

## MAT 171 - CLASS NOTES - Section 3.7: Modeling Using Variation

1. **Direct Variation** - the following statements are equivalent

- (a)  $y$  varies directly with  $x$
- (b)  $y$  is directly proportional to  $x$
- (c)  $y = kx$  for some non-zero constant  $k$

In essence, as the input goes up the output goes up by some proportional amount.

2. **Inverse Variation** - the following statements are equivalent

- (a)  $y$  varies inversely with  $x$
- (b)  $y$  is inversely proportional to  $x$
- (c)  $y = \frac{k}{x}$  for some non-zero constant  $k$

In essence, as the input goes up the output goes down by some proportional amount.

3. Suppose  $y$  varies directly with  $x$ . Suppose  $y = 45$  when  $x = 5$ . Find  $y$  when  $x = 13$ .

4. Suppose  $y$  varies inversely with  $x$ . Suppose  $y = 6$  when  $x = 3$ . Find  $y$  when  $x = 9$ .

5.  $a$  varies directly with  $b$  and inversely with the square of  $c$ . Suppose  $a = 7$  when  $b = 9$  and  $c = 6$ . Find  $a$  when  $b = 4$  and  $c = 8$ .

6.  $y$  varies jointly with  $m$  and the square of  $n$  and inversely with  $p$ . Suppose  $y = 15$  when  $m = 2$ ,  $n = 1$ , and  $p = 6$ . Find  $y$  when  $m = 3$ ,  $n = 4$  and  $p = 10$ .

7. Write an equation that expresses each relationship, then solve the equation for  $y$ .

(a)  $x$  varies directly with cube root of  $z$  and inversely with  $y$ .

(b)  $x$  varies jointly with  $y$  and  $z$  and inversely with the square root of  $w$ .

8. An alligator's tail length,  $T$  varies directly with its body length,  $B$ . An alligator with a body length of 4 feet has a tail length of 3.6 feet. What is the tail length of an alligator whose body length is 6 feet.
9. Radiation machines used to treat tumors produce an intensity of radiation that varies inversely with the square of the distance from the machine. At 3 meters the radiation intensity is 62.5 milliroentgens per hour. What is the intensity at a distance of 2.5 meters?