**Draw a picture**

There are only 5 formulae... Tools write them down, sub in what you know, see what happens!!

**Geometry**

**Triangles & Sectors**

The point D lies on CB such that AD is an arc of a circle with centre A, radius 8 cm. The area of the triangle ABC is 20 cm². Find the area & perimeter of the shaded region.

1. $A = \frac{1}{2} ab \sin \theta$

2. $A = \frac{1}{2} r^2 \theta$

3. $L = r \theta$

4. Cosine Rule
   
   $a^2 = b^2 + c^2 - 2bc \cos A$

5. Sine Rule
   
   $\frac{\sin A}{a} = \frac{\sin B}{b}$

6. **Radians**
   
   $\frac{\pi}{180^\circ} = \text{Rads}$

   $1^\circ \approx 57^\circ$

7. **Circle words**
   
   - 1. chord makes 2 segments
   - 2. radii make 2 sectors
GEOMETRY  INTRODUCTION TO VECTORS

DOING, vectors ...

Thinking about vectors ...

Notation

Vector Magnitude

Unit Vectors

Vector Direction

Parallel Vectors

Adding Vectors

Negative Vectors

Number x vector

You will need

- sin rule
- cosine rule
- SOH CAH TOA
- Pythagoras
- Simplifying Surd
- Simultaneous Equations
- The idea of proof

But more important...

- The ability to draw little diagrams to see what's going on

Applications

- Literally anything at all happening in 2D or 3D Space!
Position vector
Fixed from origin to point A
\[ \overrightarrow{OA} = a \]

Relative position vector where is A from the perspective of B?
\[ \overrightarrow{BA} = a - b \]

Midpoint AB
\[ \overrightarrow{OX} = \frac{\overrightarrow{OA} + \overrightarrow{AB}}{2} \]

Distance \( A \rightarrow B \)
\[ = \text{length of vector } \overrightarrow{AB} \]

Angle between vectors

Ratio Theorem
\[ x \text{ divides } AB \text{ in the ratio } p:q \]
\[ \overrightarrow{OX} = \overrightarrow{OA} + \frac{p}{p+q} \overrightarrow{AB} \]

\[ \overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AB} + \frac{3}{5} \overrightarrow{BC} \]

A has position vector \( (7i - 2j) \). The vectors \( \overrightarrow{AB} \) and \( \overrightarrow{AC} \) are given by \( (i - j) \) and \( (6i + 4j) \) respectively. The point D divides the line segment BC in the ratio 3:2. Find the coordinates of D and the angle \( \angle BAC \).

\[ \overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AB} + \frac{3}{5} \overrightarrow{BC} \]

Explain this as it's the key to the solution

\[ = \left( \frac{7}{5} \right) + \left( \frac{-1}{5} \right) + \frac{3}{5} \left[ \left( \frac{6}{5} \right) \right] \]

\[ = \left( \frac{8}{3} \right) + \frac{3}{5} \left( \frac{6}{5} \right) \]

\[ = \left( \frac{8}{3} \right) + \left( \frac{3}{3} \right) \]

\[ = \left( \frac{11}{3} \right) \]

Coordinates:
**You will need**

- Relative position vectors
  \[ \mathbf{AB} = \mathbf{b} - \mathbf{a} \]
- Vector magnitude (use pythagoras)
- Distance \( AB \)
  - length of relative position vector \( \mathbf{b} - \mathbf{a} \)
- Right angle? … only if pythagoras works!
- Parallel vectors
  \[ \mathbf{a} = \lambda \mathbf{b} \]
- Angle between vectors
  \[ \theta = \cos^{-1} \]
- Don’t forget SOH CAH TOA

**Points/Lines**

- Colinear
- Bisect
- \( \perp \) Bisector

**Quadrilaterals**

- Parallelogram
- Trapezium
- Rectangle
- Rhombus
- Square

**Triangles**

- Right-angled
- Isosceles
- Similar

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**Vector Proofs**

You need to

(a) learn the conditions for each shape (etc)

(b) practice applying checking the conditions