Section 2.2 – Mathematical Models

Problem Set 3

Write a mathematical formula to describe the following situations.

1. The temperature of one gas is 25° more than the temperature of a second gas.
2. John has four more than three times the number of quarters that Mark has.
3. The number of windows on the first floor of a building is twelve more than the windows on the second floor.
4. The cost of one painting is $5,000 less than the cost of a second painting.
5. The cost to build a house in one number is $10,000 more than half the cost to build in another neighborhood.

Find the following values.

6. The **combined gas law** says that if V is the volume of a gas, P is the pressure of the gas and T is the temperature of the gas then

$$\frac{PV}{T} = k$$

   Where k is a constant. If the pressure of a gas is 3.1 atmospheres, its volume is 25 cubic centimeters and its temperature is 200°F then what is the gas's constant?

7. The **average** of two numbers, a and b, is equal to the sum of the numbers divided by 2:

$$avg. = \frac{a+b}{2}$$

   What's the average of 10 and 27?

8. If the **acceleration** of a car is a, it accelerates at that rate for t seconds and its initial velocity is v_0 then its final velocity, v, will be $v = v_0 + at$. If a car's initial velocity is 25mph and it accelerates at a rate of 2.5 for 3 seconds, what will its final velocity be?

9. **Compound Interest** Suppose you put money in a savings account and every month you get interest on it. Instead of taking the interest out and spending it, you leave the interest in the account each month. This means that, at the end of month two, you'll get interest not just on the original amount you put in but also on the interest that you left in on month one. At the end of month three, you'll get interest on the principle, the interest from month one and the interest form month two, etc. Over time, this "compounding" can add up to some serious money. The formula for calculating the amount in your account is

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

   where r is the annual interest rate, n is the number of times the interest is compounded every year, t is the number of years you let the investment go, P is the principle (just like in question two) and A is the amount in the account after t years. If you invest $2,500 in an account at 4.5% annual interest compounded every month, i.e. 12 times per year, and let it sit for five years, how much money will be in the account?

10. If S_1 is the distance from an object to a lens and S_2 is the distance from the lens to the projected image of the object on the other side of the lens then the lens's **focal length**, f, is given by