# WORKSHEET 6 - MOVIE TICKETS

My mom always talks about how much more expensive things are now than they were when she was a kid. One of the things that gives her "sticker shock" is the cost of going to the movies (even without snacks!). When we went to the movies last week, the ticket cost was $8.75. My mom remembers seeing Star Wars for $2.25 and that was in 1977 (she saved her ticket stub, so she is sure that was the price). That certainly seems more expensive, but if you take inflation into account, is this actually more expensive?

"Inflation," when we talk about money, is the rise in the general level of prices. This accounts for the fact that $1 doesn't buy as much as it used to. At the same time, we might have more dollars than we used to. This doesn't necessarily mean that we're worse off, but it's information that economists use to figure out how we're doing in terms of our ability to buy goods and services.

For example, here is what $1 in 1970 would be "worth" for some different years:

| | |
|---|---|
| 1977 | $1.00 |
| 1985 | $1.78 |
| 1995 | $2.51 |
| 2005 | $3.22 |
| 2015 | $3.94 |

1. Predict the "worth" of the 1977 dollar for 2015, using at least one linear equation that can be made from the data above (excluding the 2015 data point).

2. Use your answer from part 1 to predict the 2015 price of the movie ticket, if it kept up with inflation based on the 1977 price of the Star Wars ticket.

3. Compare your answers in parts 2 and 3 with today's prices ($8.75). Is a movie ticket more or less expensive than is was in 1977 when inflation is taken into account? Is your mom right? How close is your value of the 1977 dollar in 2015 to the one given above?

## MATH STANDARDS ALIGNMENT

CCSS.MATH.CONTENT.8.EE.C.7.A

Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

CCSS.MATH.CONTENT.8.EE.C.7.B

Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

**Personal Finance Big Ideas:**
*Inflation, What is Money, Time Value of Money*

## METHOD 1: MAKE A TABLE

First, I will set x as number of years from 1977 and how much $1 in 1977 would be "worth" for as y. Then, the table that was given can be modified as

| x | Y |
|---|---|
| 0 | $1.00 |
| 8 | $1.78 |
| 18 | $2.51 |
| 28 | $3.22 |

1. First, we will find out the linear equation. Since we are looking for the linear equation that can be made from the data above, we'll use the standard linear equation form: y = mx + b ('m' being the slope, and 'b' being the y-intercept)

   Since the y-intercept is the y value when x=0, I can see from the first row of my table that the y-intercept is 1. So, b = 1. And my equation is now:

   Y = mx + 1 and I still need to find m.

   The slope is equivalent to $(\Delta y)/(\Delta x)$ (or the change in y divided by the change in x). I will use (8, 1.78) and (18, 2.51).

   m = $(\Delta y)/(\Delta x)$.
   = (2.51 – 1.78)/(18 -8)
   = 0.73/10
   = 0.073

   Now, we have the approximate linear equation for the data: y= 0.073x + 1

2. To find out how many years it has been since 1977, I can subtract 1977 from 2015:

   2015 – 1977 = 38

   It's been 38 years since Star Wars came out, so I can figure out the estimated 2015 price based on the 1977 dollar.

   First, I'll figure out how much $1 from 1977 would be worth in 2015.

   Y = 0.073(38) + 1 = $3.77

That is the value of one 1977 dollar in 2015.

3. I want to find the value of $2.25 1977 dollars in 2015, so I can multiply (3.77)(2.25) to find the price of the 1977 movie ticket in 2015.

   (3.77)(2.25) = $8.48

   Well, a movie ticket is a little more expensive than it was in 1977 – the value of the 1977 ticket is $8.48 and the cost of the 2015 ticket is $8.75, so it is $0.27 more expensive in 2015 dollars than the 1977 cost of the Star Wars ticket.

   My calculation of the value of the 1977 dollar in 2015 is slightly smaller than the one in the table provided. I am not sure why, but maybe inflation is not actually linear.

## METHOD 2: CREATE A LINEAR EQUATION

1. I think I can use the point in the table provided to make an equation for a line that represents inflation.

   First, I will set x as number of years from 1977 and how much $1 in 1977 would be "worth" for as y. Then, the table that was given can be modified as

| x | Y |
|---|---|
| 0 | $1.00 |
| 8 | $1.78 |
| 18 | $2.51 |
| 28 | $3.22 |

   If the years are my x-value and the price is my y value, I can use those two years and prices to find the slope.

   (18, 2.51) and (28, 3.22)

   Slope = rise over run = (change in y)/(change in x)

   Slope = (3.22 – 2.51)/(28 - 28)

   Slope = 0.71/10

   Slope = 0.071

Now I want to find the equation for the line. I can see from the table above that the y-intercept is 1.

So my equation to find the value of a dollar x years from 1977 is:

$y = 0.071x + 1$

I can use this to predict the 2015 value. 2015 is 38 years from 1977, so x = 38:

$y = 0.071(38) + 1$

$y = \$3.70$

2. to find the price of a movie ticket in 2015 based on 1977 prices, I can use the value of the 1977 dollar in 2015 that I found in part 1.

   $2.25(3.70) = \$8.35$

   The movie ticket, based on my inflation linear equation using the 1977 dollar would be $8.35

3. My predicted value for the movie ticket suggests that the movie ticket at 2015 prices $8.75 is more expensive than the movie ticket at 1977 prices adjusted for inflation ($8.35). So movie tickets are more expensive in 2015, my mom is correct!

   I calculated the value of the 1977 dollar in 2015 as $3.70 and it is less than the price as suggested in the table given in the problem for the value of the 1977 dollar in 2015 – I am not sure why this is different, but I don't think it's necessarily a constant or consistent increase. Maybe some years there is more inflation than other years.