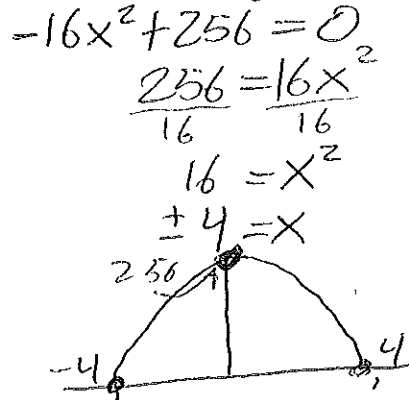


1. A helicopter is flying at an elevation of 256 feet above the Columbia River when it releases a package. The equation $p(x) = -16x^2 + 256$ describes the height of the package $p(x)$, in feet, and the time x , in seconds.

- Find the maximum height of the package
- Find when the package hits the water
- Draw a graph of the package's flight.

a) Max height = 256 feet
 b) Hits water: $t = 4$ seconds



2. I'm trying to work on my long jump, so I go to the football field to practice. The equation $h(x) = -\frac{1}{5}x^2 + \frac{28}{5}x - \frac{187}{5}$ represents the height of my feet above the ground $h(x)$, in feet, and the horizontal distance from the endzone x , in yards.

- Find the maximum height of the jump
- Find when I am on the ground
- Can I jump farther than 5 yards?

a) Max height = 1.8 feet
 b) Ground: $x = 11$ & $x = 17$ (yards)
 c) $17 - 11 = 6$ yards, **Yes!**

$$(-\frac{1}{5}x^2 + \frac{28}{5}x - \frac{187}{5}) = (0) \cdot -5$$

$$x^2 - 28x + 187 = 0$$

$$(x - 11)(x - 17) = 0$$

$$x = 11, x = 17$$

$$\text{Max height: } h = \frac{11 + 17}{2} = \frac{28}{2} = 14$$

$$-\frac{1}{5}(14)^2 + \frac{28}{5}(14) - \frac{187}{5} = 1.8$$

3. During the last snowstorm, I went down to the Hawthorne Bridge and threw off a snowball. The equation $s(x) = -16x^2 + 64x + 48$ describes the height of the snowball $s(x)$, in feet, and the time x , in seconds.

- Find the maximum height of the snowball.
- Find when it hits the water
- Find when the snowball is 64 feet high.

a) Max height: $s(1.5) = 108$ feet
 b) Hits water: $x = 4$ seconds
 c) $-16x^2 + 64x + 48 = 64$

$$-16x^2 + 64x + 48 = 0$$

$$-16$$

$$x^2 - 4x - 3 = 0$$

$$(x - 4)(x + 1) = 0$$

$$x = 4, x = -1$$

$$h = \frac{4 + (-1)}{2} = \frac{3}{2} = 1.5$$

$$s(1.5) = -16(1.5)^2 + 64(1.5) + 48 = 108$$

4. I can mow a lawn in 30 minutes and Ms. Boubel can mow a lawn in 40 minutes. Working together, the equation $m(x) = \frac{x}{30} + \frac{x}{40}$ represents how many lawns we can mow, $m(x)$, in x minutes.

- How long will it take for us to mow 1 lawn?
- How long will it take to mow between 3 and 5 lawns?
- How many lawns can we mow in 4 to 8 hours?

c) $m(4)$
 $m(240) = 14$
 $m(480) = 28$
 14 to 28 lawns

b) $3 < \frac{x}{30} + \frac{x}{40} < 5$
 $3600 < 40x + 30x < 6000$
 $3600 < 70x < 6000$
 $51.43 < x < 85.71$
 Between 51.43 & 85.71 minutes

a) $1 = \frac{x}{30} + \frac{x}{40} \rightarrow 30 = x + \frac{30x}{40}$
 $1200 = 40x + 30x$
 $1200 = 70x$
 $17.14 = x$ 17.14 minutes

5. Manufacturers of ball bearings need them to be almost perfectly identical, otherwise they will not rotate smoothly. Ball bearings are in the shape of a sphere, so the volume of a ball bearing is $V(x) = \frac{4}{3}\pi x^3$, where $V(x)$ is the volume in mm^3 and x is the radius in mm.

a. If the radius can be between 9 mm and 11 mm, what are the possible volumes?

b. If the possible volumes can be between 4100 mm^3 and 4300 mm^3 , what are the possible radii?

$$a) V(9) = \frac{4}{3}\pi \cdot 9^3 \approx 3053.6$$

$$V(11) = \frac{4}{3}\pi \cdot 11^3 \approx 5575.3$$

$$3053.6 < V(x) < 5575.3$$

$$b) \frac{4100 = \frac{4}{3}\pi x^3}{\frac{4}{3}\pi}, \frac{4300 = \frac{4}{3}\pi x^3}{\frac{4}{3}\pi}$$

$$978.8 = x^3, 1026.5 = x^3$$

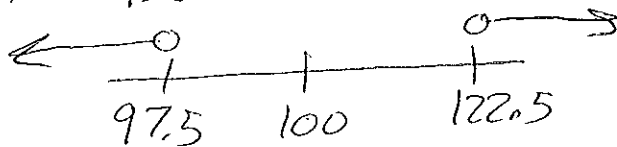
$$9.93 < x < 10.08$$

6. Some statisticians define an outlier as a value that is greater than 1.5 standard deviations away from the mean. IQ scores are normally distributed with a mean of 100 and a standard deviation of 15.

a. Write the range of IQ scores that are defined as outliers

b. Use an absolute value to write an inequality that describes the outliers.

$$a) 1.5 \cdot 15 = 22.5$$



$$x < 97.5 \text{ or } x > 122.5$$

$$b) |x - 100| > 22.5$$

7. A parabola has the equation $f(x) = x^2 + bx - 21$ and has a solution of $x = 7$ and $x = a$. Find the values of a and b .

because 7 is solution

$$f(7) = 7^2 + b(7) - 21 = 0$$

$$49 + 7b - 21 = 0$$

$$28 + 7b = 0$$

$$7b = -28$$

$$b = -4$$

$$x^2 - 4x - 21$$

$$(x - 7)(x + 3)$$

$$x = 7, x = -3$$

$$a = -3$$