Suggested Learning Activities for Grade 7 students during the COVID-19 school closure.

Seattle Public Schools is committed to making its online information accessible and usable to all people, regardless of ability or technology. Meeting web accessibility guidelines and standards is an ongoing process that we are consistently working to improve.

While Seattle Public Schools endeavors to only post documents optimized for accessibility, due to the nature and complexity of some documents, an accessible version of the document may not be available. In these limited circumstances, the District will provide equally effective alternate access.

Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District’s swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student’s teacher.
# Week of May 4 – 8

**Grade Level: 7th Grade**

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<tr>
<th>7th Broadcast Schedule</th>
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<td>Taariikhda qabiilooyinka Gobolka WA</td>
<td>Historia Tribal del estado de WA</td>
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- **SPS-TV Channels in the City of Seattle**: Comcast 26 and 319, Wave 26 and 695, Century Link 8008 and 8508.
- **በባይታት ዲተማውስት ከእኔናት TV ትረክፋል**: Comcast 26 እና 319, Wave 26 እና 695, Century Link 8008 እና 8508.
- **西雅图市政府的SPS电视频道**: Comcast 26频道和319频道, Wave 26和695频道, Century Link 8008和8508。
- **Mawjadaha aad ka heli karto telefishanka dugsiyada dadwaynaha Seattle waa**: Comcast 26 iyo 319, Wave 26 iyo 695, Century Link 8008 iyo 8508.
- **Los canales SPS-TV en la ciudad de Seattle son**: Comcast 26 y 319, Wave 26 y 695, Century Link 8008 y 8508.
- **SPS-TV Channels trong thành phố Seattle**: Comcast 26 và 319, Wave 26 và 695, Century Link 8008 và 8508.
Populations & Resources, Lesson 9

Matter and Energy in Ecosystems, Lesson 1

Name _____________________________________________________
School_____________________________________________________
Class Period ________________________________________________
Teacher ____________________________________________________

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
Hello Families,

We hope you and your family are well and safe during this time. During this unprecedented out-of-school time, the SPS middle school science team will be offering instructional opportunities for students that align with the district’s adopted middle school science instructional materials.

This investigation packet is part of a series of district-aligned lessons for middle school science developed by AmplifyScience and adopted by SPS in 2019. While Amplify Science lessons are designed to be done in the classroom with peers, there are some activities that students can complete at home.

In this packet you will find activities to accompany the lesson videos being aired this week through Seattle’s Public television programming on SPS TV (local channel 26). The videos and packets are also posted to the, SPS Science webpage under their corresponding grade level. These lesson videos, developed in collaboration between SPS teachers, Denver Public Schools teachers, and Amplify Science, feature teachers going through the information in the lessons. The work in this packet is intended to be completed alongside the viewing of the video of the corresponding videos.

Closed captioning for the videos is available many home languages if this helpful to your family.

- Click CC (bottom right of video)
- Click Setting (the gear next to CC)
- Click Subtitles/CC
- Click Auto-translate
- Choose your language

For students who have access to the internet and the following devices and browsers may wish to log-in to their AmplifyScience account from home are welcome to do so. Chrome and Safari are the recommended browsers to use for full functionality of the Amplify digital tools and features.

Sincerely,

Seattle Public Schools Science Department

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
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SIMPLIFIED CHINESE
你好 SPS 初中家庭，

希望您和您的家人在这一段时间内过得安好。在这段空前未有的停课期间, SPS 中学科学团队将为学生提供教学机会, 这些课程与校区采用的中学科学教学材料是一致的。


如果有助您的家人, 可以多为他们提供种语言的视频隐藏字幕。

可以上互联网以及有以下设备和浏览器的学生可以在家中登录其 AmplifyScience 帐户。
Hola Familias de Secundaria de las Escuelas Públicas de Seattle,

Esperamos que usted y su familia estén bien y seguros durante esta temporada. Durante este tiempo sin antecedentes fuera de la escuela, el equipo de ciencias de la escuela secundaria de SPS ofrecerá oportunidades de instrucción para los estudiantes, que se alinean con los materiales de instrucción de ciencias de la escuela secundaria adoptados por el distrito.

Este paquete de investigación es parte de una serie de lecciones extraescolares remotas alineadas con el distrito, desarrolladas por AmplifyScience. Si bien las lecciones de Amplify Science están diseñadas para realizarse en el aula con sus compañeros, hay algunas actividades que los estudiantes pueden completar en casa. En este paquete encontrará actividades para acompañar los videos de las lecciones que se transmiten esta semana a través de la programación de televisión pública de Seattle en SPS TV (canal local 26). Los videos y paquetes también se publican en la página web de SPS, https://www.seattleschools.org/academics/curriculum/science.

Los subtítulos para los videos están disponibles en muchos idiomas caseros si esto es útil para su familia.

- Presione CC (abajo a la derecha del video)
- Presione Setting (el engrane cercano a CC)
- Presione Subtitles/CC
- Presione Auto-translate
- Escoja su lenguaje

Los estudiantes que tienen acceso a Internet y a los siguientes dispositivos y navegadores pueden iniciar sesión en su cuenta AmplifyScience desde casa.

- **Computadoras de Escritorio y Laptops** (*Chrome* y *Safari*)
- **Chromebooks**
- **iPads con iOS11.3+** (iPad5+) – *Navegador sugerido: Safari*

Sinceramente,
Departamento de Ciencias de las Escuelas Públicas de Seattle

**SPANISH**

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
Waxaad halkan ka heli kartaa sawiro qaar iyo luqado hadii ay tahay mid ku caawineysa qoyskaada.

- guji CC (bottom right of video)
- guji Setting (the gear next to CC)
- guji Subtitles/CC
- guji Auto-translate
- Dooro luqadaada

Ardayga heysta Khadka internet raacana tilmaanta isticmaalka ka dibna ay galaan koontadooda AmplifyScience guriga.

- Desktops and Laptops (Chrome & Safari)
- Chromebooks
- iPads that support iOS11.3+ (iPad5+) – talo isticmaal : Safari

Mahadsanid,
Dugsiyada Dadweynaha Seattle Waaxda Sayniska

VIETNAMESE
Kính gửi các gia đình của học sinh cấp 2 SPS,

Chúng tôi hy vọng quý vị và gia đình đều được khỏe mạnh và an toàn trong thời gian này. Trong thời gian nghỉ học chưa từng xảy ra này, nhóm khoa học của các trường cấp 2 SPS sẽ mang đến cho các em học sinh cơ hội học tập phù hợp với tài liệu giảng dạy khoa học dành cho cấp 2.


Phụ đề cho các video có sẵn qua nhiều ngôn ngữ nên điều này giúp ích cho gia đình của quý vị.

- Nhập CC (duôi cùng bên phải của video)
- Nhập vào Setting (biểu tượng hình bánh răng bên cạnh CC)
- Nhập vào Subtitles/CC
- Nhập vào Auto-translate
- Chọn ngôn ngữ của quý vị

Học sinh nào truy cập vào internet và các thiết bị và trình duyệt sau có thể đăng nhập vào tài khoản AmplifyScience của các em từ nhà.

- Desktops and Laptops (Chrome & Safari)
- Chromebooks
- iPads that support iOS11.3+ (iPad5+) - Suggested browser: Safari

Trân trọng,
Seattle Public Schools Science Department

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
Populations & Resources Lesson 9

Key Concepts

- Within a population, organisms are always being born and dying.
- A system can be stable even as things are being added to and removed from it. If the amounts being added and being removed are not equal, then the system will change.
- If the number of births and deaths in a given time are equal, then the population size will be stable.
- If there are more births than deaths in a given time, then the size of the population will increase. If there are fewer births than deaths, then the size of the population will decrease.
- Organisms need to release energy from energy storage molecules in order to reproduce.
- Organisms in consumer populations get energy storage molecules from eating organisms in resource populations.
- The more energy storage molecules available to a population, the more the organisms in that population can reproduce.
- Two populations can compete for the same resource population. A change to one of these populations affects the size of the other.
- The size of a population can be affected by any population that is connected to it in a food web, even if they are not directly connected.

On the next page is the remaining evidence ecologists have about some other populations of organisms in the Arctic Ocean ecosystem.

Analyze and interpret the evidence using your understanding of population stability and change.
Evidence Card E: Algae

- Every year between 1980 and 2010, ecologists counted algae in 10 locations in Glacier Sea.
- They concluded that the population was stable and then started to increase around 2000.

Evidence Card F: Walleye Pollock

- Every year between 1980 and 2010, ecologists counted walleye pollock at 10 different collection locations throughout Glacier Sea.
- They concluded that the population was stable and then started to decrease around 2000.
Refer back to lesson 3 and lesson 6 for population sample evidence for the other populations of organisms in the ecosystem.

1. What does the evidence tell you about the algae population? How might this have affected the moon jelly populations?

2. What does the evidence tell you about the walleye pollock population? How might this have affected the moon jelly populations?
What does the evidence tell you about the orca population? How might this have affected the moon jelly populations?

Student Ecologists,
You have done an amazing job collecting evidence to help scientists understand why there has been a sudden increase in the moon jelly population size.

Using your analysis of the population sample data for the different populations in the ecosystem, and the key ideas you have learned throughout our evidence collection, write a letter and include a visual explanatory model to help scientists understand what you have figured out about the moon jelly populations.

Science Vocabulary:
- Births
- Reproduction
- Deaths
- Stable
- Changing
- Population
- Ecosystem
- Resource Population
- Consumer Population
- Energy Storage Molecules
- Direct Effect
- Indirect Effect
Checklist: If possible, check your own writing and have someone else take a look!

- Do you have a clear claim about what is causing the moon jellies to increase so quickly?
  - For example, ____________ caused it, or ____________ and ____________ caused it

- Have you used some of our science unit words?

- Have you cited evidence from the population sample data?
  - For example, “the walleye pollock population data shows...”

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
Final Model: What do you think caused an explosion of jelly fish population to occur? Why are the Arctic Ocean moon jellies increasing at such a rapid rate?

*Draw a visual to help us understand how this change occurred!*

Questions I still have:
Lesson 1: Investigating a Biodome

Just last year NASA announced that the first human mission to Mars will be sometime in the 2030s! That’s in OUR lifetime!

Since then, there are so many different scientists in the world that have been trying and preparing to figure out how humans can survive on Mars.

One of the biggest challenges that scientists face is in trying to figure out how to create an Earth-alike atmosphere on a different planet. Today we are going to focus on one type of experiment that scientists have been working on to try and figure out this question.

VIDEO: The Biodome Project. If you have access to the internet or are viewing on TV, view the video now to learn about the Biosphere project.

What is one thing you found interesting about this biosphere?

What questions do you have about living in a biosphere?
Introducing the Biodome

Five years ago, a local group called the Econauts began an ambitious project to determine if humans could survive on another planet. They constructed a biodome, an ecosystem inside a glass dome larger than a football field. The ecosystem was filled with plants, animals, and a volunteer group of eight humans.

The Problem

For the first few years, the plants and animals inside the biodome seemed healthy and normal. In the last few years, however, the Econauts began to notice some problems. Animals were getting sick and failing to reproduce. Plants weren’t growing as big or producing as much fruit as they once did. The Econauts realized that something had gone wrong. Although the organisms were safely removed from the biodome, the cause of these problems is still a mystery.
Why didn’t the plants and animals in the biodome have enough energy storage molecules?

Welcome to the Biodome Investigation Team! You just learned about Biosphere 2, an experimental research facility that was built for learning more about Earth and its ecosystems.

Five years ago, the Econauts constructed a biodome similar to Biosphere 2. They recently noticed that the organisms inside the biodome were getting sick and failing to reproduce. To protect the people and organisms inside, they shut down the biodome. The Econauts hired us to figure out what caused their biodome to fail, but we need your help. I’m including a presentation that explains your mission in more detail.

Student ecologists, we are counting on you!

Bryan
Dr. Bryan Corry, Head Ecologist
Biodome Investigation Team

**Vocabulary**

**Energy storage molecule:** a molecule that organisms can use to release the energy they need to survive
What is the connection between energy storage molecules and plants that do not grow and animals that do not reproduce?
Examining the Biodome Files

We will begin to investigate the Chapter Question by examining some documents from the biodome that Dr. Corry left us. As you read, look for information that might help you figure out why there weren’t enough energy storage molecules for plants and animals in the biodome. Remember, these are just your initial claims, so don’t worry about being right or wrong. As you read through the files, you will be brainstorming as many possibilities as you can as to why there not enough energy storage molecules. The more hypotheses we can generate, the faster we can figure out what happened to the Biodome!

Reading: “Biodome File 1: News Stories”

Active Reading Strategies

- Use red pencil (or other color) to underline evidence
- Use green pencil (or other color) to circle unit glossary words and unfamiliar words
- Write definitions above circled words
- Write in the margins to identify questions, impactful ideas, and “a-ha!” moments

Group Builds Ecosystem from Scratch

The Econauts, a local group of space fans, have built a glass dome bigger than a football field. Inside, they have installed their very own ecosystem, complete with trees, plants, and animals. The dome is completely enclosed, but the plants and animals inside should have all the air and water they need to survive. This type of enclosed ecosystem is known as a biodome.

Members of the group plan to live sealed inside this biodome for several years. Their aim is to find out whether humans could build domes like this on the Moon, Mars, or other planets, creating livable spaces and food sources out in space.

The members of Econauts are not astronauts or scientists, just space fans who hope to live in space someday. Group members have varied backgrounds, including careers in business, advertising, gardening, medicine, and goat farming.

Other organizations have attempted to build biodomes in the past, with little long-term success. Ecosystems are complicated, and it’s not so easy to create one that can survive in a sealed glass dome. In order to design their biodome, the Econauts group has hired expert ecologists to give their advice on what kinds of plants and animals to include, and how many of each. With the advice of these ecologists, the group members hope their constructed ecosystem will be self-sustaining, with plenty of plants for the animals to eat, plenty of sunlight and water for the plants, and plenty of air for both.
The human occupants will also be eating food farmed and raised in the biodome. Econaut Sarah Willard stated, “I’m really excited to live inside this biodome and help take care of the animals and plants. It will feel like being one of the first humans to live in a colony on another planet.”

**Biodome Fails: Ecologists to Determine Why**

Five years ago, a local group of space fans called the Econauts constructed an ecosystem sealed under glass—a biodome. Recently, the group noticed an ominous decrease in the populations of organisms: the ecosystem appeared to be in the process of collapsing. The occupants were safely removed from the biodome, but the cause of the crash is still a mystery. A group of expert ecologists has been hired to investigate the failed biodome and try to determine what went wrong. They will advise the Econaut group on how a second attempt could be improved.
Reading: “Biodome File 2: Econaut Biographies & Job Descriptions”

Active Reading Strategies

- Use red pencil (or other color: ) to underline evidence
- Use green pencil (or other color: ) to circle unit glossary words and unfamiliar words
- Write definitions above circled words
- Write in the margins to identify questions, impactful ideas, and “a-ha!” moments

Each of the eight Econauts has been assigned a specific job based on his or her work and interests outside the biodome. They are expected to perform the requirements listed in the descriptions of their jobs, as well as record their activities at least once per season.

The Econauts

Ecoanaut Biographies

1. Harrison Grant is a 26-year-old water technician from Phoenix, Arizona, who has taken responsibility for the Econauts’ water system. He has loved space since he was a little boy and has thought a great deal about possible water systems for use in space, though he isn’t a professional space scientist.

2. Erica Li is a 22-year-old college student from Kihei, Hawaii. She is working toward a career in advertising. Erica grew up hunting wild pigs with her family and getting oysters and crabs from the ocean. She learned about the biodome while taking astronomy classes in college, and she can’t wait to bring her hunting and foraging skills into the dome.

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
3. Sarah Willard is a 29-year-old goat farmer from Wenatchee, Washington, and she’ll be caring for the Econauts’ herd of twenty goats. Sarah has been an amateur astronomer since she was a teenager, and she never expected that her goat-farming skills would help people learn how to live in space. She’s looking forward to keeping the biodome goats happy and healthy.

4. Jeff Anderson is a 28-year-old gardener from Fort Collins, Colorado, who is responsible for growing all of the Econauts’ food. Jeff became interested in space on an eighth-grade trip to the Kennedy Space Center in Florida, and has dreamed since then of contributing to the future of humans in space. He hopes his work in the biodome will help future generations learn to grow food if they settle on other planets.

5. Ana Lopez is a 52-year-old doctor from Greenville, South Carolina, who will provide medical care in the biodome. Ana is fascinated by the idea of living in space, and has studied the medical needs of people living in enclosed spaces so she is prepared to take great care of the Econauts during their project.

6. Keith Yoo is a 24-year-old banker from Pittsburgh, Pennsylvania, who will serve as the Econauts’ groundskeeper. Keith has no experience with maintaining an ecosystem, but he’s interested in the psychology of people living in confined spaces, so he’s excited to offer his services to the team.

7. Gabriel Gutierrez is the Econauts’ chef. He is 35 years old and comes from Oklahoma City, where he specializes in farm-to-table cooking. Gabriel works with a local university to study ways of introducing more natural food into the diets of people in space, and he is excited about the challenge of cooking good food from limited sources.

8. Celeste Parker is a 38-year-old computer network administrator from Minneapolis, Minnesota. She has dreamed of living in space since she was a girl, and hopes to buy a ticket for one of the first commercial flights in space. She will run all of the technology required for the Econauts’ biodome.

**Econaut Job Assignments**

**Gardener:** Jeff Anderson Pick fruits and vegetables and deliver them to the chef. Make sure all plants are receiving enough water. Plant new fruits and vegetables as necessary.

**Groundskeeper:** Keith Yoo Maintain biodome buildings and grounds. Rake up dead leaves, place them in sealed garbage bags, and bury them at least 6 feet underground.

**Computer Systems Operator:** Celeste Parker Make sure all computer equipment is working properly, and enter all biodome data for graphing.

**Water Maintenance:** Harrison Grant Check and maintain the water system so there is enough water available to all organisms.

**Chef:** Gabriel Gutierrez Prepare breakfast, lunch, and dinner for each of the residents. Make sure food provides what the Econauts’ bodies need.

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*Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)*
**Hunter:** Erica Li Hunt rabbits with bow and arrow and deliver to chef. Search for fruits and edible plants in the forest area.

**Goatherd:** Sarah Willard Care for goats, making sure they have plenty to eat and drink. Milk goats and deliver milk to chef.

**Doctor:** Ana Lopez Provide basic medical care and regular checkups to all biodome residents.

**Burial Duty:** All (this job rotates monthly) In order to keep the biodome looking orderly and full of life, we will bury any animals or plants that die. They will be placed in sealed garbage bags and buried at least 6 feet underground. We will bury all garbage as well.
### Reading: “Biodome File 3: List of Recommended Organisms to Include in the Biodome”

**Active Reading Strategies**
- Use red pencil (or other color: ☐) to underline evidence
- Use green pencil (or other color: ☐) to circle unit glossary words and unfamiliar words
- Write definitions above circled words
- Write in the margins to identify questions, impactful ideas, and “a-ha!” moments

<table>
<thead>
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<th>Producers</th>
<th>Primary Consumers</th>
<th>Secondary Consumers</th>
<th>Decomposers</th>
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<tr>
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<td>worms</td>
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</tr>
<tr>
<td>mosses</td>
<td>termites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ferns</td>
<td>turtles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>elodea</td>
<td>brine shrimp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(aquatic plant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rabbits</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I wonder why they decided not to include worms. Bacteria need worms to break dead matter into smaller pieces so bacteria can feed on it.

It’s a good thing that they included producers for both land and water ecosystems.

Gr 7, Populations & Resources Unit, Lesson 9 (Amplify 3.4) and Matter & Energy in Ecosystems, Lesson 1 (Amplify 1.2)
biotic matter: matter that makes up the living and dead organisms of an ecosystem set of interacting parts forming a complex whole

abiotic matter: matter that makes up the nonliving parts of an ecosystem, such as air, water, and rocks

Think about your initial claims to the Chapter question - are they about the biotic or abiotic matter in the ecosystem?
Investigation Question: Where do the energy storage molecules in an ecosystem come from? Explore the Matter & Energy digital Sim (short for simulation). It is a model of an ecosystem, and it is similar to the models that professional ecologists use to study ecosystems.

Key features of the Sim include:

- **Different types of molecules and atoms:** The Sim includes energy storage molecules, carbon, carbon dioxide, water, and oxygen. Oxygen and water are only visible in cell view.

- **How energy storage molecules move:** These molecules flow between the different parts of the ecosystem, such as when organisms die or eat other organisms.
• **Control buttons:** The Sim includes buttons that allow students to kill organisms, bury dead matter, burn dead matter, trap carbon dioxide, and adjust the amount of sunlight.

• **Graphs:** By pressing the graph icon, students are able to see visual data about the ecosystem and plot nine different quantities.

• **View Cell:** By pressing VIEW CELL, students can zoom in to see what is happening at the cellular level in various parts of the ecosystem.

• **Information:** By pressing the information icon, students can see numerical data rather than a visual representation of the ecosystem.

• **The words biotic matter and abiotic matter:** Where do we see these labels in the Sim?

<table>
<thead>
<tr>
<th>Part of ecosystem</th>
<th>Contains energy storage molecules? (yes or no)</th>
<th>Energy storage molecules flowing in? (yes or no)</th>
<th>Energy storage molecules flowing out? (yes or no)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producers</td>
<td>![Yes]</td>
<td>![Yes]</td>
<td>![No]</td>
</tr>
<tr>
<td>Consumers</td>
<td>![Yes]</td>
<td>![No]</td>
<td>![No]</td>
</tr>
<tr>
<td>Decomposers</td>
<td>![Yes]</td>
<td>![No]</td>
<td>![No]</td>
</tr>
<tr>
<td>Dead matter</td>
<td>![Yes]</td>
<td>![No]</td>
<td>![No]</td>
</tr>
<tr>
<td>Abiotic matter</td>
<td>![Yes]</td>
<td>![No]</td>
<td>![No]</td>
</tr>
</tbody>
</table>
Where do energy storage molecules first appear in the ecosystem?

What ideas do you have about where energy storage molecules in an ecosystem come from?
Reflecting on Lesson 1.2

Where do the energy storage molecules in an ecosystem come from?

Before next time, share the evidence you’ve gathered today and your ideas about the Investigation Question with a family member or friend!
Middle School Math
Grade 7
Topic 8
Lessons 8-3 & 8-4

Solve Problems Involving Geometry
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1. **AIM** the camera so the FULL page is easily viewable on your screen. For best results, flatten the page, or if scanning a screen be sure the entire page is visible on your phone screen.

2. **TAP** the screen to scan the entire front of the page. Scan the ENTIRE page. Scanning a single problem will not work. Scan the page BEFORE students write on the page.

3. **BOUNCE** the page to life by clicking your Bounce Pages program icon.

4. Update the operating system on your device and the Bounce Pages app as needed.
How many triangles can be drawn with a side length of 4 inches included between angles that measure $30^\circ$ and $60^\circ$?

Draw a 4-inch line segment and rays that form the $30^\circ$ and $60^\circ$ angles. There is only one way to draw the other two sides. Extend the rays until they intersect.

Only one triangle can be drawn given these conditions.

How many triangles that have sides measuring 4 centimeters and 5 centimeters in length, with an included angle measuring $55^\circ$, can be drawn?

1. Use a ruler and protractor to draw a $55^\circ$ angle.

2. As necessary, extend or shorten one side of the angle to a length of 4 centimeters.

3. As necessary, extend or shorten the other side of the angle to a length of 5 centimeters.

4. Complete the triangle by drawing the third side. How many unique segments can be drawn to form the third side?

5. How many triangles that have sides measuring 4 centimeters and 5 centimeters in length with an included angle measuring $55^\circ$ can be drawn?

On the Back!

6. How many triangles with angles measuring $45^\circ$ and $55^\circ$ with an included side measuring 3 inches in length can be drawn?
1. How many triangles can be drawn with side lengths of 3 units, 4 units, and 5 units? Explain.

2. Draw a triangle with side lengths of 16 units and 30 units and an included angle of 90°.

3. How many triangles can be drawn with one 90° angle, a 70° angle, and an included side measuring 3 inches? Explain.

4. Critique Reasoning Dora says that only one triangle can be constructed with two given side lengths and one given angle measure. Is Dora correct? Explain. 

5. Can a triangle be drawn with side lengths of 7.3 meters, 4.6 meters, and 11 meters? Explain.

6. Danielle wants to construct different triangles with angle measures of 90°, 45°, and 45°, but she was only able to draw the triangle shown at the right.

What mistake might Danielle have made?
7. Draw two different triangles given the following conditions for \( \triangle TRI \):

\[
TR = 6 \text{ units}, \ IT = 9 \text{ units}, \ m\angle TIR = 35^\circ
\]

8. In \( \triangle NMP \), \( m\angle MNP = 45^\circ \), \( MN = 7.5 \text{ feet} \), and \( MP = 5 \text{ feet} \).

How many triangles can be drawn when given the information above?

9. Higher Order Thinking Given two angle measures and the length of the included side, does this side length affect the number of triangles that can be drawn? Explain.

10. Which of the following describes possible methods that can be used to construct a triangle given the lengths of two sides and the measure of a nonincluded angle? Select all that apply.

- Construct one side with a given length. Use this side to form an angle with the given measure, then construct the opposite side with the given length.
- Construct one side with a given length. Use this side to form an angle with the given measure, then extend the other side of the angle until it has the same measure as the other given length and construct the side opposite the angle.
- Construct an angle with the given measure. Extend each side of the angle until these sides have the same measure as the given lengths and construct the side opposite the angle.
- Construct an angle with the given measure. Extend one side of the angle until it has the same measure as one of the given lengths and draw the side opposite the angle with the given length.
- Construct an angle with the given measure. Extend one side of the angle until it has the same measure as one of the given lengths. At the end of the extended side length, construct a side with a \( 90^\circ \) angle that has the same length as the other given side length. Then extend the other side with the included angle until it forms a triangle.
8-3 Additional Practice

1. How many triangles can be drawn with side lengths of 3 units, 4 units, and 5 units? Explain.  
   Sample answer: When given all three side lengths of a triangle, only one triangle can be drawn.

2. Draw a triangle with side lengths of 16 units and 30 units and an included angle of 90°. Sample drawing of the triangle shown.

3. How many triangles can be drawn with one 90° angle, a 70° angle, and an included side measuring 3 inches? Explain.  
   Sample answer: Only one triangle can be drawn given the measure of a side length that is included between two angles with given measures.

4. Critique Reasoning: Dora says that only one triangle can be constructed with two given side lengths and one given angle measure. Is Dora correct? Explain. No; Sample answer: It may be possible to construct more than one triangle if the angle with given measure is not included between the two sides with given lengths.

5. Can a triangle be drawn with side lengths of 7.3 meters, 4.5 meters, and 11 meters? Explain. Yes, The sum of the two shortest side lengths is greater than the longest side: 7.3 + 4.5 > 11.

6. Danielle wants to construct different triangles with angle measures of 90°, 45°, and 45°, but she was only able to draw the triangle shown at the right. What mistake might Danielle have made? Sample answer: She did not consider that the triangle could be enlarged or reduced, while keeping the same angle measures, to make a different triangle.

7. Draw two different triangles given the following conditions for \( \triangle \): TR = 6 units, \( \angle \) TIR = 35°. Sample drawings.

8. In \( \triangle \) AMP, \( \angle \) MNP = 45°, MN = 7.5 feet, and MP = 5 feet. How many triangles can be drawn when given the information above? More than one triangle. Sample answer: If two sides and an nonincluded angle are given, there are two triangles that can be drawn, and each side \( MP \) can be two different lengths.

9. Higher Order Thinking: Given two angle measures and the length of the included side, does this side length affect the number of triangles that can be drawn? Explain. No; Sample answer: Since two angles and an included side are given, there is only one way to draw the triangle, and it is not affected by the length of the given side.

E Assessment Practice

10. Which of the following describes possible methods that can be used to construct a triangle given the lengths of two sides and the measure of a nonincluded angle? Select all that apply. 
   - Construct one side with a given length. Use this side to form an angle with the given measure, then construct the opposite side with the given length.
   - Construct one side with a given length. Use this side to form an angle with the given measure, then extend the other side of the angle until it has the same measure as the other given length and construct the side opposite the angle.
   - Construct an angle with the given measure. Extend each side of the angle until these sides have the same measure as the given lengths and construct the side opposite the angle.
   - Construct an angle with the given measure. Extend one side of the angle until it has the same measure as one of the given lengths and draw the side opposite the angle with the given length.
   - Construct an angle with the given measure. Extend one side of the angle until it has the same measure as one of the given lengths. At the end of the extended side length, construct a side with a 90° angle that has the same measure as the other given side length. Then extend the other side with the included angle until it forms a triangle.
In the diagram, which angles are adjacent to \( \angle VWX \)? What is the value of \( x \)?

Adjacent angles are angles that share a ray.

\( \angle VWZ \) and \( \angle XWY \) are adjacent to \( \angle VWX \).

\( \angle YWZ \) and \( \angle VWX \) are vertical angles, so they have equal measures.

\[ m \angle YWZ = m \angle VWX \] Write an equation.

\[ 3x + 4 = 100 \] Substitute values from the diagram.

\[ 3x + 4 - 4 = 100 - 4 \] Subtract 4 from both sides.

\[ 3x = 96 \] Simplify.

\[ \frac{3x}{3} = \frac{96}{3} \] Divide both sides by 3.

\[ x = 32 \] Simplify.

In the diagram, what type of angles are \( \angle ABE \) and \( \angle DBC \): adjacent angles or vertical angles? What is the value of \( x \)?

1. Do \( \angle ABE \) and \( \angle DBC \) share a ray?

2. Are \( \angle ABE \) and \( \angle DBC \) opposite each other?

3. What type of angles are \( \angle ABE \) and \( \angle DBC \): adjacent angles or vertical angles?

4. Write an equation that relates the measure of \( \angle ABE \) to the measure of \( \angle DBC \).

5. Solve the equation from Exercise 4. What is the value of \( x \)?

On the Back!

6. \( \angle QRS \) and \( \angle TRS \) are adjacent angles that are complementary.
   The measure of \( \angle QRS \) is \( 78^\circ \). What is the measure of \( \angle TRS \)?
8-4 Additional Practice

1. a. Name a pair of adjacent angles in this figure.

b. What common point is shared by all adjacent angles in this figure?

2. Dexter needs to find each angle in this figure that is adjacent to \( \angle LON \). He claims that \( \angle MON \) is adjacent to \( \angle LON \).
   a. List each angle that is adjacent to \( \angle LON \).
   b. Why is Dexter’s claim incorrect?

3. a. Use vertical angles to find the value of \( x \).

b. Explain how to find the value of \( x \) without using vertical angles.

4. Find the measure of the complement to an 18° angle. Explain your answer.

5. The measure of \( \angle 1 \) is 39°. What is the measure of the angle adjacent to \( \angle 1 \)? Explain.
6. The adjacent angles shown below are supplementary. Find the value of \( x \). 

\[ \begin{align*}
3x^\circ & \quad 54^\circ 
\end{align*} \]

7. Find the supplementary angle to an angle that is 128.9°. Explain your answer.

8. Higher Order Thinking \( \text{In the diagram, } m\angle 1 = (125 - y)^\circ, \ m\angle 2 = 24^\circ, \text{ and } m\angle 3 = (x + 46)^\circ. \text{ Solve for } x \text{ and } y \text{ and find } m\angle 1 \text{ and } m\angle 3. \text{ Explain how you found the measure of each angle and the value of each variable.} \)

9. Cooper incorrectly claims \( m\angle b = 125^\circ \) in the diagram shown at the right.

**PART A**
Find \( m\angle b \). Explain your answer.

**PART B**
What mistake did Cooper likely make?
In the diagram, which angles are adjacent to $\angle VWX$?
What is the value of $x$?
Adjacent angles are angles that share a ray.
$\angle VWZ$ and $\angle XWY$ are adjacent to $\angle VWX$.
$\angle VWY$ and $\angle XWV$ are vertical angles, so they have equal measures.

$m \angle VWZ = m \angle VWX$
Write an equation.
$3x + 4 = 100$
Substitute values from the diagram.
$3x + 4 - 4 = 100 - 4$
Subtract 4 from both sides.
$3x = 96$
Simplify.
$x = \frac{96}{3}$
Divide both sides by 3.
$x = 32$
Simplify.

In the diagram, what type of angles are $\angle ABE$ and $\angle DBC$?
adjacent angles or vertical angles? What is the value of $x$?

1. Do $\angle ABE$ and $\angle DBC$ share a ray? 
   **No**

2. Are $\angle ABE$ and $\angle DBC$ opposite each other?
   **Yes**

3. What type of angles are $\angle ABE$ and $\angle DBC$? adjacent angles or vertical angles?
   **Vertical angles**

4. Write an equation that relates the measure of $\angle ABE$ to the measure of $\angle DBC$.
   $2x - 8 = 50$

5. Solve the equation from Exercise 4. What is the value of $x$?
   $x = 29$

On the Back!

6. $\angle QRS$ and $\angle TRS$ are adjacent angles that are supplementary.
The measure of $\angle QRS$ is $78^\circ$. What is the measure of $\angle TRS$?
   $12^\circ$

6. The adjacent angles shown below are supplementary. Find the value of $x$.
   $3x + 15 = 180$
   $x = 50$

7. The measure of $\angle 1$ is $45^\circ$. What is the measure of the angle adjacent to $\angle 1$?
   **$135^\circ**

8. Higher Order Thinking. In the diagram, $m \angle 1 = (125 - y)^\circ$, $m \angle 2 = 2y^\circ$, and $m \angle 3 = x - 40^\circ$. Solve for $x$ and $y$ and find $m \angle 1$ and $m \angle 3$. Explain how you found the measure of each angle and the value of each variable.

   $x = 20$, $y = 30$; $m \angle 1 = 90^\circ$; $m \angle 3 = 60^\circ$. Sample answer:
   $\angle 1$ is a right angle, so $m \angle 1 = 90^\circ$. Solve the equation
   
   $(125 - y) + 90 = 180$;
   $y = 25$

   $\angle 2$ and $\angle 3$ are complementary angles. Solve the equation
   
   $25 + 30 = 55$;
   $m \angle 3 = 60^\circ$

   Substitute the given expression for $m \angle 3$ and solve the equation
   
   $x - 40 = 60$; $x = 100$

Assessment Practice

9. Cooper incorrectly claims $m \angle b = 125^\circ$ in the diagram shown at the right.

   **PART A**
   Find $m \angle b$. Explain your answer.
   $35^\circ$; Sample answer: $m \angle b = 90^\circ$; $m \angle b = 35^\circ$

   **PART B**
   What mistake did Cooper likely make?

   He subtracted $55^\circ$ from $180^\circ$ instead of subtracting $55^\circ$ from $90^\circ$. Cooper may have confused the properties of complementary and supplementary angles.