14 Word Problems

September 20, 2020 3:45 PM

Thurs at 9 30
Clear 9 50

Follow these general rules when solving story problems:

1. Define the variables. (Write "Let x = …" statements.)
2. Write an equation.
3. Solve the equation (factor, graph, or use the quadratic formula).
4. Answer the questions. (Write a final SENTENCE. Remember the units.)

Example 1 – Find Mystery Number Problem:

Twelve less than the square of a number is 4 times the number. Find the number.

-12 = equals x x^2 multiply

(1) Define variable

Let x = the number

(2) Equation

$x^2 - 12 = 4x$

$-4x \quad -4x$

(3) Solve - Rewrite so 1 side = 0

$x^2 - 12 - 4x = 0$

$1x^2 - 4x - 12 = 0$

$\boxed{2} \times \boxed{-6} = -12$

$\boxed{2} + \boxed{-6} = -4$

$(x+2)(x-6) = 0$

$x + 2 = 0$ OR $x - 6 = 0$

$-2 \quad -2 \qquad +6 \quad +6$

$\boxed{x = -2}$ or $\boxed{x = 6}$

(4) Sentence!

The numbers are -2 & 6

Check! $(-2)^2 - 12 = 4(-2)$?

$4 - 12 = -8$

$-8 = -8$ ✓

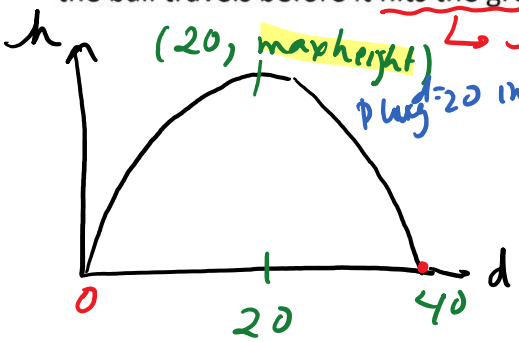
$(6)^2 - 12 = 4(6)$?

$36 - 12 = 24$

$24 = 24$ ✓

Example 2 – Ball kick/toss Problem: The function $h = -0.025d^2 + d$ models the height, h, in metres of a kicked soccer ball that travels the horizontal distance, d, in metres. Find the horizontal distance the ball travels before it hits the ground.

↳ $h = 0$



plug d=20 into equation!

① Variables

Let h = height

d = horizontal distance →

② Equation

ground → "height" $0 = -0.025d^2 + d$

③ Solve: Factor out d!

$0 = d(-0.025d + 1)$

$d = 0$ OR $-0.025d + 1 = 0$

$-1 \quad -1$

$\frac{-0.025d}{-0.025} = \frac{-1}{-0.025}$

$\boxed{d = 40\text{ m}}$

④ Sentence:

The ball travels 40 m horizontally before it hits the ground.

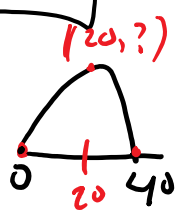
Variations to this problem:

- water spray
- rocket
- flare

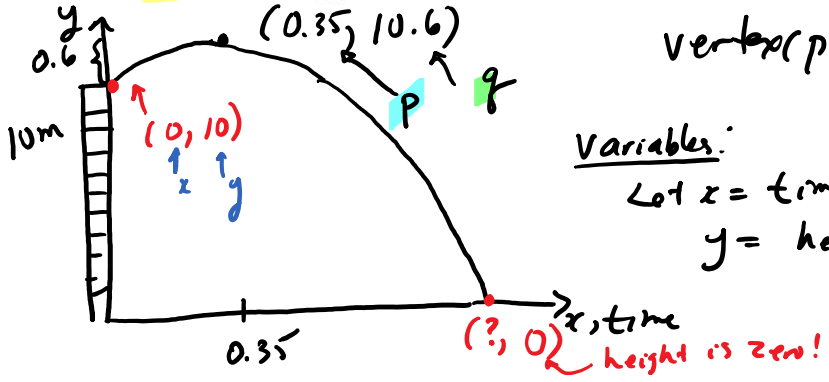
How would you find max height?

Max height occurs at $\frac{0+40}{2}$

$= 20\text{m}$



Example 3 – Jumping/Diving Problem: Sam dives of a 10-metre high diving board. He reaches his maximum height of 0.6 m above the board after 0.35 s. How long did it take him to reach the water?



vertex(p, q)

Variables:
Let x = time in sec
y = height in m

Find equation in vertex form:

$y = a(x-p)^2 + q$ Plug in x, y, p & q to find a.

$10 = a(0-0.35)^2 + 10.6$

$-10.6 \qquad -10.6$

$\frac{-0.6}{0.1225} = \frac{a(0.1225)}{0.1225}$

$a = -4.89$

$a \approx -4.9$

So $\boxed{y = -4.9(x-0.35)^2 + 10.6}$

at water level → $0 = -4.9(x-0.35)^2 + 10.6$

$-10.6 \qquad -10.6$

$\frac{-10.6}{-4.9} = \frac{-4.9(x-0.35)^2}{-4.9}$

$\sqrt{2.16} = \sqrt{(x-0.35)^2}$

$\pm 1.46 = x - 0.35$

$+0.35 \qquad +0.35$

$x = 0.35 \pm 1.46$

$x = 0.35 + 1.46$ $\qquad$ $x = 0.35 - 1.46$

$\boxed{x = 1.81}$ $\qquad$ $x = -1.11$

Reject! Can't have neg. time!

It took 1.81 sec to reach the water.

Example 4 – Find Length and Width of Rectangle Problem:

Example 4 – Find Length and Width of Rectangle Problem:
The width of a rectangle is 4 feet less than the length. The area is 10 square feet. Find the length and the width.

Rectangle

Assignment:

- "What kind of Music do Barbers …?" sheet, #1, 2, 4 (like Example 1), 5, 8
- Quadratic Word Problem Assignment