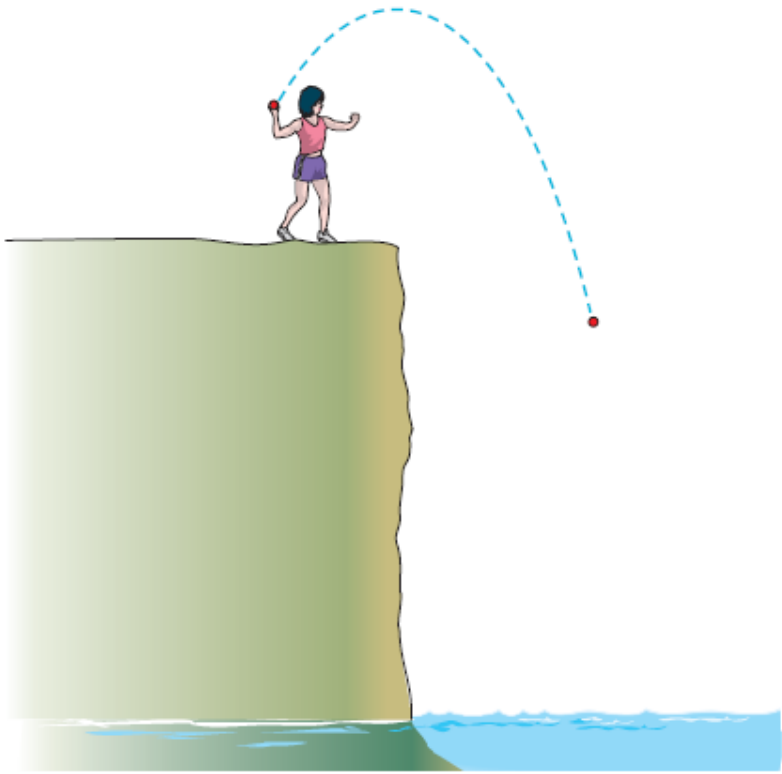


2.2 – Multiplying Polynomials

- GOAL – Simplify polynomials by multiplying.



In a physics textbook, Kristina reads about an experiment in which a ball is thrown upward from the top of a cliff, ultimately landing in the water below the cliff. The height of the ball above the cliff, $h(t)$, and its velocity, $v(t)$, at time t are respectively given by

$$h(t) = -5t^2 + 5t + 2.5$$

and

$$v(t) = -10t + 5$$

Kristina learns that the product of the 2 functions allows her to determine whether the ball is moving toward or away from the top of the cliff.

How can she simplify the equation for $v(t) \times h(t)$?

Physics Problem cont'd

$$v(t)h(t) = (-10t + 5)(-5t^2 + 5t + 2.5)$$

$$= (-10t)(-5t^2 + 5t + 2.5) + (5)(-5t^2 + 5t + 2.5)$$

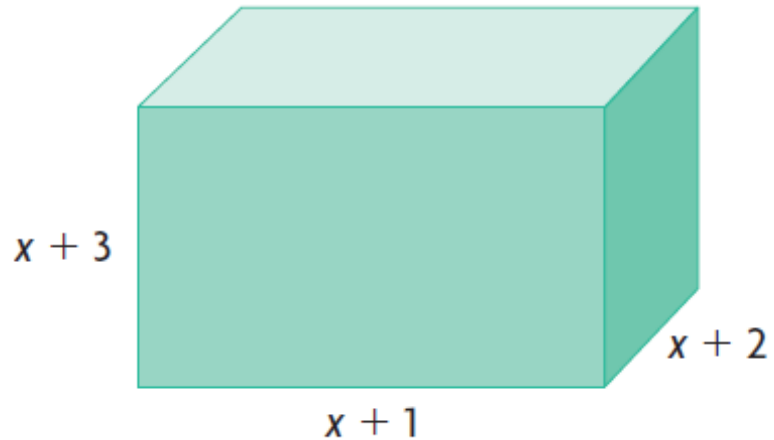
$$= (50t^3 - 50t^2 - 25t) + (-25t^2 + 25t + 12.5)$$

$$= 50t^3 - 50t^2 - 25t^2 - 25t + 25t + 12.5$$

$$= 50t^3 - 75t^2 + 12.5$$

Example #2

- Determine a simplified function that represents the volume of the given box.



$$V = lwh$$

$$V = (x + 1)(x + 2)(x + 3)$$

$$= (x^2 + 3x + 2)(x + 3)$$

$$= x^3 + 3x^2 + 2x + 3x^2 + 9x + 6$$

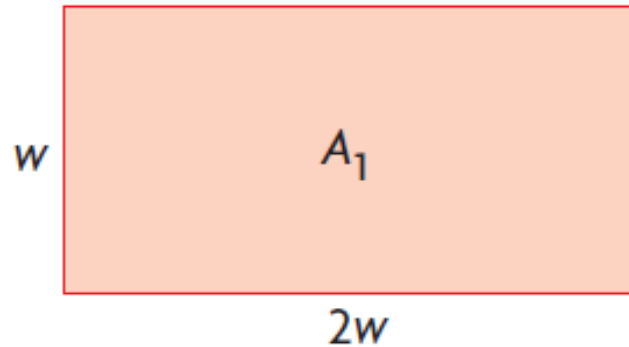
$$= x^3 + 6x^2 + 11x + 6$$

Example #3

- Is $(2x + 3y + 4z)^2 = 4x^2 + 9y^2 + 16z^2$?
 - Substitute 1 for each of the variables in each expression to see if the results are different.
 - Let $x = y = z = 1$
 - L.S. = $(2x + 3y + 4z)^2$
 - $= (2(1) + 3(1) + 4(1))^2$
 - $= 9^2$
 - $= 81$
- R.S. = $4x^2 + 9y^2 + 16z^2$
 $= 4(1)^2 + 9(1)^2 + 16(1)^2$
 $= 4 + 9 + 16$
 $= 29$
- Since L.S. \neq R.S., the expressions are not equivalent.

Example #4

- A rectangle is twice as long as it is wide. Predict how the area will change if the length of the rectangle is increased by 1 and the width is decreased by 1. Write an expression for the change in area and interpret the result.



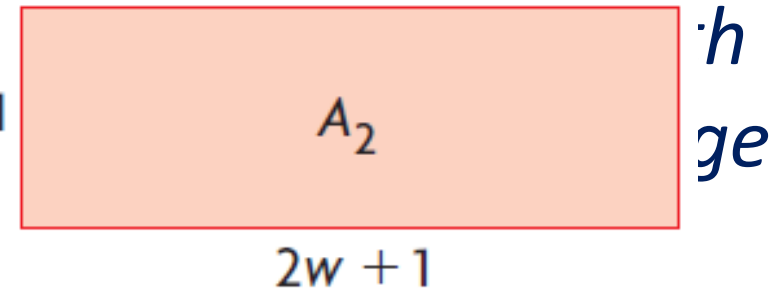
$$\begin{aligned} A_1 &= (2w)w \\ &= 2w^2 \end{aligned}$$

Increasing the length by 1 and decreasing the width by 1, does this mean...

Change in Area

$$\begin{aligned} &= A_2 - A_1 \\ &= (2w^2 - w - 1) - (2w^2) \\ &= -w - 1 \end{aligned}$$

Therefore, there will be a change in area.



$$\begin{aligned} A_2 &= (2w + 1)(w - 1) \\ &= 2w^2 - w - 1 \end{aligned}$$

In Summary...

$$ab = ba \text{ (commutative property)}$$

$$(ab)c = a(bc) \text{ (associative property)}$$

$$a(b + c) = ab + ac \text{ (distributive property)}$$
