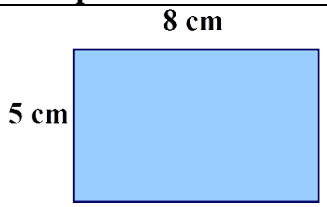
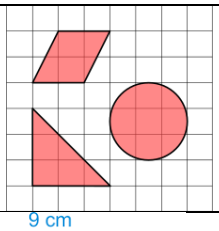
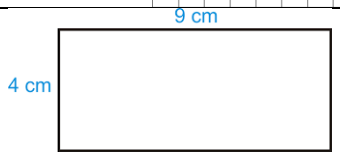
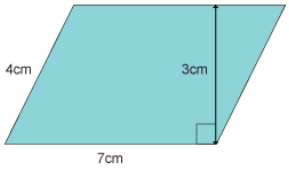
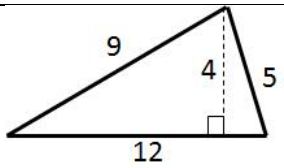
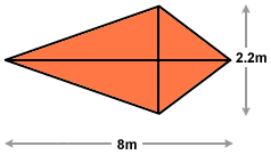
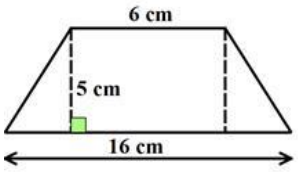
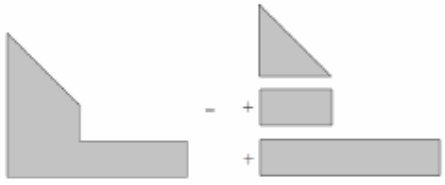
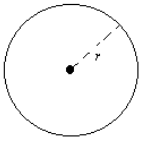
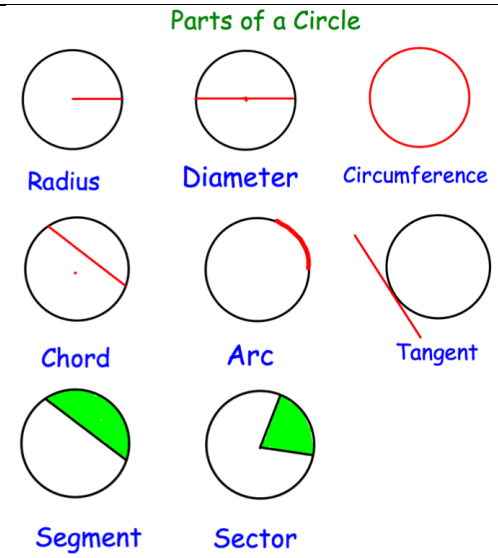
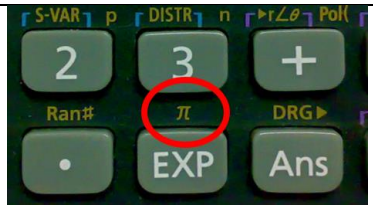
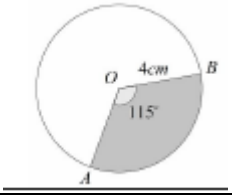
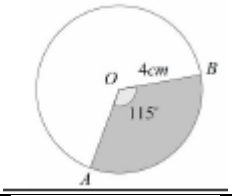
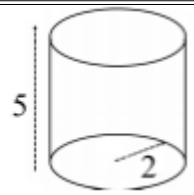
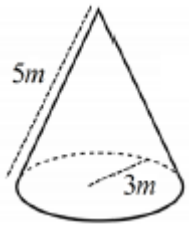
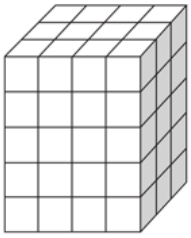
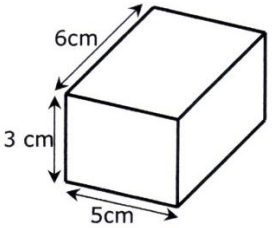
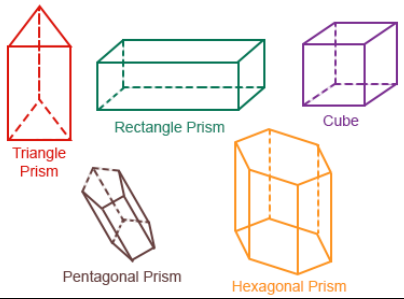
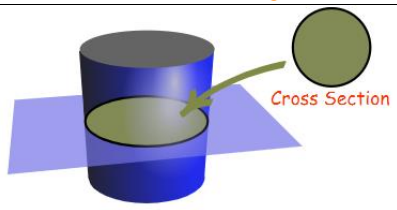
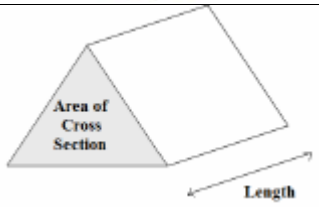
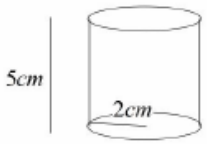
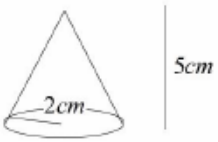
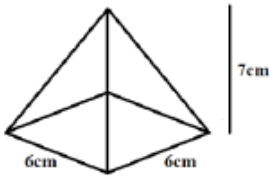
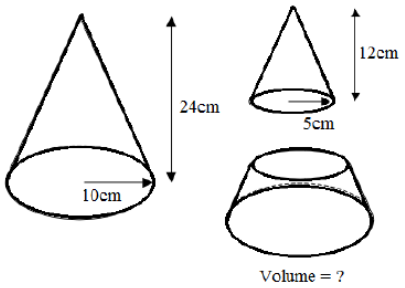
Year 9 Higher Knowledge Organisers
GM3 Area and Volume

Topic/Skill	Definition/Tips	Example
1. Perimeter	The **total distance** around the **outside** of a shape. Units include: mm, cm, m etc.	 $P = 8 + 5 + 8 + 5 = 26cm$
2. Area	The amount of **space inside** a shape. Units include: mm^2, cm^2, m^2	
3. Area of a Rectangle	**Length x Width**	 $A = 36cm^2$
4. Area of a Parallelogram	**Base x Perpendicular Height** Not the slant height.	 $A = 21cm^2$
5. Area of a Triangle	**Base x Height ÷ 2**	 $A = 24cm^2$
6. Area of a Kite	Split in to **two triangles** and use the method above.	 $A = 8.8m^2$
7. Area of a Trapezium	$\frac{(a+b)}{2} \times h$ "Half the sum of the parallel side, times the height between them. That is how you calculate the area of a trapezium"	 $A = 55cm^2$
8. Compound Shape	A shape made up of a **combination of other known shapes** put together.	
9. Circle	A circle is the locus of all points equidistant from a central point.	

10. Parts of a Circle	**Radius** – the **distance** from the **centre** of a circle to the **edge** **Diameter** – the total **distance** across the **width** of a circle **through the centre**. **Circumference** – the **total distance** around the **outside** of a circle **Chord** – a **straight line** whose **end points lie on a circle** **Tangent** – a **straight line** which **touches** a circle at exactly **one point** **Arc** – a **part of the circumference** of a circle **Sector** – the **region** of a circle enclosed by **two radii** and their intercepted **arc** **Segment** – the **region** bounded by a **chord** and the **arc** created by the chord	
11. Area of a Circle	$\boldsymbol{A = \pi r^2}$ which means 'pi x radius squared'.	If the radius was 5cm, then: $A = \pi \times 5^2 = 78.5cm^2$
12. Circumference of a Circle	$\boldsymbol{C = \pi d}$ which means 'pi x diameter'	If the radius was 5cm, then: $C = \pi \times 10 = 31.4cm$
13. π ('pi')	Pi is the circumference of a circle divided by the diameter. $\boldsymbol{\pi \approx 3.14}$	
14. Arc Length of a Sector	The arc length is part of the circumference. Take the **angle** given **as a fraction over 360°** and **multiply** by the **circumference**.	Arc Length = $\frac{115}{360} \times \pi \times 8 = 8.03cm$ 
15. Area of a Sector	The area of a sector is part of the total area. Take the **angle** given **as a fraction over 360°** and **multiply** by the **area**.	Area = $\frac{115}{360} \times \pi \times 4^2 = 16.1cm^2$ 
16. Surface Area of a Cylinder	**Curved Surface Area = $\boldsymbol{\pi dh}$** or **$\boldsymbol{2\pi rh}$** **Total SA = $\boldsymbol{2\pi r^2 + \pi dh}$** or **$\boldsymbol{2\pi r^2 + 2\pi rh}$**	 $Total\ SA = 2\pi(2)^2 + \pi(4)(5) = 28\pi$

17. Surface Area of a Cone	**Curved Surface Area = $\boldsymbol{\pi rl}$** where $l = slant\ height$ **Total SA = $\boldsymbol{\pi rl + \pi r^2}$** You may need to use Pythagoras' Theorem to find the slant height	 $Total\ SA = \pi(3)(5) + \pi(3)^2 = 24\pi$
18. Surface Area of a Sphere	$\boldsymbol{SA = 4\pi r^2}$ Look out for hemispheres – halve the SA of a sphere and add on a circle (πr^2)	Find the surface area of a sphere with radius 3cm. $SA = 4\pi(3)^2 = 36\pi cm^2$
19. Volume	Volume is a measure of the amount of space inside a solid shape. Units: mm^3, cm^3, m^3 etc.	
20. Volume of a Cube/Cuboid	$\boldsymbol{V = Length \times Width \times Height}$ $\boldsymbol{V = L \times W \times H}$ You can also use the Volume of a Prism formula for a cube/cuboid.	 volume = 6 x 5 x 3 = 90 cm^3
21. Prism	A prism is a 3D shape whose **cross section is the same** throughout.	
22. Cross Section	The **cross section** is the **shape** that **continues** all the way **through the prism**.	
23. Volume of a Prism	$\boldsymbol{V = Area\ of\ Cross\ Section \times Length}$ $\boldsymbol{V = A \times L}$	

24. Volume of a Cylinder	$\boldsymbol{V = \pi r^2 h}$	 $V = \pi(4)(5)$ $= 62.8cm^3$
25. Volume of a Cone	$\boldsymbol{V = \frac{1}{3}\pi r^2 h}$	 $V = \frac{1}{3}\pi(4)(5)$ $= 20.9cm^3$
26. Volume of a Pyramid	$\boldsymbol{Volume = \frac{1}{3}Bh}$ where B = area of the base	 $V = \frac{1}{3} \times 6 \times 6 \times 7 = 84cm^3$
27. Volume of a Sphere	$\boldsymbol{V = \frac{4}{3}\pi r^3}$ Look out for hemispheres – just halve the volume of a sphere.	Find the volume of a sphere with diameter 10cm. $V = \frac{4}{3}\pi(5)^3 = \frac{500\pi}{3}cm^3$
28. Frustums	A frustum is a solid (usually a cone or pyramid) with the **top removed**. Find the volume of the whole shape, then take away the volume of the small cone/pyramid removed at the top.	 $V = \frac{1}{3}\pi(10)^2(24) - \frac{1}{3}\pi(5)^2(12)$ $= 700\pi cm^3$