



Concept: Exponents in Formulas

Name:

COMPUTER COMPONENT

Instructions: Select the computer program *Understanding Exponents* (Neufeld)
Follow the instructions to the Main Menu.
Select *Exponents in Formulas* from the Main Menu.



Work through all sections of this topic **in order**:

- *The Power Key*
- *An Introduction to Formulas*
- *Area Formulas involving Exponents*
- *Volume Formulas Involving Exponents*
- *Examples with Area Formulas*
- *Examples with Volume Formulas*
- *Practice Questions*

Additional Required Materials: *Scientific calculator*



As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Practice Questions* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

NOTES

The power keys are often labeled as:

$$x^y$$

$$x^y$$






$$x^{\wedge}y$$









Locate the power key on your calculator.

Experiment with your own calculator. Record the steps you would use on your calculator in order to find:

(a) 3^5 (*Answers will vary*)

Our Calculator	View Window	Your Calculator	View Window
	0.		
	3.		
	3.		
	5.		
	243.		

(b) $(-3)^5$ (*Answers will vary*)

Our Calculator	View Window	Your Calculator	View Window
	0.		
	3.		
	-3.		
	-3.		
	5.		
	-243.		

(c) $2^6 + 6^3$ (Answers will vary)

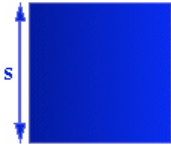
Your Calculator	View Window
	280

Remember:

- $\pi = 3.1416$
- *Include the units*
- *Round to three decimal places*

Area Formulas Involving Exponents

Record the formulas for the different shapes:



Area of a **square**

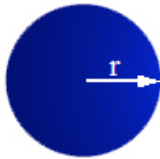
$$Area = S^2$$

Practice:

The side of the block is 3.5 m . *Calculate the area of the square.*

$$= (3.5)^2$$

$$= 12.25m^2$$



Area of a **circle**

$$Area = pr^2$$

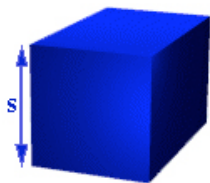
Practice:

The radius of the circle is 4.2 cm. *Calculate the area of the circle.*

$$= 3.1416(4.2)^2$$

$$= 3.1416(17.64)$$

$$= 55.418 cm^2$$



Surface area of a **cube**

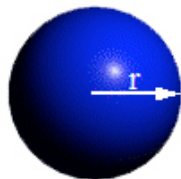
$$Area = 6s^2$$

Practice:

The side of the cube is 3.2 m. *Calculate the surface area of the cube.*

$$= 6(3.2)^2$$

$$= 61.44m^2$$



Surface area of a **sphere**

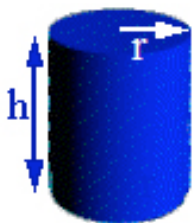
$$Area = 4\pi r^2$$

Practice:

The radius of the sphere is 1.2cm. *Calculate the surface area of the sphere.*

$$= 4(3.1416)(1.2)^2$$

$$= 18.1cm^2$$



Surface area of a **cylinder**

$$Area = 2pr^2 + 2prh$$

Practice:

The cylinder has a radius of 0.8cm with a height of 4m. *Calculate the surface area of the cylinder.*

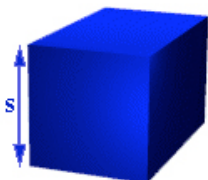
$$= 2(3.1416)(0.8)^2 + 2(3.1416)(0.8)(4)$$

$$= 4.021 + 20.106$$

$$= 24.127 \text{ cm}^2$$

Volume Formulas Involving Exponents

Record the formulas for the different shapes:



Volume of a **cube**

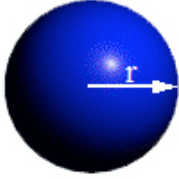
$$Volume = s^3$$

Practice:

The side of the cube is 3.2 m. *Calculate the volume of the cube.*

$$= (3.2)^3$$

$$= 32.768 \text{ m}^3$$



Volume of a **sphere**

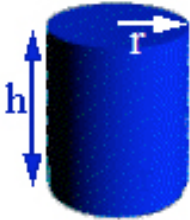
$$Volume = \frac{4}{3}pr^3$$

Practice:

The radius of the sphere is 1.2 m. *Calculate the volume of the sphere.*

$$= \frac{4}{3}(3.1416)(1.2)^3$$

$$= 7.236 \text{ m}^3$$



Volume of a **cylinder**

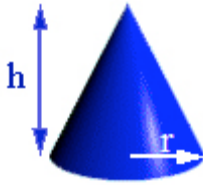
$$Volume = pr^2h$$

Practice:

The cylinder has a radius of 0.8cm with a height of 4m. *Calculate the volume of the cylinder.*

$$= (3.1416)(0.8)^2(4)$$

$$= 8.042 \text{ m}^3$$



Volume of a **cone**

$$Volume = \frac{1}{3}pr^2h$$

Practice:

The cone has a radius of 0.8cm with a height of 4m. *Calculate the volume of the cone.*

$$\begin{aligned} &= \frac{1}{3}(3.1416)(0.8)^2(4) \\ &= 2.678 m^3 \end{aligned}$$

OFF COMPUTER EXERCISES

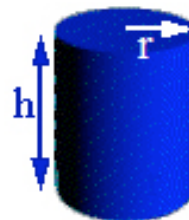
- For each of the following expressions, substitute the given value and then evaluate the expression.

$$\begin{aligned} \text{(a) } & -3x^2 - y^3 \quad \text{when } x = -1 \text{ and } y = 2 \\ &= -3(-1)^2 - (2)^3 \\ &= -11 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & -2x^2 - 3y^2 \quad \text{when } x = -3 \text{ and } y = -4 \\
 & = -2(-3)^2 - 3(-4)^2 \\
 & = -66
 \end{aligned}$$

2. You are asked to paint the following cylindrical water tank. This means that you must find its surface area in order to know how much paint to buy. *Find its surface area to one decimal place if the height is 4m and the radius is 1m.*

$$\begin{aligned}
 \text{Area} &= 2\pi r^2 + 2\pi rh \\
 &= 2(3.1416)(1)^2 + 2(3.1416)(1)(4) \\
 &= 31.4 \text{ m}^2
 \end{aligned}$$

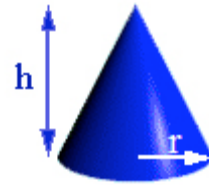


3. Find the volume of the tank in question 2 to two decimal places.

$$\begin{aligned}
 \text{Volume} &= \pi r^2 h \\
 &= (3.1416)(1)^2(4) \\
 &= 12.6 \text{ m}^3
 \end{aligned}$$

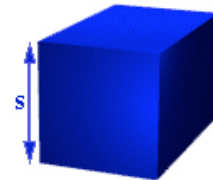
4. When farmers bring their wagons filled with cobs of corn to the local grain elevator, the corn is removed from the cob. The remainder of the cob is then taken by a conveyor belt to be stored in a pile which is the shape of a cone.

- (a) If the height of the conical pile is 40m and its radius is 20m, what is the volume of the pile of cobs?



$$\begin{aligned} \text{Volume of Cone} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (20 \text{ m})^2 (40 \text{ m}) = \frac{1}{3} \pi (400)(40) \approx \boxed{16746 \text{ m}^3 \text{ of corn}} \end{aligned}$$

- (b) Trucks with cubic containers (of which each side is 2.5m) are hired to remove the pile. How many trips must the trucks make in order to move the entire pile?



$$\begin{aligned} \text{Volume of One Truckload} &= s^3 = (2.5)^3 = 15.625 \text{ m}^3 \\ \text{Number of Truckloads} &= 16746 \div 15.625 \approx \boxed{1072 \text{ loads}} \end{aligned}$$