The Sack

Once upon a time, in a land far, far away, there lived a sack of corn. It was a very special sack of corn, according to its owner - a farmer who had a doctorate in *Mathematics*, and knew about such things.

He did not know much about farming, however, and he owned just a goat and a wolf. The only reason he had the goat was because he had won it as a prize, though if truth be told, he had been hoping for a flashy sports car. He would never admit that to the goat, of course, but their relationship had always been strained.

The wolf had been sold as a pup to the farmer, who believed he was buying a sheepdog to look after the goat. He was not a very good farmer, as has been mentioned. He did manage to teach the wolf some cool tricks, which we will elaborate upon later as they become necessary for the purpose of the narrative, but you can rest assured that none of them were in any way useful for herding sheep, and certainly not for herding a solitary goat. The wolf was terrified of the goat.

Our story begins as the farmer is being chased out of the village for having murdered the king's son. It was, of course, an accident, but the king was not as logical a person as the farmer, and he would not listen to reason nor a lecture on combinatorics.

In brief, a wandering gypsy had been offended by the king somehow, and she had placed a curse and some radioactive waste on one of the sacks of corn in the village. Of course, not knowing which sack of corn was tainted would have rendered them all unusable, and would have had a devastating effect on the village's economy, so the king decreed that someone must find the cursèd sack of corn as quickly as possible, before the sun rose and the stock markets opened. Our protagonist made the ever-foolish mistake of getting involved, and asked that all of the sacks of corn in the village be brought forth, along with a selection of children to taste them, because children are stupid and dispensable and will eat anything except broccoli.[1]

In all, there were 2000 sacks of corn in the village. In an ideal world—the kind with an unlimited supply of children to poison—the farmer could have given a grain from a different sack to each of a couple of thousand children, and simply waited to see which one died, and then everyone who was in

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[1]Not you, dear reader. You are very special and you are universally loved. That is why someone bought you this book. You are not like other children – you eat your broccoli, don't you?

a position to complain would have lived happily ever after. This world is, however, not ideal, and due to the region's exceedingly ugly inhabitants and great advances in ophthalmology, there were very few children to be found.

We must give the farmer the benefit of the doubt and assume that this paucity is the only reason he allowed the king's son to partake in his computations, for otherwise the farmer must have been very silly indeed, despite what his doctorate in *Mathematics* might suggest.[2]

We shall make some other assumptions, too, because mathematicians always do that. It's a way for them to make their jobs easier, and often gives them a get-out clause in the event that their calculations fail. They're sneaky that way:

Assumption 1. A poisoned child will die/mutate/otherwise suffer the ill-effects of the curse/radiation precisely at sun-up. We cannot simply keep feeding the greediest child grains of corn one at a time, expecting him or her to conviently kick the bucket as soon as they taste the grain from the poisoned/cursèd sack. Death is rarely convenient. (Except for the dying precisely at sun-up thing, which we shall attribute to magic or somesuch. Oh! Maybe they turn briefly into a vampire, and then permanently into dust.)

Assumption 2. The children are all of a standard constitution - we need not worry that one of the children is the invincible Rasputin[3] reincarnate, nor that one of the children is actually allergic to corn and might go into anaphylactic shock even if the grain that they eat is unpoisoned/uncursèd.

Armed with these assumptions and your mathematical prowess, what is the least number of children you would have needed to guarantee finding which was the poisoned sack of corn by sun-up, if you had been in the farmer's large and smelly shoes?

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[2]There are some *very* silly mathematicians.

[3]The Empress of Russia's boyfriend, who, in 1916, was assassinated by being fed poisoned wine and cakes, shot three times, beaten with a club, and eventually tied up and thrown into a river, where he died of hypothermia.

The Boat

And so it was that our protagonist killed the king's son, and got the sack, with which he now fled, as fast as his disgruntled goat was prepared to carry him. The wolf kept pace a few cautious yards behind.

Eventually they came to a small river, which was far too polluted to swim across. Very fortunately, there was a small rowing boat tied to the shore. The boat was only big enough to hold the farmer and one of the goat, the wolf, or the sack of corn, at any one time.

The farmer decided that he could not leave the goat alone with the sack of corn, because even if it was radioactive and cursèd, the goat would eat it anyway. The farmer was not entirely sure why he was dragging this sack of cursèd radioactive corn around with him, but it suits the purpose of the narrative, so he can hold onto it for now, at least.

The farmer could not take the sack of corn and leave the goat alone with the wolf either, for fear the goat would eat the wolf. The goat would eat anything. As if to prove this point, it took a large bite out of one of the oars.

The puzzle of getting the goat, the wolf, and the sack of corn to the other side is, of course, a trivial one, and you have probably solved it already.

The farmer's dilemma here was that although he was content to borrow the boat to get himself and his companions to the other side, he was not sure if it counted as stealing to leave the boat on the opposite side of the bank to the one he had found it on. He did not want to add petty larceny to his criminal record of manslaughter.

While he was mulling this over, he espied on the far bank a beautiful maiden with fiery red hair who seemed like she might also be interested in crossing the river.

"Hello!" he yelled. "I am trying to cross the river with my goat, my wolf, and this sack of corn. Unfortunately, the boat appears to be too small to carry all of us at once, so I am going to have to make multiple trips. To compound the issue, I cannot leave the goat alone with either the wolf or the sack of corn. If I am not with him, he will try to eat them. We have an understanding, you see." Here, he gestured towards a large blackthorn stick tied to his belt. "It is possible," he continued, "for me to get everything across safely because I'm a mathematician. However, I don't want to leave the boat on the opposite side of the river to where I found it, for that might greatly inconvenience the owner. It looks like you might be trying to cross the river too - perhaps we could help each other out?"

The beautiful maiden cupped her hands to her mouth and shouted back at him - "I'm a vegan!".[4]

The farmer was not entirely sure what to make of this. "Look," he continued, "I'm in a bit of a hurry - the king is after me. He thinks I killed his son."

"Did you?"

"Well. . . technically. . ."

The beautiful maiden smiled so broadly he could see her teeth sparkle from where he stood. "Oooh! I'm a kleptomaniac!" she tittered.

This changed things a little, thought the farmer. While it seemed she would now be willing to help on the grounds of anarchy, he would be foolish to trust her completely. While the goat and the wolf would be safe with her, he could not leave her unsupervised with the sack of corn, even if it was radioactive and cursèd, because she had all the hallmarks of being a lunatic. After some thought, he realised that with the maiden's help, he could get himself, the goat, the wolf and the sack of corn to the far side of the river, and end up with both the boat and the maiden on this side, all the while ensuring that he would be on hand to prevent any of the others eating each other.

How does he do it?

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[4]A vegan is someone who does not eat either wolf or goat, but hates plants and will do anything in their power to destroy them.