

Name: Key

Algebra II Honors
Application Problems Unit 1

1. a) Parents are investing \$12,000 in a college fund for their daughter, Megan. They invest in a fund offering 4.5%, compounded quarterly, how much money will they have when Megan turns 18 years old?

$$A = 12,000 \left(1 + \frac{.045}{4} \right)^{18 \cdot 4} = \$ 26,853.20$$

- b) Megan turns out to get a full scholarship so the parents decide to keep the money in the fund for a home in the future. How much money will be in the fund when she turns 30 years old?

$$12,000 \left(1 + \frac{.045}{4} \right)^{30 \cdot 4} = \$ 45,941.5$$

2. Now Megan is 30 and has a great job. She decides to invest her first bonus of \$25,000 and would like it to grow to at least \$200,000 by the time she is 65. Assume interest compounded annually, what interest rate must she get? Is this a reasonable goal?

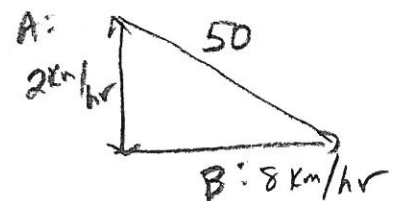
$$200,000 = 25,000 (1+r)^{35}$$

$$r \geq 6.129\%$$

3. Antonio and Betty are at the intersection of two roads which form a right angle. At noon, Antonio begins walking north two km/hr and at 1 pm Betty starts jogging east at 8 km/hr. At what time will Antonio and Betty be 50 km apart?

	$d = r \cdot t$	
A	2 t	
B	8 t-1	

7 pm



$$(2t)^2 + (8t-8)^2 = 50^2$$

$$4t^2 + 64t^2 - 128t + 64 = 2500$$

$$68t^2 - 128t - 2436 = 0$$

$$17t^2 - 32t - 609 = 0$$

$$\frac{32 \pm \sqrt{(-32)^2 - 4(17)(-609)}}{2(17)}$$

$$\frac{32 \pm 206}{2}$$

4. A 100 inch piece of wire is cut into two pieces, which are each bent into the shape of a square. The sum of the enclosed areas is 397 square inches. Find the lengths of each piece of wire.



$$\frac{x^2}{4^2} + \frac{(100-x)^2}{4^2} = 397$$

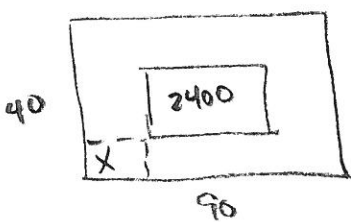
$x = 24''$
 $100 - x = 76''$

$$\frac{x^2}{16} + \frac{10000 - 200x + x^2}{16} = 397$$

$$0 = \frac{x^2}{8} - \frac{25x}{2} + 228 \quad 0 = x^2 - 100x + 1824$$

$$0 = (x-76)(x-24)$$

5. An athletic field is 40 yards wide and 90 yards long. If a lawnmower cuts a border around the outside of the field, how wide must the border be so that one-third of the lawn is cut?



$$(90-2x)(40-2x) = 2400$$

x : length of border

$$3600 - 180x - 80x + 4x^2 = 2400$$

$$4x^2 - 260x + 1200 = 0$$

$$4(x^2 - 65x + 300) = 0$$

$$4(x-60)(x-5) = 0$$

$x = 60,5$

$x = 5 \text{ yd.}$

6. The distance from Greenville to Maryville is 180 kilometers. It took Ed one hour longer to drive to Maryville from Greenville than it did to return. Find the rate in each direction if the rate returning was 15 kilometers per hour faster than the rate going.

	$d = r \cdot t$		
going	180	r	t
return	180	$r+15$	$t-1$

$$180 = r \cdot t$$

$$180 = (r+15)(t-1)$$

$$180 = rt - r + 15t - 15$$

$$0 = \left(\frac{-180}{t} + 15t - 15 \right) t$$

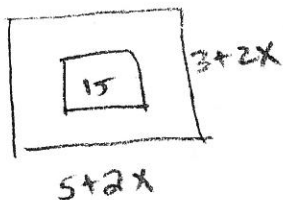
$$0 = 15t^2 - 15t - 180$$

$$15(t^2 - t - 12) = 0$$

$$(t-4)(t+3) = 0$$

$t = 4$

7. A rectangular flower bed is 3m wide and 5m long. The town hall wants to put a sidewalk of uniform width around the flower bed. If they only have enough concrete to cover at most 48 square meters, what will the outside dimensions of the sidewalk be?



$$(3+2x)(5+2x) - 15 = 48$$

$$4x^2 + 16x + 15 - 15 = 48$$

$$4(x^2 + 4x - 12) = 0$$

$$4(x+6)(x-2) = 0$$

$x = 2, -6$

9×7