Math 1030 #17d
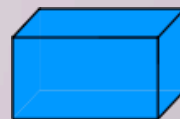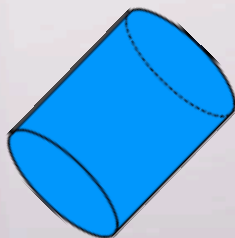
Fundamentals of Geometry

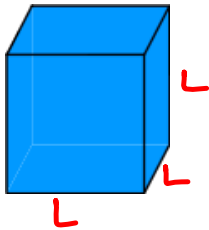## Scaling
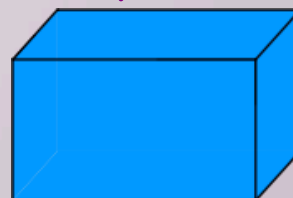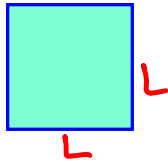
$P = 4L$

$A = L^2$

double	triple	quintuple
$2L$ scale factor = 2	$3L$ scale factor = 3	$5L$ scale factor = 5
$P_2 = 4(2L)$ $= 8L = \boxed{2P}$	$P_3 = 4(3L)$ $= 12L = 3(4L)$ $= \boxed{3P}$	$P_5 = 4(5L)$ $= 5(4L) = \boxed{5P}$
$A_2 = (2L)^2$ $= 2^2 L^2 \boxed{2^2 A}$	$A_3 = (3L)^2$ $= 3^2 L^2 = \boxed{3^2 A}$	$A_5 = (5L)^2$ $= 5^2 L^2 = \boxed{5^2 A}$

(row labels: L, P, A)

$SA = 6L^2$

$V = L^3$

| double	triple	quintuple
$2L$ scale factor = 2	$3L$ scale factor = 3	$5L$ scale factor = 5
$S_2 = 6(2L)^2$ $= 2^2(6L^2)$ $= \boxed{2^2 SA}$	$S_3 = 6(3L)^2$ $= 3^2(6L^2)$ $= \boxed{3^2 SA}$	$S_5 = 6(5L)^2$ $= 5^2(6L^2)$ $= \boxed{5^2 SA}$
$V_2 = (2L)^3$ $= \boxed{2^3 V}$	$V_3 = (3L)^3 = 3^3 L^3$ $= \boxed{3^3 V}$	$V_5 = (5L)^3$ $= 5^3 L^3 = \boxed{5^3 V}$

(row labels: L, SA, V)

Scaling a 2D Object

scale factor 3

EX 1: If you <u>triple</u> all sides of a 3-ft by 5-ft patio, how do the area and perimeter of the new patio compare with the old?
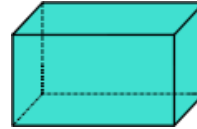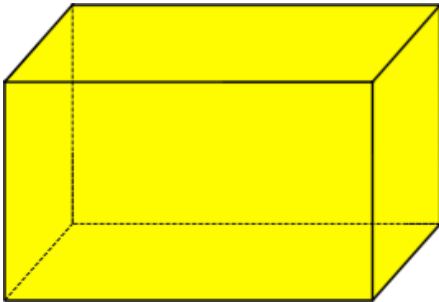
new P = 3 * old perimeter

new A = 3^2 * old area

= 9 * old area

5ft

3 ft
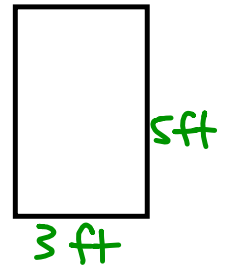
Scaling a 3D Object

EX 2:

a) If the smaller box above can be painted with 2 cans of paint, how many cans will it take to paint a similar box with dimensions four times as large?

is this asking about Surface area or volume? we want surface area.

scale factor = 4 ⟹ surface area scale factor = 4^2

⟹ we need $4^2(2) = 16(2) = 32$ cans of paint.

b) If the larger box holds 512 cubic centimeters of styrofoam pebbles, how much will the smaller box hold?

this is a volume question.

volume scale factor = $4^3 = 64$ ⟹ large box has 64 times bigger volume than small box

$512 \text{ cm}^3 = V_{sm}(64)$

$V_{sm} = 8 \text{ cm}^3$

c) If one wants to tape the larger box in all 3 directions, how much more tape must one have than it took to tape the smaller one?

length of tape is a 1-d measurement

⟹ length of tape scale factor = $4^1 = 4$

⟹ we need 4 times as much tape

EX 3: A model version of a T-Rex is 2 feet tall with a surface area
of 3 square feet and volume of 1 cubic foot. If the actual T-Rex
(which is proportionally identical to the model) is 18 feet tall,
what is the volume and surface area?

scale factor	small	real
ht	9	2 ft	18 ft
S	$9^2 = 81$	3 ft^2	$3(81) = 243$ ft^2
V	$9^3 = 729$	1 ft^3	$1(729) = 729$ ft^3