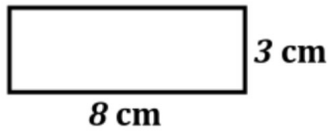
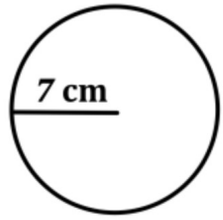
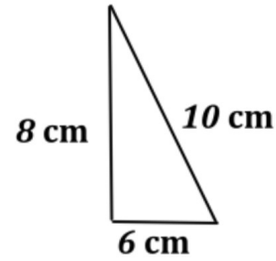
Determine the perimeter and area of each shape.



$P = 2(L+W)$
$P = 2(8+3)$
$P = 2(11)$
$P = 22\text{ cm}$
$A = L \times W$
$A = 8 \times 3$
$A = 24\text{cm}^2$

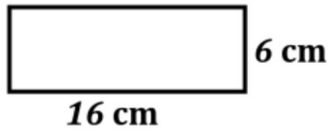


$C = 2\pi r$
$C = 2 \times \pi \times 7$
$C = 44\text{cm}$
$A = \pi r^2$
$A = \pi \times 7^2$
$A = 154\text{cm}^2$

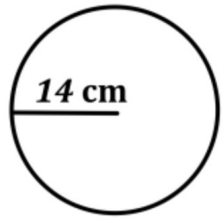


$P = a+b+c$
$P = 8+6+10$
$P = 24\text{cm}$
$A = \frac{a \times b}{2}$
$A = \frac{8 \times 6}{2}$
$A = 24\text{cm}^2$

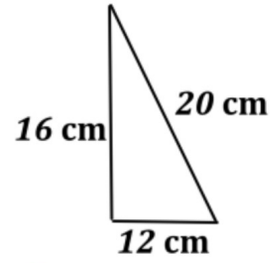
Determine the perimeter and area of each shape, this time, doubling each dimension.



$P = 2(L+W)$
$P = 2(16+6)$
$P = 2(22)$
$P = 44\text{cm}$
$A = L \times W$
$A = 16 \times 6$
$A = 96\text{cm}^2$



$C = 2\pi r$
$C = 2 \times \pi \times 14$
$C = 88\text{cm}$
$A = \pi r^2$
$A = \pi \times 14^2$
$A = 616\text{cm}^2$

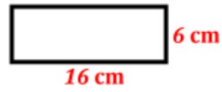


$P = a+b+c$
$P = 16+12+20$
$P = 48\text{ cm}$
$A = \frac{a \times b}{2}$
$A = \frac{16 \times 12}{2}$
$A = 96\text{cm}^2$

What effect does doubling a shapes dimensions have on its perimeter and area?

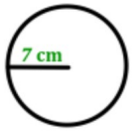
Perimeter = 22 cm

Area = 24 cm²



Perimeter = 44 cm

Area = 96 cm²



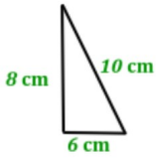
Perimeter = 44 cm

Area = 154 cm²

Perimeter = 88 cm

Area = 616 cm²

Scale factor is the change in dimensions



Perimeter = 24 cm

Area = 24 cm²

Perimeter = 48 cm

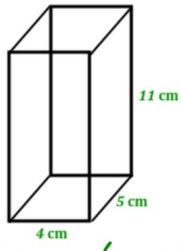
Area = 96 cm²

Perimeter → Perimeter × scale factor

Area → Area × scale factor squared

Is the same true for 3-dimensional shapes?

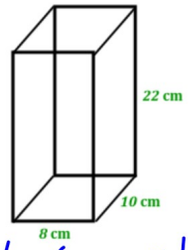
Determine the volume and surface area of the following shapes.



Vol = l × w × h

V = 4 × 5 × 11

V = 220 cm³



Vol = l × w × h

V = 8 × 10 × 22

V = 1760 cm³

×8 (2³)

Surface Area = 2(lw + wh + lh)

= 2(4×5 + 5×11 + 4×11)

= 2(20 + 55 + 44)

= 2(119)

= 238 cm²

×4 (2²)

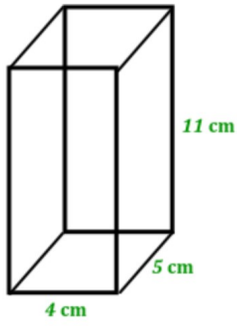
= 2(8×10 + 10×22 + 8×22)

= 2(80 + 220 + 176)

= 2(476)

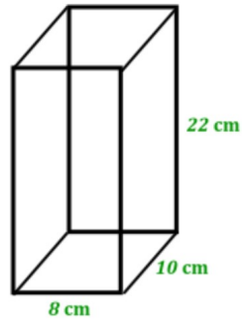
= 952 cm²

Determine the volume and surface area of the following shapes.



Surface Area = *238* cm²

Volume = *220* cm³



Surface Area = *952* cm²

Volume = *1760* cm³

Surface area → Surface area × Scale factor squared

Volume → Volume × Scale factor cubed

MTH1W Grade 9 Mathematics

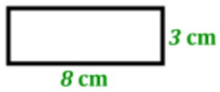
6.7 Effects of Changing Dimensions

Goal(s) *- Investigate how changing one or more dimensions of a 2D or 3D shape/ object affects the perimeter/circumference, area, surface area, and volume*

Jun 19-8:29 AM

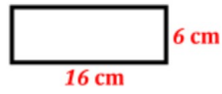
When changing **all** the dimensions of a figure to create a new figure...

The **perimeter changes by the same amount *as the scale factor*** of the dimensions.



Perimeter = *22 cm*

Figure 1



Perimeter = *44 cm*

Figure 2

*Side lengths of Figure 2 are **2 times** those of Figure 1.*

*The perimeter of Figure 2 is **2 times** that of Figure 1.*

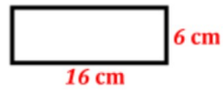
Scale factor is the value that the dimensions have been multiplied by.

When changing **all** the dimensions of a figure to create a new figure...

The **area changes by the *square of the scale factor***.

Area = *24 cm²*

Figure 1



Area = *96 cm²*

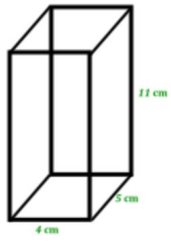
Figure 2

*Side lengths of Figure 2 are **2 times** those of Figure 1.*

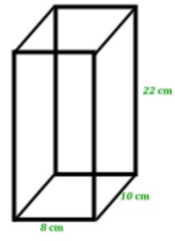
*The area of Figure 2 is **$2^2 = 4$ times** that of Figure 1.*

When changing **all** the dimensions of a figure to create a new figure...

The **surface area changes by the *square of the scale factor***.



Surface Area = 238 cm²



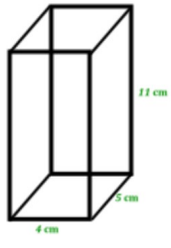
Surface Area = 952 cm²

*Side lengths of Figure 2 are **2 times** those of Figure 1.*

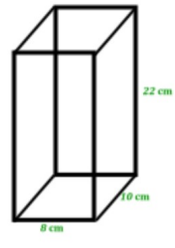
*The surface area of Figure 2 is $2^2 = 4$ **times** that of Figure 1.*

When changing **all** the dimensions of a figure to create a new figure...

The **volume changes by the *cube of the scale factor***.



Volume = 220 cm³

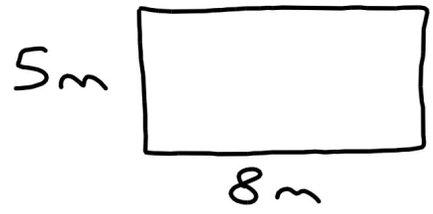


Volume = 1760 cm³

*Side lengths of Figure 2 are **2 times** those of Figure 1.*

*The volume of Figure 2 is $2^3 = 8$ **times** that of Figure 1.*

A rectangle has a width of **5 m** and a length of **8 m**. Determine the **perimeter** and **area** of a similar shape where the sides are three times as long.



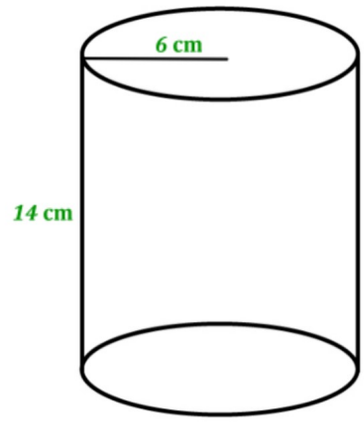
$P = 2(l+w)$
$P = 2(8+5)$
$P = 2(13)$
$P = 26\text{m}$

$A = l \times w$
$A = 8 \times 5$
$A = 40\text{m}^2$

Sides are $\times 3$
$\Rightarrow P = 26 \times 3$
$P = 78\text{m}$

$\Rightarrow A = 40 \times 3^2$
$A = 360\text{m}^2$

Given the following cylinder:



How would the volume change if the height and radius were quadrupled?

dimensions are $\times 4$
$\Rightarrow$ Volume $\rightarrow$ Vol $\times 4^3$
$= \text{Vol} \times 64$

How would the volume change if the height and radius were halved?

dimensions are $\times \frac{1}{2}$
$\Rightarrow$ Volume $\rightarrow \text{Vol} \times \left(\frac{1}{2}\right)^3$
$= \text{Vol} \times \frac{1}{8}$ (or $\text{Vol} \div 8$)