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MATH 108
Spring 2023
HW 1: Due 01/25

"I mean not homework. It's not work if you love it."
–Alex Dunphy, Modern Family

Problem 1. (10pt) *High Voltage* is an electronics store that, among other products, sells televisions. They sell a particular brand of OLED TV that costs \$949.99. To help drive up sales, they will place the TV on sale for 15% off.

(a) What is the mark-down on this television, i.e. what is the discount?

(b) What is the final advertised price for the television?

(c) How much is the TV after a sales tax of 7%.

(d) Suppose over next two months, they discount the price by 15% twice, what is the advertised price of the television?

Solution.

(a) The markdown, i.e. discount, is 15% of \$949.99. But this is $\$949.99(0.15) \approx \$142.50$.

(b) From (a), we know that the product has been marked down by \$142.50. But then the final price is $\$949.99 - \$142.50 = \$807.49$. Alternatively, because the TV is on sale for 15% off, only $100\% - 15\% = 85\%$ of the cost remains. But this is $\$949.99(0.85) \approx \$807.50$.

(c) From (b), the discounted price is \$807.50. But then this is increased by 7% due to sales tax. Therefore, the final price is $\$807.50(1 + 0.07) = \$807.50(1.07) \approx \$864.03$.

(d) Each time the TV is discounted by 15%, only 85% of its price remains. But then the cost of the TV is...

$$\$807.50(0.85)(0.85) = \$807.50(0.85)^2 = \$807.50(0.7225) \approx \$583.42$$

From the computation above, we can see that in the end it is as if the TV is discounted by another 27.75% (because $0.7225 = 1 - 0.2775$). [Note: This is equivalent to its original price being discounted by approximately 38.59% because $(0.85)^3 = 0.614125$ and $0.614125 = 1 - 0.385875$.]

Problem 2. (10pt) Suppose that Richard Hoover is driving across the Southwest. After a day of driving, he maps out his travel plans over the next few days. He predicts that the total number of miles he will drive d days from now is given by $M(d) = 390d + 135$.

(a) What is the slope of $M(d)$? What does it represent?

(b) What is the y-intercept of $M(d)$? What does it represent?

(c) On the plot below, sketch $M(d)$.

(d) Find how many miles he will have driven after 3 total days of driving.

Solution.

(a) The function $M(d) = 390d + 135$ is a linear function because it has the form $y = mx + b$ with $M = y$, $d = x$, $m = 390$, and $b = 135$. Therefore, the slope of $M(d)$ is 390. Interpreting this slope $m = 390 = \frac{390}{1}$ as $m = \frac{\Delta M}{\Delta t}$, we see that for each additional day, Richard has driven an additional 390 miles; that is, Richard is driving 390 miles each day.

(b) From (a), we can see that the y-intercept is 135; that is, $M(0) = 135$. But then after 0 additional days after his first day of driving, Richard has driven 135 miles; that is, Richard drove 135 miles on his first day.

(c) We know that $M(d) = 390d + 135$ is a line with y-intercept 135 and slope 390. We can see the sketch of the function on the graph below.

(d) This is $M(3) = 390(3) + 135 = 1170 + 135 = 1305$. Therefore, Richard has driven a total of 1305 miles after 4 days (3 additional days after his first day).