Perimeter, area and volume

1. The radius of the base of the cylinder is $2x$ cm and the height of the cylinder is h cm.
The radius of the sphere is $3x$ cm.
The volume of the cylinder is equal to the volume of the sphere.
Express h in terms of x. Give your answer in its simplest form.

2. Two cones, **P** and **Q**, are mathematically similar.
The total surface area of cone **P** is 24 cm².
The total surface area of cone **Q** is 96 cm².
The height of cone **P** is 4 cm.
    (a) Work out the height of cone **Q**.
The volume of cone **P** is 12 cm³.
    (b) Work out the volume of cone **Q**.

3. The width of a rectangle is x centimetres.
The length of the rectangle is $(x + 4)$ centimetres
(a) Find an expression, in terms of x, for the perimeter of the rectangle.
Give your expression in its simplest form.
The perimeter of the rectangle is 54 centimetres.
b. Work out the length of the rectangle.

4. The diagram shows triangle ABC and a circle, centre O.
A, B and C are points on the circumference of the circle.
AB is a diameter of the circle. AC = 16 cm and BC = 12 cm.
(a) Angle ACB = 90o. Give a reason why.
b. Work out the diameter AB of the circle.   c. Work out the area of the circle.
Give your answer correct to 3 significant figures

5. The length of the cuboid is 60 cm. The width of the cuboid is 15 cm.
The height of the cuboid is 30 cm. Work out the volume of the cuboid.

6. The diagram shows a cylinder. The diameter of the cylinder is 20 cm.
The height of the cylinder is 2 cm. (a) Work out the volume of the cylinder
(b) Write your answer to part (a) in litres.

7. A solid sphere of radius 3 cm just fits inside a hollow cone of radius 6 cm and height 8 cm. A (vertical) cross-sectional view is shown.
Calculate the fraction of the volume of the cone taken up by the sphere.
You **must** show your working.

8. (a) A circular lawn has a radius of 2.7 m.
Calculate the area of the lawn.
(b) (i) Convert 80 cm to metres.
 (ii) A rectangle measures 80 cm by 60 cm. Find the area of the rectangle.
Give your answer in m2.

9. A rectangle in the sequence has an area of 110 cm2.
What is its perimeter?

10. A sphere has radius r.
A cone has base radius r and perpendicular height x.
The volume of the sphere is double the volume of the cone.
(a) Show that $x = 2r$
(b) Calculate the ratio of the surface area of the sphere to the curved surface area of the cone. Give your answer in surd form.

11. A semi-circle is cut from a circle. The circle has a diameter of 30 cm.
The semi-circle has a diameter of 20 cm. Calculate the shaded area.
Give your answer in terms of Π. State the units of your answer.

12. A cuboid is made from centimetre cubes. The area of the base of the cuboid is 5 cm2.
The volume of the cuboid is 10cm3. Work out the surface area of the cuboid.

13. A hemispherical bowl of radius 6 cm has the same volume as a cone of perpendicular height 27 cm. Calculate the base radius, r, of the cone.

14. The diagram shows a solid made from a cone and a hemisphere.
The radius of both shapes is r. The slant height of the cone is l.
The perpendicular height of the cone is h.
The curved surface area of the cone and the curved surface area of the hemisphere are
equal. (a) Show that $l = 2r$
(b) Find the perpendicular height, h, of the cone in terms of r.

15. A race track is made from two straights and two semicircles.
The straights are 80 m long. The race track has a total perimeter of 400 m.
Calculate the distance, d, between the two straights.

16. A trapezium has parallel sides of length $(x + 1)$ cm and $(x + 2)$ cm.
The perpendicular distance between the parallel sides is x cm.
The area of the trapezium is 10cm2. Find the value of x.

17. A square has diagonals of length 15 cm.
Calculate the area of the square.

18. Jasmin has a pond in her garden.
The surface of the pond is a semicircle of radius 1.4 m.
(a) Calculate the area of a semicircle of radius 1.4 m.
You **must** show your working. State the units of your answer.
(b) The pond is 50 cm deep. The sides of the pond are vertical.
Calculate the volume of the pond. Give your answer in cubic metres.

19. A cone has base radius 6 cm and height h cm.
A smaller cone of base radius 2 cm and height 3 cm is cut from the top.
The remaining frustum has dimensions as shown.
Calculate the volume of the frustum.

20. *ABCD* is a triangular based pyramid.
The base *ABC* is an equilateral triangle with side 5 cm.
The volume of the pyramid is 36cm3.
$V = \frac{1}{2}$ base area x perpendicular height.
Calculate the perpendicular height, h, of the pyramid.

21. A cuboid has sides such that the longest side is two units more than the
shortest side, and the middle length side is one unit longer than the shortest
side. The total surface area of the cuboid is 52 units².
(a) Construct an equation to calculate the surface area.