

COURSE (ORDINARY LEVEL)

PAPER II

THE LINE

Distance (Length)
 $|AB| = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

Midpoint
 $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$

Slope
 $m = \frac{\text{Rise}}{\text{Run}} = \frac{y_2-y_1}{x_2-x_1}$

* Parallel lines same slope
 * Perpendicular lines slopes multiply to give -1
 * Turn upside down & change the sign

Equation of a line
 1 $y - y_1 = m(x - x_1)$
 2 $y = mx + c$
 * need slope and point to sketch a line
 let $x=0$ to get y
 let $y=0$ to get x

Area of a Triangle
 $\frac{1}{2} |x_1y_2 - x_2y_1|$
 * One point must be (0,0)
 * use translation if necessary.

Theorems
 * Intersecting lines use Simultaneous Equations
 * To test if a point is on a line sub it into

Co-ORDINATE GEOMETRY

Pythagoras: The square of the hypotenuse is equal to the sum of the squares of the other 2 sides.

Vertical angles opposite angles equal

Corresponding angles equal

Alternate angles

Parallel lines
 * opposite sides parallel & equal
 * opposite angles =
 * diagonals bisect each other.

Quadrilateral
 4 sided polygon.
 Twice angle at circum.

Parallelogram
 * opposite sides parallel & equal
 * opposite angles =

Polygon - closed shape with at least 3 straight sides

Circle
 angle at centre = 2 x angle at circum.
 angle in a semi-circle = 90°

Circle
 Perpendicular from centre to chord bisects it.
 Angles standing on same arc are equal.

Circle
 Tangent \perp Radius

Circle
 Exterior = Sum of Interior Opposites
 $\angle 1 = \angle 2 + \angle 3$

Circle
 Smallest side opposite smallest angle.
 Largest side opposite largest angle.
 Sum of any 2 sides must be greater than 3rd side.

Circle
 Intersection of a line & circle
 use Simultaneous Equations
 one linear, one Quadratic
 eg. $x^2 + y^2 = 25$
 Centre (0,0) $r = \sqrt{5} = 5$
 $x^2 + y^2 = 7$ - the line
 $x^2 + y^2 = 10$ - the circle
 get either x or y on its own and sub into circle equation to find points of intersection

Circle
 Tangent to a circle
 line touches at one point only.
 r^2 inside
 r^2 outside
 r^2 ON.

THE CIRCLE

Circle
 EQ: $(x-h)^2 + (y-k)^2 = r^2$
 eg. $(x-2)^2 + (y+4)^2 = 9$
 Centre (2, -4) $r = \sqrt{9} = 3$

Circle
 Points in/on/outside
 test by substituting into the equation.
 r^2 inside
 r^2 outside
 r^2 ON.

Circle
 Similar Triangles
 Same angles but not same size
 sides are proportional in order.

Circle
 Congruent \equiv Triangles
 exactly the same all sides and all angles equal.
 - SAS
 - SSS
 - ASA
 - RHS

Circle
 Isosceles
 2 sides
 Equilateral
 all sides
 all angles.
 Scalene
 no 2 sides
 no 2 angles.

GEOMETRY

Probability
 * Impossible
 * Relative Frequency
 estimate of probability of event
 no. of times event happens / total number of trials.
 * Expected Frequency
 = Number of trials x Probability
 = Expected Value
 * Sum of all outcomes x Probabilities

Probability
 * Fundamental Principle of Arrangements
 How many ways can we arrange
 4 chairs
 $4! = 4 \times 3 \times 2 \times 1 = 24$
 eg. $\binom{6}{2} = \frac{6 \times 5}{2 \times 1} = 15$ I can pick 2 people from 6.
 * Selections - number of ways
 * Trial - act of doing an experiment
 * Outcome - one of the results of trial
 * Event - one or more specific outcomes

Probability
 * Mutually exclusive events that cannot occur at the same time
 * Bernoulli Trial
 Univariate - one variable
 Bivariate - two variables

Probability
 * AND
 * OR
 * Complement
 $P(\text{not happening}) = 1 - P(\text{event happening})$
 Total number of possible outcomes = 1
 Number of desirable outcomes = 1
 Area of $\Delta = \frac{1}{2} ab \sin C$

TRIGONOMETRY

Trigonometry
 Sine Rule
 $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
 Cosine Rule
 $a^2 = b^2 + c^2 - 2bc \cos A$
 use when given:
 2 sides and included angle
 3 sides

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Trigonometry
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 exactly the same all sides and all angles equal.
 - SAS
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Trigonometry
 Isosceles
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TRANSFORMATIONS

Transformations
 * Translation
 * Reflection
 * Rotation
 * Enlargement
 * Shear

Translation
 * Parallel lines same slope
 * Perpendicular lines slopes multiply to give -1
 * Turn upside down & change the sign

Reflection
 * Mirror image
 * Line of symmetry

Rotation
 * Turn around a point
 * Angle of rotation

Enlargement
 * Scale factor
 * Centre of enlargement
 * Image Area = $K^2 \times$ Object Area

Shear
 * Slanting
 * Area preserved

STATISTICS

Statistics
 * Mean
 * Median
 * Mode
 * Range
 * Standard Deviation
 * Correlation

Statistics
 * Histogram
 * Bar Chart
 * Scatter Graphs
 * Line Plot

Statistics
 * Normal Distribution
 * Empirical Rule
 * Standard Deviation
 * Average

Statistics
 * Area & Volume
 * Surface Area
 * Similar Solids

Statistics
 * Probability
 * Expected Value
 * Relative Frequency

Statistics
 * Mean
 * Median
 * Mode
 * Range
 * Standard Deviation
 * Correlation

Statistics
 * Histogram
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AREA & VOLUME

Area & Volume
 * Rectangle
 * Triangle
 * Circle
 * Trapezium
 * Parallelogram
 * Rhombus
 * Square
 * Rectangle
 * Triangle
 * Circle
 * Trapezium
 * Parallelogram
 * Rhombus
 * Square

Area & Volume
 * Similar Solids
 * Similar Figures
 * Similar Solids

Area & Volume
 * Similar Solids
 * Similar Figures
 * Similar Solids