Algebra 2 Final Review Part 5: Word/Application Problems

Be careful to determine when a linear model is appropriate and when an exponential model is appropriate. A **linear model** makes sense when things change by the **same amount** each period. An **exponential model** makes sense when things change by the **same percentage** each period.

1. Katie and Bob love playing Skee-Ball at Chuck-E-Cheese's. They are good and they win many prize tickets with their scores. One day, they went in to their local Chuck-E-Cheese's, carrying the prize tickets they won the previous time. They started to play Skee-Ball. Thirty minutes after they started playing, they had a total of 850 tickets (including those they brought in with them). Seventy minutes after they started playing, they had a total 1330 tickets. Assume that they win tickets at a steady rate, so their number of tickets is a linear function of time.
   a. On a graph relating tickets they have to time since they started playing, plot the two points that are given. Be sure to choose input and output variables carefully.
   b. Write a linear function $C(t)$ that shows the number of tickets they had t minutes after they got there that day. Graph that line on the axes provided.
   c. What is the slope and what meaning does it have in this problem? What units is slope in (? Per ?)
   d. How many tickets did they start with that day?
   e. What is $C(90)$ and what does it mean in this problem?
   f. How many minutes after they get there will they have 1950 tickets, which is enough for the Star Wars Lego set they want?

2. At the buffet dinner, adults cost $15 each and children cost $6. If 60 people attended and a total of $729 was taken in, then how many of each attended?

3. Between 1880 and 1930, US oil production grew at a constant annual rate of 7.9%. In 1930, production was 995 million barrels.
   a. If this growth continued indefinitely, what would production be in 1934?
   b. What was US oil production in 1905?
   c. If growth continued at this 7.9% annual rate after 1930, when would oil production reach 1800 million barrels?
   d. In actuality, US oil production reached 1800 million barrels in 1949. What was its annual rate of growth between 1930 and 1949? Your answer should be the percentage growth rate to TWO decimal places (like 11.25% or 1.47%).

4. A rectangle's length is six inches greater than its width. When you add three inches to its width and subtract four inches from its length, the area falls by eight square inches. What were its original dimensions?

5. A US company that makes clothing has been laying off American workers as they increasingly make their products in Mexico and Asia. Each year, the size of the American workforce falls by 12%. It is currently 12,000 people. How many years will it be until the size of the American workforce halves (in other words, becomes half as large as it currently is).

6. At the grocery store, four lemons and eight oranges cost a total of $5.00. Three lemons costs $0.15 more than two oranges. What is the price of each fruit?

7. A rocket was launched off a tower; it rose for a while and then fell to the ground next to the tower. Its height (in feet) t seconds after it's launch is given by the equation $h(t) = -16t^2 + 80t + 400$. [You may use your calculator however you like for this one—graph the function!]

a. How tall is the tower?
b. What is $h(3)$ and what meaning does it have in the context of this problem?
c. What was the highest it got and when did it reach this height?
d. When did it land?
e. When was its height 450 feet?

8. Mrs. Cordero keeps a bowl of candy in the math office. Eight school days after she filled it, there were 145 pieces of candy in it. Each school day, twenty-three pieces are eaten.

a. Write a linear function $C(t)$ showing the amount of candy in the bowl t days after Mrs. Cordero filled it.
b. What is the slope and what meaning does it have in this problem?
c. How many pieces were in the bowl immediately after it was filled?
d. When will the bowl be empty?

Answers

1a. t=minutes since they came that day C(t)=number of tickets they have b. $C(t) = 12t + 490$
c. 12 tickets per minute d. C(0)=490 so 490 tickets
e. C(90)=1570; 90 minutes after arriving they have 1570 tickets f. C(121.67)=1950 so 121.67 mins

2. x= adults y=kids $x + y = 60$ *and* $15x + 6y = 729$ *so* $x = 41$ adults and 19 kids

3a. $995(1.079)^4 = 1348.7$ million barrels b. $995 = x(1.079)^{25}$ *so* $x = 148.7$ million barrels
c. $1800 = 995(1.079)^x$ using logs x=7.8 yrs so 1937-1938 d. $1800 = 995(x)^{19}$ *so* $x = 1.0317$ → 3.17%

4. w=width $w(w + 6) = (w + 3)(w + 2) + 8$ so w=14 → 14x20

5. $12000(0.88)^x = 6000$ so x=5.42 years (using logarithms)

6. x=lemons price y=oranges price $4x + 8y = 500$ $3x = 2y + 15$ x=35 cents and y=45 cents

7a. $h(0) = 400$ *feet* b. $h(3) = 496$; 496 feet after 3 seconds c. vertex! $t = 2.5$ *and* $h(2.5) = 500$
d. $h(t) = 0$ use quad-formula or calc-zero and get 8.09 seconds (negative answer makes no sense)
e. $h(t) = 450$ so t=0.73 seconds or 4.27 seconds

8a. $C(t) = -23t + 329$ b. -23 pieces per day c. $C(0) = 329$ pieces d. 14.3 days after filling