




Engage, Enable and Empower

Work for individual students not attending school

Half Term 2: October to December

Pupils who are absent should select the activity that they are up to. Click on the link in the activity box below. This will take you to Office 365 where the work is stored. In the lesson it will tell the pupil if they need to submit the work to their teacher.

Lessons

Date (week commencing)	Lessons	Focus/Topic/Theme	Hyper link to Activity
2/11/20	1	Radians Arcs and Sectors Pg 9	<p>Use your revision guides and assessment practise books to hone your skills.</p> <p>Links to lesson PowerPoints below </p> <p>https://deyes.sharepoint.com/sites/TemporaryCurriculumResources/Documents/Forms/AllItems.aspx?id=%2Fsites%2FTemporaryCurriculumResources%2FDocuments%2FTemporary%20Curriculum%20Resources%2FEngineering%20Construction%2FYear%2012%2FMr%20Norbury&viewid=4fb17346%2D4524%2D46a5%2D4bc23%2Df06e6b70c0f8</p>
9/11/20	2	Trigonometric Ratios and Graphs Pg 10	
16/11/20	3	Sine and Cosine Rule Pg 11	
23/11/20	4	Vector Addition Pg 12	
30/11/20	5	Pythagoras and Trig in Engineering Assessment sheet on teams.	
7/12/20	6	Surface area and Volume Pg 13	
14/12/20	7	Systems of force Pg 14	

Who to contact
You can email **your class teacher** if you have any questions regarding the activities set.

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Year 12 T1 Electrical and Electronic Engineering Knowledge Organiser

Trigonometric methods

Angular measurement

You are already familiar with angular measurements made in **degrees**. In practical terms, this is the most common way to define an angle on an engineering drawing that a technician might see when manufacturing a component in the workshop.

However, there is another unit of angular measurement, called the **radian**, which is used extensively in engineering calculations.

Key terms

- Degree** (symbol °): one degree is $\frac{1}{360}$ th of a complete circle. A complete circle contains 360°.
- Radian** (symbol rad or r): one radian is the angle subtended at the centre of a circle by two radii of length r that describe an arc of the same length r on the circumference. A complete circle contains 2π rad.
- Subtend**: to form an angle between two lines at the point where they meet.

Circular measurement

One revolution of a full circle contains 360° or 2π radians. It is necessary straightforward to convert angles stated in degrees to radians and vice versa.

Given that 2π radians = 360°

$$1 \text{ radian} = \frac{360^\circ}{2\pi} = 57.3^\circ \text{ (to 3 s.f.)}$$

$$\text{and } 1^\circ = \frac{2\pi}{360} = 0.0175 \text{ rad (to 3 s.f.)}$$

The use of radians makes it straightforward to calculate some basic elements of circles with the general formulae shown in **Table 1.6**, where the angle θ is measured in radians.

Table 1.6 General formulae for the circular formulae (see **Figure 1.7**)

Arc length	$s = r\theta$
Circumference of a circle	$C = 2\pi r = 2\pi s$
Area of a sector	$A = \frac{1}{2}r^2\theta$
Area of a full circle	$A = \frac{1}{2}(2\pi r)^2 = \pi r^2$

Figure 1.7 Arc length and sector of a circle

Triangular measurement

In right-angled triangles we name the three sides in relation to the right angle and one of the other two angles. (See **Figure 1.8**).

Figure 1.8 Trigonometric naming conventions for a right-angled triangle

- The side opposite the right angle is the **hypotenuse** (hyp).
- The side opposite the angle θ is the **opposite** (opp) side.
- The side opposite the angle θ is the **adjacent** (adj) side.

Pythagorean Theorem

For any right-angled triangle with sides a and b and hypotenuse h , the square of the hypotenuse is equal to the sum of the squares of the other two sides.

$$h^2 = a^2 + b^2$$

The ratios of the lengths of these sides are given specific names and are widely used in engineering (see **Figure 1.9-1.11**).

Table 1.7 General formulae for the circular formulae (see **Figure 1.7**)

Table 1.8 Trigonometric naming conventions for a right-angled triangle

Table 1.9 Trigonometric ratios

Table 1.10 Values for the trigonometric ratios and angles

Table 1.11 Inverse trigonometric ratios

Sine and cosine rules

The basic definitions of the trigonometric functions sine, cosine and tangent only apply to right-angled triangles. However, the sine and cosine rules can be applied to any triangle of the form shown in **Figure 1.12**.

The sine rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

The cosine rule can take three different forms depending on the missing value to be determined:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

Vectors and their applications

Many quantities encountered in engineering, such as force and velocity, are only **fully** described when magnitude, direction and sense are known (see **Figure 1.13**). Such quantities are called **vectors**. When adding or subtracting vectors you must always take into account the direction in which they act.

Diagrammatic representation of vectors

- The length of the arrow represents the magnitude of the vector.
- The angle θ specifies the direction of the vector.
- The head of the arrow specifies the positive sense of the vector.

Figure 1.13 A vector for magnitude, direction and sense

Diagrammatic representation of vectors

Figure 1.14 Two vectors added to form a resultant vector

Figure 1.15 Two vectors subtracted to form a resultant vector

Figure 1.16 Two vectors added to form a resultant vector

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