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| **UNIT 17: Perimeter, area and volume 2: circles, cylinders, cones and spheres** | **Teaching time**  5-7 hours |

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**SPECIFICATION REFERENCES**

N8 calculate exactly with multiples of *π*

N14 estimate answers; check calculations using approximation and estimation, including answers obtained using technology

N15 round numbers and measures to an appropriate degree of accuracy; …

A5 understand and use standard mathematical formulae; rearrange formulae to change the subject

G9 identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

G16 know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)

G17 know the formulae: circumference of a circle = 2*πr* = *πd*, area of a circle = *πr*2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area and volume of spheres, pyramids, cones and composite solids

G18 calculate arc lengths, angles and areas of sectors of circles

**PRIOR KNOWLEDGE**

Students should know the formula for calculating the area of a rectangle.

Students should know how to use the four operations on a calculator.

**KEYWORDS**

Area, perimeter, formula, length, width, measurement, volume, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area

**OBJECTIVES**

By the end of the unit, students should be able to:

* Recall the definition of a circle and identify, name and draw parts of a circle including tangent, chord and segment;
* Recall and use formulae for the circumference of a circle and the area enclosed by a circle circumference of a circle = 2*πr* = *πd*, area of a circle = *πr*2;
* Use *π* ≈ 3.142 or use the *π* button on a calculator;
* Give an answer to a question involving the circumference or area of a circle in terms of *π*;
* Find radius or diameter, given area or perimeter of a circles;
* Find the perimeters and areas of semicircles and quarter-circles;
* Calculate perimeters and areas of composite shapes made from circles and parts of circles;
* Calculate arc lengths, angles and areas of sectors of circles;
* Find the surface area and volume of a cylinder;
* Find the surface area and volume of spheres, pyramids, cones and composite solids;
* Round answers to a given degree of accuracy.

**POSSIBLE SUCCESS CRITERIA**

Recall terms related to a circle.

Understand that answers in terms of pi are more accurate.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Calculate the radius/diameter given the area/circumference type questions could be explored, including questions that require evaluation of statements, such as Andy states “Diameter =   
2 × Radius” and Bob states “‘Radius = 2 × Diameter”. Who is correct?

**COMMON MISCONCEPTIONS**

Diameter and radius are often confused and recollection which formula to use for area and circumference of circles is often poor.

**NOTES**

Emphasise the need to learn the circle formula: ‘Cherry Pie’s Delicious’ and ‘Apple Pies are too’ are good ways to remember them.

Formulae for curved surface area and volume of a sphere, and surface area and volume of a cone, will be given on the formulae sheet in the examination.

Ensure that students know it is more accurate to leave answers in terms of *π* but only when asked to do so.