

# Bags of Colored Carrots

In *Bags of Colored Carrots* Sophie and Norman help Ezra (and Irma), owners of a farm stand, with mathematical problems that arise as they sell multi-colored carrots. The mathematical problems involve figuring out how many carrots are being purchased altogether (adding). The story features a great deal of talk about more than and less than 5 (and later 10). These are important numbers and learners get to do considerable thinking about them. Discussing and developing addition strategies is another major mathematical focus of the “carrot” story.

The *STORY* provides a purpose for mathematical thinking. The carrots must be put into bags and bags come in two (later three) sizes. Putting carrots in bags involves concepts of greater, less, and equal; as well as partitioning sets in various ways. Basic ideas about division come into play here – basic but also complicated because each size bag represents a different divisor. At their most complex, the problems involve putting carrots (up to 20) into bags of three sizes with the constraint of using the fewest bags possible. It turns out that there can be many ways to do this. Knowing that some math problems have many solutions is also a big idea. All in all, *Bags of Colored Carrots* is an invitation to complex mathematical thinking on the part of 1st and 2nd graders.

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## **Bags of Colored Carrots**

It was a sparkling fall day and Sophie was excited. She was going with her family to visit family friends, who lived on a farm. Sophie had been to the farm before, and she loved the drive because she got to see barns, fields of corn, cows, and chickens as she gazed out of the car window. Sophie knew that this was the time of year when lots of crops were being harvested, and she was hoping she might see someone working in the fields.

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Sophie invited her good friend Norman to come along. Norman had moved to Sophie's town from New York City and had never seen a real farm before. Sophie couldn't wait to show Norman what a real farm looked like.

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As the car slowed to turn down the road that went to the farm, everyone noticed that a new farm stand had been set up just across the country lane. It was a small, quaint farm stand with a selection of fresh, local produce. The stand had a handmade sign, some baskets with vegetables, and some wooden shelves inside displaying lots of jars.

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“Can we get out and see the farm stand?” Sophie asked.

“Of course!” Her parents answered. They had learned from their farmer friends that the people who owned the stand were very nice and that the stand would be a safe and fun place to visit.

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Sophie and Norman scrambled out of the car while Sophie's parents walked over to introduce themselves to the owners of the farm stand. The owners were a husband and a wife, who both looked friendly. The man was not very tall and wore overalls and a straw hat. His very tall wife was wearing a tee shirt and jeans with her hair in a long braid.

“I’m Irma, and this is my husband, Ezra,” said the woman with a smile as she introduced herself to Sophie’s parents. “Welcome to our farm stand.” “We moved to New England last year, and we’ve always dreamt about owning a farm stand,” Ezra added.

“Wow, it’s exciting that you are finally making your dream come true!” Sophie’s mom said.

Irma explained, “It’s been very fun for us so far. We’ve been able to meet lots of nice people from the area, and learn about farming and running a business.”

Sophie and Norman overheard this conversation from where they stood, and looked at each other. “Maybe I’ll own a farm stand one day,” Sophie thought out loud.

“We should stay and watch what Irma and Ezra do at their farm stand,” Norman suggested.

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“Stay for a while and then walk over to the farm. We’ll be there helping our friends do some weeding,” Sophie’s mom said.

Sophie’s parents got into their car and drove the short distance to their friends’ farm.

Norman and Sophie walked over to Ezra, and Norman asked, “What are you selling today?”

“Carrots,” Ezra answered, holding up a bunch of carrots, each a different color. There was a red, yellow, orange, white, and a purple carrot in his hand.

“Those are carrots?” exclaimed Norman. “They don’t look like the carrots my dad buys at the grocery store. He normally buys these really small, orange carrots! Are you sure these have not been painted?”

“I have never seen so many colors of carrots either,” declared Sophie.

“Nope,” Ezra chuckled. “These come from your friend’s farm down the road.”

“Ezra!” Irma shouted from the other side of the farm stand. “We’re running out of small bags again. I’m going to get more. There are a few customers waiting. Will you take care of them while I’m gone?”

“I will,” said Ezra. “Would you like to help me at the farm stand?” he asked Sophie and Norman.

“Yes, can we really?” asked Norman.

“Of course,” replied Ezra.

Just as Sophie and Norman approached the counter, Ezra noticed customers following closely behind them.

“How can I help you today?” Ezra asked the first customer.

“I would like to get some carrots. Can I get a bag to put them in?” the red-haired woman asked with a smile.

“How many carrots do you want?” inquired Ezra.

“I think I’ll get **3** yellow carrots,” said the woman.

“Hmmm,” mumbled Ezra, “**3** is less than **5**.” Ezra handed the woman a small bag.

“Thank you. Please come back to our farm stand again!” he said, as the woman walked over to the bins of carrots.

It was a busy day. Many of the people driving down the road were stopping for vegetables. The next customer walked up to Ezra.

“I would like to purchase **8** red carrots,” he said politely.

“**8** is more than **5**,” Ezra said quietly to himself. “Norman, may I have a large bag please?”

“Why do we need a large bag this time?” Norman asked as he handed the bag to Ezra.

“The little bags can hold **5** carrots,” Ezra replied as he handed the bag to the man, who went to pick out his red carrots. “The large bags can hold **10** carrots. When a customer tells me how many carrots they would like to buy, I give them the bag that is right size – a little bag for **fewer than 5** carrots and a large bag for **more than 5** carrots.”

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The next customer, a woman wearing a baseball cap, walked up to the counter and told Ezra she wanted **4** orange carrots.

“**4** is less than **5**,” Norman remarked. “That means we use a small bag.” Sophie handed the woman a small bag.

**1. The next customer wants 6 purple carrots. Should Ezra give her a small bag or a large bag?**

**1a. A boy with a Patriots sweatshirt wants 2 white carrots. Which size bag should Ezra give him?**

When Ezra turned around there was only one customer left in line. Ezra recognized her because she lived in the house next door.

“Hi,” Ezra said with a tired smile, “What brings you here today?”

“I saw all of your colorful carrots and decided to stop by. My granddaughter’s favorite color is red and her sister’s favorite color is purple, so I would like to buy **4** red and **4** purple carrots. Maybe I will finally be able to get them to eat some vegetables,” she said with a laugh.

Ezra reached under the counter and took out two small bags and handed them to the woman, who went to the bin to get the purple and red carrots.

“Ezra, why did you give her two small bags? Didn’t Irma say we are running out of small bags? Wouldn’t one large bag have worked?” Sophie asked.

“Well,” Ezra scratched his head. “She wanted **4** purple carrots and **4** red carrots. **4** red is less than **5**. And **4** purple is less than **5**. So that means two small bags.”

“But that’s **8** carrots and they could all fit in one large bag,” Norman suggested.

“Hmm...” Ezra said. “I’m not sure how you figured that out.”

Just then another customer arrived on a bicycle that was pulling a wooden wagon. She approached the counter.

“I would like to purchase **2** purple carrots and **6** white carrots,” she announced.

Ezra looked at Sophie and Norman. “Okay, what now?” he asked.

“**2** purple plus **6** white is **8** carrots,” Norman stated.

“And **8** is more than **5**!” Sophie declared.

“Large bag it is!” Ezra said with a smile.

**2. The next person in line wants 4 red and 2 yellow carrots. Which size bag should Ezra give him?**

**2a. The last person in line was a woman who arrived in a dark green truck. She wants 2 white and 3 purple carrots. Which size bag should Ezra give her?**

“We are really good at this!” Norman said proudly. “We could open our own farm stand!”

Just then a man wearing bright yellow shoes approached the farm stand.

“Hi,” he said with a smile. “I would like to buy **6** yellow and **6** orange carrots please.”

“**6** plus **6** is **12**,” Norman announced. He turned to Sophie and said, “Would you please get a large bag?”

“Wait,” said Sophie. “I don’t think that’s right.”

“**6** yellow plus **6** orange is definitely **12**,” Norman said. “And **12** is more than **5**.”

“But Ezra said that the large bags can only hold **10** carrots,” said Sophie.

“Oh right, I forgot,” Norman said, frowning. “What do we do?”

**3. What bags should Ezra give to the man who wants 6 yellow and 6 orange carrots?**

The next customer slowly made her way up to the stand. She had a cast on her right leg. Sophie and Norman looked at her cast. She smiled and said, "I hurt my knee when I fell hiking on some very slippery rocks. The cast comes off tomorrow and soon I'll be able to go hiking again." She turned to Ezra and said, "I would like **11** white carrots and **11** purple carrots.

"We can figure this one out!" Norman announced. "**11** plus **11** is..." he paused then said, "Well I know it is more than **10**, so we need a large bag for that."

Norman looked over at Sophie hoping for some help. Sophie had that thoughtful look she gets when she has an idea.

**4. What bags should Sophie and Norman tell Ezra to give the woman who wants 11 white and 11 purple carrots?**

The next customer walked up and said, “I am baking a carrot cake for my sister’s birthday tomorrow. She loves carrots. I need carrots to make the cake. And I know it sounds silly, but I want to decorate the top of the cake with colorful carrots.”

“How many carrots will you need?” asked Ezra.

The girl glanced at the list in her hand before answering. “**6** orange carrots, **6** purple, **5** yellow and **4** white,” she replied.

**5. What bags should Ezra give to the girl who is making a carrot cake for her sister and wants 6 orange, 6 purple, 5 yellow, and 4 white carrots?**

Ezra, Sophie, and Norman noticed that they were almost out of bags. They also noticed Irma walking over carrying a large box. It was the new batch of paper bags and just in time.

“Guess what, Irma?” Ezra exclaimed. “Sophie and Norman helped me figure out the best way to use our bags!”

“That’s wonderful!” Irma said with a big smile. “I hope they can help us figure out a way to use these new bags too,” she added.

“What do you mean?” Ezra asked, glancing over into the box. “Are these bags different?”

“Yes,” replied Irma, selecting three brown bags from the box. “The company we order recycled paper bags from have changed the sizes of their bags. Instead of small bags that hold **5** carrots and large bags that hold **10** carrots, these bags come in three sizes. Small bags hold **3** carrots, medium bags hold **5**, and large bags hold **8** carrots.”

“We can do it!” Norman said confidently.

“Wait, that’s not all,” added Irma. “The price of bags has gone up and it is important to not use more bags than you have to.”

At that moment, a colorfully dressed man walked up to the farm stand. He was walking a small goat on a leash. “Good afternoon,” he smiled. Sophie, Norman and Ezra looked at each other. They had never seen someone with a pet goat on a leash. The goat was nibbling on some carrot greens hanging over the edge of the bin.

The man noticed the surprised look on everyone's face and said, "Most people have never seen someone walking a goat on a leash. I have had Frieda ever since she was a kid. Kid is what a young goat is called. Isn't that funny? Frieda lives in my barn with the other goats but she loves to come for walks."

"Well what can we do for you today?" asked Ezra.

"I would like to get some carrots for Frieda." said the man. "I am not sure what color carrots she likes. I think I'd like **2** red, **2** yellow, **2** white, **2** purple and **1** orange carrot. I know Frieda likes orange carrots."

"Coming right up!" Ezra announced as he reached for a bag but then stopped. With the new bags, Ezra was not sure what size to use.

Sophie said, “First we have to figure out how many carrots altogether.”

Norman was already thinking about how many carrots the man wanted and said loudly enough for everyone to hear, “**2** red and **2** yellow are **4**, **2** white make **6**, **2** purple make **8** and **1** orange... that’s **9** carrots.”

Sophie was looking at the new bags and imagining **9** carrots. “Aha!” she exclaimed. “There’s more than one way to put **9** carrots into the new bags. We could use two medium, size **5** bags but we could also use a large size **8** bag and a small size **3** bag. Both ways use the same number of bags – two.”

Ezra was scratching his head. He was not sure he understood what Sophie was saying.

**6. What could Sophie draw to Ezra that there is more than one way to put **9** carrots into two new bags?**

Ezra knew that they were supposed to use as few bags as possible. But now he also knew that there could be more than one way to put carrots into bags. Ezra decided that the best thing to do was to tell customers what bags they could have and let them decide what to use for their carrots.

The man with the goat decided to put his **9** carrots into two medium size **5** bags. He went on his way. Frieda walked beside him with a purple carrot in her mouth. At that moment, two teenage girls got off their bikes and walked over. They were riding the same color bicycles, they were dressed exactly alike and, as they got closer, everyone could see that they were twins. They looked exactly the same.

“Hi,” the girls said at the very same time.

“We’d like to buy some carrots,” one announced. “Our mom said to buy **3** orange carrots, **4** yellow carrots, **3** purple carrots...”

“...and **4** white carrots,” finished her twin sister.

“**3** plus **4** are **7** and **3** plus **4** are **7** and **7** plus **7** is **14**,” said Norman with a big smile.

“Good math Norman!” exclaimed Sophie and Ezra at the very same time. Sophie started thinking about **14** carrots and said, “I think there are many ways to put these carrots into bags.”

“I knew it,” sighed Ezra. “This IS going to be complicated.” He turned to the twins and said, “We will figure out what choices you have for bags and then you can decide.”

Once again the twins spoke at precisely the same time and said precisely the same thing, “Our mom said that some of the carrots are for our neighbor and it would be good, if we could have MORE than two bags.”

Norman was not sure how to begin.

“Let’s draw a picture. That might help us get started solving this problem,” suggested Sophie. “We can show Ezra the picture to help him understand.”

**7. Draw a picture that Sophie and Norman can give to Ezra showing how many ways you can put 14 carrots into the three different sized bags.**

The farm stand was getting very busy and everyone who came wanted some of the colorful carrots. Things were SO busy that Norman, Sophie, and Ezra each had their own customers to help.

Norman was figuring out the ways you can put **8** purple carrots and **8** red carrots into bags.

Sophie was helping someone who wanted **5** red carrots, **6** purple carrots, and **7** yellow carrots.

Ezra's customer wanted **2** orange carrots and **8** white carrots.

8a,b,c. Can you help Sophie, Norman, and Ezra figure out how many ways each of their customers can bag their carrots? (Norman 16, Sophie 18, Ezra 10)

“Wow we have been busy today,” Sophie said, turning to Norman, Ezra, and Irma.

“Yes you have. You and Norman must come visit again soon,” Irma invited.

Sophie and Norman glanced at each other. “We’d love to,” they said at the exact same time. After saying goodbye to Ezra and Irma they walked down to the farm with big smiles on their faces. They couldn’t wait to tell everyone about the adventure they had at the farm stand!

“I can’t believe we solved some of those problems. At first they seemed impossible to me,” Norman said. “Can I tell you a secret? I didn’t think I was very good in math. But I know that I AM getting better at math and I think I just might be pretty good at it.”

“I know just what you mean,” replied Sophie with a smile. “I can almost feel the connections in my brain growing when I help solve the problems at the farm stand.”

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