Williams Middle School
Rising 8th Grade Summer Homework

Instructions

- You have ELA, Humanities, Math, and Science summer work in this packet.
- You can complete the work on separate pieces of paper or you can do the assignments electronically and save them.
- All summer assignments will be due to your Middle School Advisor Friday August 13, 2021 [you can turn your assignments in as early as the first day of school, August 9, 2021, but the final date we will accept assignments will be Friday. This will be your first grade in each of the classes listed above.]

If you have any questions, you may e-mail any middle school leader:

Mrs. Bracher, Director: kbracher@uplifteducation.org
Mr. Hamlin, Dean: jhamlin@uplifteducation.org
Mr. Sapp, Dean: bsapp@uplifteducation.org
DIRECTIONS

Read March: Book One then answer the Questions After Reading (page 2) and complete the Alternative Book Report (page 3).

March: Book One by John Lewis

Congressman John Lewis (GA-5) is one of the key figures of the civil rights movement. His commitment to justice and nonviolence has taken him from an Alabama sharecropper’s farm to the halls of Congress, from receiving beatings from state troopers to receiving the Medal of Freedom from the first African-American president. March is a vivid first-hand account of John Lewis’ lifelong struggle for civil and human rights. Book One spans John Lewis’ youth in rural Alabama, his life-changing meeting with Martin Luther King, Jr., the birth of the Nashville Student Movement, and their battle to tear down segregation through nonviolent lunch counter sit-ins, building to a stunning climax on the steps of City Hall.

A NOTE TO PARENTS

To share in the reading with your scholar, click here to access a discussion guide for March: Book One from the Anti-Defamation League or here to access a guide from Top Shelf Comix.
Questions After Reading

PART 1: QUESTIONS AFTER READING

After finishing your graphic novel, pick one question from each section (Comprehension, Author's Craft, and Characters & Setting) to answer.

Each answer must be at least 6 sentences in length. Your work must show care for content, quality, grammar, and mechanics. You must use text evidence from throughout the entire book to support your answers; be sure to include page numbers with your text evidence.

Comprehension

A. Choose another book you have read. Consider the following: characters, setting, problem, solution, events, themes, etc. How were these books the same? How were they different? Use details from each text to support your answer.

B. What was the central conflict in the story? Did the conflict in the story remind you of another conflict, either in your own life, in another story you have read, or in the world? How?

Author's Craft

A. What is the theme of the book? How did the author develop this theme over the course of the book? What do you think the author wants you to gain from this story?

B. How did the author choose to tell the story? In first or third person? From whose point of view? Why do you think the author chose to tell the story that way? How does the perspective influence how events are described?

C. What was the tone of this book? The mood? Did it remain consistent throughout the piece or did it change? How did the author establish each?

Character & Setting

A. How did the main characters change from the beginning of the story to the end of the story? How did their actions and behavior change? Their morals, values and beliefs? How would you describe the main character now that you have finished the story?

B. Pick a character. How did you feel about this character at the beginning of the story? In the middle? At the end? Did your opinion of this character change as you read? Why or why not?

C. How did the author make the setting realistic or believable? What elements did he/she choose to include? Was the setting essential to the story, or could the story have been set at another time or in another place? What makes you think that?
Alternative Book Report

PART 2: ALTERNATIVE BOOK REPORT

After finishing your graphic novel, complete one project from the list below. Your completed project must include at least 3 direct quotes from the text.

To complete the project, select a significant character from your graphic novel then complete the prompt using the character you selected. Your work must show care for content, quality, grammar, and mechanics.

Character Astrology Signs

After reading brief descriptions of the astrology signs, figure out which sign you think your character was born under. Write an explanation of why you think he or she fits the sign. Be sure to consider his or her actions, attitudes, and thoughts from throughout the book.

College Application

Create a college application for your character. On the application include Name, Academic Rank in Class, High School Courses Taken and Grades, Extracurricular Activities, and Work Experience. Then write a short essay (from his or her point of view) describing an experience, event, or person that had a significant impact on his/her life?

Movie Recommendations

Pick four movies you would recommend to your character. Give a brief summary of each movie and explain why you think your character should see it. Be sure to consider the character’s likes and dislikes when making recommendations.

Dream Vacation

Pick a dream vacation destination for your character, describe it, and write a brief explanation of why he or she would want to go there. Then create a 5-day itinerary for his or her trip. Be sure to select activities you think your character would enjoy.

Current Events

Select three current events articles you think your character would be interested in reading. Then explain how your character would respond to each of the stories and the opinions your character would have about what was happening in the story.

Design a Bedroom

Design your character’s bedroom. Draw it or write about it, making sure to include an explanation of why you designed the room as you did. Consider what he or she might keep in the closet, hang on the walls, or decorate the space.
miles away—to present its case to Governor George Wallace. Learning of the march, Wallace warned against it.

1. Why was the Civil Rights Act in 1964 not effective in Selma, Alabama?

2. What was the purpose of the march?

On Sunday, March 7, 600 marchers set out from Brown’s Chapel in Selma. Leading the march were the SCLC’s Hosea Williams and the Student Nonviolent Coordinating Committee (SNCC)’s John Lewis. The activists started across the Edmund Pettus Bridge and reached its crest. Lewis later described what they saw: "There, facing us at the bottom of the other side, stood a sea of blue-helmeted, blue-uniformed Alabama state troopers." Local deputies on horseback also had been called in. An officer ordered the marchers to disperse. Then another order was issued: "Troopers, advance!"

"The troopers and posse men swept forward," Lewis wrote, "a blur of blue shirts and billy clubs and whips...And then they were upon us. The first of the troopers...swung his club against the left side of my head." Next, "a cloud of smoke rose all around us. Tear gas. I began choking, coughing."

Dozens of marchers were knocked to the ground and half-trampled underfoot. Swinging their nightsticks, deputies on horseback charged into the rest. They pursued the marchers back across the bridge to the chapel, clubbing many as they ran.

3. How is the graphic novel’s depiction of this event similar and different to the article description?
Americans were outraged. The brutality they witnessed on television became known as "Bloody Sunday." King and the rest of the activists planned a second symbolic march for the following Tuesday. Meanwhile, the SCLC asked a federal court judge to order the governor not to interfere. This time, there was no violence as the marchers turned back on their own accord. But that night, white men in Selma attacked three white ministers involved in the march. One of the ministers died. Public anger soared.

President Lyndon B. Johnson stepped in and ordered aid for the marchers. On Sunday, March 21, about 3,200 marchers set out escorted by Alabama National Guard troops, 2,000 U.S. Army soldiers, and federal agents.

By the time the marchers reached Montgomery four days later, their number had swelled to 25,000. In a speech on the capitol steps, King told the marchers, "They told us we wouldn't get here....But all the world today knows that we are here." Then King and a small delegation presented their petition to Wallace's office. In many ways it was a fitting location to end a civil rights march—Montgomery had been were the modern movement began with a boycott of its buses.
4. Would you consider the outcome of this March a success? Why or why not?

5. Why do you think John Lewis chose to open his book with scenes from this moment?
HUMANITIES CONNECTIONS TO LITERATURE

HUMANITIES CONNECTION ASSIGNMENT PART 1

While the events of *March: Book 1* are not fictional, the way the story is told, both narratively and visually, is in the literary style used in fiction. This allows for the opportunity to tell a story in a powerful and emotional way.

In Humanities classes we use more traditional nonfiction approaches to texts. This gives a broader view of events and tries to be more objective in its approach, though all texts are subject to some degree of bias. Both types of texts are important. When we know the larger historical context, it can enhance our appreciation of books we read that have a basis in history. *March: Book 1* opens with an event that occurred on the Edmund Pettus Bridge in Selma, Alabama. The article below discusses the events that occurred on that day.

When reading about historic events, non-fiction can provide additional historic context or background evidence that can enhance your understanding of the story. Read the article below and answer the guiding questions provided.

A Bridge in Selma

By 1965, many activists believed the Civil Rights Act of 1964 was incomplete. Across the South, local white officials continued to prevent black citizens from registering to vote. To highlight this continuing problem, the Southern Christian Leadership Conference (SCLC) decided to focus on the city of Selma, Alabama. Selma's sheriff Jim Clark had developed an aggressive campaign of voter harassment. His deputies regularly bullied, beat, or arrested black people trying to enter the courthouse to register.

In January 1965, the Rev. Dr. Martin Luther King Jr. and other civil rights leaders met in Selma. They staged a series of nonviolent marches to draw national attention to the city's abuses. Time and again, Clark's men harassed and arrested the marchers, among them schoolchildren and King himself. Then the SCLC proposed a new strategy: a march to the state capitol in Montgomery—about 50
Primary sources are the building blocks of history — original documents and objects that were created at the time under study. They are different from secondary sources, accounts that retell, analyze, or interpret events after the fact. Studying primary sources can give you a deeper understanding of the events. It is important to analyze each one to consider where the source came from, what part of the story it tells, and in what ways that sources might be useful in helping us understand what happened.

Analyze the following primary sources related to events from *March: Book 1* by answering the questions below.

**Document 1: Greensboro Sit-In, February 1, 1960**
1. The above photograph was taken to be used as part of reporting in a newspaper. From just four young men on the first day, it spread to hundreds of people by February 4th. How may this photograph have played a role in the success of the movement?

2. Civil Rights leader Julian Bond said, "The Civil Rights Movement for me began on February 4, 1960." He recounted how he was sitting with a friend in Atlanta where Bond attended Morehouse College and he saw in the paper a headline that read "Greensboro students sit-in for third day." Bond wondered aloud to his friend: "I wonder if anyone will do that here." When his friend replied that he was sure someone would do it, Bond paused and responded: "Why don't we make that 'someone.' us?" How do courageous actions lead to courageous acts of others?

Document 2: NBC White Paper: Sit-In, December 20, 1960

Source Information:

Shortly after the Greensboro, North Carolina, sit-in began on February 1, 1960, Nashville students, who had initiated "test sit-ins" in 1959, followed suit. Despite beatings, arrests, jailing of protesters, and a bombing, six stores agreed in May to desegregate their lunch counters. This is an excerpt from NBC White Paper: Sit-In, broadcast December 20, 1960, protesters, where protestors describe the experience.

Click here to view the film.

https://www.loc.gov/exhibits/civil-rights-act/multimedia/nashville-sit-ins.html

1. In what ways was the peaceful nature of the sit-ins effective? How would this be a challenge to continue in the face of attacks and arrests?
2. John Lewis was one of the main organizers of these sit-ins in Nashville. He is the man who speaks in the broadcast video at the 1:05 min mark. How does his words in this news clip foreshadow the work he'd do for the rest of his life?

3. Martin Luther King, Jr, called the Nashville movement “the best organized and most disciplined in the Southland. What evidence is there in the video that supports this claim?

Document 3: Interview with Juanita Craft

Source Information:

Juanita Craft was a civil rights leader and politician in Dallas, served on the Dallas City Council, and was the Membership Chair of the Dallas National Association of Colored People (NAACP). In 1944, she was the first African American woman to vote in Dallas. As Dallas Youth Council Leader, she protested the blacks-only policy on Negro day at the Texas State Fair. She helped enroll the first African American student at North Central State College (University of North Texas). She led the Youth Council in picketing lunch counters, restaurants, and public transportation to protest segregation. She also assisted Clarence Broadnax in the 28-day protest at the Piccadilly Cafeteria.

Below is an excerpt from an interview with Juanita Craft about her involvement in the Civil Rights movement. The interview was conducted by Michael L. Gillette on February 9, 1974 on behalf of Humanities Texas.

Gillette: Were you involved with the lunch counters?

Craft: Oh, Lord yes. Durham helped us figure it out. We picketed the state fair in the fall of 1955. We picketed the Melba Theater in the spring of 1955. We picketed the Majestic Theater beginning in 1955. Just all along every week we had a protest line. SMU students began to move in and help there, and we had a situation worked out by Mr. Durham that was really interesting. Because as long as they don't put a sign up, “Negros not served here,” we had a right to go in there. What we would do in trying to purchase tickets, we formed a circle. The first youth would go up “One ticket, please”. “We can’t sell you a ticket.” “Thank you.” He’d walk right on back and get at the foot of line. Sometimes we had maybe a hundred kids just keep going
there asking to [buy a] ticket. And the agent would say, “I’ve told you once we cannot sell you a ticket.” “Oh. I thought you’d changed your mind.” And go right on back.

The [sit-ins] at the dime stores and lunch counters, they were the most fascinating because those kids really worked. But there was no sign out saying you can’t go in. Why would you serve someone in one part of your store and then wouldn’t serve them in another part? We would always instruct the kids to go buy something that would have the wrapper or the paper bag. H.L. Green, for instance, that was one we gave the devil. They would buy something big so it could be easily seen, like maybe drawing paper or something that would be wrapped or in a big bag. Then, they’d go from there to the lunch counter and order a Coke

**Gillette:** And they wouldn’t be served?

**Craft:** No. But the law says the manager has a right to tell you why. So then the kids would ask to speak to the manager. Well, while that kid was two, there was two together for witnesses they’d be talking to the manager. There are two more coming in from outside with that big bunch of drawing paper or something similar, be headed to the lunch counter. Well he’d get rid of those two, here’s two more coming in. In the meantime, I had three or four telephones set up with kids talking over the phone. They would call, “May I speak to the manager please? Do you serve people of color?” We tried not to use, “Will you serve Negroes?” “Will you serve people of color?” And of course all he could say is “No.” We were taking his time

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1. **How did members of the movement expand beyond lunch counters in Dallas?**

2. **What is evidence from the interview that demonstrates that the student protestors involved were knowledgeable and well-thought in their actions or methods of protests?**

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Consider this excerpt from the article, “The Moment When Four Students Sat Down to Take a Stand” published by the Smithsonian Magazine. After noting that the campaign
did succeed in desegregating many public facilities, including that same first lunch counter on July 25, 1960, many noted that importance the movement had on changing the students themselves.

"[Diane] Nash maintains the biggest effect of this campaign was the change it produced in the activists themselves, who began to understand their own power and the power of nonviolent direct action. Segregation would not become illegal until the passage of the 1964 Civil Rights Act, but Nash said it ceased to exist in 1960 everywhere blacks decided that "we were not segregatable" any longer."...

"Sixty years later, the activists still believe nonviolent action is the key to a better future and that the future is in our hands. As Joe McNeil, now a retired Air Force Major General, said when interviewed in 2017..."I walked away with an attitude that if our country is screwed up, don’t give up. Unscrew it, but don’t give up. Which, in retrospect, is pretty good for a bunch of teenagers."

1. What larger lesson from the work or the activist can we apply to the world today? What about their ideas, beliefs, actions or work inspires you?
HUMANITIES CONNECTIONS TO LITERATURE

HUMANITIES CONNECTION ASSIGNMENT PART 3

In 7th Grade Texas History, you learned little about the time period that followed after the American Civil War called the Reconstruction era. There were many issues that the nation had to deal with during this time period as part of the struggle of both coming to terms with the devastation of war and the struggle to reunite together a nation. For African Americans there was additional challenges to navigate as their lives were reshaped with the end of slavery. Many questions remained as people debated on how to define freedom, how those formerly enslaved people should maintain their freedom, and what role they should play in American society.

This assignment has two parts and both are aimed at helping you connect the work of the Civil Rights Work to the work for rights during the Reconstruction Era, as well as today. The first part is a museum exhibit that will give you a broad overview. The second part is an article that discusses some of the African American activists who led others to assert their equality during this time of transition.

The Fight for Voting Rights: 150 Years and Counting

The National Museum of African American History and Culture put together an online exhibit featuring the history of the fight for equal voting rights over the years, with its beginning in the Reconstruction era. Visiting this exhibit, reading the information and examining the various artifacts will give you a better understanding and appreciation for the work done by so many over the years. Visit the site by clicking the link below and read through the information before doing the following activities and questions:

Link the The Fight For Voting Rights Exhibit
The exhibit highlights quotes from different individuals from different eras. Select one of the quotes that you find interesting or meaningful. Copy & paste the quote in the above box. In this box explain your selection:

1. What does the quote mean in simple language?

2. What value does it have for you or for people who may be learning about the struggle for full human equality?
Select an image from the online exhibit you find interesting, surprising or meaningful and copy and paste it above. In this box explain your selection:

1. What is it an image of? Why did you select it?

2. What value does it have as part of the history of these movements?

**Asserting Equality: Black Political Activism During Reconstruction**

*ASSERTING THEIR EQUALITY.*

Two Hundred Permanent Civil Rights Leagues to be Organized by the Colored Men of Ohio.

Mr. Graham Denwell, the well known lawyer and politician of this city, has just returned from a tour through Ohio, where he has been organizing equal rights leagues among the

During Black History Month, we honor African Americans who profoundly impacted the course of American history. During Reconstruction—an era that lasted from about 1865 to 1877—African
Americans gained new political and legal rights that were implemented with the support of the federal government. A number of activists redefined how blacks participated in American politics, society, and culture, especially in the South. Men like Hiram Revels, Robert Elliot, and Joseph Rainey were part of the vanguard of black political leadership in this period.

These activists accomplished many significant objectives despite facing harsh racism and having their efforts undermined by Southern whites who felt threatened by newly empowered black citizens. Though African Americans saw many of the gains made during Reconstruction rolled back in the late nineteenth and early twentieth centuries, the actions of these early African American leaders inspired those who followed them and carved a path for civil rights leaders in the mid-twentieth century.

**Black Activism in Reconstruction**

Although African American slaves were freed by the end of the Civil War, they were not immediately given legal and political rights under President Andrew Johnson. During the first years of Reconstruction, blacks formed Equal Rights Leagues in the South to demand equality under the law, including the right to vote, and to fight oppressive black codes—laws that restricted the lives of newly freed African Americans in various ways.

From 1867 to 1877—the period known as Radical Reconstruction—black Americans were given many basic rights by Congress, such as official citizenship and the right to vote. As more African Americans were allowed to participate in American political life, organizations like the growing Union League supported black political activism in the South. Beginning in 1867, blacks took part in state constitutional conventions for the first time and comprised the vast majority of Republican voters in the South.

During Reconstruction, about 2,000 African American men served in political office. Hundreds of blacks held local offices in the South, more than 600 were elected to state legislatures, and 16 served in Congress. To take these posts, they often had to win elections plagued by violence and fraud. Southern whites used many forms of intimidation to oppose black voters, politicians, policies, and rights. The Ku Klux Klan and other white supremacy organizations also attacked Republican leaders and African Americans during this period, killing at least 35 black officials.

1. In what ways were the challenges that faced activists and African Americans similar to the challenges that faced activists and African Americans during the Civil Rights Movement?
Hiram Revels

One of the most influential black leaders during Reconstruction was Hiram Revels, the first African American elected to serve in the U.S. Senate. Revels represented the state of Mississippi. Like many black leaders of this era, he had acquired leadership experience in the church and the Union Army. Revels had been born free in North Carolina. Educated in Illinois, he was a preacher in the Midwest and a black regiment’s chaplain in the Union Army during the Civil War. He went to Mississippi in 1865 to work for the Freedmen’s Bureau.

In January 1870, Revels was elected to the U.S. Senate by the Mississippi state legislature, to complete the term of a seat left vacant since the Civil War. When elected, Revels was widely praised. His biography and personal description were published in newspapers across the country, such as the Wisconsin State Register and the Little Rock, Arkansas, Morning Republican. In the Dover Gazette & Strafford Advertiser, Revels was lauded as “a man of much energy of
character, with excellent and well developed mental qualifications. In his person is centered one of the grandest thoughts of the nineteenth century—the equality of all men before the law.”

Revels served just one year in the Senate because he was not chosen for a full six-year term; he was replaced by a white Republican and former Confederate general. Though Revels and other black politicians usually did not have the same power as white politicians in office, they successfully supported and advocated measures for racial equality.

Robert Elliott

Another important African American politician of the Reconstruction era was South Carolina’s Robert Elliott. Like Revels, Elliott was well educated. Born in England, he attended schools there and trained as a typesetter. He came to Boston in 1867 and moved to South Carolina later that year. Elliott became involved in politics in 1868 as a delegate at the state constitutional convention. African Americans in South Carolina had been organizing politically longer than those living in most other states, and many blacks were elected to early state conventions there. At the 1868 convention, Elliott was one of 78 black delegates. He stood out for his strong oratory skills and passionate support for compulsory education.

Subsequently, Elliott held a county office, was elected to both the state house and state assembly, and was appointed the assistant adjutant general before winning a seat in the U.S. House of Representatives in 1870. In Congress, Elliott faced several challenges. Unlike other African Americans serving in the House at that time, he was dark skinned and was more radical in his passionate support for black civil rights. Consequently, he and many other African American congressmen were refused service in various establishments in Washington, D.C. Elliott supported a bill that would ban such forms of public discrimination.

Joseph Rainey
Also a politician from South Carolina, Joseph Rainey was the first African American to serve in the U.S. House of Representatives. He was a member of the House from 1870 to 1879, the longest tenure of any African American legislator during Reconstruction. In April 1874, Rainey experienced another first, becoming the first black man to preside over a session of the House.

Unlike Revels and Elliott, Rainey had been born into slavery, though his father bought his family’s freedom when Rainey was a child. Receiving a limited education, Rainey was trained as a barber, then was forced to serve in the Confederate Army until he and his family escaped to Bermuda. Returning after the end of the Civil War, Rainey became active in Republican politics in 1867 and won a seat in the state senate in 1870. Shortly thereafter, he was elected to complete a congressional term for a U.S. Representative who resigned due to scandal. Winning several subsequent elections on his own—though not without legal controversy—Rainey advocated for both his black and white constituents, but focused especially on civil rights.

After leaving office, Rainey remained politically active even as African American rights eroded. In January 1881, he took part in the Cleveland conference of colored men which was organizing a push for African American rights under the newly elected president, James Garfield. In an open letter to Rainey and other participants published in the *Lynchburg Virginian*, Arthur St. A. Smith wrote, “gentlemen, let me say that if you, the present leaders of our people do not secure some substantial recognition at
the hands of Gen. Garfield, you might as well take back seats, for you gentlemen, at least, can never rally the negroes to the Republican polls again ....”

Post-Reconstruction Activism

After Reconstruction ended, other black political leaders continued to fight for the civil rights and the legal justices that were being denied to African Americans. Many more conventions were held and organizations were formed on state and national levels, to help coordinate efforts and expand the political footprint of African Americans and their supporters. One such meeting was held in November 1889. According to the Milwaukee Daily Sentinel, the Wisconsin Civil Rights league was created and began framing a civil rights bill to present to the state legislature. Another gathering was held in early 1889 to form a National Afro-American League that was intended, according to T. Thomas Fortune in the New York Age, “to secure the rights denied the race.” Although the fight for civil rights did not end in the nineteenth century, the work of courageous black Americans such as Revels, Elliott, and Rainey helped to introduce a new democratic order and forever changed the political and social landscape of the United States.

1. As mentioned in the “Fight for Voting Rights” exhibit, the Civil Rights Movement is sometimes called “The Second Reconstruction”. In a few paragraphs explain why that is the case by explaining the similarities between the two eras. Evidence from both the exhibit and the article can be used to support your claim.
Rising 8th Grade
2021 Summer Assignment
Math and Science
### Linear Equations

- **Slope-Intercept form**
  \[ y = mx + b \]

- **Constant of proportionality**
  \[ k = \frac{y}{x} \]

### Circumference

- **Circle**
  \[ C = 2\pi r \quad \text{or} \quad C = \pi d \]

### Area

- **Triangle**
  \[ A = \frac{1}{2}bh \]

- **Rectangle or parallelogram**
  \[ A = bh \]

- **Trapezoid**
  \[ A = \frac{1}{2}(b_1 + b_2)h \]

- **Circle**
  \[ A = \pi r^2 \]

### Volume

- **Prism**
  \[ V = Bh \]

- **Pyramid**
  \[ V = \frac{1}{3}Ah \]

### Additional Information

- **Pi**
  \[ \pi \approx 3.14 \quad \text{or} \quad \pi \approx \frac{22}{7} \]

- **Distance**
  \[ d = rt \]

- **Simple interest**
  \[ I = Prt \]

- **Compound interest**
  \[ A = P(1 + r)^t \]
# STAAR Grade 7 Mathematics Reference Materials

**Length**

<table>
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<tr>
<th>Customary</th>
<th>Metric</th>
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<tbody>
<tr>
<td>1 mile (mi) = 1,760 yards (yd)</td>
<td>1 kilometer (km) = 1,000 meters (m)</td>
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<tr>
<td>1 yard (yd) = 3 feet (ft)</td>
<td>1 meter (m) = 100 centimeters (cm)</td>
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<tr>
<td>1 foot (ft) = 12 inches (in.)</td>
<td>1 centimeter (cm) = 10 millimeters (mm)</td>
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**Volume and Capacity**

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<td>1 liter (L) = 1,000 milliliters (mL)</td>
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<td>1 quart (qt) = 2 pints (pt)</td>
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<tr>
<td>1 pint (pt) = 2 cups (c)</td>
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<tr>
<td>1 cup (c) = 8 fluid ounces ('l oz)</td>
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**Weight and Mass**

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<td>1 kilogram (kg) = 1,000 grams (g)</td>
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<tr>
<td>1 pound (lb) = 16 ounces (oz)</td>
<td>1 gram (g) = 1,000 milligrams (mg)</td>
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Math Connections

Name: ___________________________  Date: __________

Organs are made up of different types of tissue, which in turn are made up of different types of cells. In this activity you will analyze the different geometric structures cells can assume.

Epithelia tissue lines most digestive tracks in animals. One of the cells found in epithelia tissue, called simple columnar, has elongated hexagonal prism shapes (similar to the shape of a honeycomb). When the cells get crowded, they take the shape of a pyramid.

Another type of cell in epithelia tissue, called simple cuboidal cells, is box-like and takes the form of a rectangular prism. When crowded together, simple cuboidal cells also take the shape of a pyramid. You will discover that the difference in volume is between a prism and a pyramid sharing the same base and height.

To model the shape, six small equilateral triangle pieces are connected to form the base of a hexagonal prism (model for the simple columnar cell). Two hexagons create the top and bottom bases of the cell. One way to connect the six triangles together is shown below.

Look at only one cross-section piece of the simple columnar cells—a triangular prism-shaped piece. The triangular prism pictured below makes up one out of the six total triangular prisms found in the hexagonal prism cell.

1. Shade in the two congruent, parallel bases in the triangular prism below. Explain why what you shaded forms the bases of the prism.

Imagine stacking your cut-up triangle pieces inside the triangular prism model. Think of the prism as being constructed of many triangle pieces, layered on top of one another (see the drawing below).

Think about how many triangles would be needed to fill up this prism model. You would need as many triangles as the distance from one base to the other.

2. If the distance from one base to the other is 10 mm long, and each triangle is 0.5 mm thick, how many triangles would it take to fill up the prism?

Answer: _________________
3. If you filled the triangular prism completely full, you would then know the volume of the prism. Determine the volume of the prism after considering the dimensions of one of the triangle bases.

Knowing that the distance from base to base is 10 mm, calculate the volume of the triangular prism.

Answer: 

4. To find the volume of the triangular prism cross-section of the cell, use the formula \( V = \text{area of the base} \times \text{height of the prism} \) or \( V = Bh \). Explain how this formula connects to the model from questions 2 and 3.

When the simple columnar cells get crowded, they take on a pyramidal shape. Keeping the dimensions constant with the triangular prism, an example of the pyramidal is shown below.

Imagine filling up the triangular pyramid full of liquid (or materials commonly found in a cell, such as the nucleus, cell-membrane, mitochondrion, etc.). Imagine taking that filled triangular pyramid and dumping the contents into the triangular prism (pictured above, on the right).

How many times do you think it would take Ms. Simon to fill up the triangular pyramid and transfer its liquid into the triangular prism until the prism would be completely filled?

Your guess: 

If you guessed “three times,” you are correct. Explain in your own words how you came to this conclusion?

5. Using the formula for the volume of a triangular prism, what is the formula for the volume of a triangular pyramid? (Use symbols: \( V \) for volume, \( B \) for area of the base, and \( h \) for height of the pyramid).
6. What is the volume of the triangular pyramid pictured on page 1? The height of the triangle is 0.06 mm, and the base of the triangle is 0.08 mm. The pyramid’s height—the distance from the top vertex to the bottom base, forming a right angle with the base—is also 10 mm.

Answer: 

Now, let’s investigate the volume of simple cuboidal cells. Help the students investigate volume differences between a rectangular prism and a rectangular pyramid which share a congruent base and height.

7. For the shapes above, the base of the rectangular prism is the same as the base of the rectangular pyramid. What is the area of the base for both the prism and pyramid?

Answer: 

8. The formula for the volume of a rectangular prism is the area of the base multiplied by the height of the prism, or \( V = Bh \), where \( B \) represents the area of the base. Calculate the volume of the rectangular prism.

Answer: 

To demonstrate the relationship between the volumes of a rectangular pyramid and a rectangular prism that have congruent bases and equal heights, imagine filling the rectangular pyramid up with sand and then dumping the sand from the pyramid into the rectangular prism. How many times do you think it will take to fill the rectangular prism with sand?

Your guess: 

9. If you guessed “three times,” you are correct. The volume of a rectangular pyramid is \( \frac{1}{3} \) of the volume of a rectangular prism. Using the formula for the volume of a rectangular prism, what is the formula for the volume of a rectangular pyramid? (Use symbols \( V \) for volume, \( B \) for area of the base, and \( h \) for height of the pyramid). Use your formula to calculate the volume of the rectangular pyramid pictured above.

Answer: 
Math Connections

Name: ___________________________ Date: __________

All eukaryotic cells contain organelles, which are any of a number of organized or specialized structures within a living cell. The unique structures and chemical compositions of individual organelles in plant and animal cells allow those organelles to perform distinct functions within the cell. Some organelles, like the nucleus, are found in both plant and animal cells; other organelles are used to distinguish between plant and animal cells.

A seventh-grade science class spent the past week discussing animal and plant cells. The students discussed the function and structure of the various organelles present in both types of cells. Today the students will analyze the geometry found in the structure of animal cells. Use the materials supplied by your teacher and the picture below to answer the questions that follow.

The teacher explained that the nucleus and nucleolus of an animal cell are nearly perfect circles.

1. Use the string and centimeter ruler provided by your teacher to measure the circumference of the nucleus in the magnified picture above. (Round your answer to the nearest tenth.)
Refer to the picture of the animal cell on page 1 to answer the following questions. (Round your answers to the nearest tenth.)

2. What is the measure of the diameter of the nucleus? Write a math sentence to show how you would solve for diameter.

3. What is the circumference of the nucleolus? Write a math sentence to show how you would solve for circumference.

4. What is the measure of the diameter of the nucleolus?

5. Use the information from the previous four questions to complete the table below. For the last column, use a calculator to divide the circumference by the diameter.

<table>
<thead>
<tr>
<th>Cell structure</th>
<th>Circumference</th>
<th>Diameter</th>
<th>Circumference / diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nucleolus</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Compare your results to those of your classmates. What do you notice about the quotient?

6. For any circle, the ratio between the diameter and circumference is known by the Greek letter \( \pi \) (pi), which is close to the value 3.14. Measure and cut off a piece of string equal to the diameter of the nucleus. Approximately how many of the diameter-sized pieces of string do you need to measure all the way around the circular nucleus? Try it out, explain the results of your experiment, and define what \( \pi \) means to you.
Functions of a Cell

The cell theory states that all living organisms are composed of cells. Cells are the basic unit of structure and function in living things, and all cells arise from preexisting cells. This theory holds true for all living things, unicellular or multicellular.

Cellular respiration is one of the key ways a cell gains useful energy to fuel cellular processes by producing adenosine triphosphate (ATP). It occurs in both prokaryotic and eukaryotic cells and has three main stages.

Stage 1: Glycolysis

One molecule of glucose is split into two molecules of ATP, two molecules of pyruvic acid (3-carbon sugar), and two high-energy, electron-carrying molecules of NADH.

<table>
<thead>
<tr>
<th>Products of Glycolysis</th>
<th>Pyruvic acid</th>
<th>ATP</th>
<th>NADH</th>
<th>H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of molecules</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Stage 2: The Krebs Cycle

The two molecules of pyruvic acid are converted to acetyl CoA in the mitochondria. The chart below shows the products of the Krebs cycle for every one molecule of acetyl CoA that enters.

<table>
<thead>
<tr>
<th>Products of the Krebs cycle</th>
<th>CO₂</th>
<th>CoA</th>
<th>ATP</th>
<th>NADH⁺</th>
<th>FADH₂⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of molecules</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Stage 3: Electron Transport Chain

The electrons produced from the Krebs cycle are passed to oxygen. This process forms ATP. It happens in the mitochondria of eukaryotic cells and in the cell membrane of prokaryotic cells.

<table>
<thead>
<tr>
<th>Products of Electron Transport Chain in Prokaryotic Cells</th>
<th>H₂O</th>
<th>ATP</th>
<th>NAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of molecules</td>
<td>2</td>
<td>38</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Products of Electron Transport Chain in Eukaryotic Cells</th>
<th>H₂O</th>
<th>ATP</th>
<th>NAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of molecules</td>
<td>2</td>
<td>36</td>
<td>2</td>
</tr>
</tbody>
</table>
Math Connections

Use the tables and information from page one to help you answer the questions below. Set up a proportion for each question to show how you solved the problem.

1. In a eukaryotic cell, how many ATP molecules will result from the cellular respiration of 30 glucose molecules?

2. In the Krebs Cycle, 25 molecules of acetyl CoA enter in the same cycle. How many molecules of ATP are produced? How many molecules of CO₂ are produced?

3. In glycolysis, if 24 molecules of pyruvic acid are produced, how many molecules of glucose are there?

4. Use the chart below to show the products of the Krebs Cycle for 24 molecules of acetyl CoA that enter the cycle.

<table>
<thead>
<tr>
<th>Number of molecules</th>
<th>CO₂</th>
<th>CoA</th>
<th>ATP</th>
<th>NADH⁺</th>
<th>FADH₂⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

5. In a prokaryotic cell, what are the products of five glucose molecules from the process of cellular respiration?

<table>
<thead>
<tr>
<th>Number of molecules</th>
<th>H₂O</th>
<th>ATP</th>
<th>NAD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>