Perimeter, Area & Volume

Name _____ Date _____

Area, perimeter and volume are related topics. It can be confusing sorting out which one is which!

Table 1 lists examples of area, perimeter and volume questions that have come up in Edexcel Functional Skills exams. It shows what you're asked to calculate, and what units to expect.

	Perimeter	Area	Volume
	One dimension (length)	**Two Dimensions** (length and width)	**Three Dimensions** (length, width, depth)
	e.g. line, distance	e.g. square, circle, triangle, polygon	e.g. cube, sphere, pool, pond, barrel, jug
Functional Skills Examples	Edging for a lawn or garden	A wall that needs papering or painting	How much water in a swimming pool or pond
	Putting up coving around a room	A room that needs wallpaper	Removing sludge
	Building a wall around a pond or pool	A garden that needs fertiliser	How much fertiliser to put in a watering can of water
	Doing a charity run or planning a run or race	Covering a pond in netting	Capacity of air that a fan can move in a certain time
	The distance a security guard walks on his 'beat'	A patch of earth that needs turfing, gravelling or paving	How much chlorine needs to be put in a swimming pool
	Fencing for a sheep field	Buying kitchen worktops	Using water or gas meter readings to calculate accurate bills or compare bills
	Distance driven by a travelling salesperson	Making floor plans or loft insulation	Scaling up or down liquids in a recipe
Possible Units	mm, cm, m, km, inches, feet, yards, miles	mm^2, cm^2, m^2, km^2, in^2, $yards^2$, $miles^2$, acres, hectares	mm^3, cm^3, m^3, km^3, in^3, millilitres, centilitres, litres, quarts, gallons, pints, fluid ounces, tsp, tbsp

Table 1

If you take the first letter of each of these skills … you get P. A. V.

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A Piece of PAV!

I have made a Pavlova out of two layers of meringue, and two layers of cream.

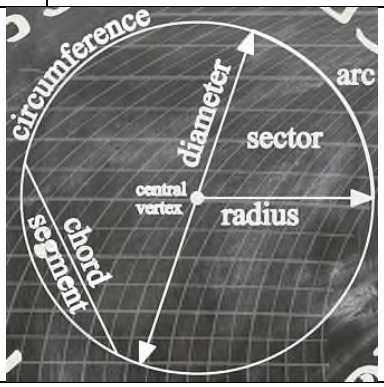
The diameter of my Pavlova is 30cm.

The meringue circles are 1.5cm deep, and the cream is 1cm thick.

As it's for a special occasion, I want to put a special ribbon around it for presentation.

π is 3.14

Example question(s)	I've got 80cm of ribbon. Do I have enough to go around the Pavlova?	What area of meringue must I cover with cream? I have 1.5 litres of whipped cream. Is this enough?	Calories (Kcal) for Pavlova = 3.2 x volume in cm^3. How many calories in my Pavlova?
PAV?	**Perimeter**	**Area (and volume/capacity)**	**Volume**
Formula	$2\pi r$	πr^2	$\pi r^2 h$
Working out.	Circumference = perimeter. Radius = $\frac{\text{diameter}}{2}$ 30cm ÷ 2 = 15cm Formula: $2\pi r$ = 2 x 3.14 x 15 = 94.2cm of ribbon	Area of 1 meringue circle = πr^2 = 3.14 x 15^2 = 3.14 x (15 x 15) = 706.5cm^2 Two layers = 706.5 x 2 = 1413 cm^2 Cream is 1cm thick so I need 1413 cm^2 x1 = 1413cm^3 (or 1413ml) 1.5 litres = 1500ml or 1500cm^3	Height = (2x1.5) + (2x1) Height = 3 + 2 = 5 Volume of Pavlova = $\pi r^2 h$ = 3.14 x (15 x 15) x 5 = 3.14 x 225 x 5 = 3532.5 cm^3 Calories = 3.2 x vol = 3.2 x 3532.5 = 11,304 Kcal
Answer	*No, I do not have enough ribbon. I need 94.2cm of ribbon*	*I will need to cover 1,413cm^2 with cream. Yes, I have enough cream.*	*There are 11,304Kcal in my Pavlova.*



Remember

Always show your workings, and show that you can substitute the numbers you're given into the formula.

Even if you get the answer wrong, you may get marks for the working.

Perimeter, Area & Volume

Curriculum mapping

GCSE MATHEMATICS: GEOMETRY & MEASURES – 2. Mensuration & calculation		
Weighting percentages for Foundation tier (grades 1-5) Number (N) 25%, Algebra (A) 20%, Ratio, proportion & rates of change (R) 25%, Geometry & measures (G) 15%, Probability (P) and Statistics (S). P & S have a combined weighting of 15%. Enlarged **bold** font indicates main coverage.		
Foundation (grades 1-5)		Additional Foundation and Higher only (grades 4-9)
G14	**use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money etc.)**	
G15	measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings	
G16	**to know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)**	
G17	**know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)**	surface area and volume of spheres, pyramids, cones and composite solids (including frustrums) Note: Solutions in terms of π may be asked for.
G18 -G23	No Foundation coverage	

Subject content - FUNCTIONAL SKILLS MATHEMATICS 2018 (Comes into effect September 2019)		
✓ indicates content covered by this resource, although this will vary with the student group and how the resource is used by the teacher. ✓✓ = a key (learning objective). → = not specifically covered but included to show progression across levels. *Content at each level subsumes and builds upon the content at lower levels.*		
Fundamental mathematical knowledge and skills: these must be demonstrated in their own right, **both with and without a calculator**, in addition to being used to solve problems or complete tasks.		
Entry Level 3	**Level 1**	**Level 2**
Using numbers and the number system		
Various calculations: E3.2 (addition & subtraction), E3.3 (division), E3.4 (multiplication). →	L1.5 Use simple formulae expressed in words for one or two-step operations →	L2.3 Evaluate expressions and make substitutions in given formulae in words and symbols ✓✓
Using common measures, shape and space		
E3.14 Use and compare measures of length, capacity, weight and temperature using metric or imperial units to the nearest labelled or unlabelled division → E3.15 Compare metric measures of length including millimetres, centimetres, metres and kilometres → E3.19 Sort 2-D and 3-D shapes using properties including lines of symmetry, length, right angles, angles including in rectangles and triangles →	L1.22 Calculate area and perimeter of simple shapes including those that are made up of a combination of rectangles → L1.23 Calculate the volumes of cubes and cuboids →	L2.16 Calculate perimeters and areas of 2-D shapes including triangles and circles and composite shapes including non-rectangular shapes (formulae given except for triangles and circles) ✓✓ L2.17 Use formulae to find volumes and surface areas of 3-D shapes including cylinders (formulae to be given for 3-D shapes other than cylinders) ✓✓

References:

Department for Education (Feb 2018), Subject content functional skills: mathematics
https://www.gov.uk/government/publications/functional-skills-subject-content-mathematics
DfE (2013), *Mathematics GCSE subject content and assessment objectives.*
https://www.gov.uk/government/publications/gcse-mathematics-subject-content-and-assessment-objectives
Also covers many **adult numeracy curriculum** elements. *http://www.excellencegateway.org.uk/content/etf1075*
Edexcel (Perason) past papers (Functional Skills Mathematics)
https://qualifications.pearson.com/en/qualifications/edexcel-functional-skills/Maths.coursematerials.html

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Curriculum mapping

Solving mathematical problems, carrying out tasks and decision making.		
Entry Level 3 students are expected to be able to:	**Level 1 students** are expected to be able to:	**Level 2 students** are expected to be able to:
Use the content knowledge and skills to recognise and obtain a solution or solutions to a:		
[1]**simple problem**	[2]**straightforward problem.** ✓	[3]**complex problem.** ✓
E3a. Use given mathematical information including numbers, symbols, simple diagrams and charts.	L1a. L2a. Read, understand and use mathematical information and mathematical terms used at this level ✓	
E3b. Recognise, understand and use simple mathematical terms appropriate to Entry Level 3.	L1b. L2b. Address individual problems as described above ✓	
E3c. Use the methods given above to produce, check and present results that make sense to an appropriate level of accuracy.	L1c. L2c. Use knowledge and understanding to a required level of accuracy	
E3d. Present results with appropriate explanation using numbers, measures, simple diagrams, charts and symbols appropriate to Entry Level 3.		L2d. Identify suitable operations & calculations to generate results ✓
	L1d. L2e. Analyse and interpret answers in the context of the original problem ✓	
	L1e. L2f. Check the sense, and reasonableness, of answers ✓	
	L1f. Present results with appropriate explanation and interpretation demonstrating simple reasoning to support the process & show consistency with the evidence presented ✓	L2g. Present results and explain results clearly and accurately demonstrating reasoning to support the process and show consistency with the evidence presented

[1]A **simple mathematical problem** requires **working through one step or process**. At Entry Level it is expected that students will be able to address individual problems each of which draw upon knowledge and/or skills from **one** MCA (NS, MS or HD).

Context should be familiar to all students and easily described.

KEY:
MCA = appropriate mathematical content area(s).
NS = Using numbers and the number system.
MS = Using common measures, shape and space.
HD = Handling information and data.

[2]A **straightforward problem** requires students to either work through one step or process **or to work through more than one connected step or process**. Individual problems are based on the knowledge and/or skills in the MCA (i.e. NS, MS or HD). At Level 1 it is expected that the student will be able to address individual problems, some of which **draw upon a combination of any two of the MCA** and require students to make connections between those content areas.

The context of individual problems at L1 will require some comprehension in order for the student to be able independently to identify and carry out an appropriate mathematical approach.

[3]**A complex problem** requires **a multi-step process, typically requiring planning and working through at least two connected steps or processes**. Individual problems are based on a combination of the knowledge and/or skills from the MCA (NS, MS or HD). At Level 2 it is expected that the student will be able to address individual problems some of which draw upon a combination of **all three MCA** and require students to make connections between those content areas.

The context of individual problems at L2 will require interpretation and analysis in order for the student to be able independently to identify and carry out an appropriate mathematical process or processes.