1. 3 cm : 1.5 km = 1 cm : $\boxed{m = 0.5 \text{ km}}$.

   The areas are in a ratio of 1^2 cm^2 : 0.5^2 km^2 = 1 cm^2 : 0.25 km^2. This gives us the following proportion:

$$\frac{A}{20} = \frac{0.25}{1}$$
$$A = \boxed{5 \text{ km}^2}$$

2. $\boxed{\text{(a) } 5\pi \text{ cm} \quad \text{(b) } 2.5 \text{ cm}}$

3. (a) We know that the volume of a cone is $\frac{1}{3} \cdot \pi r^2 \cdot h = 120$ cm^3.

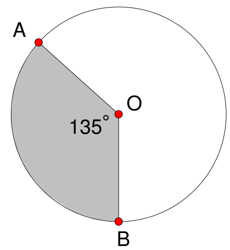
$$V = \frac{1}{3} \cdot (\pi \cdot (2r)^2) \cdot \frac{h}{3}$$
$$V = \frac{1}{3} \cdot \pi 4r^2 \cdot \frac{1}{3}h$$
$$V = \frac{4}{3}\left(\frac{1}{3} \cdot \pi r^2 \cdot h\right)$$
$$V = \frac{4}{3} \cdot 120 \text{ cm}^3$$
$$V = \boxed{160 \text{ cm}^3}$$

   (b) This cone is similar so we can simply look at the ratio of the volumes. The ratio of the measures is 1 : 2 so the ratio of their volumes is 1 : 8. This gives us that the volume of the new cone is $8 \times 120 = \boxed{960 \text{ cm}^3}$.

4. (a) $\boxed{88 \text{ cm}}$

   (b) The circumference of the circle is 28 cm so the **major** arc $AB = \frac{225}{360} \cdot 28\pi = 17.5\pi = 17.5(\frac{22}{7}) = \boxed{55 \text{ cm}}$.

   (c) This may have been graded incorrectly. The area of the circle is $14^2\pi = 196\pi$ cm^2. The area of the shaded sector is $\frac{135}{360} \cdot 196\pi = 73.5\pi = 73.5(\frac{22}{7}) = \boxed{231 \text{ cm}^2}$.

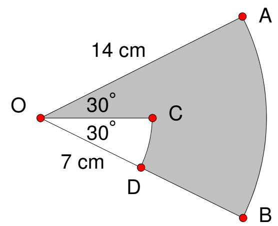


5. (a) $\boxed{\frac{343\pi}{12} = 28\frac{7}{12}\pi}$

(b) The perimeter of the shaded region is $AB + BD + CD + CO + AO$.

$AB = \frac{60}{360} \cdot 28\pi = \frac{14\pi}{3}$ cm. $BD = 7$ cm. $CD = \frac{30}{360} \cdot 14\pi = \frac{7\pi}{6}$ cm. $CO = 7$ cm. $AO = 14$ cm.

This gives us the perimeter to be $\frac{14\pi}{3} + 7 + \frac{7\pi}{6} + 7 + 14 = \boxed{28 + \frac{35\pi}{6} \text{ cm} = 28 + 5\frac{5}{6}\pi \text{ cm}}$.



6. (a) The surface area we're looking for is the surface area of the cylinder in which the water and the sphere occupy minus the top base of the cylinder. This surface area is the base of the cylinder plus the lateral area of the cylinder.

The base of the cylinder is simply $7^2\pi = 49\pi$ cm^2.

The lateral area of the cylinder is $14\pi \cdot 14 = 196\pi$ cm^2.

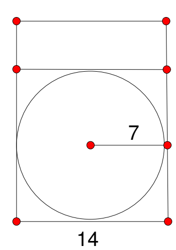
The total surface area touching the water is $49\pi + 196\pi = 245\pi = 245(\frac{22}{7}) = \boxed{770 \text{ cm}^2}$.

(b) The volume of the water in the can is the volume of the cylinder mentioned above minus the volume of the sphere.

The volume of the cylinder with height 14 cm is $7^2\pi \cdot 14 = 686\pi = 2156$ cm^3.

The volume of the sphere is $\frac{4}{3} \cdot \pi \cdot 7^3 = \frac{4}{3} \cdot 343\pi = \frac{1372}{3} \cdot \frac{22}{7} = \frac{4312}{3}$ cm^3.

The volume of the water in the can is $2156 - \frac{4312}{3} = \boxed{\frac{2156}{3} = 718\frac{2}{3} \text{ cm}^3}$.



7. $\boxed{\text{(a) } 3.142 \text{ cm}^2 \quad \text{(b) } 9.426 \text{ cm}^2 \quad \text{(c) } 10.278 \text{ cm}^2}$

8. (a) This problem may have been graded incorrectly. The volume of the model is the volume of the cone plus the volume of the cylinder plus the volume of the hemisphere. Note that the radius for all of these solids is 7 cm (from the hemisphere).

The volume of the cone is $\frac{1}{3} \cdot 7^2\pi \cdot 9 = 147\pi$ cm^3.

The volume of the cylinder is $7^2\pi \cdot 15 = 735\pi$ cm^3.

The volume of the hemisphere is $\frac{1}{2} \cdot \frac{4}{3} \cdot 7^3\pi = \frac{686\pi}{3}$ cm^3.

The volume of the model is $147\pi + 735\pi + \frac{686\pi}{3} = \boxed{\frac{3332\pi}{3} = 1110\frac{2}{3}\pi \text{ cm}^3}$.

(b) This problem may have been graded incorrectly. The mass is the volume times the density: $\frac{3332\pi}{3} \times 0.4 = \boxed{\frac{6664\pi}{15} = 444\frac{4}{15}\pi \text{ g}}$.

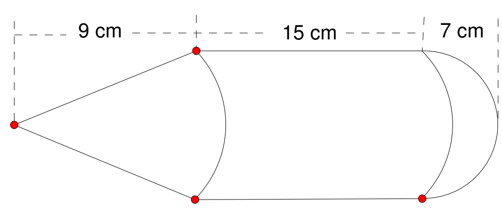
(c) This problem may have been graded incorrectly. We are looking for the surface area of the cone plus the surface area of the cylinder plus the surface area of the hemisphere (minus their bases).

To find the surface area of the cone, we need its lateral height. Use Pythagorean Theorem to find its height: $\sqrt{9^2 + 7^2} = \sqrt{130}$ cm. Its surface area without the base is then $= 7\pi \cdot \sqrt{130} = 7\pi\sqrt{130}$ cm^2.

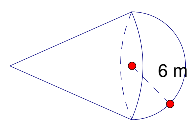
The lateral area of the cylinder is $14\pi \cdot 15 = 210\pi$ cm^2.

The surface area of the hemisphere without the base is $\frac{1}{2} \cdot 4\pi 7^2 = 98\pi$ cm^2.

The total surface area of the model is $28\pi\sqrt{2} + 210\pi + 98\pi = \boxed{(308 + 7\sqrt{130})\pi \text{ cm}^2}$.



9. This problem may have been graded incorrectly. The diagram is drawn below.



(a) The volume of the hemisphere is $\frac{1}{2} \cdot \frac{4}{3} \cdot 6^3\pi = \boxed{144\pi \text{ m}^3}$.

(b) The volume of the cone is $\frac{1}{3}\pi r^2 h$. If we set that equal to $\frac{4}{3}$ the volume of the hemisphere, we get:

$$\frac{4}{3} \cdot 144\pi = \frac{1}{3}6^2\pi h$$
$$192 = 12h$$
$$h = \boxed{16 \text{ m}}$$

10. (a) $\boxed{2304 \text{ cm}^3}$

(b) The volume is $\frac{1}{3}$ base $\times$ height. We can use this to find the height:

$$144 = \frac{1}{3} \cdot 96h$$
$$h = \boxed{4.5 \text{ cm}}$$

(c) Supposing the width and length of the cuboid are $2x, 3x$, then $6x^2 = 96$ so $x = 4$. This gives us the width and length to be $\boxed{8 \text{ cm} \times 12 \text{ cm}}$.