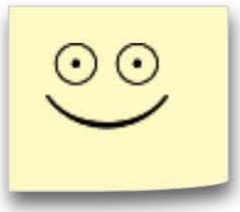


The MathPaks Project

The Prison Mathematics Project

SIMIODE EXPO 2024

February 10, 2024

prisonmathproject.org

@prisonmathproj on X

The MathPaks Mission

The current aim of MathPaks is to create an unaccredited undergraduate-level curriculum for distribution to PMP participants engaged in self-study. Ideally, these paks can be further utilized in mentorship communications to prompt further mathematical discussions and discovery.

The MathPaks Tale

From our Founder (the new Mr. G):

*"When I first started studying math, I was in solitary confinement, within a prison inside a prison. An older guy named Mr.G slid envelopes under my door, and with a combination of all of my free time and the low stimuli, I was completely and utterly hooked. ...**it was beautiful**. Just what I needed under those circumstances, and at risk of sounding like some Evangelist, **math ended up saving my life**__. long story. :) Anyway I want to share that with people, and so it was a long time goal of mine to become Mr. G to other people . . . "*

$$\text{Zopf} = 1 + \cfrac{1}{2 + \cfrac{1}{3 + \cfrac{1}{4 + \ddots}}}$$

Zopf means "braid"; a reference to how the fraction's numbers twist around the real line.

Like the *Zopf* braid, MathPaks should be ***interwoven*** to the point that teaching/learning take turns throughout the unit.

We want them to be ***interactive*** (learning by doing problems) as well as ***instructional*** (teaching the actual content).

MathPak 02

Algebra 1a

Participant Name:
Inmate #:

PMP
PRISON MATHEMATICS PROJECT

Section 4: Linear Functions and Graphs

Linear functions and graphing linear functions allow us to make sense of phenomena in the world around us. Mathematical modeling gives numerical structure to patterns and situations in the world. For instance, if we are given a $50 gift card and want to buy a cup of coffee every morning, a linear function can depict how much money will remain on the gift card after each purchase. It will also help us figure out how many mornings we can buy coffee! We use linear functions in everyday life often without knowing or acknowledging their use.

In this section, we will explore linear functions and practice graphing these functions.

Imagine you are trying to use a rideshare app (i.e., Lyft or Uber) to get home from the park. App 1 says it will charge $1.75 per mile while App 2 says it will charge $0.80 per minute. You want to figure out which app will charge the least for your 5 mile ride home which will take approximately 11 minutes.

Since App 1 charges $1.75 per mile, for a one mile ride, we'd be charged $1.75, or we could use C to denote cost and x to denote miles and write $C(1)$=1.75. For a two mile ride, C(2)=1.75+1.75=3.50.

We can create a table to map out the rest of the cost for App 1:

$x = miles$	1	2	3	4	5
$C = cost$	1.75	3.50	5.25	7	8.75

The linear equation for the cost of using App 1 is $C(x) = (1.75\ dollars/mile) \times (x\ miles)$. In other words, for each additional mile we travel on a trip booked through App 1, we are charged an additional $1.75. This is illustrated in the table above where the cost increases by $1.75 for each additional mile (x). We also could've used the linear equation by plugging in x=5 miles. Using our linear equation, we get $C(5) = (1.75\ dollars/mile) \times (5\ miles) = 1.75 \times 5 = 8.75$. We conclude our trip would cost $8.75 if we book the trip through App 1.

Looking at App 2, we know this app charges $0.80 per minute of travel and our ride home is approximately 11 minutes. So for one minute ride, we'd be charged $0.80, or using C to denote cost and m to denote minutes, we'd write C(1)=0.80. For a two-minute ride, we'd be charged C(2)=0.80+0.80=1.60.

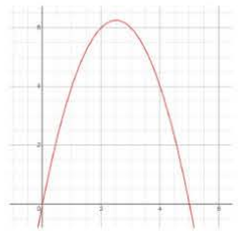
We can create a table to map out the rest of the cost for App 2:

$m = minutes$	1	2	3	4	5	6	7	8	9	10	11
$C = cost$	0.80	1.60	2.40	3.20	4.00	4.80	5.60	6.40	7.20	8.00	8.80

The linear equation for the cost of using App 2 is $C(x) = (0.80\ dollars/minute) \times (x\ minutes)$. In other words, for each additional minute we travel on a trip booked through App 2, we are charged an additional $0.80. This is illustrated in the table above where the cost increases by $0.80 for each additional minute (m). We also could've used the linear equation by plugging in m=11 minutes. Using our linear equation, we get $C(11) = (0.80\ dollars/minute) \times (11\ minutes) = 0.80 \times 11 = 8.80$. We conclude our trip would cost $8.80 if we book the

A potato gun is fired from the point $x = 0$. The potato's path through the air follows the parabola $y = -x^2 + 5x$. How far away from the launch point does the potato land?

The graph of the parabola is shown below:



The y-axis shows the height of the potato at a given moment, so the x-axis (where $y = 0$) is the ground. We solve the quadratic equation $-x^2 + 5x = 0$:

$$-x^2 + 5x = -x(x - 5) = 0$$

$$x = 0, 5$$

The solution $x = 0$ is the launch point. The solution $x = 5$ means that when the potato hits the ground, it is 5 units away from the launch point. We confirm by looking at the graph that the parabola intercepts the y-axis at $x = 0$ and $x = 5$.

***

Suppose you deposited $100 into a bank account at the beginning of 2021, 2022, and 2023. The account earns interest at a rate of $x\%$ per year. At the beginning of 2023 (after your last deposit), the account balance was $306.04. What interest rate does the account earn per year?

If B is the starting balance of a bank account that earns $x\%$ interest per year, the balance of the account at the end of the year is $B(1 + x)$. For example, if the starting balance is $100 and the interest rate is 5%, the balance after one year is:

$$100(1 + 5\%) = 100(1.05) = 105$$

Algebra Paks will be available on the revamped PMP website soon . . .

If interested in volunteering with MathPaks, mentorship, or helping out PMP in other ways, please send a message to PMP@pmathp.org

And then onto a Calculus sequence and beyond!

You also visit our website at prisonmathproject.org or follow us on X **@prisonmathproj.**