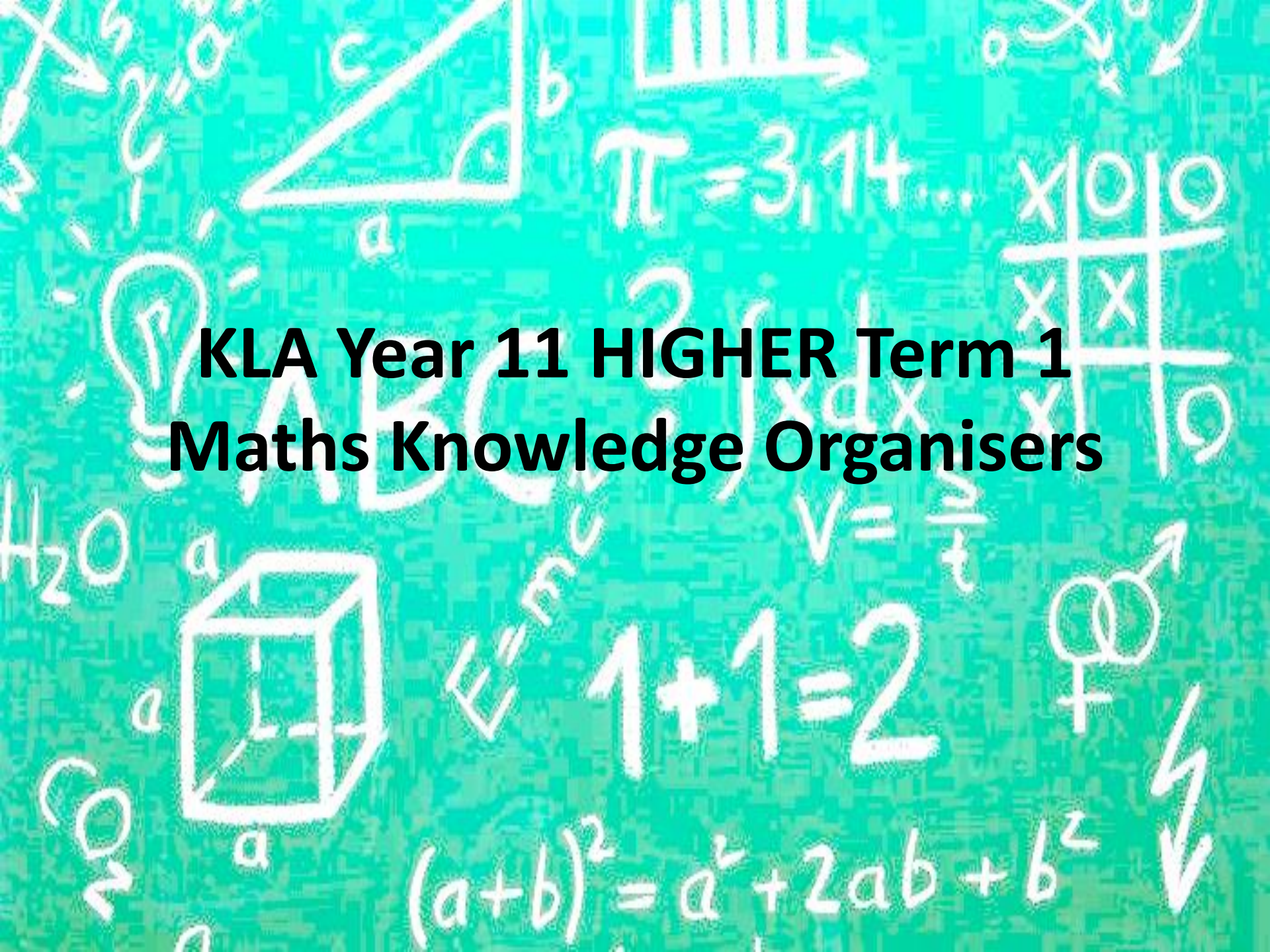


**KLA Year 11 HIGHER Term 1
Maths Knowledge Organisers**



Year 11 – Higher Knowledge Organiser Half Term 1

Key Topics and Vocabulary

Direct and inverse proportion

Direct Proportion

Inverse Proportion

Using proportionality formulae

Direct Proportion with powers

Inverse Proportion with powers

Inequalities

Inequality

Inequality symbols

Inequalities on a Number Line

Graphical Inequalities

Quadratic Inequalities

Set Notation

Pythagoras theorem and basic trigonometry

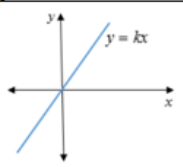
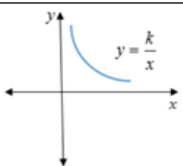
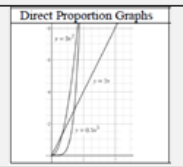
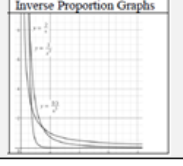
Trigonometry


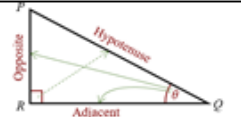

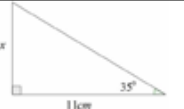
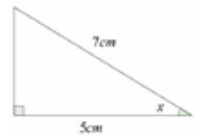
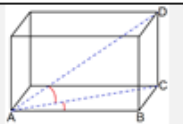
Hypotenuse

Adjacent

Trigonometric Formulae

3D Trigonometry

1. Direct Proportion	<p>If two quantities are in direct proportion, as one increases, the other increases by the same percentage.</p> <p>If y is directly proportional to x, this can be written as $y \propto x$</p> <p>An equation of the form $y = kx$ represents direct proportion, where k is the constant of proportionality.</p>	
2. Inverse Proportion	<p>If two quantities are inversely proportional, as one increases, the other decreases by the same percentage.</p> <p>If y is inversely proportional to x, this can be written as $y \propto \frac{1}{x}$</p> <p>An equation of the form $y = \frac{k}{x}$ represents inverse proportion.</p>	
3. Using proportionality formulae	<p>Direct: $y = kx$ or $y \propto x$</p> <p>Inverse: $y = \frac{k}{x}$ or $y \propto \frac{1}{x}$</p> <ol style="list-style-type: none"> Solve to find k using the pair of values in the question. Rewrite the equation using the k you have just found. Substitute the other given value from the question in to the equation to find the missing value. 	<p>p is directly proportional to q. When $p = 12$, $q = 4$. Find p when $q = 20$.</p> <ol style="list-style-type: none"> $p = kq$ $12 = k \times 4$ so $k = 3$ $p = 3q$ $p = 3 \times 20 = 60$, so $p = 60$
4. Direct Proportion with powers	<p>Graphs showing direct proportion can be written in the form $y = kx^n$</p> <p>Direct proportion graphs will always start at the origin.</p>	<p>Direct Proportion Graphs</p> 
5. Inverse Proportion with powers	<p>Graphs showing inverse proportion can be written in the form $y = \frac{k}{x^n}$</p> <p>Inverse proportion graphs will never start at the origin.</p>	<p>Inverse Proportion Graphs</p> 

Topic/Skill	Definition/Tips	Example
1. Trigonometry	The study of triangles.	
2. Hypotenuse	<p>The longest side of a right-angled triangle.</p> <p>Is always opposite the right angle.</p>	
3. Adjacent	Next to	
4. Trigonometric Formulae	<p>Use SOHCAHTOA.</p> $\sin \theta = \frac{O}{H}$ $\cos \theta = \frac{A}{H}$ $\tan \theta = \frac{O}{A}$  <p>When finding a missing angle, use the 'inverse' trigonometric function by pressing the 'shift' button on the calculator.</p>	<p>Use 'Opposite' and 'Adjacent', so use 'tan'</p> $\tan 35 = \frac{x}{11}$ $x = 11 \tan 35 = 7.70 \text{ cm}$  <p>Use 'Adjacent' and 'Hypotenuse', so use 'cos'</p> $\cos x = \frac{b}{7}$ $x = \cos^{-1}\left(\frac{5}{7}\right) = 44.4^\circ$ 
5. 3D Trigonometry	<p>Find missing lengths by identifying right angled triangles.</p> <p>You will often have to find a missing length you are not asked for before finding the missing length you are asked for.</p>	

Year 11 – Higher Knowledge Organiser Half Term 2

Key Topics and Vocabulary

Circle theorems

Angles in a semi-circle have a right angle at the circumference.

Opposite angles in a cyclic quadrilateral add up to 180°.

The angle at the centre is twice the angle at the circumference.

Angles in the same segment are equal.

A tangent is perpendicular to the radius at the point of contact.

Tangents from an external point are equal in length.

Alternate Segment Theorem

Sine and Cosine rules

Exact Values for Angles in Trigonometry

Sine Rule

Cosine Rule

Topic/Skill	Definition/Tips	Example																								
1. Exact Values for Angles in Trigonometry	<table border="1"> <thead> <tr> <th></th> <th>0°</th> <th>30°</th> <th>45°</th> <th>60°</th> <th>90°</th> </tr> </thead> <tbody> <tr> <td>sin</td> <td>0</td> <td>$\frac{1}{2}$</td> <td>$\frac{\sqrt{2}}{2}$</td> <td>$\frac{\sqrt{3}}{2}$</td> <td>1</td> </tr> <tr> <td>cos</td> <td>1</td> <td>$\frac{\sqrt{3}}{2}$</td> <td>$\frac{\sqrt{2}}{2}$</td> <td>$\frac{1}{2}$</td> <td>0</td> </tr> <tr> <td>tan</td> <td>0</td> <td>$\frac{1}{\sqrt{3}}$</td> <td>1</td> <td>$\sqrt{3}$</td> <td>—</td> </tr> </tbody> </table>		0°	30°	45°	60°	90°	sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	—	
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tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	—																					
2. Sine Rule	<p>Use with non right angle triangles. Use when the question involves 2 sides and 2 angles.</p> <p>For missing side: $\frac{a}{\sin A} = \frac{b}{\sin B}$</p> <p>For missing angle: $\frac{\sin A}{a} = \frac{\sin B}{b}$</p> <p>There is an ambiguous case (where there are two potential answers)</p>	$\frac{x}{\sin 85} = \frac{5.2}{\sin 46}$ $x = \frac{5.2 \times \sin 85}{\sin 46} = 3.75\text{cm}$ $\frac{\sin \theta}{1.9} = \frac{\sin 85}{2.4}$ $\sin \theta = \frac{1.9 \times \sin 85}{2.4} = 0.789$ $\theta = \sin^{-1}(0.789) = 52.1^\circ$ <p>To find the two angles, use sine to find one and then subtract your answer from 180 to find the other answer.</p>																								
3. Cosine Rule	<p>Use with non right angle triangles. Use when the question involves 3 sides and 1 angle.</p> <p>For missing side: $a^2 = b^2 + c^2 - 2bc \cos A$</p> <p>For missing angle: $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$</p>	$x^2 = 9.6^2 + 7.8^2 - (2 \times 9.6 \times 7.8 \times \cos 85)$ $x = 11.8$																								

Topic/Skill	Definition/Tips	Example
Circle Theorem 1	Angles in a semi-circle have a right angle at the circumference.	$y = 90^\circ$ $x = 180 - 90 - 38 = 52^\circ$
Circle Theorem 2	Opposite angles in a cyclic quadrilateral add up to 180°.	$x = 180 - 83 = 97^\circ$ $y = 180 - 92 = 88^\circ$
Circle Theorem 3	The angle at the centre is twice the angle at the circumference.	$x = 104 \div 2 = 52^\circ$
Circle Theorem 4	Angles in the same segment are equal.	$x = 42^\circ$ $y = 31^\circ$
Circle Theorem 5	A tangent is perpendicular to the radius at the point of contact.	$y = 5\text{cm (Pythagoras' Theorem)}$
Circle Theorem 6	Tangents from an external point are equal in length.	$x = 90^\circ$
Circle Theorem 7	Alternate Segment Theorem	$x = 52^\circ$ $y = 38^\circ$

Year 11 - Higher
Maths
Knowledge Questions

Below are a series of questions.

Use these to apply your knowledge and practice.

Ratio and proportion

If we know how much 2 items cost how can I work out how much 6 items cost? What about 1 item?

Sine and cosine rules

How do we know which angle to substitute into the sine rule?

Algebraic fractions

What's the same/different about e.g. $\frac{1}{2}a$ and $\frac{a}{2}$?

What does 'in terms of x ' mean? Is it possible to get a numeric answer?

Vectors

What's the same and what's different about a translation and a drawing representing a vector?
 What do the numbers in the column vector represent?

Gradients and rate of change

Is the gradient positive or negative? How do you know?
 What is the gradient of the line? How do you know?

Transforming functions

How do we know which direction to translate the object in?
 Why is it important to consider the scales of axes when giving a vector of translation?

Year 11 - Higher
Maths
Knowledge Checklist

KNOWLEDGE
 PROGRESS

KNOWLEDGE CHECKLIST		R	A	G
1	Ratio and proportion			
2	Sine and cosine rules			
3	Algebraic fractions			
4	Vectors			
5	Gradients and rate of change			
6	Transforming functions			
7	Further equations and graphs			
8				
9				
10				

Further equations and graphs

What features of a graph help us to identify its equation?
 Which types of graphs do you find easier to identify?
 Why?

High Flyers - Enrichment Task



Esther earns £28 000 a year.

She pays 20% tax on earnings over £12 500

She pays 12% National Insurance on earnings over £8632

Work out Esther's monthly take-home salary.