Section 3.2 – 2D Nets and Surface Area of 3D shapes

Surface Area

- So what about **Surface Area?**
- How does Surface Area differ from Area?

Well it is still 2-Dimensional shapes but it is the **combination of all** the 2-Dimensional sides of a 3-Dimensional figure.

- The Space you can wrap with paper, material, etc.
- The Space you can paint, colour in, etc.
- Requires 2 axes of direction, 2-D

2-D shapes
have units cm^2

So what Shapes do we have know?

- Cubes
- Rectangular Prisms
- Right Triangular Prisms
- Pyramids
- Cones
- Spheres

✓ See the attached page for all the General Formulas
✓ We will discuss a few in detail

➢ Remember that we just need to take the AREA of each 2-D side and **ADD them up**!

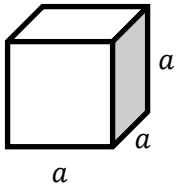
What is a Net Drawing?

It can be helpful to visualize the 3-D shape as an unfolded 3-Dimensional Shape

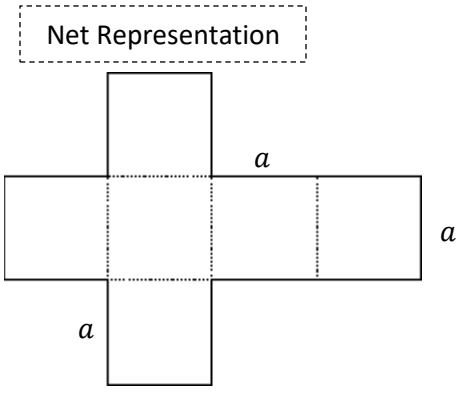
The unfolding of the shape into a flat 2-D surface is called **A Net Representation**

General Formulas

Cube:

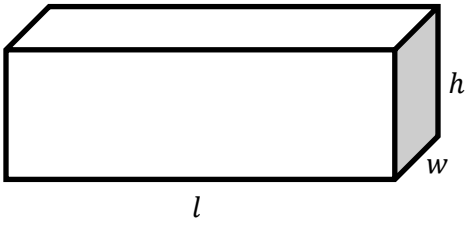


$6a^2$ *where a is the side length*

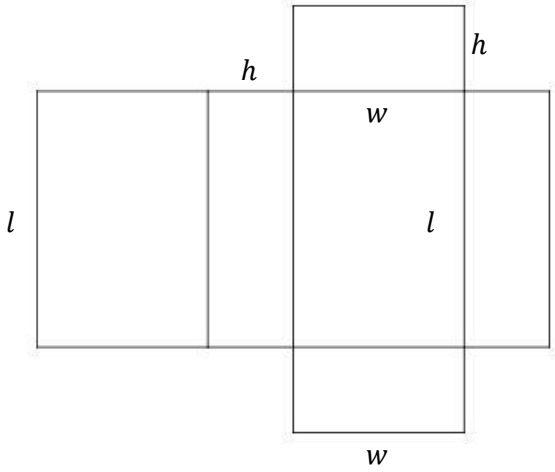


Rectangular Prism:

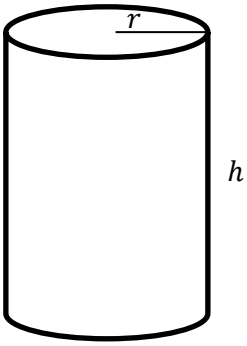
$2lw + 2lh + 2wh$



Net Representation



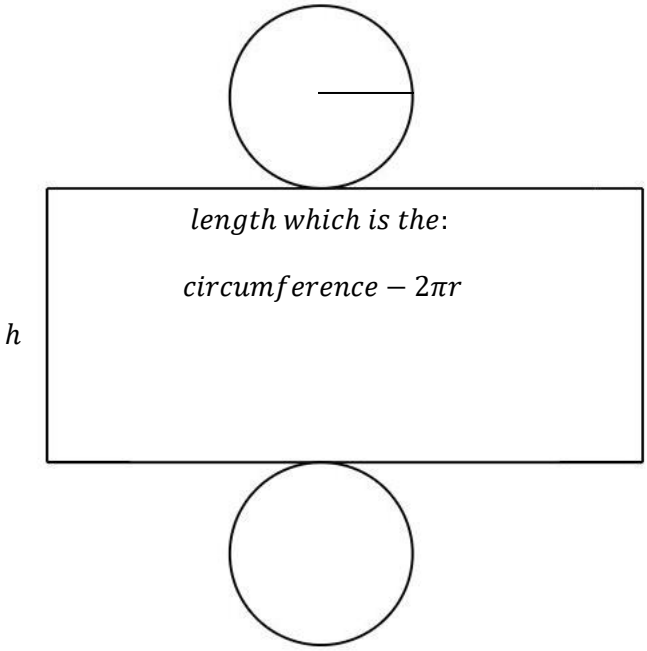
Cylinder:



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

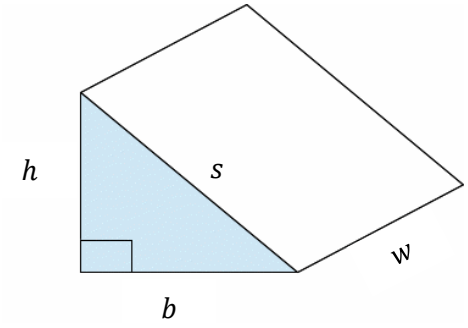
where $\boldsymbol{r}$ *is the* $\boldsymbol{radius}$ *of the circle*
and $\boldsymbol{h}$ *is the* $\boldsymbol{height}$ *of the cylinder*

Net Representation

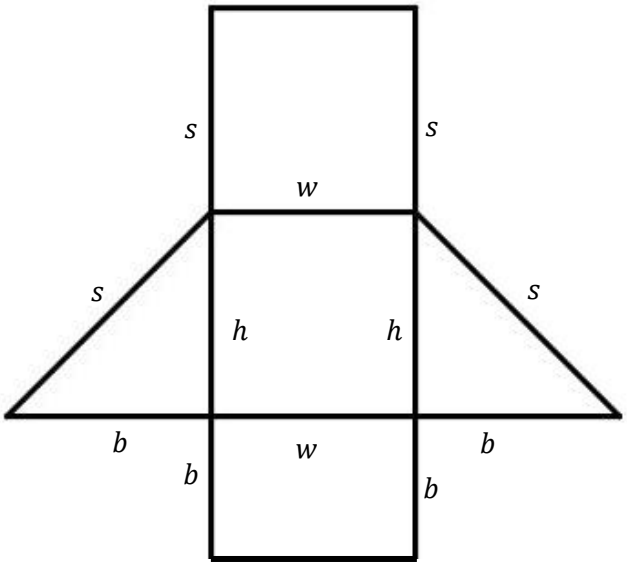


Right Triangular Prism:

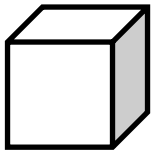
$$\frac{2(b*h)}{2} + (w*h) + (b*w) + (w*s)$$



Net Representation



Example: Solve the following using their Equations

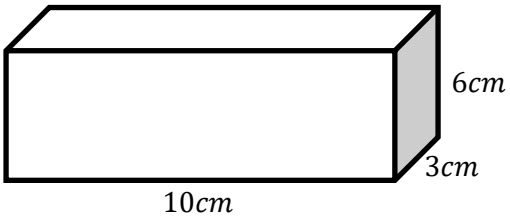


$$SA = 6a^2$$

$$SA = 6(4)^2$$

$$SA = 6(16) = 96\ cm^2$$

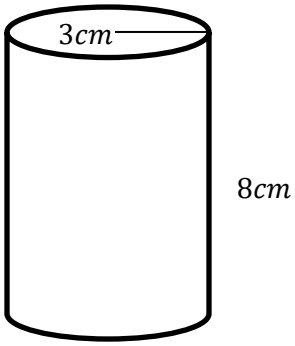
Example:



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

$$SA = 2(10)(3) + 2(10)(6) + 2(3)(6)$$

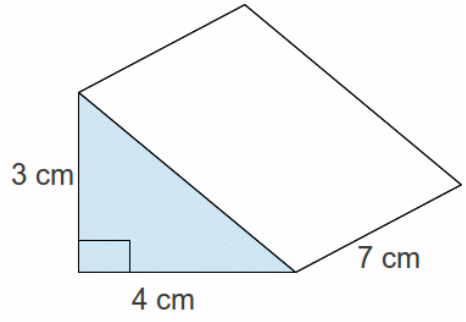
$$SA = 60 + 120 + 36 = 216\ cm^2$$



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

$$SA = 2\pi(3)^2 + 2\pi(3)(8)$$

$$SA = 18\pi\ + 48\pi = 66\pi\ cm^2$$



$$SA = All\ Areas\ Combined$$

$$SA = 2\frac{bh}{2} + bw + wh + ws$$

$$SA = (4)(3) + (4)(7) + (7)(3) + (7)(5)$$

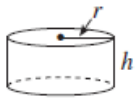
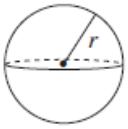
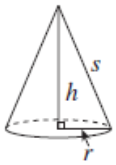
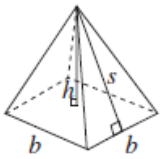
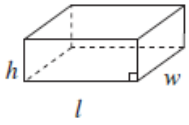
$$SA = 12 + 28 + 21 + 35 = 96\ cm^2$$

- When dealing with Right Prisms we can summon our good old Pythagorean Theorem to solve for unknown lengths on our Right Triangle $a, b, and\ c$
- Except that the Pythagorean Theorem in this case is:

$$b^2 + h^2 = s^2$$

$$base^2 + height^2 = (slant\ height)^2$$

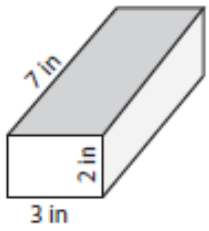
Surface Area and Volume General Formula Sheet

Geometric Solid	Surface Area	Volume
Cylinder 	$A_{top} = \pi r^2$ $A_{base} = \pi r^2$ $A_{side} = 2\pi rh$ $SA = 2\pi r^2 + 2\pi rh$	$V = (\text{area of base}) \times h$
Sphere 	$SA = 4\pi r^2$ **or** $SA = \pi d^2$	$V = \frac{4}{3}\pi r^3$
Cone 	$A_{side} = \pi rs$ $A_{base} = \pi r^2$ $SA = \pi r^2 + \pi rs$	$V = \frac{1}{3} \times (\text{area of base}) \times h$
Square-Based Pyramid 	$A_{triangle} = \frac{1}{2}bs$ (for each triangle) $A_{base} = b^2$ $SA = 2bs + b^2$	$V = \frac{1}{3} \times (\text{area of base}) \times h$
Rectangular Prism 	$SA = wh + wh + lw + lw + lh + lh$ **or** $SA = 2(wh + lw + lh)$	$V = (\text{area of base}) \times h$
General Right Prism	$SA =$ the sum of the areas of all the faces	$V = (\text{area of base}) \times h$
General Right Pyramid	$SA =$ the sum of the areas of all the faces	$V = \frac{1}{3} \times (\text{area of base}) \times h$

Section 3.2 – Practice Problems

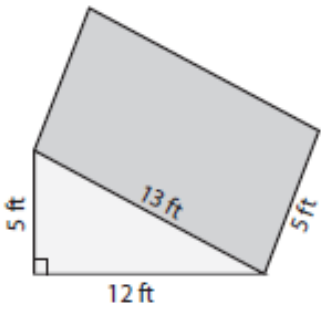
Find the Exact Surface Area of the following shapes, **draw nets** for all but the cones and spheres.
Round to 1 decimal place if necessary.

1)



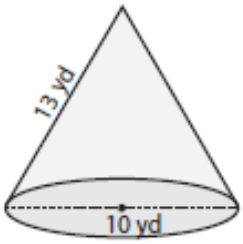
Surface Area = _____

2)



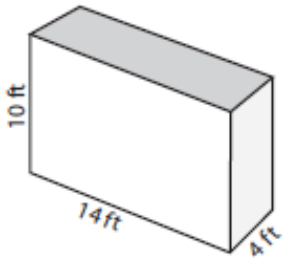
Surface Area = _____

3)



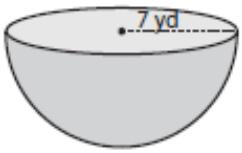
Surface Area = _____

4)



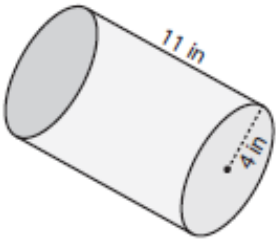
Surface Area = _____

5)



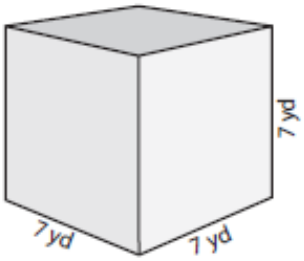
Surface Area = _____

6)



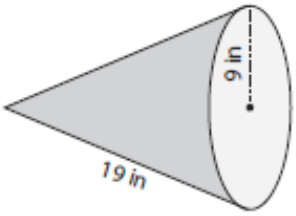
Surface Area = _____

7)



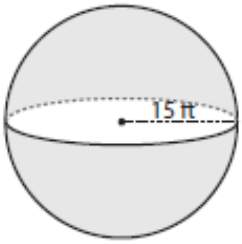
Surface Area = _____

8)



Surface Area = _____

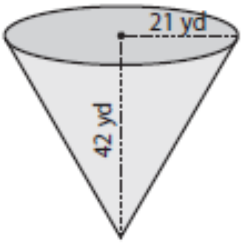
9)



Surface Area = _____

Find the Exact Surface Area of the following shapes. Round to 1 decimal place if necessary.

10)

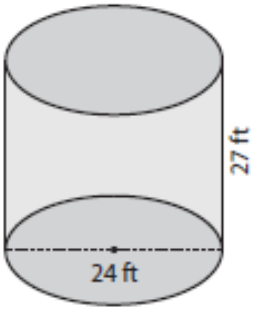


Surface Area = _____

11)

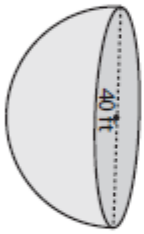
Surface Area = _____

12)



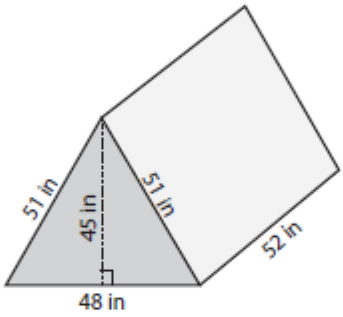
Surface Area = _____

13)



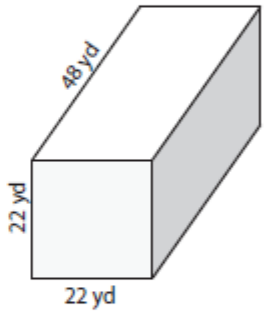
Surface Area = _____

14)



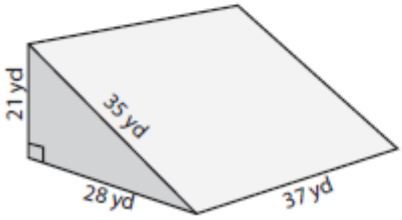
Surface Area = _____

15)



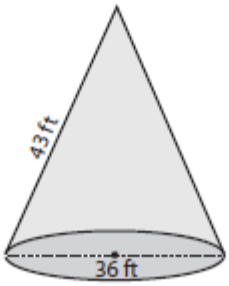
Surface Area = _____

16)



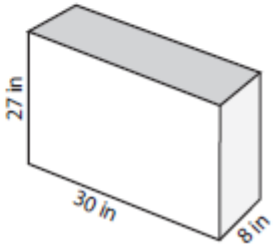
Surface Area = _____

17)



Surface Area = _____

18)



Surface Area = _____

Section 3.2 – Answer Key

1. $82in^2$
2. $210ft^2$
3. $282.7yd^2$
4. $472ft^2$
5. $461.8yd^2$
6. $377.0m^2$
7. $294.0yd^2$
8. $791.7in^2$
9. $2827.4ft^2$
10. $4486.2yd^2$
11. $2770in^2$
12. $2940.5ft^2$
13. $3769.9ft^2$
14. $9960in^2$
15. $5192yd^2$
16. $3696yd^2$
17. $3499.5ft^2$
18. $2532in^2$