Maths AS Level Knowledge Organiser

Spring 1

Pure 06 - **Circles**

Describe the process for finding the midpoint of a line segment, then state how you would find the equation for the perpendicular bisector.

State the formula for a circle with centre at the origin. How does this change if the centre is at any given point (a, b)?

How does the perpendicular bisector of a chord and a tangent interact with the centre of a circle?

In what ways can a straight line intercept with a circle?

Explain how you could find the centre of a circle given three points on its circumference:

Pure 07 - Algebraic Methods

Define the term Polynomial:

Describe the Factor Theorem, and explain why it is true and how it can be used:

Explain how a proof of a mathematical statement differs from a Demonstration. Give an example.

List the three main types of proof, and briefly describe them:

Pure 09 - Trigonometric Ratios

Derive the Sine Rule.
(Hint: By using sine, find the area of the triangle twice using different angles)

State the formula for the area of a triangle (given the length of two sides and the angle between them).

State both common forms of the Cosine Rule:

Explain why the sine rule may sometimes give two solutions as an answer to an unknown angle:

Pure 09 - Trigonometric Ratios

Sketch the graph for $y = \sin\theta \ \{0° \leq \theta \leq 360°\}$, labelling key points and features:

Sketch the graph for $y = \cos\theta \ \{0° \leq \theta \leq 360°\}$, labelling key points and features:

Sketch the graph for $y = \tan\theta \ \{0° \leq \theta \leq 360°\}$, labelling key points and features:

Pure 10 - Trigonometric Identities and Equations

Simplify these Phase Shifted trigonometric equations:

$\sin(180° - \theta) =$

$\cos(180° - \theta) =$

$\tan(180° - \theta) =$

$\sin(180° + \theta) =$

$\cos(180° + \theta) =$

$\tan(180° + \theta) =$

$\sin(360° - \theta) =$

$\cos(360° - \theta) =$

$\tan(360° - \theta) =$

State how $\tan\theta$ can be expressed in terms of $\sin\theta$ and $\cos\theta$:

Draw the $30°$, $60°$, $90°$ and $45°$, $45°$, $90°$ unit triangles, and use these to demonstrate how the exact values for the sine, cosine, and tangent of these angles are found:

Pure 10 - Trigonometric Identities and Equations

Define the Principle Value

State the ranges of θ for which the Principle Value can be found on your calculator for $\sin\theta$, $\cos\theta$ and $\tan\theta$:

Draw the Unit Circle, and show how it relates to $\sin\theta$, $\cos\theta$ and $\tan\theta$:

Using the equation of a circle and the Unit Circle, show that $\sin^2\theta + \cos^2\theta \equiv 1$:

Pure 12 - **Differentiation**

Explain how the gradient of a curve can be defined for any given point on a curve.

Describe how the limit formula for calculating the gradient function works

Describe the rule for finding the derivative of a function of the form $f(x) = ax^n$

How could you find the derivative for a function $f(x)$, when $f(x) = h(x) + g(x)$

Describe how you could find the equation of the tangent to a curve at point $(a, f(a))$

Pure 12 - **Differentiation**

Using the gradient function, explain how you could find if the function is increasing or decreasing over an interval $[a, b]$.

What is a second order derivative? State a formula for finding the second order derivative,

Explain how you can find a Stationary Point. What are the three main types of Stationary Point, and how can you tell them apart?

Applied 04 - **Correlation**

Define the term Bivariate Data.

Explain the concept of Correlation. How can you tell if something is correlated or not?

Describe what a Causal Relationship is. How can you tell if some correlated variables have a Causal relationship?

State the general form of the equation of a regression line. Describe each variable and coefficient, and what they mean in context to the type of correlation.

When using a Regression Line, what limitations do you have on making predictions?

Applied 05 - **Probability**

Explain the difference between an Outcome and an Event.

Define what is meant by a Mutually Exclusive event.

Define the Intersection, Union, and Compliment of events A and B. Use Venn Diagrams to illustrate these ideas.

Define what is meant by an Independent event.

Describe a situation in which a Tree Diagram is appropriate to use.