March 30, 2020

Hello EPS student (Grade 5),

Keeping your head in the game is very important - even when you are not physically in your school building. We've created packets to provide you with opportunities to enhance the skills you've been working on the past several months.

Some of the work and/or questions may seem easy while others may be a bit challenging. It is important to complete the lessons to the best of your ability. We included a wide variety of topics and activities to keep you engaged.

You can work at your own pace. We don't expect you to complete everything in one day. If you finish the packet, our best advice is to read for pleasure.

When school begins again, simply bring these packets to your teachers for review.

If you need anything or have questions about the school closing, your parents can call our administration building at (814) 874-6000.

Be sure to take care of yourself. Get plenty of rest, eat well, and make sure you are washing your hands with soap and water several times a day.

We will see you all after the break.

Mr. Polito, Superintendent

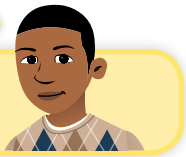
Mrs. Habursky, Assistant Superintendent

Understand Fractions on a Number Line

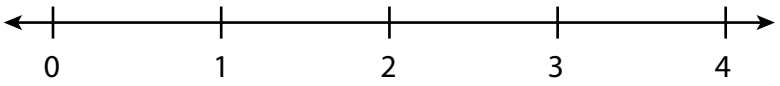
PA Core: CC.2.1.3.C.1
Eligible Content: M03.A-F.1.1.2

Think It Through

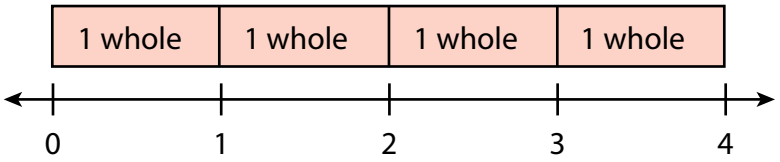
How do number lines help us understand numbers?



You are used to seeing a number line show whole numbers.



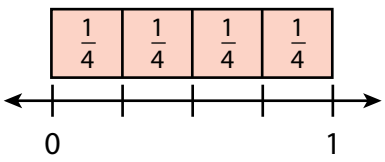
The numbers on this number line are the same distance apart. The distance from one number to the next number is 1 whole. Each time you add another whole, you count another whole number on the number line.



Think **You can show more than whole numbers on a number line.**

Fractions show equal parts of a whole. You can see this on a number line too.

The section between 0 and 1 on a number line shows 1 whole. If you mark this section to show equal parts, it is the same as dividing a whole into equal parts.

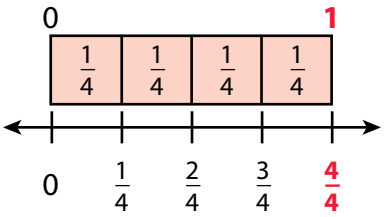


The section between 0 and 1 is marked off into 4 equal parts, so each part shows $\frac{1}{4}$.

Underline the sentence that tells why each part of the number line shows $\frac{1}{4}$.

Think Number lines can help us understand fractions greater than 1.

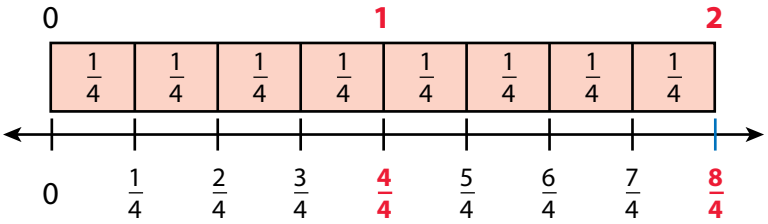
You can count fractions on a number line just like you can count whole numbers.



When you count whole numbers, you say 1, 2, 3, 4, . . . When you count fourths, you say $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \ldots$

You can also use number lines to show fractions greater than 1.

To do this, mark off each section between pairs of whole numbers (like 0 and 1 and 1 and 2), into the same number of equal parts. Then count the fractions.



The distance from zero to 2 on the number line can be named as 2, or $\frac{8}{4}$.

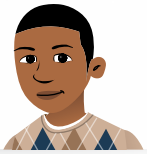
Reflect

1 How many $\frac{1}{3}$s or "thirds" are there between 0 and 1 on a number line? How do you know?

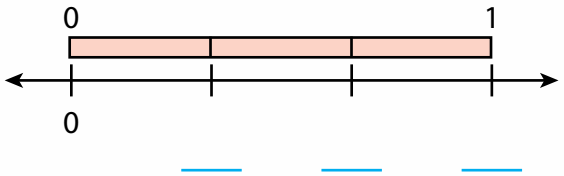
Think About Fractions as Equal Groups on a Number Line

Let's Explore the Idea

Looking at the number of equal parts helps you think about fractions on a number line.



2 Look at the section between 0 and 1 on the number line below.

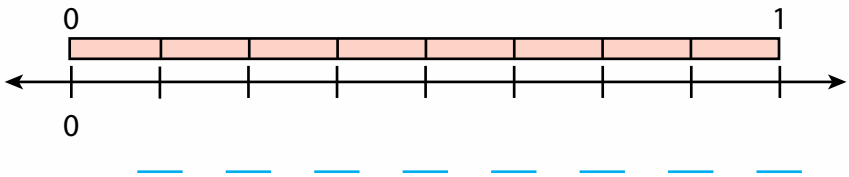


How many equal parts are there? _____

What fraction does each part show? _____

Write the missing labels on the number line.

3 Look at the section between 0 and 1 on the number line below.

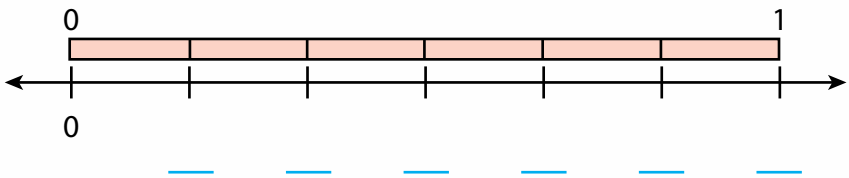


How many equal parts are there? _____

What fraction does each part show? _____

Write the missing labels on the number line.

4 Look at the section between 0 and 1 on the number line below.



How many equal parts are there? _____

What fraction does each part show? _____

Write the missing labels on the number line.

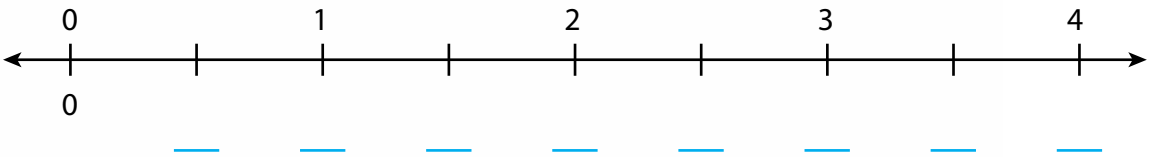
Let's Talk About It

Solve the problems below as a group.

5 Look at the number lines in problems 2–4. How is showing fractions on a number line like showing fractions using models? _____

_____

6 Look at the sections between the whole numbers on the number line below.



How many equal parts are in each section? _____

What fraction does each part show? _____

Each mark on the number line represents a fraction. What denominator will all the fractions have? _____

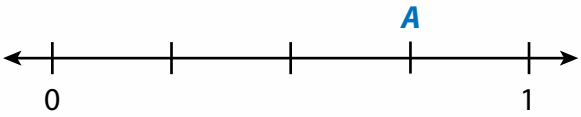
Write the missing labels on the number line.

7 Look at the fractions you wrote on the number line above that are greater than 1. What do you notice about the numerator and denominator in each of these fractions? _____

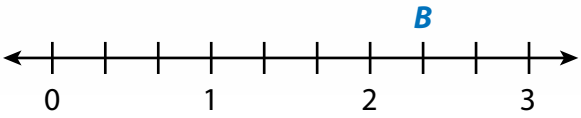
_____

Try It Another Way **Work with your group to identify each fraction.**

8 Look at the number line below. What fraction is at *A*? _____



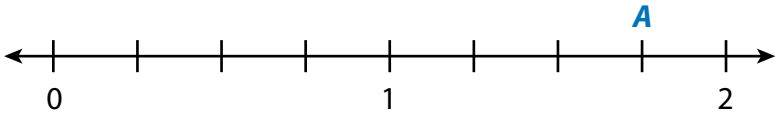
9 Look at the number line below. What fraction is at *B*? _____



Connect Ideas About Fractions on a Number Line

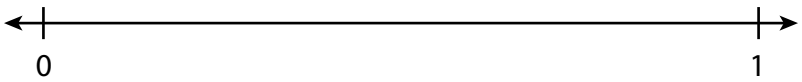
Talk through these problems as a class, then write your answers below.

10 Explain Look at the number line below.



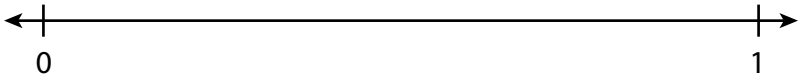
Amira says that *A* is at $\frac{7}{8}$. Is she right? Explain why or why not.

11 Demonstrate Use the number line below to show the fraction $\frac{4}{6}$.



Explain how you knew where to label $\frac{4}{6}$.

12 Illustrate Use the number line below to show that there are 8 eighths in 1 whole.



Apply Ideas About Fractions on a Number Line

13 Put It Together Use what you have learned to complete this task.

Zara and John are hiking on a trail that is 2 miles long. There are signs to mark each eighth of a mile along the trail.

Part A Draw a number line to show the length of the trail. Then mark the number line off to show where each sign is.

Part B Zara stopped for water at the $\frac{3}{8}$-mile sign. Label the $\frac{3}{8}$ mark on the number line with a *Z* for Zara.

Part C John stopped to rest after $\frac{12}{8}$ miles. Label the $\frac{12}{8}$ mark on the number line with a *J* for John.

Part D Who stopped before the 1-mile mark? Who stopped after the 1-mile mark? Explain how you know.

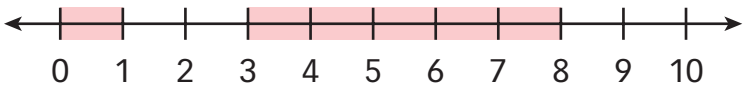
Understand
Fractions on a Number Line

Name: _____

Prerequisite: How can you place whole numbers on a number line?

Study the example showing points and sections on a number line. Then solve problems 1–6.

Example

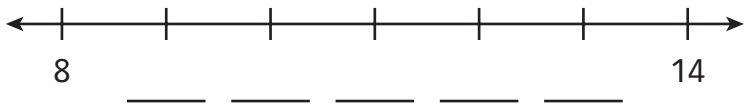


The part of the number line between 0 and 1 shows one whole.

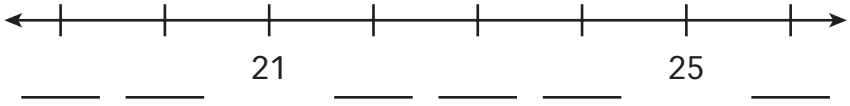
The part of the number line between 3 and 8 shows 5 wholes.

Label the number lines with the missing numbers.

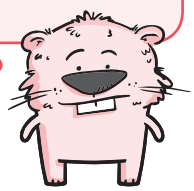
1



2

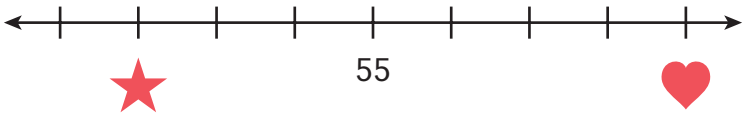


Remember, the numbers on a number line are greater as you move from left to right.



Solve.

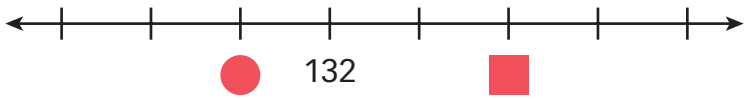
3 This number line counts by ones. Write the numbers for the star and the heart.



Star _____

Heart _____

4 This number line counts by ones. Write the numbers for the circle and the square.



Circle _____

Square _____

Some marks are hidden on these number lines. Estimate. Choose the number marked by the star.

5

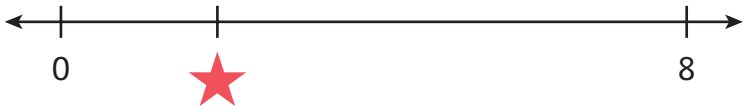
A 1

B 5

C 8

D 2

6



A 2

B 4

C 5

D 6

Name: _____

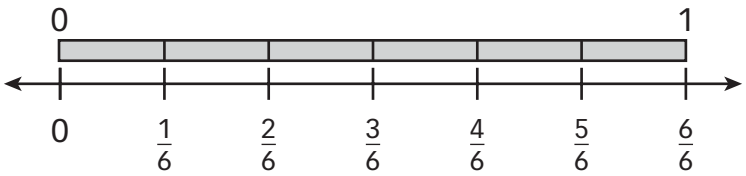
Use Equal Groups on a Number Line to Think About Fractions

Study how the example shows fractions on a number line. Then solve problems 1–12.

Example

The number line shows just the section from 0 to 1.

That is one whole.

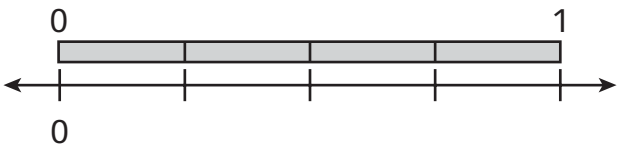


There are 6 equal parts in this section.

Each part is $\frac{1}{6}$ of the whole.

To label the marks, count like you do with whole numbers.

Use this number line to answer problems 1–4.



_____ _____ _____ _____

1 How many equal parts are there in this whole? _____

2 What fraction does each part show? _____

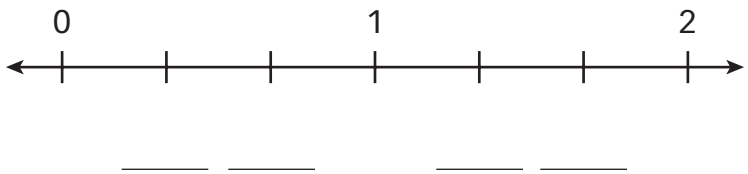
3 Label the marks on the number line.

4 What is another name for 1? _____

Vocabulary

fraction a number that names part of a whole..

Use this number line to answer problems 5–8.



_____ _____ _____ _____

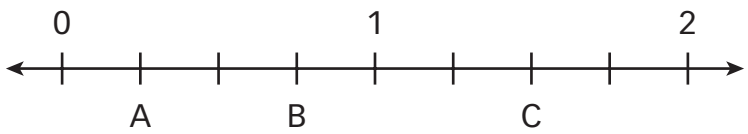
5 How many equal parts are between 0 and 1? _____

6 How many equal parts are between 1 and 2? _____

7 What fraction does each part show? _____

8 Write fractions to label the marks.

Use this number line to answer problems 9–11.

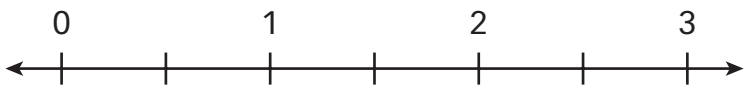


9 ***A*** is _____.

10 ***B*** is _____.

11 ***C*** is _____.

12 Write the fraction $\frac{3}{2}$ where it belongs on this number line.



Explain how you knew where to put $\frac{3}{2}$.

_____

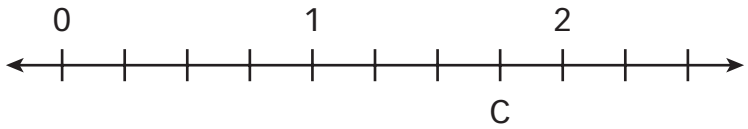
_____

Name: _____

Reason and Write

Study the example problem. Underline two parts that you think make it a particularly good answer and a helpful example.

Example



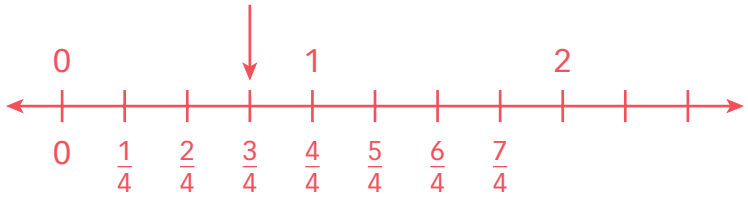
Peter said, "The fraction for point ***C*** is $\frac{3}{4}$."

Steve said, "The fraction for point ***C*** is $\frac{7}{4}$."
Who is right? How did you decide?
Who is wrong? What is the mistake?

Show your work. Use pictures, words, or numbers to explain how you decided what to draw.

Peter's answer is wrong. Peter saw that each whole is separated into 4 equal parts. So he knows that the denominator of the fractions is 4 and he has to count fourths.

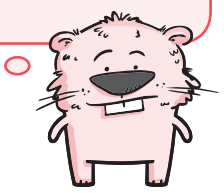
Peter's mistake was he started counting fourths at 1 instead of at 0. The point for $\frac{3}{4}$ is closer to 0, where I drew it below.



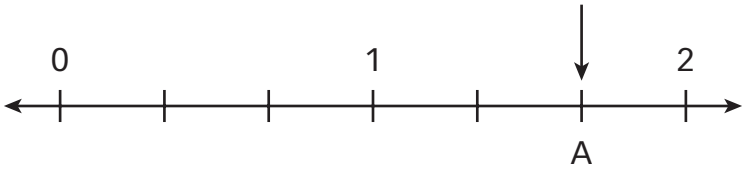
Steve was right. He knew that the denominator is 4 and he has to count fourths. He started counting with 0. From 0 to *C* there are 7 fourths. The fraction for point *C* is $\frac{7}{4}$.

Where does the example . . .

- use a picture to explain?
- use numbers to explain?
- use words to explain?
- give details?



Solve the problem. Use what you learned from the example.



Jackie said that the fraction for point ***A*** is $\frac{5}{6}$.

Ann said that the fraction for point ***A*** is $\frac{5}{3}$.

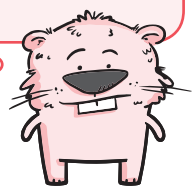
Who is right? Tell how you know.

Who is wrong? What is the mistake?

Show your work. Use pictures, words, or numbers to explain how you decided what to draw.

Did you . . .

- use a picture to explain?
- use numbers to explain?
- use words to explain?
- give details?



Stargazing

by ReadWorks

After the sun sets, take a look at the night sky. On a clear night, you'll be able to see stars scattered across the black expanse that we call our universe. If you're lucky, you might be able to spot some stars that look bigger than others-they shine brighter and attract our attention more than their smaller neighbors do. You might wonder: why are some stars brighter than others?

After much observation, scientists discovered the way stars appear to us depends on more than their actual size-it's also about how far they are from us. Therefore, the farther a star is from Earth, the smaller it will appear to us. The closer it is, the bigger it will look.

Try to think of the biggest star you've seen in the sky. An easy one, right? The sun! That's because the sun is closest to us compared to all other stars, located at just a short 150 million kilometers from Earth.

The next one? That's a tougher question. Many people answer Alpha Centauri, but some don't know that it's actually a cluster of three stars-Alpha Centauri A, Alpha Centauri B, and Proxima Centauri. Proxima Centauri is 4.24 light-years away and closest to our sun. A light-year is the distance that light travels in one year. We use this measurement because light is

the only thing in the universe that maintains a constant speed. However, even though Proxima Centauri is the closest star to the earth after the sun, you can only see it with a very powerful telescope. That doesn't make sense-didn't we just say that closer stars appear larger and more visible?

Well, Proxima Centauri is what we call a red dwarf. Red dwarf stars are very small, typically having less than half the mass of the sun. That means they generate less energy than the sun. Most stars burn hydrogen for fuel. Similar to the way a car uses gas for power, a star uses hydrogen for energy. Red dwarfs burn hydrogen very slowly, which means they generate little light compared to stars like the sun.

Proxima Centauri is the closest star after the sun, but that doesn't necessarily mean it's what we consider close in our minds. To completely understand how far away this star is, let's think about traveling 4.24 light-years away. NASA has built one of the fastest spacecrafts in existence, called New Horizons, which travels at about 60,000 kilometers per hour. Even at this speed, it would take the spacecraft 78,000 years to reach Proxima Centauri from Earth.

Sadly, the first few closest stars are not visible to the naked eye at night, which means we can't see them while we're stargazing from our homes or backyards. The closest star we can see at night is called Sirius, or the Dog Star. While Proxima Centauri is only 4.24 light-years away, Sirius is 8.6 light-years away. However, since Sirius is so large (almost twice the size of the sun), we can see it in the night sky.

So go outside and see what you can find up there!

The Brightest Sky

by Aditi Sriram

Emine had grown up in New York City and thought she could handle anything. No street was too crowded, no skyline too bright, and no parade too loud. She owned the city, and she was in command. The city was a part of her.

Or so she thought. When Emine traveled to Cairo for a two-week vacation, she wasn't prepared for what happened the moment she stepped off the plane. The heat hit her like a slap on the face. The dust found her eyes and nose immediately, and clogged them. Taxi drivers at the airport clamored for her attention, shouting and barking at her and each other in Arabic, trying to convince her to come with them. "Best price," they insisted in thick accents, looking at her eagerly. "For you-best price."

But Emine was determined to adapt to the city's frenetic energy. On her first evening in Cairo, she took a stroll from her hotel to the banks of the Nile, and watched the boats bobbing lazily on the water. Away from the traffic, people strolled and laughed quietly; the palm trees whispered in the wind, and Emine felt calmer. She watched the sun set, a deep red orb that sank into the clouds and then disappeared behind distant minarets, casting the evening in meditative hues of pink and purple. Emine relished the sight; it was nearly impossible to witness such a sight in New York City.

After a week of sightseeing in and around Cairo, Emine felt like she had a handle on the city. She knew all the second-hand bookshops and the metro. She had sugary crepes for breakfast. She listened to the calls to prayer from the many mosques. She could count up to

ten in Arabic, which made bargaining and ordering food a little easier. And she could recognize the stray cats that lazed outside her hotel. It was time for something new, Emine thought. A tour operator down the street had approached her a few times, advertising all kinds of trips on the Nile, to the Pyramids, and into the Black and White Deserts. The last adventure had caught her eye ever since she saw the pictures in the brochure, and Emine decided she would do it before her trip was up.

The following week, Emine joined two South Korean tourists and a friendly Bedouin guide, and together they drove 250 kilometers into the deserts. The Black Desert contained black volcanic rocks, whereas the White Desert contained white chalk rocks. The setting sun set the sky on fire, which she was used to, but what came next startled her completely: stars! Stars everywhere, and not at all like the few stars she could see in the New York City sky! These stars twinkled and nearly danced above her. Every few minutes, a shooting star whizzed by.

Her guide explained they were deep enough in the desert that no manmade light could interfere with the natural light in the sky. Compared to New York City's skyline, there was absolutely no electricity around her for miles. As a result, it looked like millions of people were taking pictures from the sky-each star a camera flash. Some stars shone more steadily than others, and the guide told her those were planets. He took out a high-powered telescope, through which Emine could see Saturn and its rings. She was amazed at how rapidly it moved from the field of view in the eyepiece of the telescope, because it was orbiting the sun so quickly. Emine fell asleep counting not sheep, not stars, but *shooting* stars. She had easily seen ten that night-more than she had ever seen before in her life.

In the morning, Emine was up early to watch the sun rise. The red ball was bigger than she had ever imagined, and Emine understood that, compared to the stars she had seen the night before, it was so much closer to planet Earth. Even as the sun rose higher in the sky, she could make out other stars twinkling faintly in the fresh morning sky and knew she would remember that sunrise forever.

Name: _____ **Date:** _____

Use the article "Stargazing" to answer questions 1 to 2.

1. Of all the stars in the sky, the one that looks the biggest from Earth is the sun. Why does the sun appear to be bigger than other stars?

_____

_____

_____

2. Explain how the distance between a star and Earth affects how big the star looks from Earth. Support your answer with information from the article.

_____

_____

_____

Use the article "The Brightest Sky" to answer questions 3 to 7.

3. Emine travels to Cairo on vacation. While there, where does she drive with two South Korean tourists and a Bedouin guide?

_____

_____

_____

4. Read these sentences from "The Brightest Sky" about Emine waking up in the desert.

"In the morning, Emine was up early to watch the sun rise. The red ball was bigger than she had ever imagined, and Emine understood that, compared to the stars she had seen the night before, it was so much closer to planet Earth."

Why is Emine up early?

5. What is the size of the "red ball"?

6. What is the "red ball" compared to?

7. What is much closer to Earth than the stars Emine saw the night before?

Use the articles "The Brightest Sky" and "Stargazing" to answer question 8

8. Think back to what you learned from "Stargazing" about the size of the sun and its distance from Earth. Then reread the sentences above from "The Brightest Sky." Pay special attention to how the sentences describe the "red ball" that Emine sees. What might the "red ball" be? Support your answer with evidence from both "Stargazing" and "The Brightest Sky."

Partial Eclipse

by Alizah Salario

Marcus tilted the telescope toward the sky. He was excited to watch the sun. He remembered that it is dangerous to look at the sun with the naked eye because it can damage unprotected eyes. So he placed a special glass filter on the front end of the telescope that would protect his eyes from the sun's rays. Then he carefully looked through the eyepiece and adjusted the focus so that the sun was smack in the middle of the lens. The first solar eclipse in years was about to darken the skies of Bloomfield, in the middle of a sunny Saturday afternoon, and Marcus wasn't going to miss it for the world.

He'd firmly planted the telescope tripod in the earth a few yards from the edge of the baseball diamond, not far from where his high school's junior varsity team was warming up for a game. Technically he was in the outfield, but the grass became wet and mushy further out in the park. Severe thunderstorms had nearly flooded every basement in town that week, but thankfully the sun came out again on the day of the eclipse.

A few geese had migrated from a nearby pond and squatted at the edge of the field. They flapped restlessly. Marcus knew animals had a sixth sense about nature's movements and wondered whether the geese were aware the sun would soon be stamped out from the sky.

As the JV players tossed pitches back and forth and practiced sliding into first base, Marcus did his best to ignore them. Yet he couldn't help but watch as they torqued their pitching arms back and let the balls go whizzing forth, then land softly in the cushion of a catcher's mitt. So what if he hadn't made the baseball team? Anyone could swing a bat, but not everyone could stare at the heavens and decipher the movement of planets. Thanks to his geometry teacher, Marcus finally felt like he was better at something than everyone else.

He thought back to Thursday's geometry class, when Mr. Baker had turned the lesson into an impromptu astronomy lecture. He'd even brought in an old telescope and was explaining the power of its usage.

"Eclipses are all about parabolas and angles," he'd explained. Half the class yawned as Mr. Baker waxed on about the elliptical shape of Earth's orbit and the penumbra and umbra-concentric circles of dark shadows created by an eclipse. Even though they'd had an official astronomy unit in fifth grade, by high school, most of his peers couldn't even recall what a solar eclipse was. That's when Marcus got annoyed. He raised his hand but spoke without being called on.

"Don't you remember? It's when the moon passes between the sun and Earth. So the moon blocks the sun, which means that light can't get to Earth, so a certain area of the earth will get dark as night in the middle of the day. Well, in this case only semi-dark. It's a partial eclipse," he said knowingly.

Taylor, the girl sitting in front of him, turned around and gave him a dirty look.

"What's your problem?" he whispered to her under his breath. He didn't know why he said it. He was secretly glad she even looked at him.

Marcus didn't understand why people seemed to find him annoying because he was smart. He wasn't trying to show off or anything. He was genuinely interested in learning just about everything, which was why he'd spend his lunch period talking to Mr. Baker.

"I'm glad at least one of my students takes an interest in the finer points of geometry-no pun intended," said Mr. Baker. "Marcus, if you promise to be careful, I'll let you borrow the telescope this weekend. I'll also lend you a special glass filter so that you can look at the sun safely. An eclipse is an incredible sight with this level of magnification."

For once, Marcus didn't have anything to say-besides thank you. He nodded heartily and watched as Mr. Baker pulled the tripod out from behind his desk. Even though there was a

box for the telescope, Marcus wrapped the delicate instrument in his hooded sweatshirt and held it protectively to his chest. He felt like he was harboring an important secret.

When he walked out of the classroom, Taylor was standing by the lockers, staring off into space. Her music was playing so loudly that he could hear it pulsing from her ear buds.

"What's in your sweatshirt?" she asked suspiciously, as she took out her headphones.

Marcus felt his cheeks grow warm. He probably did look ridiculous, cradling a telescope like a newborn.

"It's nothing. Just something that Mr. Baker let me take home."

"It's not that telescope, is it?" she asked.

Marcus nodded meekly.

"That's cool," she said. "But you know there's a smartphone app that calculates the circumference of both solar and lunar eclipses, right?"

"No," thought Marcus. He didn't know. He didn't have a smartphone.

"Who cares?" he told Taylor. His words came out harsher than he'd intended. Taylor put her ear buds back in her ears.

"I'm going to ignore you now," she said matter-of-factly.

Marcus thought back to the moment by the lockers as he stood in the field and began the five-minute-countdown until the eclipse. He wished, for a moment, that Taylor was there with him. An eclipse seemed so momentous, so awe-inspiring, it seemed a shame not to have anyone to share the experience with. No one else seemed to think it was anything more than a distraction. He glanced at the bleachers filling with parents and younger siblings, fans and groupies, all bubbling with anticipation for the big game. Marcus pushed the thought out of his head and checked the time on his boring old phone. Two minutes left.

"Attention in the outfield!" Coach Bernardi's booming voice echoed through a loudspeaker, and jolted Marcus out of his reverie.

Bernardi was waving his arms wildly above his head, trying to get his team members to pay attention.

"Due to a solar eclipse, the game will be delayed approximately 30 minutes. I repeat: the JV baseball game will be delayed 30 minutes due to a solar eclipse."

The team stopped for moment, collectively shrugged, and then returned to whatever they'd been doing before.

Marcus was so distracted he hardly realized the eclipse had begun. He snapped back to the filtered telescope to watch the moon inch its way in front of the sun, making the sun look like a crescent.

As soon as he looked at the sky up-close through the telescope, the world around him went quiet. The moon crept on, covering a quarter and then nearly half of the sun. In mere minutes, the sky darkened. The sudden change felt odd and eerie, like a celestial power was using a remote control to shift the moon across the sky. But Marcus wasn't scared. He felt excitement surge through him, right down to his toes. "This is what I've been waiting for," he thought.

Marcus hardly blinked. He felt instantly transported high up into the heavens, floating across the clouds. The remaining crescent of sun was blazing while the moon seemed to be moving faster and faster. Then the darkness of the moon appeared closer and closer. Closer and closer until Marcus realized he was no longer looking at the moon, but something else fast-moving and round. He heard a startling crack. The telescope jolted and the eyepiece pressed hard against his socket. Marcus fell backwards onto his behind.

It was over before he realized what had happened. Marcus scrambled to his feet and held tightly to the tripod. When he looked through the eyepiece again, he only saw jagged shards. The lens was broken. Marcus began combing through the grass, searching frantically for whatever pieces of glass he could recover. That's when he came across the baseball.

"How could you do this to me?" he yelled at no one in particular. He grabbed the baseball and slammed it into the earth. What idiot had thrown a baseball at him? Then he picked up the ball again and headed toward the diamond. By that point, Marcus had all but forgotten about the eclipse.

His stomach lurched as he thought about telling Mr. Baker what had happened. Sure, it wasn't his fault, but he had positioned the telescope just so. He'd set up in a baseball field and been so focused he failed to notice an object heading toward him, even as he looked right at it. He should've been quicker, faster, and better. But he wasn't skilled enough to make the team, and he certainly wasn't fast enough to avoid the assault.

As Marcus stepped onto the baseball field, he realized he was the only one moving. Fans and players all stood still as statues. They were crowding around another filtered telescope that a parent brought to watch the eclipse. Each person was trying to get a chance to look through the telescope. There was still a sliver of sunshine remaining, but to Marcus, the moment felt like the depths of night.

Marcus squeezed the baseball in his hand and lifted it above his shoulder. It didn't matter whom he threw it at. He just needed a target, someone who-

"Hey man, you okay?" Marcus hardly noticed the first baseman jogging toward him. "Did I do that? Did we?" he asked, looking at the telescope by Marcus. "Bummer."

"Well, I certainly didn't do it myself," said Marcus.

"It...uh...was an accident. I guess we kind of weren't paying enough attention, with the eclipse happening and all. It's pretty awesome, isn't it?"

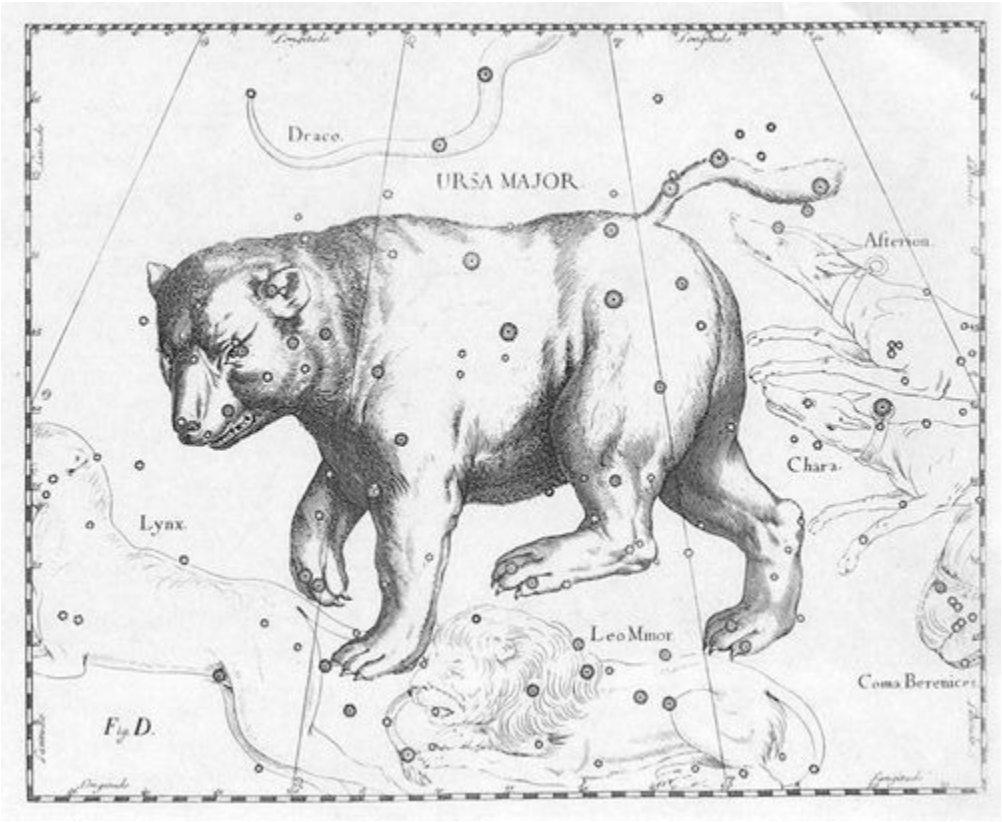
With that, they both joined the crowd, wanting their own chance to see the eclipse. Marcus softened. He was tired of getting wrapped up in petty problems when there were plenty of things in life that were far more important. He knew accidents happened. So much was beyond his control.

"Yeah," he said to the first baseman. "The eclipse is unbelievable."

As the moon blanketed the sun, Marcus's chance came up to look through the telescope, but he let the first baseman look through it first. And then, minutes later, everyone looked on as the moon moved past, letting the Saturday afternoon sun shine bright, once again.

Field Trip

by Aditi Sriram



Jeremy couldn't believe his luck. The morning of his 6th grade field trip to the Rose Center for Earth and Space at the Museum of Natural History, he fell ill. "This can't be," he thought. "Science is my favorite subject, and I'm not going to be able to go to the Museum with Mr. Connolly and my friends?" He pleaded with his parents to let him go to school anyway, but they were firm in their refusal. "The sooner you rest at home, the sooner you'll get better," his mother said. "Don't be so hard on yourself, champ," his father said. "We can always go another time."

"I won't be with Mr. Connolly and my science class if I go another time," Jeremy protested. "It won't be the same."

"It won't be the same if you're feeling ill at the museum either," his mother said, trying to reason with him. "Now take this medicine and go lie back down."

Jeremy closed his eyes as he swallowed the white tablet with a gulp of water. "What if I feel

better before the field trip begins?"

"We'll decide then," his mother said, while his father nodded.

Jeremy returned to his bed, fuming. Even though it was sunny outside, he felt a black cloud hovering over his head, threatening stormy weather inside his brain and making him angry. But soon after he lay in bed, the medicine his mother had given him began working, and he fell asleep almost right away.

When Jeremy awoke, his room was bathed in darkness. Outside his window it was dark, too. What time was it? Had he slept through the day? Was it the next day? Was it the middle of the night? Jeremy was completely confused. "Mom!" he called out.

Jeremy's dad walked into his room with a smile on his face, and wearing his hiking shoes. "Champ! You're awake," he said.

"What time is it? Did I miss everything?"

Jeremy's dad put a hand on his forehead and checked for a temperature. Nothing. "Not at all, in fact, you're just in time for your field trip. If you're feeling better, that is."

Jeremy jumped out of bed, stretched, and did a little dance. His energy was back. "I'm feeling fine," he said.

"Great. Now put on a sweater and lace up your shoes and follow me."

Jeremy checked the time as he was getting dressed. 8:05 p.m. It didn't make any sense. Where could he possibly be going with his father so late in the day? Surely the museum was closed, and Mr. Connolly had gone home. But Jeremy didn't slow down. He dressed and met his father in the living room, where he was sitting with a man he had never met before, and a peanut butter and jelly sandwich, his favorite.

"I have a surprise for you," his father said. "Jeremy, meet Professor Helfand. He is a professor of astronomy at Columbia University, where they have an observatory. Do you know what an observatory is?"

Jeremy nodded. "Mr. Connolly described them to us in class when we began the chapter on planetary science. It's a viewing tower from where you can observe the planets and galaxies through high-powered telescopes, track their movements, and study their behavior." Jeremy was talking so fast, he could barely chew on his sandwich.

"That's absolutely right," Professor Helfand said, impressed. "And because you missed your field trip this morning, we're going to pay a little visit to the observatory tonight so that you can have a field trip of your own."

Jeremy couldn't believe his ears. "I'm ready!" he shouted at his dad.

"Not so fast, champ. Finish your sandwich, and then we'll go. You haven't eaten anything all day, remember?"

"I can't believe I slept all day-but this is the best night of my life!" Jeremy said with a laugh.

Jeremy, his dad, and Professor Helfand took the subway to Columbia University, where they walked to the Physics Building and took the elevator to the top floor. There were many rooms with all kinds of computers, some big and others small, some that looked like really old machines and others that looked brand new. Most had notebooks next to them, which were filled with charts, numbers, even little drawings of orbits. Professor Helfand explained that each computer was connected to a specific telescope, and that there was one person in charge of each telescope, and observing the movement of one planet, or star.

Jeremy noticed that some of the charts showed patterns: numbers that repeated, timings separated by exactly one hour. The professor showed him that the repeating numbers were distances between planets, or between planets and their moons, or distances between stars, and showed him how the orbits of these planetary bodies created patterns of collective behavior. "Because of gravitational forces," he said, "the planets and their moons have fixed orbits, and so they end up being the same distance from each other every so often. Once we have enough of these numbers written down, and have been tracking these planets' trajectories for enough time, we can create models that predict where these planets, and their moons, are going to be one month from now, or one year from now-how far from each other, how far from planet Earth, our moon and our sun."

"I keep forgetting that there is more than one sun in the universe," Jeremy said after a pause. "How many suns are there?"

"That's a great question, and not one that we have the answer to," Professor Helfand replied. "What we know so far is that planet Earth, and the seven other planets in our solar system, are part of the Milky Way galaxy, which is one of many galaxies in the universe. The farther we can see with our telescopes, and the more patterns and behaviors we can predict and detect of all the celestial bodies we know so far, the more galaxies we can discover, and the more suns we can identify. But it's going to take a lot of work to get there."

"How exciting," Jeremy said, marveling at the possibilities of discovery in front of them.

Jeremy's father called Jeremy over to the central observation deck, where an enormous telescope had been set up and positioned on a specific constellation in the sky. "Can you identify it?" his father asked him.

"I think so. The Big Dipper?"

"Absolutely right!" Professor Helfand said. "It's part of one of the brightest constellations we can see, called Ursa Major. Here's a little trick about Ursa Major and the North Star. See the two stars on the extreme right, at the bottom of the constellation?"

Jeremy looked carefully into the telescope and trained his eyes slowly to the right, where the handle of Big Dipper sank downwards and turned into a trapezoid. "Yes, I see the base of the constellation," he said.

"Perfect. Now, imagine a line connecting those two stars-they're called Merak and Dubhe-and extend it all the way up into the top of the lens."

Jeremy imagined a bright white line connecting the two stars, and stretching past them. It felt like he was connecting the dots in an art book from 2nd grade, only this was way cooler. "O-k-a-y,' he said slowly. He could feel his father's hands on his shoulders, keeping him steady.

"What do you see, champ?" his father asked.

Jeremy stared into the lens, trying to stay focused. "Oh!" he shouted. "I think I see another star, but it looks bigger than all the others! Is it really a star?" Jeremy squirmed with excitement.

"Well done," Professor Helfand said. "You just located the North Star in our humongous sky. You know, Jeremy, maybe when you're older, you can join our team and help us look for more constellations and galaxies in the sky. There's so much out there that we have no idea about. Would you be interested?"

Jeremy thought about Mr. Connolly and his friends walking around the Rose Center and playing with the kiddie exhibits, while he stood here at the top of the world, looking deep into the sky. "I can't wait," he said, with a smile on his face as bright as a hundred suns.

Name: _____ **Date:** _____

Use the article "Field Trip" to answer questions 1 to 2.

1. What is one fact Jeremy learns about Ursa Major when he is at the observatory?

_____

_____

_____

2. Astronomy is the scientific study of stars, planets, and other objects in outer space. How does the story teach the reader about astronomy?

_____

_____

_____

Use the article "Partial Eclipse" to answer questions 3 to 4.

3. What does Marcus see the moon do as he watches the solar eclipse through the telescope?

_____

_____

_____

4. How does the story teach the reader about what happens during a solar eclipse?

Use the articles "Field Trip" and "Partial Eclipse" to answer questions 5 to 6

5. Compare the ways that the two stories teach the reader about astronomy. Support your answer using details from both stories.

6. Contrast the ways that the two stories teach the reader about astronomy. Support your answer using details from both stories.

