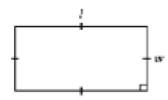
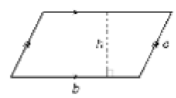
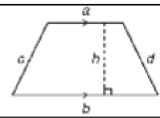
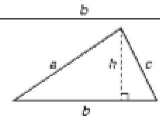
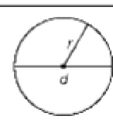
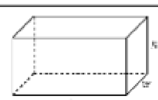
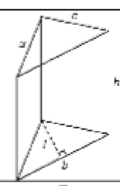
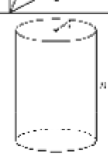
MBF 3C1 Name: ____________________________

Solving Problems with Geometry

When using geometry to solve problems it is important to consider constraints. **Constraints** are conditions that limit or restrict options. Examples of constraints include maximum Cost min/max size, safety regulations, energy efficiency, or performance. Architects, engineers, fashion designers and other professionals deal with these types of constraints every day.

MEASUREMENT FORMULAS:

2-DIMENSIONAL SHAPE	DIAGRAM	PERIMETER FORMULA	AREA FORMULA
rectangle		$P = 2l + 2w$ (for a square $P = 4s$)	$A = lw$ (for a square $A = s^2$)
parallelogram		$P = 2b + 2c$	$A = bh$
trapezoid		$P = a + b + c + d$	$A = \frac{(a+b)h}{2}$
triangle		$P = a + b + c$	$A = \frac{bh}{2}$
circle		$C = \pi d$ or $C = 2\pi r$	$A = \pi r^2$

3-DIMENSIONAL OBJECT	DIAGRAM	SURFACE AREA FORMULA	VOLUME FORMULA
rectangular prism		$SA = 2lw + 2wh + 2lh$	$V = lwh$
triangular prism		$SA = bl + ah + bh + ch$	$V = \frac{blh}{2}$
cylinder		$SA = 2\pi r^2 + 2\pi rh$	$V = \pi r^2 h$

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Example 1

Sometimes, basic safety considerations depend on understanding nets and volumes. Consider an engineer who needs to design a square-based berm (a shallow container to prevent the spread of oil from a leaking oil tank). The cylindrical oil tank is 20 m in diameter, and has a height of 20 m. The berm must have a height of 5 m.

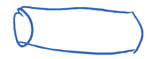
a. Make the appropriate calculations to find the minimum dimensions of the berm.

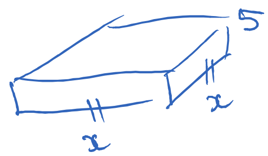
Max Volume of oil if tank is full

$V=\pi r^2 h$

$V=\pi(10)^2(20)$

$V \doteq 6283\ m^3$





$V=lwh$

$6283=(x)(x)5$

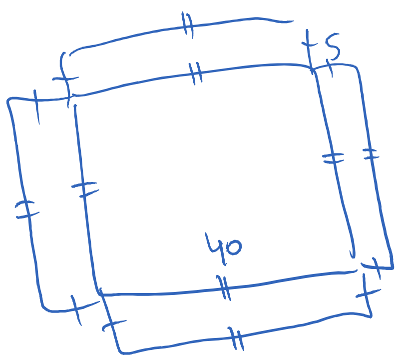
$1256.6=x^2$

$35.4=x$

safer to overestimate

$\therefore$ dimensions of berm are 40 m by 40 m by 5 m

b. Select a suitable scale. Draw a net for the berm and a net for the oil tank.



$C=2\pi r$

$C=2\pi(10)$

$C \doteq 63$