ESTIMATION MODEL

For this estimation model, I choose two different puzzle Grand Teton 32-piece round puzzle and Winter Walk 100 piece classic from “jigzone.com”. While I am writing my overview here, I might change my 100 pieces puzzle to 80 pieces; it looks very difficult and lots of pieces. I am already afraid.

**Initial Estimation**

**32 piece round puzzle**

I feel like 32 piece puzzle is quite easy and it can be solved within 3 mins on average. It is in rounded shape which helps to predict the outmost pieces very easy. The pieces are itself big that you can relate each small piece to the big picture. Here is my estimation in sequence for 24 pieces:

Solo : Tg = 3 mins

With Friend: Tg = 2 mins

With 4 people: Tg = 3 mins

My estimation might be surprising but, my estimation is somewhat affected by the average time shown on the website too. This is my first look estimation. Below is my estimation after I analyzed the puzzle for about 5 mins.

I thought of calculating my guess; It doesn’t look hard. If we spent 30 seconds to join 2 pieces of puzzle. Then, to make 16 pieces would take 8 minutes. To convert that 8 into 4 pieces by joining two different pieces then it would take 2 minutes more. And again, 1 minute to make a single piece. Which is in total 11 mins. Which means 20 seconds for each piece. (Not bad for one person)

When done by 2 people if that was our first attempt for both; maybe we can join 3 pieces in 30 seconds. Which will take us 5.30 minutes to convert into 11 pieces. And 2 mins to convert into 4 pieces and 30 seconds to join final 4 pieces. Which are 8 minutes in total for 2 people?

1 people : Tc = 11 mins

2 people : Tc = 8 mins = (11 – x \* 11) = calculate x ? let x is a change in mins in ratio when we double the number of players => x = 3/11

4 people: Tc = (8 – x\*8) = 8 – 3/11\*8 = 5.82 mins

Even though calculation says 5.82 mins we cannot drag and drop the pieces in two different places at the same time in laptop. So, I feel like communication will take more time when with 4 people so the total time to solve 32 puzzles can be around 9 mins.

**100 piece classic puzzle**

This looks insanely hard. I am surprised by the average time taken by people in this puzzle. But here is my initial guess:

1 person: Tg = 1 hour

2 person : Tg = 45 minutes

4 people: Tg = 40 minutes

In 100 pieces puzzle, the total time estimate is same for 4 people and 2 people because I think it’s a big puzzle which will be beneficial to have more puzzle, unlike in 32 pieces puzzle where I guessed efficiency will go down because of too many people.

Some calculation of time estimation: Same approach as before with different number of pieces

100 -> 50 -> 25 -> 12 -> 6 -> 3 -> 1

50 + 25 + 12 + 6 + 3 + 1 = 96 steps = 96\*0.5 mins = 48 mins

1 person: Tc : 48 mins

2 people: Tc: 100 -> 33 -> 11 -> 4 ->1 = 33 + 11 + 4 + 1 = 49 steps = 49\*0.5 mis = 25 mins

4 people: Tc: 25- x\* 25 = 13 minutes

Because we know, x = (48-25)/ 48 = 0.479

Because of lack of multitasking in laptop it will take 20 mins for 4 people to solve 100 pieces puzzle.

**Experiment (The experiment is conducted with 1, 2, and 3 people because I was out of town)**

The experimental data for 32 pieces of round puzzle.

1st attempt: 1 person: 5 mins to complete the puzzle

2nd attempt: 1 person: ¾ of the puzzle was completed in 3:15 mins

3rd attempt: 1 person : 3:54 mins to complete the whole puzzle.

2 people: 3:16 mins (1 person did the puzzle before but was not the driver)

3 people: 2:13 mins (1 person did the puzzle before but was not the driver)

The experimental data for 100 pieces classic puzzle

1 person: 28:21 mins

2 people: 22:26 mins (1 person did that puzzle before but was not the driver)

3 people: 15:13 mins (1 person did that puzzle before but was not the driver)

Notes:

There you can see the puzzle is incomplete for the 2nd attempt when done by 1 person. It was actually a technical difficulty and lack of understanding. In the 1st attempt, everything went good because that problem didn’t occur. In the 2nd attempt, the top part of the larger piece started from the middle of the puzzle screen. It didn’t come in my mind that I can drag the whole big piece of the puzzle. It was a very simple thing, but that didn’t come in my mind at that point. Later I realized and continued the new puzzle.

There was a point where we couldn’t match anything for 1 minute even while we were 3 people. It happened mostly in 100 pieces puzzle. The picture quality was poor, and the pieces were small.

**Estimation equation**

For easier puzzle or puzzle with around 25 pieces. I would say time to solve puzzle doesn’t depend on number of people. It is just like brute force algorithm when n is very small. There is no visible difference in using brute force searching or sorted-binary search when n is small.

T -> n (T is directly proportional to the number of pieces when n is close to 30)

Where T is time and n is number of pieces

For complex puzzle number of people definitely helps to increase efficiency.

T -> n (T is directly proportional to number of pieces when n is close to 30)

Where T is time and n is number of pieces

T -> 1/P ( where P is the number of people)

1 person: T = 28 \* 60 + 21 = 1701 secs

2 people: T = 1346 secs = 1701 – x \* 1701 => x = 0.2087

Now let’s predict for 3 people: 1346 – 0.2087 \* 1346 = 1065 seconds

Experimental data: 913 seconds

Rate of Error: 15% (Which is a lot. A more experiment with more people is needed for even precise result)

**Reflection**

1. Variables are always a convenient way of representing changing numbers. Especially when the numbers are totally random.
2. I was afraid when I saw 100 pieces puzzle on my screen. But when I used the technique to match similar one first then it got fairly simple. I first arranged the sides. And then did bright color and did lots of white space. But by the second attempt, I knew a lot of minor difference too.
3. I want more people, and every time a puzzle should be same as I did in my experiment. No person should be repeated in any experiment.