4.2 Game : Prime climb

Vocabulary To shuffle, to draw a card, to roll a die, to roll dice.

Exercise 1 — **How to play.** Watch "Prime Climb" Instructional Video https://youtu.be/usBHrp6s4xY and play a few games.

Objective Get both your pawns to 101 exactly.

Set-up

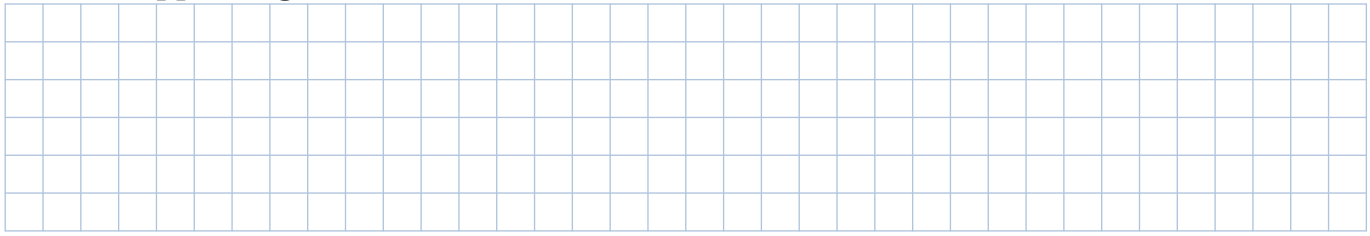
1. Lay out the board and shuffle the 24 Prime Cards
2. Choose your color. Place two pawns on 0
3. Use the "Go first" dice to decide who will play first.

Game Play Players take turns. A turn consists of four phases:

1. **ROLL** the dice. The two numnbers your roll will be use *individually* to move your pawns.
   In the case of **DOUBLES**, use the number you rolled four times instead of twice.
   You must use all your rolls each turn except on the turn you win.
2. To **MOVE** your pawn, *ADD, SUBTRACT, MULTIPLY* or *DIVIDE* the number your pawn is on by the number you rolled.
3. **BUMP** If you end your Move phase with either of your pawns on the same space as another pawn (including your own), you MUST send the pawn you landed on to 0.
4. **DRAW** a Prime Card if you end your Move phase with one or more of your pawns on a red prime.
   Keeper cards are kept face up for a future turn. Can't be played the turn you draw it.
   Action cards are played immediately.

Exercise 2 — **investigate.** Answer the following riddles.

1. How can you get two pawns from 0 to 101 in four rolls (that's eight numbers) without any number appearing on a die more than once?



2. It's possible to solve the last problem with the additional stipulation that three of your four rolls sum to the same number. Can you find out how?

3. a) Your pawn is at 100. What is the probability of reaching 101 on your next roll? (You don't have to use both dice rolls when you reach 101, though of course you may.)

		first die											
		1	2	3	4	4	5	5	6	6	7	8	9	10
second die	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	9													
	10													

b) What if your pawn was at 99?

4. In the middle of a certain game, Katherine and I were down to a single pawn each. Hers was on 24, and mine was on a certain unnamed number. I rolled a little too forcefully, and the dice went off the table on her side.

- "Ha," she said. "If you had been at 0, you could have hit me."
- "Then I can hit you from where I am!" I said.

What number was I on?

4.2.1 Solutions for Puzzles

for full article https://archive.nytimes.com/wordplay.blogs.nytimes.com/2014/05/19/primo/

1. Solution 1: Dice 1 $2 \times 6 \times 8 + 5 = 101$ and Dice 2 : $10 \times 9 + 4 + 7$

   Alternate solution, first roll: (10,1) -> P1 at 11, P2 at 0

   Second roll: (9,2) -> P1 at $9 \times 11 + 2 = 101$, P2 at 0

   Third roll: (8 , 3) -> P2 at $(0 + 3) \times 8 = 24$

   Fourth roll (4;5) -> P2 at $24 \times 4 = 96 + 5$.
2. Solution 1: $2 + 12 = 8 + 4 = 5 + 7$ give all 12. So 3 roll out of 4 add up to 12.

   For the alternate solution, 3 rolls all sum to 11.
3. 35% when pawn is at 100, and 34% when pawn is at 99.
4. The dice are either 6 and 4, either 8 and 3. He was on a number that was able to hit.

   As Golden Dragon explained: “Since he could have hit 24 if he had been at 0, that means that the dice must have been either 8 and 3 or 6 and 4. So whatever number he really was at needs to be able to reach 24 with either pair. Trying various combinations, I found 16 to satisfy this. 16 minus 8 = 8 times 3 is 24. 16 times 6 = 96 divided by 4 is 24.”

   Ravi noticed that 1 could have solved the problem as well: “From 0, it is only 0 + 8 X 3 or 0 + 4 X 6 that hit 24. And when on 1, you could use 1 X 8 X 3 or 1 X 4 X 6 to get to 24 with either of the rolls.”