 Key

Measurement

Key Ideas:

1. **Conversions within and between systems.**

   - **Use your formula sheet for conversions between systems.**
   - **Use your formula sheet for conversions within the imperial system.**
   - **You MUST KNOW your conversions within the metric system. This is NOT on the formula sheet.**
     - **1 cm = 10 mm**
     - **1 m = 100 cm**
     - **1 km = 1000 m**
   - **Within Systems: Larger unit to Smaller unit (multiply)**
   - **Within Systems: Smaller unit to Larger unit (divide)**

2. **Surface Area**

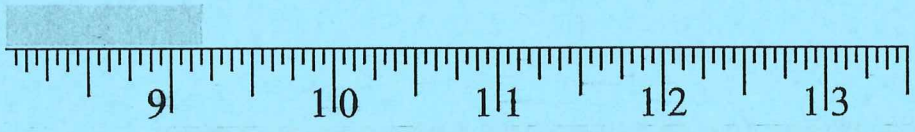
   - **Finding the area of the shape that you can "touch".**
   - **May need to use Pythagorean Theorem for a cone or right pyramid to find the slant height before using the surface area formula.**
   - **Think about what you can physically "touch"! You may only need the Lateral Area (area of the sides) for composite objects.**
   - **For a hemisphere, remember to add the area of the circle on the bottom!!**
   - **"B" represents Base Area, "P" represents Perimeter of the Base.**

3. **Volume**

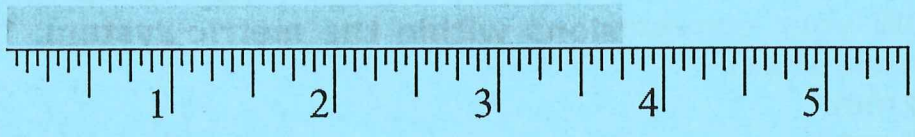
   - **Finding the space inside an object.**
   - **May need to use Pythagorean Theorem for a cone or right pyramid to find the perpendicular height before using the volume formula.**
   - **For composite objects, find the volume of each shape and then add together.**

Conversions Within and Between Systems

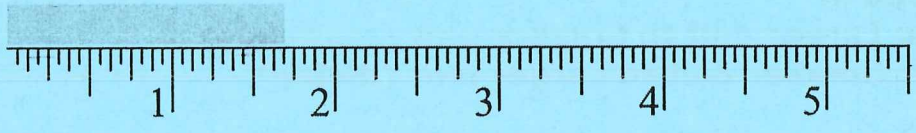
1. State the following measurements represented in the diagram.



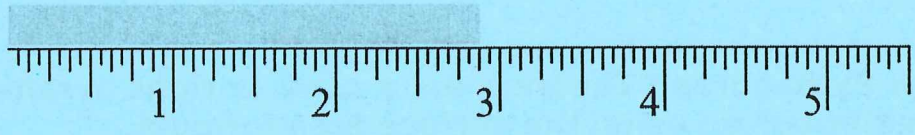
$9\frac{3}{16}$"



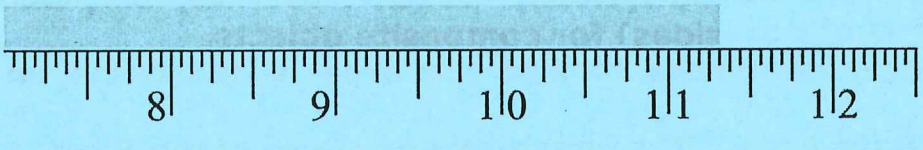
$3\frac{3}{4}$"



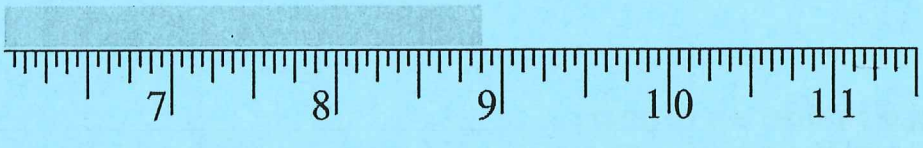
$1\frac{11}{16}$"



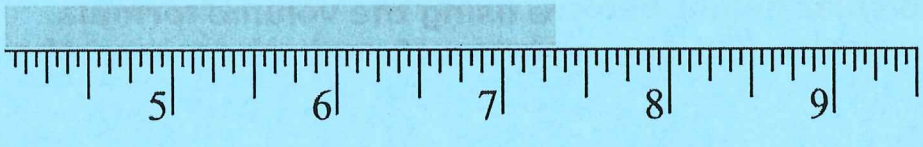
$3\frac{7}{8}$"



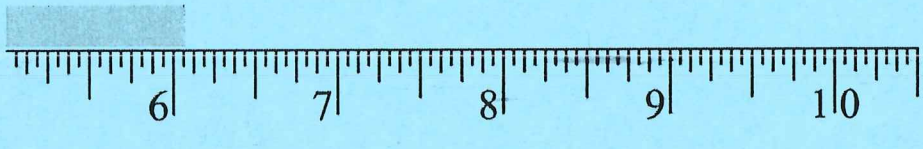
$11\frac{5}{16}$"



$8\frac{7}{8}$"



$7\frac{5}{16}$"



$6\frac{1}{16}$"

2. Andrea is constructing a pen for her dog. The perimeter of the pen is $70\ ft$.

a) Determine the perimeter of the pen, in yards and feet.

$\frac{70}{3} = 23$ yds 1 ft

b) The fencing material is sold by the yard. It costs $\$2.49/yd$. Determine the cost of this material, before taxes.

$24 \times 2.49 = \$59.76$

3. Convert each measurement.

a) 45 cm to metres

$45\text{cm} \cdot \frac{1\text{m}}{100\text{cm}} = 0.45\text{m}$

b) 5 yds to inches

$5\text{yds} \cdot \frac{36\text{ inches}}{1\text{yd}} = 180\text{ inches}$

c) 120 m to kilometres

$120\text{m} \cdot \frac{1\text{ km}}{1000\text{m}} = 0.120\text{m}$

d) 6.5 miles to feet

$6.5\text{ miles} \times \frac{5280\text{ ft}}{1\text{mile}} = 34\,320\text{ ft}$

4. Convert each measurement.

a) $9\ yd.$ to the nearest metre

$$9\ \text{yd} \cdot \frac{0.9144\ \text{m}}{1\ \text{yd}} = 8\ \text{m}$$

b) $11\,000\ in.$ to the nearest metre

$$11\,000\ \text{in} \cdot \frac{1\ \text{m}}{39.37\ \text{in}} = 279\ \text{m}$$

c) $5\ km$ to the nearest mile

$$5\ \text{km} \times \frac{0.6214\ \text{mile}}{1\ \text{km}} = 3\ \text{miles}$$

d) $160\ cm$ inches

$$160\ \text{cm} \cdot \frac{1\ \text{inch}}{2.54\ \text{cm}} = 63\ \text{inches}$$

5. On the Alex Fraser Bridge in Delta, B.C., the maximum height of the road above the Fraser River is $154\ m$. On the Tacoma Narrows Bridge in Tacoma, Washington, the maximum height of the road above The Narrows is $510\ ft$. Which road is higher above the water? How much higher is it?

Fraser River 154m

Tacoma Narrows Bridge

$$510\ \text{ft} \cdot \frac{0.3048\ \text{m}}{1\ \text{ft}}$$

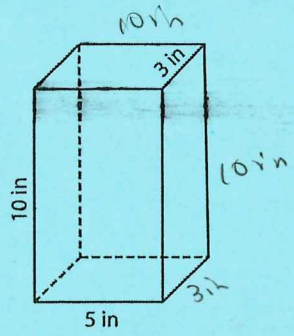
$$155.448\ \text{m}$$

→ higher by $1.448\ \text{m}$

Surface Area and Volume of 3D Objects

6. Determine the surface area of each object below.

a)



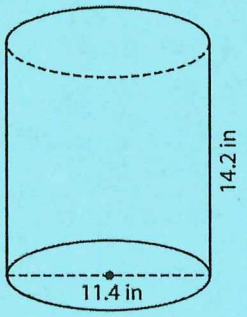
$SA = 2lw + 2lh + 2wh$

$= 2(5)(3) + 2(5)(10) + 2(3)(10)$

$= 30 + 100 + 60$

$= 190 \text{ in}^2$

b)



$r = 5.7$ in

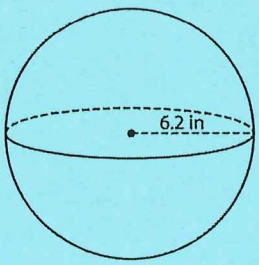
$SA = 2\pi rh + 2\pi r^2$

$= 2\pi(5.7)(14.2) + 2\pi(5.7)^2$

$= 712.7 \text{ in}^2$

7. Determine the volume of each object below.

a)

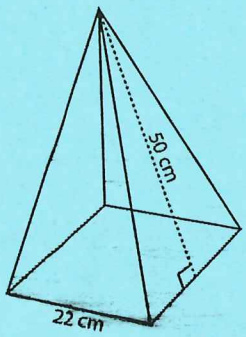


$V = \frac{4\pi r^3}{3}$

$= \frac{4\pi(6.2)^3}{3}$

$= 998.31 \text{ in}^3$

b)

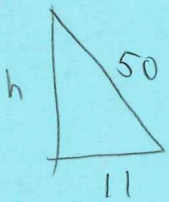


$B = 22^2$

$V = \frac{Bh}{3}$

$= \frac{22^2\sqrt{2379}}{3}$

$= 7869 \text{ cm}^3$

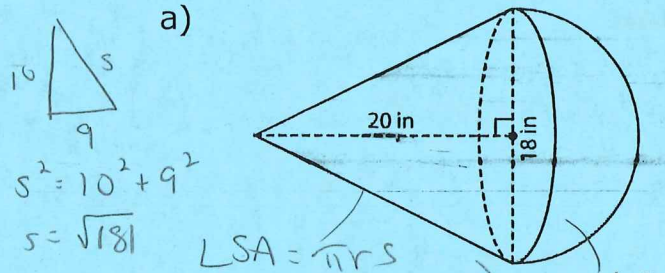


$h^2 = 50^2 - 11^2$

$h = \sqrt{2379}$

8. Determine the surface area of the following composite objects.

a)



$s^2 = 10^2 + 9^2$

$s = \sqrt{181}$

$LSA = \pi r s$

$= \pi(9)(\sqrt{181})$

$= 380.392...$

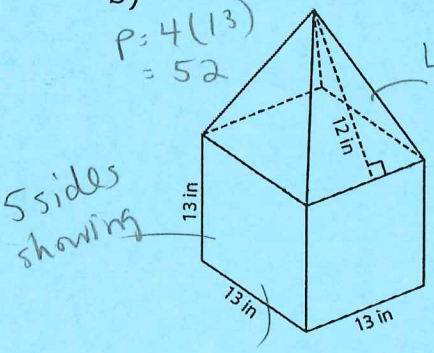
$LSA = 2\pi r^2$

$= 2\pi(9)^2$

$= 508.938...$

Total = $889.33 in^2$

b)



$P = 4(13)$

$= 52$

$LSA = \frac{Ps}{2}$

$= \frac{52(12)}{2}$

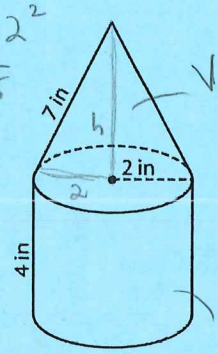
$= 312$

$SA = 5(13)(13)$

$= 845$

Total = $1157 in^2$

9. Determine the volume of the composite object below.



$h^2 = 7^2 - 2^2$

$h = \sqrt{45}$

$V = \frac{\pi r^2 h}{3}$

$= \frac{\pi(2)^2\sqrt{45}}{2}$

$= 42.1488...$

$V = \pi r^2 h$

$= \pi(2)^2(4)$

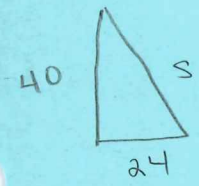
$= 16\pi$

Total = $92.414 in^3$

10. Determine the volume of a right cone with a diameter of $7\ ft.$ and a height of $15\ ft.$

$$V = \frac{\pi r^2 h}{3}$$
$$= \frac{\pi (3.5)^2 (15)}{3}$$
$$= 192.42\ ft^3$$

11. The height of a right square pyramid is $40\ in.$, and the side length of the base is $48\ in.$ Determine the lateral area of the pyramid to the nearest square inch.



$s^2 = 40^2 + 24^2$
$s = \sqrt{2176}$

$P = 4(48)$
$= 192$

$$LSA = \frac{Ps}{2}$$
$$= \frac{192(\sqrt{2176})}{2}$$
$$= 4478.171$$

or

$4478\ in^2$

12. The radius of a hemisphere is $30.5\ mm$. Determine the surface area of the hemisphere to the nearest tenth of a millimetre.

$$SA = 3\pi r^2$$
$$= 3\pi (30.5)^2$$
$$= 8767.4\ mm^2$$

13. Determine the slant height of a cone whose surface area is 301.44 square inches and has a radius of 6 inches.

$SA = \pi r s + \pi r^2$

$301.44 = \pi(6)s + \pi(6)^2$

$301.44 - 36\pi = 6\pi s$

$\frac{(301.44 - 36\pi)}{(6\pi)} = s$

$9.992 \text{ in} = s$

14. A box has a surface are of 450 cm^2. Its length and width are 8 and 6 cm respectively. Determine its height.

$SA = 2lw + 2lh + 2wh$

$450 = 2(8)(6) + 2(8)h + 2(6)h$

$354 = 16h + 12h$

$354 = 28h$

$12.64 \text{ cm} = h$

15. A cylinder has a surface area of 1800 cm^2 and a radius of 12 cm. Determine its height.

$SA = 2\pi rh + 2\pi r^2$

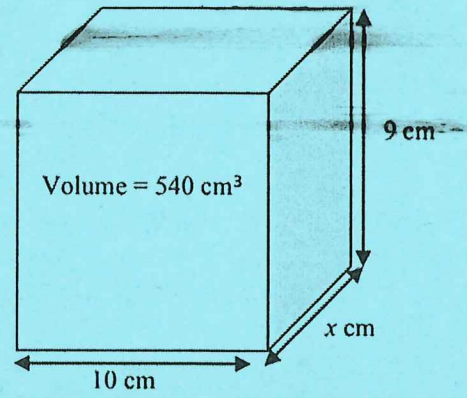
$1800 = 2\pi(12)h + 2\pi(12)^2$

$1800 - 288\pi = 24\pi h$

$\frac{(1800 - 288\pi)}{(24\pi)} = h$

$11.87 \text{ cm} = h$

16. Given that the volume of the rectangular prism below is 540 cm³. Determine the length of side marked x.



$V = lwh$

$540 = (10)(x)(9)$

$\frac{540}{90} = x$

$6 \text{ cm} = x$

17. The diameter of the base of a right cone is $12\,yd.$ and the volume of the cone is 224 cubic yards. Determine the height of the cone, to the nearest yard.

$V = \frac{\pi r^2 h}{3}$

$224 = \frac{\pi (6)^2 h}{3}$

$672 = 36\pi h$

$\frac{672}{(36\pi)} = h$

$5.94 \text{ yd} = h$