Math 2202

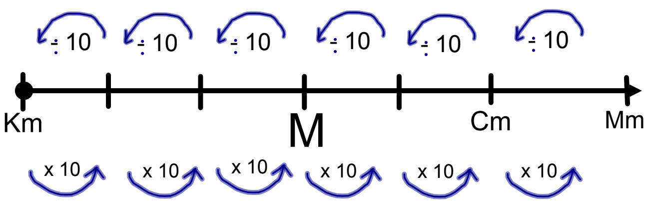
Unit 1

surface Areas

Systems of Measurement

The Metric System.

- to measure length, we use the Meter
- easier to convert units because everything is built on 10's



most used units:

km	kilometer	1000 meters
M	meter	
cm	centimeter	1/100 of a meter
mm	millimeter	1/1000 of a meter

The Imperial System

- the older system
- created mostly from reference tools (hands, fingers, etc.)
- there is no easy rule for converting, you have to use something different for each unit.

foot

(was the size of the kings foot)

3 feet make a yard

mile

(5280 feet)

1760 yards in a mile

inch

(man's thumb)

12 inches in a foot

yard

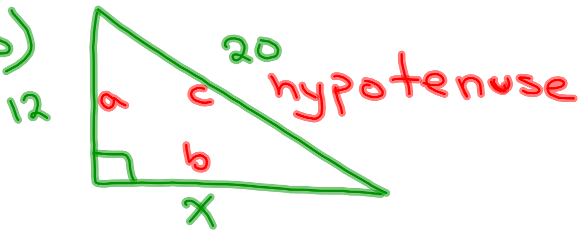
(size of 2 regular steps)

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

- the Pythagorean Theorem can be always used to find the missing 3rd side of a right angle triangle

b)



$$a^2 + b^2 = c^2$$
$$(12)^2 + b^2 = (20)^2$$
$$\cancel{144} + b^2 = 400$$
$$b^2 = 400 - 144$$
$$b^2 = 256$$
$$b = \sqrt{256} = 16$$

you will always do square root at the end.

Math 2202 Sept 6/13

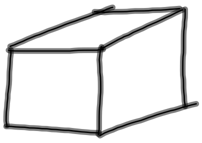
I. Geometry → Surface Area

Geometry is the study of the Real world; its shapes, angles, measurements and dimensions. Three-D shapes have 3 dimensions and are measured by...

1) Surface Area
   - the sum of all the areas of each side
   - measures the outside (walls) of a shape

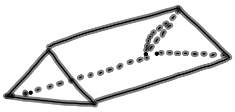
2) Volume
   - the total space inside a 3-D shape
   - measures how much space it can hold

Basic Shapes in 3D Geometry are...

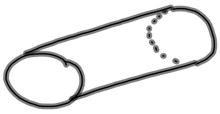


cube (all sides equal)

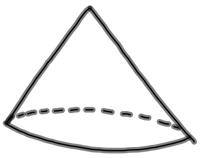
Rectangular Prism



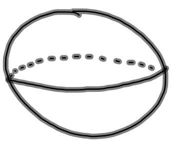
triangular Prism



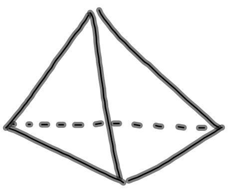
cylinder



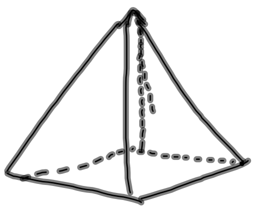
cone.



sphere.

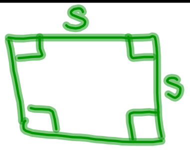


pyramids.



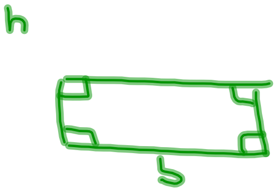
triangle base square base

First we need to review the formulas for 2D shapes: Area and Perimeter



Square $P = 4s$

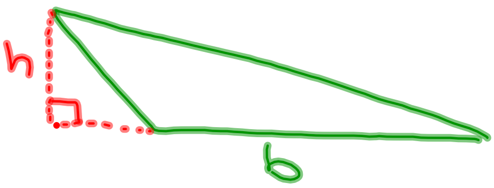
$A = s^2$



Rectangle $P = 2(b + h)$

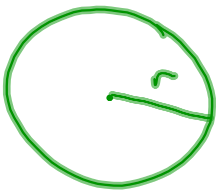
$A = bh$

triangle



P= add all sides

$A = \frac{1}{2}bh$



P → Circumference

$C = 2\pi r$ or πd

$A = \pi r^2$

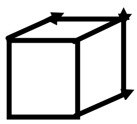
Nets of 3D shapes.

-All 3D shapes will have a surface area, equal to how much material is needed to make the object.

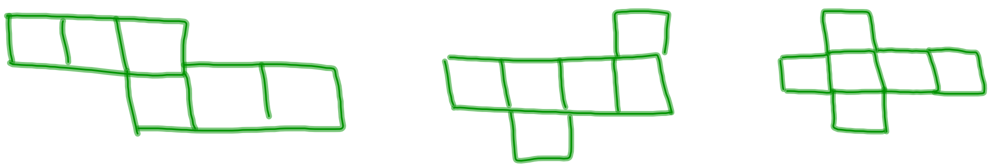
- we can see the surface area better sometimes if we break the shape apart and lay the sides down flat.

- The 'pattern' we get is called the net for the object.

Cube nets

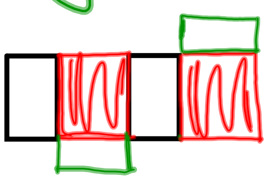


- there is more than one way to arrange the net of an object



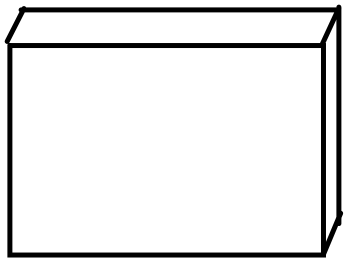
- each one is a proper net, as long as it can be folded to make the original shape

Rectangle nets.



Surface Area of Rectangular Prisms

p 7

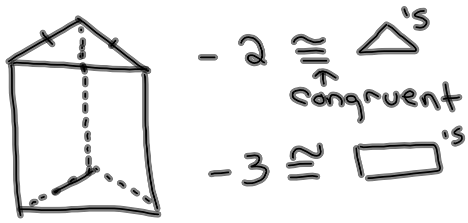


Calculate the Area of Each Side	# of Matching Faces	Total Area.

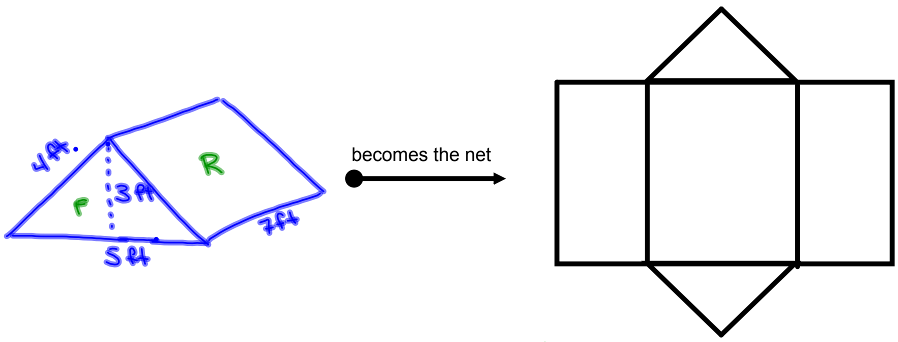
Note: to help calculate total Surface Area, you could start by drawing out the net so you can keep track of each side.

Surface Area of Triangular Prisms.

→ Special case prisms (equilateral triangles) are easy because the rectangles (sides) are the same.



→ most triangle Prisms are scalene (all 3 sides different.) It is best to use a net diagram for these because you have to see each side seperately.



SA △'s = $\frac{bh}{2} = \frac{5 \times 3}{2} = 7.5 \;\; \times 2 = 15 \text{ ft}^2$

SA base = $bh = 7 \times 5 = 35 \;\; \times 1 = 35 \text{ ft}^2$

SA sides = $bh = 7 \times 4 = 28 \;\; \times 2 = 56 \text{ ft}^2$

total 106 ft^2

Classwork pg 9

1.a) $A = \frac{b \times h}{2}$

$= \frac{(32)(12)}{2}$

$= 192\,m^2$

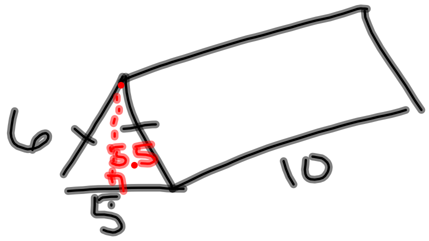
b) $A = \frac{1}{2} b h$

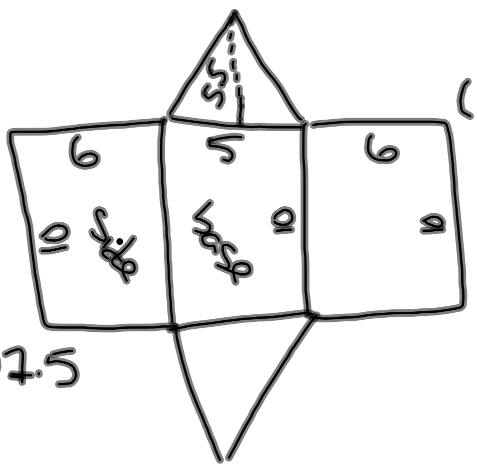
$= \frac{1}{2}(8)(8)$

$= 32\ ft^2$

3. $65\ ft^2$

5.





(a)

(b)

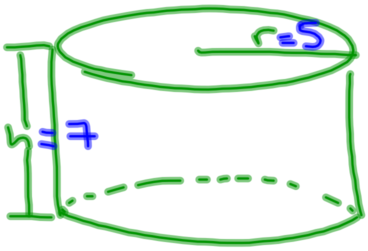
$SA\triangle = \frac{1}{2}bh = \frac{1}{2}(5)(5.5) = 27.5$

$SA\ base = (5)(10) = 50$

$SA\ sides = (6)(10) = 60 \times 2 = 120$

$197.5\ m^2$

Surface Area of Cylinders



$SA = 2\bigcirc^{5} + \square$

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

$SA = 2\pi(5)^2 + 2\pi(5)(7)$

$SA = 2\pi(25) + 2\pi(5)(7)$

$SA = 157. + 219.8$

$SA = 376.8$

pg 15.

Estimating Surface Area

Some jobs and calculations need very precise measurements, where others just need to be close. When 'just close' will do we can save a lot of time by doing an estimation. Just remember: when estimating, it is usually better to round up than down.

Ex:

Exact	Estimate
building a house	tree house
machine parts	rough plans
surgeon	painting a house
furniture	stone carving
scale model	
⋮	

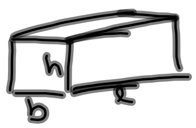
An estimate needs experience and a good reference. You should get used to using your "built in" references.

body part	measurement
thumb width	1 inch
foot	12 inches
1 hand width	6 inches
2 steps	1 yard (1 meter)
arm span	6 feet (2 meters)

p 28. Estimations → Accurate Calculations.

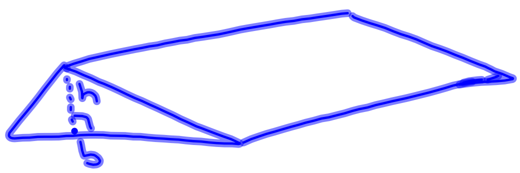
1-6

$A_{\text{Rec Prism}} = 2(b \times h) + 2(b \times l) + 2(h \times l)$

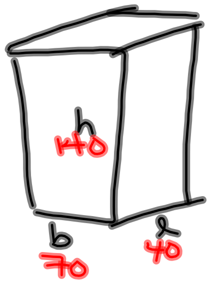


p 31.
1-5

$A_{\text{Triangle Prism}} = 2\left(\frac{1}{2} b \times h\right) + \text{sides}(b \times h)$

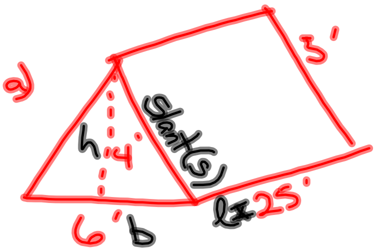


3a)



$$
\begin{aligned}
SA &= 2(b \times h) + 2(b \times l) + 2(h \times l) \\
&= 2(70 \times 140) + 2(70 \times 40) + 2(140 \times 40) \\
&= 2(9800) + 2(2800) + 2(5600) \\
&= 19600 + 5600 + 11200 \\
&= 36400 \text{ cm}^2
\end{aligned}
$$

p31 1a)



Isosceles $\triangle$

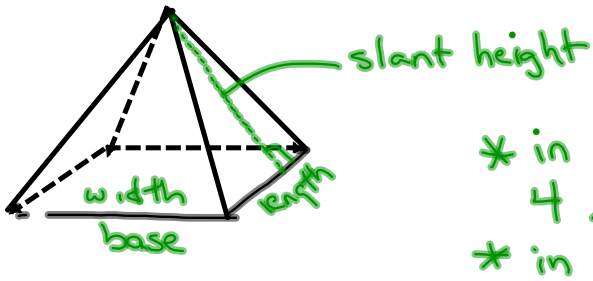
$$\overset{2\ \triangle\text{'s}}{SA = 2\left(\tfrac{1}{2}bh\right)} + \overset{2\text{ sides}}{2(l \times s)} + \overset{\text{base}}{(b \times l)}$$

$$= 2\left(\tfrac{1}{2}(6)\times(4)\right) + 2(25)(5) + (6)(25)$$

$$= 24 + 250 + 150$$

$$= 424\ ft^2$$

Surface Area of Pyramids



* in a square pyramid, all 4 △'s are the same
* in a rectangular pyramid, you will need to work on 2 different △'s

formula:

SA = Area of base + Area of △'s

Square pyr. $= (l \times w) + 4\left(\frac{1}{2}bh\right)$

↑ slant height

Ex pg 34

1a) $SA = (l \times w) + 4\left(\frac{1}{2}bh\right)$

$= (10 \times 10) + 4\left(\frac{1}{2} \times 10 \times 13\right)$

$= (100) + 4(65)$

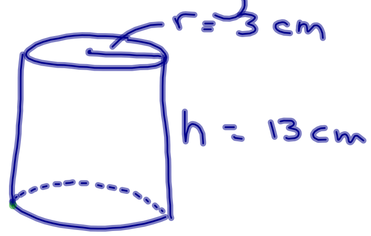
$= 100 + 260$

$= 360\ in^2$

finish pg 34 1-5

Pg 37. Surface Area of Cylinders

need:
radius
height



$$SA = 2 \text{ circles} + \text{rectangle}$$
$$= 2\pi r^2 + 2\pi r h$$
$$= 2\pi(3)^2 + 2\pi(3)(13)$$
$$= 56.5 + 245$$
$$= 301.5 \text{ cm}^2$$

Review of Formulas SA.

Rect Prism $= 2(b \times h) + 2(b \times l) + 2(l \times h)$

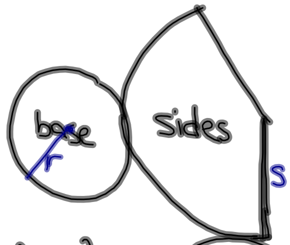
Triangle Prism $= \underbrace{2\left(\frac{b \times h}{2}\right)}_{\text{triangles}} + \underbrace{(l \times w) + (l \times w) + (l \times w)}_{\text{3 sides}}$

square Pyramids $= (l \times w) + 4\left(\frac{b \times h}{2}\right)$ *h = slant height

Cylinders $= \underbrace{2\pi r^2}_{\text{circles}} + \underbrace{2\pi r h}_{\text{side}}$

Surface Area of a Cone.

The net



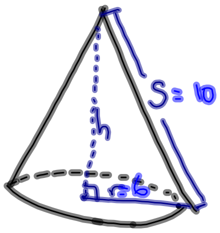
πr^2 πr^2

adjust for missing part

$\pi r s$

radius of base

slant height



Ex: $SA = \underbrace{\pi r^2}_{\text{circle base}} + \underbrace{\pi r s}_{\text{sides}}$

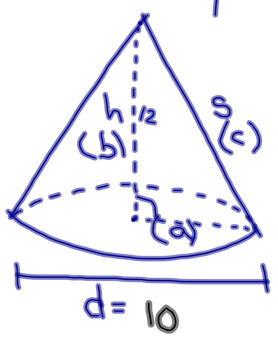
$= \pi(6)^2 + \pi(6)(10)$

$= 113 + 188.4$

$= 301.4\ cm^2$

Do...
pg 45. 1-7

? What if you don't have the slant height?



Find SA.

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

$\ast$ Use Pythagorean Th. to find s.

$a^2 + b^2 = c^2$

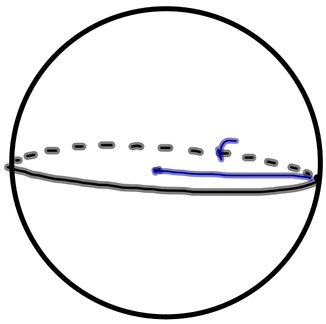
$(12)^2 + (5)^2 = c^2$

$144 + 25 = c^2$

$169 = c^2$

$c = \sqrt{169} = 13$

SA of Sphere.



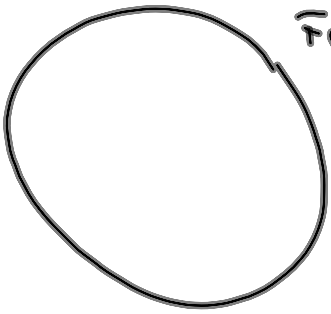
$SA = 4\pi r^2$

Pg 47-49
Cones & spheres

Examples Cones & Spheres

pg 45, 47-49

#4. Water on the earth.



Find SA $\times$ .71 = 142753, 709 mi^2

water covering

$4\pi r^2$

$4\pi(4000)^2$

$4\pi(16000000)$

201061930

Do