



# A FRIEND'S PROMISE

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"Haven't you tested my patience enough?", implored Krish as he tumbled down the hammock, the soft rustling and crinkling of leaves making satisfying sounds, just before they flew away in the pleasant breeze of Mathura.

Krish and Sudama had come to a nearby forest for a picnic. The scorching Sun shone intensely as it approached lunchtime. The sound of their rumbling stomachs prompted Sudama to whip out his tiffin which contained sprouted lentils, and he quickly started eating it.



“How come you only brought this? What about all the yummy snacks?”, asked innocent Krish. Sudama replied, “My mom tells me that sprouts are very nutritious and give us lots of energy and protein, so it is now a staple in our house”. “That’s fine, but what about the bread or rice to eat this with??”, Krish pushed.

Sheepishly, Sudama explained that he didn’t have much food at home and that was all his mom could give him. Krish understood his friend’s situation and immediately

started rummaging his backpack for his tiffin. To his dismay, he realised that he had forgotten his tiffin at home in the rush of excitement to come for the picnic. When Krish asked Sudama for some food, unhesitatingly the latter divided it in half and offered it to an astonished Krish. Krish was very grateful and quickly had half of his share while he thought about how magnanimous Sudama was, to give him part of his food without a second thought, despite not having much to eat himself.

As Sudama finished his share of the food, Krish had only finished half of his but their growling stomachs were at ease now due to the sprouts' high fibre content. They were both far too excited to light their campfire and tell each other haunted stories, so they left the quarter of the sprouts remaining in the tiffin itself. While they were finding dry wood for the fire, Krish kept on pondering about how he would pay back Sudama for his kindness.





Suddenly, Krish had a brain wave! He decided to plant the remaining sprouts. Once the plants grow, he would be able to return more of these lentils to his best friend, and hopefully help him too. Quietly, Krish took the remaining sprouts in his hand and went to a closeby field and planted them there, spreading them around with his hands just before covering it with a layer of fresh, moist soil. After doing so, he quickly ran back to the campsite to continue with his picnic.

The two friends went about the rest of the evening and had a lot of fun. Krish regularly kept coming to the field where he had planted the sprouts, which was just a ten-minute walk from his home. He nurtured the crops with affection and helped them grow. Soon in six months, the few sprouts led to full grown plants and yielded a bountiful crop. Krish's excitement knew no bounds.

If 50 gms  $\xrightarrow{1\text{ year}}$  80 gms  
 then 80 gms  $\xrightarrow{2\text{ years}}$  MORE!!!

“If I let the crops keep growing, I can pay back Sudama so many more

lentils! After all, he has always been so helpful to me”, reasoned Krish.

As the years progressed, Krish's prosperity grew as he became the king of the kingdom he built. Sudama on the other hand, being from a humble background, remained extremely poor and relied on odd jobs for his and his family's survival, barely making ends meet. This poor lifestyle forced him to shift cities and travel to a distant land after selling his house. Soon his situation became so dire that he, his wife and his children could only afford to eat one meal per day, and that too, only if they were lucky. Upon his wife's daily coaxing and cajoling, Sudama finally decided to reunite with his childhood buddy Krish and considered asking him for some help.

He began the long journey across multiple cities barefoot and



encountered many challenges along the way due to lack of food, shelter and adequate clothing. As he neared Mathura, he saw endless swathes of lush green lentil fields on one side of the road and dense forests on the other.

Re-invigorated by this beautiful sight, he continued his journey and finally saw the seemingly never-ending field finally come to an end. Just before it ended, he saw a sign that read 'Sudama Farms'. He wanted to know more about this farm due to the sheer enormity of the land's expanse, and asked nearby residents who the field belonged to. Upon hearing that it belonged to Krish, Sudama was dumbstruck as he realised that his friend still remembered him.

After Sudama's long two week journey from his small village to Krish's kingdom, he was exhausted but finally made his way to Krish's palace. He was very excited to reunite with his childhood friend after all those years but got disparaged when he saw members of the ferocious female infantry regiment, Shakti, guarding the palace doors. Seeing Sudama's ragged clothes and dishevelled appearance, the guard refused to even listen to what he had to say, let alone allow



him to meet the king, Krish. The entire day passed and soon despondent Sudama lost all hope and decided to go back home.


Just when the sky was marked with streaks of crimson, pink and orange and dusk was setting in, Sudama heard something that made him freeze in his tracks. Almost as if Krish had sensed his best friend's presence, the large palace doors opened, and he heard his name being yelled out by his dear friend. He saw Krish running towards him, decked in his royal robes, flanked by an entourage from the Shakti.

However, instead of running towards his friend, he hid himself behind one of the nearby bushes, embarrassed by his appearance. It took a shocked Sudama a few seconds to process this unusual scene as Krish kept calling out his name. He then promptly came out of his hiding place and presented himself in front of his best friend where they embraced each other, as time seemed to freeze and stand still.

Just before the two went inside the palace, an ecstatic Sudama




praised Krish about his thriving empire and the name he built for himself. He also sheepishly asked him about why the large expanse of farms he saw on his journey were called ‘Sudama Farms’ . To this, Krish replied, “Those farms have been named after their rightful owner and that is you, my dear friend”. As soon as Sudama heard this, he burst into laughter as he thought Krish was kidding and joking around, just as he remembered his friend to be. Seeing seriousness on Krish’s face, a shocked Sudama asked, “How is that even possible? I didn’t even know that farm existed until yesterday!”. To this, Krish replied, “Do you remember our picnic many years ago? I planted some of the sprouts you had offered me when I forgot my food, and those have grown and reaped into all of this over the years!”. There was visible confusion and astonishment on Sudama’s face as he told Krish that this was not possible.



“Krish there is no way those fistful sprouts could have grown into so much”, exclaimed Sudama. To this, Krish replied, “Let me ask you a question, how many lentils do you think a single plant can yield?”. Sudama replied, “Lots. But still... You are forgetting that crops don’t grow at a constant rate every year”. “Yes... and no. Did you forget about the concept of estimation?”, said Krish, “I replanted all the seeds that grew from the plants after deducting labour costs, material and land purchase costs. While nature can be ruthless and expecting constancy with arbitrary concepts might be a fool’s errand, the time invested should also be considered. It’s actually simple maths. There were bountiful yields most years, but we had few years of suboptimal yield as well. I estimated an annual average growth rate of roughly 60%”.

“Ohh that makes sense. Wait, but even if you estimate some sort of a rate, there’s no way that those 50g of sprouts have grown into so much!”, demanded Sudama.





## GROWTH THROUGH SIMPLE INTEREST

Starting amount = 50 gms  
 Estimated growth rate = 60%  
 Additional amount of growth per year =  $\frac{60}{100} \times 50 = 30$  gms

No. of years	Amount in previous years ( $x_1$ )	Additional amount of growth/year ( $x_2$ )	Total amount of crops = $x_1 + x_2$
1	50 gms (Start amount)	30 gms	$50 + 30 = 80$ gms
2	80 gms	30 gms	$80 + 30 = 110$ gms
3	110 gms	30 gms	$110 + 30 = 140$ gms
⋮	⋮	⋮	⋮
20	$50 + 19(30)$ gms	30 gms	$50 + 20(30) = 650$ gms

So, we get a generalised rule:

$$\text{Total amount of crops} = \text{Starting Amount} + (\text{No. of years}) (\text{Amount of growth/year})$$

$P$  = Principal or Starting amount  
 $R$  = Rate or growth percent by which Principal changes/year  
 $T$  = time or no. of years

Here,

$$P = 50 \text{ gms} \quad R = 60\% \quad T = 20 \text{ years}$$

$$\text{Total Amount} = P + \left( \frac{P \times R \times T}{100} \right)$$

$$= 50 + \left( \frac{50 \times 60 \times 20}{100} \right)$$

$$= 50 + 600$$

$$\text{Total amount} = 650 \text{ gms}$$

“So you see Krish, the amount of crops that would have grown in twenty years would just be 650 grams”, concluded Sudama.

“Leave all this, we’ve finally met after twenty years! Let’s spend time with each other”, said Krish. Weary and worn out, Sudama readily agreed to this as the two went inside the palace and enjoyed each other’s company, spending the entire night talking. Krish ensured that Sudama was treated with the utmost respect and care. He arranged for his comfortable stay and offered him the best facilities and lavish feasts to pamper him. They told each other about how life had treated them, and soon a week had passed and Sudama decided to head back home. While packing his bags, he reminisced about finally getting to meet his best friend after all those years and rejoiced at the fact that Krish had not forgotten about him. However, when Krish presented him with a bag of gold coins and the documents for Sudama Farms, he refused to accept it. Although that would hugely help his family’s financial situation, there was no reason for him to accept this huge charity from Krish.

Seeing his friend’s discomfort about accepting such a large farm,

Krish decided to explain it to Sudama in detail. “You see, I started off with 50g of sprouts which I noticed grew at an estimated rate of 60%. So, 60% of 50g is 30g...” “Krish, I know you’ve always been fond of maths but what is the point of using it here? There’s no way it’s connected to farming!” Sudama interrupted restlessly. “...ah my friend, but that’s the thing. Maths is not just connected to farming, you can see its applications everywhere. It is not just a subject, it’s a way of life. We can find it all around us,” Krish says as he continued explaining to Sudama.

### GROWTH THROUGH COMPOUND INTEREST

Starting amount = 50gms  
Estimated growth rate = 60%

No. of years	Amount in previous years ( $x_1$ )	Additional amount of growth in the year ( $x_2$ )	Total amount of crops ( $x_1 + x_2$ )
1	50gms (Starting amount)	$\frac{60}{100} \times 50 = 30$ gms	$50 + \frac{60}{100} \times 50 = 50 \left(1 + \frac{60}{100}\right) = 80$ gms
2	$50 \left(1 + \frac{60}{100}\right)$ or 80gms	$\frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right)$ or $\frac{60}{100} \times 80 = 48$ gms	$50 \left(1 + \frac{60}{100}\right) + \frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right) = 50 \left(1 + \frac{60}{100}\right) \left(1 + \frac{60}{100}\right) = 50 \left(1 + \frac{60}{100}\right)^2 = 128$ gms
3	$50 \left(1 + \frac{60}{100}\right)^2$ or 128gms	$\frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right)^2$ or $\frac{60}{100} \times 128 = 76.8$ gms	$50 \left(1 + \frac{60}{100}\right)^2 + \frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right)^2 = 50 \left(1 + \frac{60}{100}\right)^2 \left(1 + \frac{60}{100}\right) = 50 \left(1 + \frac{60}{100}\right)^3 = 204.8$ gms
...	...	...	...
20	$50 \left(1 + \frac{60}{100}\right)^{19}$ or $\approx 377789$ gms	$\frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right)^{19}$ or $\frac{60}{100} \times (377789) \approx 226673.5912$ gms	$50 \left(1 + \frac{60}{100}\right)^{19} + \frac{60}{100} \times 50 \left(1 + \frac{60}{100}\right)^{19} = 50 \left(1 + \frac{60}{100}\right)^{19} \left(1 + \frac{60}{100}\right) = 50 \left(1 + \frac{60}{100}\right)^{20} \approx 604462.9099$ gms

So generalising,

$$P = 50 \text{gms} \quad R = 60\% \quad T = 20 \text{ years}$$

We get :

$$A = P \left(1 + \frac{R}{100}\right)^n$$

↑ rate  
↑ Principal  
← no. of years

The Compound Interest formula

$$\begin{aligned} \therefore A &= 50 \left(1 + \frac{60}{100}\right)^{20} \\ &= 50 (1.6)^{20} \\ &\approx 604462.9099 \text{gms} \\ &\approx 604.46 \text{kg} \\ \text{Total amount} &\approx 604.46 \text{kg} \end{aligned}$$

“So Sudama, the 50g of your initial sprouts have thus grown in a compounded manner and yielded roughly 604kg over 20 years. Now you understand how this field rightfully belongs to you?” explained Krish.

Sudama was still processing the fact that the huge plot of land and all the crops indeed belonged to him, when Krish started laughing heartily. But Sudama being the righteous friend he was, still wasn’t ready to accept this and said, “Krish I can’t take this. Finally, all of this is your effort that you have put in for years. That’s got to count for something”. To this Krish just chuckled and replied, “My contribution in this is actually negligible. I just spent the first year being consistent about tending to the small patch of crops, and then I left it to nature





Krish continued, “Slowly, with time, all this compounded and gave rise to the large expanse of Sudama farms, you see today! You see, those with pure intentions, readiness and a disciplined mindset to put in the work, are rewarded by nature and time through compounding. This is your good karma for sharing those sprouts with me so openly, without expecting anything in return”. This lesson slowly dawned on Sudama as he praised his friend for his smart wit and foresight.

He reflected, with a grateful heart, that the real riches he received in this trip were actually the lessons of compounding, power of mother nature, virtues of a sincere friendship, fruits of sharing selflessly, and the love and respect he received from his best friend. As Sudama walked home, he decided to spread these invaluable lessons to the next generation as his contribution to the world. With his newfound land and wealth, Sudama returned home happily with a heart full of gratitude, reflecting on this important lesson of compounding that his best friend taught him.

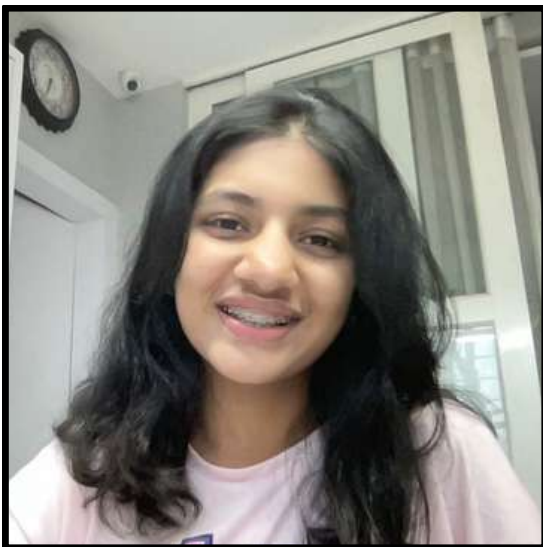
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*Two friends, Krish and Sudama are on a picnic where the former forgets his tiffin. Krish strategises different ways in which he can pay back the gracious Sudama for offering his sprouts. Due to the sudden separation of the two friends, Krish is not able to pay his friend back until much later, where the shocked Sudama receives a whole farm of lentils, instead of a handful which he had shared with Krish all those years ago. He learns the concept of compounding, fruits of sharing selflessly, the power of consistency and friendship, and the support mother nature offers to diligent workers.*

## ABOUT THE AUTHOR



My name is Navya Agarwal, a grade 9 student from Oberoi International School JVLR in Mumbai, India. As my 3rd time participating in this competition after getting shortlisted twice, I am very excited about this story. I am very fond of reading mythological stories about Lord Krishna, a beloved character in the Hindu culture. These tales are a great source to learn life lessons in a fun and memorable way, and this was my inspiration for writing this story.

I want to help others gain a better understanding about the concept of compounding, which has a very important application in life too. I have always enjoyed Maths, however, creating a mathematical story picture book, interweaving my interest in Art, English and Mythology has not only made me a risk-taker, but also helped me understand the topic better. I have come to realise that teaching others concepts actually makes your understanding of a topic much clearer. I really enjoy the process of writing mathematical stories and would encourage other students around the world to take part in the Young Mathematical Story Author competition too!