Name: _____ Date: _____ Hour: ____Alg 1____

Unit 7B Day 15: Applications of Quadratics

Focus Question: How do I solve a word problem?

Solve each problem by hand. You may use the calculator to check your answer after you have completed the problem.

1. The arch of Gateshead Millennium Bridge forms a parabola with the equation $f(x) = -0.016(x-52.5)^2 + 45$ where x is the horizontal distance in meters from the arch's left end and $f(x)$ is the distance in meters from the base of the arch.

a) How tall is the arch?

yPartofVertex (52.5, 45)

45 m tall

b) How wide is the arch?

$0 = -0.016(x-52.5)^2 + 45$

$-45 \quad -45$

$-45 = -0.016(x-52.5)^2$

$-0.016 \quad -0.016$

$\sqrt{2812.5} = \sqrt{(x-52.5)^2}$

$\pm 53.03 \approx x - 52.5$

$x - 52.5 = 53.03$ or $x - 52.5 = -53.03$

$+52.5 \quad +52.5 \qquad +52.5 \quad +52.5$

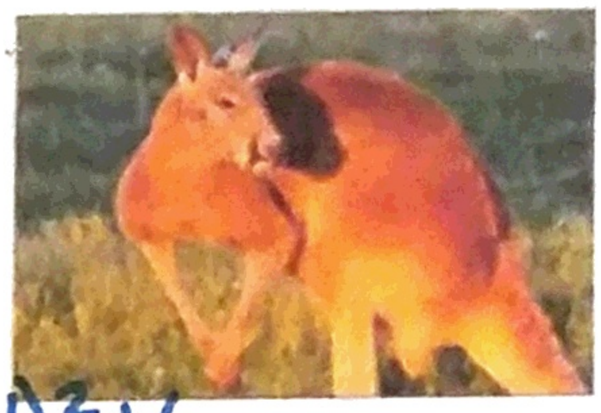
$x = 105.53 \qquad x = -0.53$

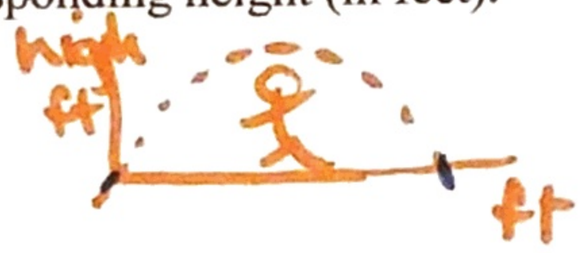
dist. btwn x int.

$105.53 - -0.53$

≈ 106.06 m

2. The function $f(x) = -0.03(x-14)^2 + 6$ models the jump of a red kangaroo where x is the horizontal distance (in feet) and $f(x)$ is the corresponding height (in feet).





a) How high can a red kangaroo jump?

ypart of vertex (14, 6)

6 ft high

$0 = -0.03(x-14)^2 + 6$

$-6 \quad -6$

$-6 = -0.03(x-14)^2$

$-0.03 \quad -0.03$

$\sqrt{200} = \sqrt{(x-14)^2}$

$\pm 14.14 \approx x - 14$

$x - 14 \approx 14.14$

$+14 \quad +14$

$x \approx 28.14$

$x - 14 \approx -14.14$

$+14 \quad +14$

$x \approx -0.14$

b) What distance does the kangaroo's jump cover?

dist. btwn x int.

$28.14 - -0.14$

≈ 28.28 ft

c) Can you answer the question "how long was the kangaroo in the air?" Explain.

No % time was not a measured variable.

3. The Cinemagic Theater keeps track of the price of tickets and the number of people in attendance. The function $a(p) = -10(p - 6.5)^2 + 150$ models the theater attendance, a, where p is the price of a ticket in dollars.

a) What price should the theater charge to maximize attendance? $6.50

x value of vertex (6.5, 150)

b) What does the 150 represent in the context of this problem?

The highest attendance for the theater

not realistic

c) Find a(0). What point is this? What does this represent in the context of the problem?

$a(0) = -10(0 - 6.5)^2 + 150$

y int. $= -10(-6.5)^2 + 150$

$= -10(42.25) + 150$

$= -422.5 + 150$

$= -272.5$ ← attendance if price is $0

d) What price(s) will cause the theater to have zero people in attendance?

x int. $0 = -10(p - 6.5)^2 + 150$

$-150 \quad -150$

$-150 = -10(p - 6.5)^2$

$\frac{-150}{-10} = \frac{-10(p-6.5)^2}{-10}$

$\sqrt{15} = \sqrt{(p - 6.5)^2}$

$\pm 3.87 \approx p - 6.5$

$p - 6.5 \approx 3.87$

$+6.5 \quad +6.5$

$p \approx 10.37$

$p - 6.5 \approx -3.87$

$+6.5 \quad +6.5$

$p \approx 2.63$

$10.37

$2.63

4. The Big Bagel Bakery sells more bagels when it reduces its prices, but then its profit changes. The function $P(s) = -200(s - 1.50)^2 + 400$ models the bakery's daily profit, P, in dollars from selling bagels when s is the selling price of a bagel in dollars.

a) What is the realistic domain of the function? Explain.

[0.01, 4] It the selling price so it can't be free & has to be worth the amount.

b) What is the vertex and what does each part of it represent?

the best selling price (1.5, 400) best expected profit

c) What is P(0) and what does it represent?

$P(0) = -200(0 - 1.5)^2 + 400$

$= -200(-1.5)^2 + 400$

$= -200(2.25) + 400$

$= -450 + 400$

P(0) = −50 ↑ cost to make the bagels

d) What price(s) will cause the bakery to have zero profit?

$0 = -200(s - 1.5)^2 + 400$

$-400 \quad -400$

$\frac{-400}{-200} = \frac{-200(s-1.5)^2}{-200}$

$\sqrt{2} = \sqrt{(s - 1.5)^2}$

$\pm 1.41 \approx s - 1.5$

$s - 1.5 \approx 1.41$ or $s - 1.5 \approx -1.41$

$+1.5 \quad +1.5 \qquad +1.5 \quad +1.5$

$s \approx 2.91 \qquad s \approx 0.09$

$2.91 $0.09