Solutions

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1. A square has a side length of 3 cm.

a) Determine the perimeter and area of the square.

b) If the square's side length is doubled, what is the resulting perimeter? Area?

c) How many times greater is the square's perimeter after its side length is doubled?

d) How many times greater is the square's area after its side length is doubled?

a) Perimeter $= 4s$
$= 4(3)$
$= 12\text{cm}$

Area $= s^2$
$= 3^2$
$= 9\text{cm}^2$

b) Perimeter $= 4s$
$= 4(6)$
$= 24\text{cm}$

Area $= s^2$
$= 6^2$
$= 36\text{cm}^2$

c) Twice as big.
$\frac{24}{12} = 2$

d) Four times as big.
$\frac{36}{9} = 4$

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3. A circular vegetable garden has radius of 2 m.

a) Determine the circumference and area of the garden.

b) If the garden's radius is tripled, what is the resulting circumference? Area?

c) How many times greater is the garden's circumference after its radius is tripled?

d) How many times greater is the garden's area after its radius is tripled?

e) Why does tripling the radius have a greater effect on the area than it does on the circumference?

a) $C = 2\pi r$
$= 2\pi(2)$
$= 12.6\text{m}$

$A = \pi r^2$
$= \pi(2)^2$
$= 12.6\text{m}^2$

b) $C = 2\pi r$
$= 2\pi(6)$
$= 37.7\text{m}$

$A = \pi r^2$
$= \pi(6)^2$
$= 113.1\text{m}^2$

c) Three times greater.
$\frac{37.7}{12.6} \approx 3$

d) Nine times greater.
$\frac{113.1}{12.6} \approx 9$

e) Greater effect because the radius is squared

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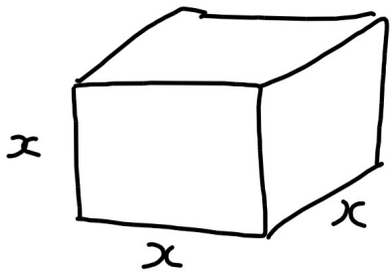
8. Show that tripling the edge length of a cube always has the same effect on the cube's volume, regardless of the cube's initial edge length.



length = width = height for a cube

$\text{Vol} = (wh$
$= (x)(x)(x)$
$= x^3$

Tripling the lengths
$\text{Vol} = (3x)(3x)(3x)$
$= 27x^3$

It doesn't matter what the original length is, the volume will always be 27x greater.

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9. Describe how each of the following would affect the volume of a cylinder.

a) doubling the height b) doubling the radius c) tripling the height

d) tripling the radius e) halving the height f) halving the radius

$$\text{Volume}_{\text{cylinder}} = \pi r^2 h$$

a) Double height → Double volume

b) Double radius → Four times volume (2^2)

c) Triple height → Triple volume

d) Triple radius → Nine times volume (3^2)

e) Halving height → Half the volume

f) Halving radius → Quarter the volume $\left(\frac{1}{2}\right)^2$

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13. A cylinder has a circular base with an area of 40 cm^2 and a height of 60 cm. Determine the volume of a cone that has five times the radius and six times the height of the cylinder.

Area cylinder base $= \pi r^2$
$= 40\text{ cm}^2$

Height of cylinder $= h$
$= 60\text{ cm}^2$

Volume cylinder $= \pi r^2 h$
$= (40)(60)$
$= 2400\text{cm}^3$

"New" cylinder $= \pi(5r)^2$
$= 25\pi r^2$
$= 25(40)$
$= 1000\text{ cm}^2$

"New" height $= 6h$
$= 6(60)$
$= 360\text{ cm}$

"New" volume $= 25\pi r^2(6h)$
$= 1000 \times 360$
$= 360{,}000\text{cm}^3$

Volume of cone $= \frac{1}{3} \times$ volume of cylinder
$= \frac{1}{3} \times 360{,}000$
$= 120{,}000\text{cm}^3$

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