

# [12-02-14-T7]

## Direct Proportion

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[1] Two tanks are being filled with water. Tank A is filled at the rate of  $3 \frac{L}{\text{min}}$  and tank B is filled at the rate of  $2 \frac{L}{\text{min}}$ . If one graphs the volume of water in each tank as a function of time, which graph will have the steeper slope?

[2] A tank is drained at the rate of  $3 \frac{L}{\text{min}}$ . If one graphs the volume of water in this tank as a function of time, what will its graph look like?

(a) A line through the origin directed up and to the right.

(b) A line through the origin directed down and to the right.

[NOTE: (a) and (b) are my mistake. It is the "line through the origin" phrase that ruins each. On the other hand, my mistake prompted student discussion that resulted in more learning than would have occurred had I not made such a mistake, so we'll leave it as is and I'll just have to be embarrassed. RT]

[2] Train A travels at a constant speed of  $80 \frac{\text{mi}}{\text{hr}}$  and train B travels at a constant speed of  $70 \frac{\text{mi}}{\text{hr}}$ . If one graphs the distance each train travels as a function of time, which graph will have the steeper slope.

[3] Use the facts of [2]. In each case, is distance increasing as a function of time or is distance decreasing as a function of time?

[4] A Coca-cola bottling plant with 4 labeling machines labels  $1000 \frac{\text{bottles}}{\text{minute}}$ . The Pepsi plant has 8 such machines that all label at the rate of  $1000 \frac{\text{bottles}}{\text{min}}$ . How would the graphs of bottles labeled as a function of time compare for these two plants?

[5] A BMW M3 accelerates from zero miles per hour to 60 miles per hour in 4.6 seconds. A BMW M5 accelerates from zero miles per hour to 60 miles per hour in 4.8 seconds. If one graphs speed as a function of time for each car, which graph will be steeper. (Assume the rates of acceleration are constant.) In each case, is speed an increasing or a decreasing function of time?

[6] The brakes on a Porsche 911 will bring the car's road speed from  $60 \frac{\text{mi}}{\text{hr}}$  to  $0 \frac{\text{mi}}{\text{hr}}$  in 3 seconds. What would the graph of speed as a function of time look like? (Assume the rate of deceleration is constant.) In each case, is speed an increasing or a decreasing function of time?

## Answers

[1] Tank A.

[2] (b) A line through the origin directed down and to the right. ↘ [Not entirely correct, but stays for discussion. RT]

[2] Train A.

[3] Distance is increasing as a function of time.

[4] The graph for the Pepsi plant would be twice as steep as that for the Coca-cola plant.

[5] The graph for the BMW M5 will be steeper.

[6] The graph would be down and to the right, ↘. The speed is in each case a decreasing function of time.