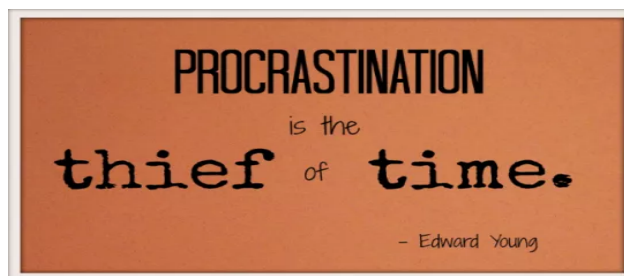


# Happy Fight Procrastination Day!

- Park your phones

- ← - Start Warm up on the board

- HW ?'s



Translating Word Problems into Algebraic Expressions

- 1) Two integers have a sum of 24. If the first integer is called  $m$ , create an expression for the second integer in terms of  $m$ .


1st integer  $m$   
2nd integer  $x$

$$m + x = 24$$

$$x = 24 - m$$

$m$  is 1st integer  
 $24 - m$  is the 2nd integer

- 2) The perimeter of a rectangle is 100. If the width is called  $w$ , create an expression for the length in terms of  $w$ .



$w$  is width  
 $L$  is length


$$2L + 2w = 100$$

$$2L = 100 - 2w$$

$$L = 50 - w$$

$w$  is the width  
 $50 - w$  is the length

- 3) The perimeter of a right triangle is 30. The hypotenuse is 13. Assuming the triangle is not isosceles and one leg is called  $x$ , create an expression for the other leg.



$x$  is one leg  
 $m$  is 2nd leg

$$x + m + 13 = 30$$

$$x + m = 17$$

$$m = 17 - x$$

$x$  is 1st leg  
 $17 - x$  is 2nd leg

- 4) A rectangle has a perimeter of 50. If the length is called  $L$ , create an expression for the width in terms of  $L$ .

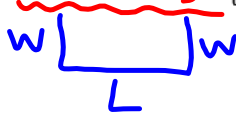
length is  $L$   
width is  $25 - L$

- 5) Two integers have a sum of 40. The first integer is called  $x$ , create an expression for the second integer in terms of  $x$ .

1st is  $x$   
2nd is  $40 - x$

- 6) A 3-sided rectangular fence is constructed against the side of a building using 150 feet of fencing. If one side of the fence is called  $w$ , create an expression for the length of the fence in terms of  $w$ .

building



$w$  is width  
 $L$  is length

$$2w + L = 150$$

$$L = 150 - 2w$$

$w$  is the width  
 $150 - 2w$  is the length

- 7) I am thinking of three consecutive integers. If the first integer is called  $y$ , create an expression for the other two integers.

1st  $y$ , 2nd  $y + 1$ , 3rd  $y + 2$

- 8) Two integers are called  $x$  and  $y$ . Create an expression that represents their product.

PRODUCT =  $xy$

- 9) Two integers are called  $x$  and  $y$ . Create an expression that represents the sum of their squares.

SUM OF SQUARES =  $x^2 + y^2$

Goal: write an expression w/ only 1 variable.  
 Creating Polynomials from Word Problems

Use the previous exercises #1-7, to complete the following problems:

- 1) Two integers have a sum of 24. If the first integer is called  $m$ , create a polynomial that represents their product.

$m$   
 $24-m$

$$\text{Product} = m(24-m)$$

$$= 24m - m^2$$

- 2) The perimeter of a rectangle is 100. If the width is called  $w$ , create an expression that represents the area of the rectangle.

$w$   
 $50-w$

$$\text{Area} = w(50-w)$$

$$= 50w - w^2$$

- 3) The perimeter of a right triangle is 30. The hypotenuse is 13. Assuming the triangle is not isosceles and one leg is called  $x$ ,

$x = 1^{\text{st}}$   
 $17-x = 2^{\text{nd}}$   
 $13 = \text{hyp}$

- a) Create an algebraic expression using Pythagorean Theorem.  
 b) Create an algebraic expression representing the area of the triangle

$$a^2 + b^2 = c^2$$

$$A = \frac{1}{2} b \cdot h$$

A.)  $x^2 + (17-x)^2 = 13^2$  . . . .

B.)  $\frac{1}{2}(x)(17-x)$  . . . .

- 4) A rectangle has a perimeter of 50. If the length is called  $L$ , create an expression for the area of the rectangle in terms of  $L$ .

- 5) Two integers have a sum of 40. The first integer is called  $x$ , create an expression for the sum of their squares.

$x$   
 $40-x$

$$x^2 + (40-x)^2$$

- 6) A 3-sided rectangular fence is constructed against the side of a building using 150 feet of fencing. If one side of the fence is called  $w$ , create an expression for the area of the fence in terms of  $w$ .

- 7) I am thinking of three consecutive integers. If the first integer is called  $y$ , create an expression that represents the product of the 2<sup>nd</sup> and 3<sup>rd</sup> integers such that the product is equal to 306.

### Creating Polynomials from Word Problems

#### Optimization Problems – using polynomials to maximize and/or minimize!

- 1) Two integers have a sum of 40. The first integer is called  $x$ .
  - a. Write a polynomial that represents the product of the two integers in terms of  $x$ .
  
  
  
  
  
  
  
  
  
  
  - b. Find the numbers that would yield a maximum product.
  
- 2) The perimeter of a rectangle is 200 with a width,  $w$ .
  - a. Write a polynomial that represents the area of the rectangle in terms of  $w$ .
  
  
  
  
  
  
  
  
  
  
  - b. Find the dimensions that would yield the **maximum** area of the box and give the maximum area.
  
- 3) Two integers have a sum of 40 where the first number is called  $m$ .
  - a. Write a polynomial that represents the sum of their squares in terms of  $m$ .
  
  
  
  
  
  
  
  
  
  
  - b. Find the two integers that would yield a **minimum** sum of squares.
  
- 4) A 3-sided rectangular fence is constructed against the side of a building. You have 120 feet of fencing material.
  - a. Write a polynomial that represents the area of the rectangle.
  
  
  
  
  
  
  
  
  
  
  - b. Find the dimensions that would yield the **maximum** area of the box and give the maximum area.

### Creating Polynomials from Word Problems

- 1) I am thinking of three consecutive integers. If the product of the 2<sup>nd</sup> and 3<sup>rd</sup> integers is 306, find the value of all three integers.
- 2) Use quadratic regression to create an algebraic model for the following problem, then use your model to answer the questions. The table below represents the horizontal distance traveled by a baseball that has been hit at various angles:

Angle (degrees)	Distance (feet)
10°	115.6
15°	157.2
20°	189.2
24°	220.8
30°	253.8
34°	269.2
40°	284.8
45°	285.0
48°	277.4
50°	269.2
58°	244.2
60°	231.4
64°	180.4



- a) What distance will correlate to an angle of 5 degrees?
  - b) What angle would generate a distance of 273 feet?
  - c) What angle would generate a distance of 200 feet?
  - d) What angle generates the maximum distance from home plate?
- 3) Nancy walks 15 meters diagonally across a rectangular field. She then returns to her starting position along the outside of the field. The total distance she walks is 36 meters. What are the dimensions of the field?

**Creating Polynomials from Word Problems**

A high diver jumps off a 10-meter springboard. For  $h$  in meters and  $t$  in seconds after the diver leaves the board, her height above the water is given by:

$$h(t) = -4.9t^2 + 8t + 10$$

- a) Find the x intercepts. Interpret the values in the context of this problem.
  
- b) Find the y intercept and interpret its value in the context of this problem.
  
- c) Identify concavity
  
- d) Find the diver's maximum height \_\_\_\_\_
  
- e) How long does it take the diver to reach max height?
  
- f) What domain and range would we use for this model?
  
- g) Sketch the graph:

**Creating Polynomials from Word Problems**

A baseball is popped up by a batter. The height of the ball above the ground after  $t$  seconds is given by the function

$$f(t) = -16t^2 + 64t + 3$$

- a) Find the x intercepts. Interpret the values in the context of this problem.
  
- b) Find the y intercept and interpret its value in the context of this problem.
  
- c) Identify concavity
  
- d) Find the maximum height of the baseball. \_\_\_\_\_
  
- e) How long does it take the baseball to reach max height?
  
- f) What domain and range would we use for this model?
  
- g) Sketch the graph:

**Creating Polynomials from Word Problems****Word Problem Extra Practice:**

- 1) The sum of two numbers is 18.
  - a. Create a polynomial to represent all possible products
  
  
  - b. What is the maximum possible value of their product?
  
  
  - c. What two numbers would be used to yield the max product?
  
- 2) Suppose that the perimeter of a rectangle is 600 ft.
  - a. If  $x$  represents the width of the rectangle (in feet), then express the length of the rectangle in terms of  $x$  as well.
  
  - b. Create a polynomial that represents all possible areas of the rectangle.
  
  
  - c. Find the maximum area of the rectangle.
  
  
  - d. Give the dimensions that yield the maximum area.



### Creating Polynomials from Word Problems

- 3) The sum of two numbers is 22.
- If the first integer is called  $x$ , define the second integer in terms of  $x$ .
  - Create a polynomial that represents the sum of their squares
  - Find the smallest possible sum of their squares.
  - What are the two integers that yield this minimum value?
- 4) A farmer has 200 feet of fencing with which to build a rectangular fence that will have a river as its fourth side. If  $x$  represents the width of the rectangle (in feet), then express the length of the rectangle in terms of  $x$  as well.
- Create a polynomial that represents all possible areas of the rectangle.
  - Find the maximum area of the rectangle.
  - Give the dimensions that yield the maximum area.