin	0	$\dfrac{1}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{\sqrt{3}}{2}$	1
cos	1	$\dfrac{\sqrt{3}}{2}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{1}{2}$	0
tan	0	$\dfrac{1}{\sqrt{3}}$	1	$\sqrt{3}$	----

TRIGONOMETRIC RULES

Sine rule	Use with **non right angled** triangles
Sine Rule (for an angle)	$\dfrac{SinA}{a} = \dfrac{SinB}{b} = \dfrac{SinC}{c}$
Sine Rule (for a side)	$\dfrac{a}{SinA} = \dfrac{b}{SinB} = \dfrac{c}{SinC}$
Cosine rule	Use with **non right angled** triangles. Use when the question involves **3 sides and 1 angle**
Cosine Rule (for a side)	$a^2 = b^2 + c^2 - 2bcCosA$
Cosine Rule (for an angle)	$CosA = \dfrac{b^2 + c^2 - a^2}{2bc}$
Area of a triangle (trig)	$Area = \dfrac{1}{2}abSinC$

COMPOUND UNITS

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