Lesson: Substitution

When an expression includes variables (letters) we can evaluate the expression if we are given numerical values for the variables. We see this regularly when using formulas.

Example 1:
A = l x w Find the area of a rectangle if the length if 8cm and the width is 6cm.

$A = l \times w$ $l = 8cm$ $w = 6cm$

$= (8) \times (6)$

$= 48cm^2$

∴ The area is $48cm^2$

Example 2:
Evaluate 2x + 1, for x = 4

$= 2(4) + 1$

$= 8 + 1$

$= 9$

When substituting, it is important to use brackets → especially if you have integer values.
*** and don't forget to follow BEDMAS!**

Example 3:
Evaluate –7y, for y = –3

$= -7(-3)$

$= +21$

Example 4: Evaluate
a + 2b, if a = 8 and b = –3

$= 8 + 2(-3)$

$= 8 - 6$

$= 2$

Example 5: Evaluate
a(b + 2c), if a = 2, b = 3, c = 5

$= 2[3 + 2(5)]$

$= 2(3 + 10)$

$= 2(13)$

$= \boxed{26}$

Example 6: Evaluate
a^2 – 2b + c, if a = –1, b = –3, c = 2

$= (-1)^2 - 2(-3) + 2$

$= 1 + 6 + 2$

$= \boxed{9}$

Practice: Substitution

Evaluate a-f given x = 3, y = 2, and z = -1

a. $\left(\frac{x}{y}\right)^3$

$=\left(\frac{3}{2}\right)^3$

$=\left(\frac{3}{2}\right)\left(\frac{3}{2}\right)\left(\frac{3}{2}\right)$

$=\frac{3\times3\times3}{2\times2\times2}$

$=\boxed{\frac{27}{8}}$

b. 3.1^y

$=(3.1)^2$

$=(3.1)(3.1)$

$=9.61$

c. $\frac{y}{x}-\frac{x}{y}$ LCM = 6

$=\frac{2^{\times2}}{3_{\times2}}-\frac{3^{\times3}}{2_{\times3}}$

$=\frac{4}{6}-\frac{9}{6}$

$=\frac{4-9}{6}$

$=\boxed{-5/6}$

d. x + y + z

$=(3)+(2)+(-1)$

$=\boxed{4}$

e. xyz

$=(3)(2)(-1)$

$=\boxed{-6}$

f. $\frac{x+y}{z}$

$=\frac{3+2}{-1}$

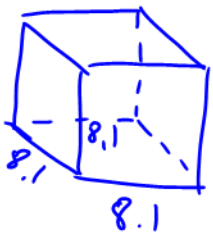
$=\frac{5}{-1}$

$=\boxed{-5}$

g. A movie theatre wants to compare the volumes of popcorn in two containers, a cube with edge length of 8.1cm and a cylinder with a radius of 4.5cm and height of 8.0cm. Which container holds more popcorn?

Formula: Cube $V = s^3$ Cylinder $V = \pi r^2 h$

(1)



$V = s^3$ $s = 8.1$

$=(8.1)^3$

$=(8.1)(8.1)(8.1)$

$=531.44\,cm^3$

(2)

$V = \pi r^2 h$ $\pi = 3.14$, $r = 4.5$, $h = 8$

$=(3.14)(4.5)^2(8)$

$=(3.14)(4.5)(4.5)(8)$

$=508.68\,cm^3$

∴ The cube holds more popcorn because its volume is larger than cyclinder's.

ANSWERS: a) 27/8, b) 9.61. c)-5/6, d) 4, e) -6, f) -5, g) the cube