

Different kinds of relationships between quantities

For each of the following situations, find an equation relating x and y if you can. For which values of x is your equation valid? If you can't find an equation, determine whether the relationship between x and y is linear or not and say why or why not.

1. There are a bunch of hoses, all of the same size. Water flows out of all of these hoses at the same constant rate. Using 3 hoses, it takes 4 hours to fill an empty tub with water. Let x be the number of hoses used to fill the empty tub and let y be the number of hours it takes to fill the tub using that many hoses.
2. Initially, there are 100 liters of water in a tub. Then water starts to flow out of the tub at a constant rate. After 20 minutes the tub is empty. Let x be the number of minutes since water starts flowing out of the tub and let y be the number of liters of water in the tub at that time.
3. Contrast the previous two situations. In both cases y decreases as x increases, yet how are the two situations qualitatively different?
4. Water freezes at 0° C, which is 32° F, and boils at 100° C, which is 212° F. Let x be a temperature in degrees Celsius and let y be that same temperature as measured in degrees Fahrenheit.

5. A marble is dropped from the top of a 64-foot tall building. After 1 second, the marble is 48 feet above the ground. Let x be the time elapsed since the marble was dropped and let y be the height of the marble above the ground at that time.

6. You owe money on your credit card. The credit card company charges 1.7 percent interest per month. Let x be the amount of money you owe initially and let y be the amount of money you will owe after 6 months assuming you do not pay off any of your debt and assuming you add no more debt (except for the interest you are charged).

7. You owe \$100 on your credit card. The credit card company charges 1.7 percent interest per month. Let x be the number of months you keep this charge on your account and let y be the amount you will owe after that many months. Assume that you do not pay off any of your debt and assume that you add no more debt (except for the interest you are charged).

8. Consider the mobiles you made with a straw, string, and paperclips. Let x be the number of paperclips on the heavy end and let y be the distance from the heavy end of the straw to the location of the string when the mobile balances horizontally.