Thank you for taking the time to check out this thematic unit for an high flyin' exploration of the world of kites. Students will "travel the world" as they learn about the history and uses of kites throughout time.

Sandie Flynn

Kites

A Thematic Unit

Student Selected Subject

Grades 4-6

Includes detailed Substitute Plans

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Kites Overview of Materials

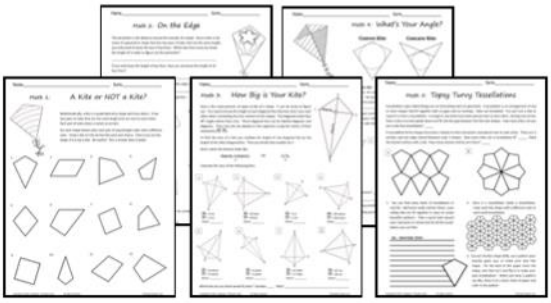
"If you could study anything you wanted, what topics would you choose?" That's the question I asked my third and fourth graders. After thinking and talking about it for a week, they listed and discussed all the possibilities, and then voted for 10 subjects. Kites was one of their top ten. If you're looking for something for the first few days of school, an exciting subject for use when you need a substitute, or just a fun week to practice useful skills, this may be the unit for you! You'll need a copy of Kite Fighters by Linda Sue Park for the Read Aloud Activities. Here's what you'll find in these materials:

File 1: **Teacher's Guide**
Overview, Standards, Book List, Credits, detailed Lesson Plans you can leave for a substitute, and Worksheet Answers. This is an exciting, student-selected topic for a special time.

File 2: **Reading Files**
Students read from a collection of 8 articles about kites. Topics include Kites of the Ancients, Military Kites, Weather Kites, Benjamin Franklin, The Fall of Icarus, Kites of the Gods, Sporting Kites, and Types of Kites. A Reading Scavenger Hunt is included. Two formats are included: Print, and Digital Power Point ®

File 3: **Writing Directions**
Students create a set of step-by-step directions, with illustrations, that walk a customer through constructing a kite from a kit.

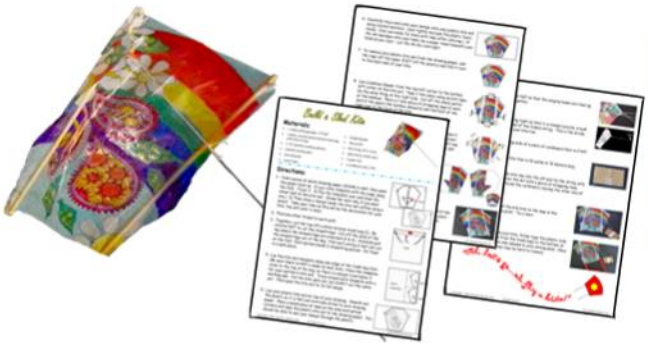
File 4: **Language Arts**
Students use vocabulary, parts of speech, context, proofreading, poetry, and listening skills to complete language arts activities.



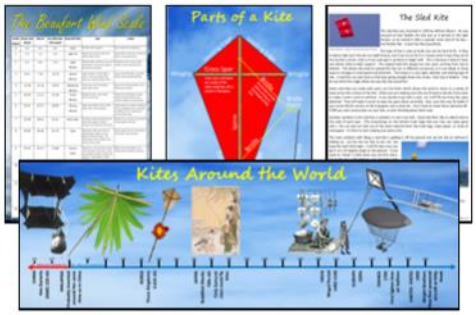
File 5: **Math**
Students learn the geometric properties of a kite and how to measure perimeter, area, and angles. They explore kite tessellations.

File 6: **Science Activities**
Five science activities allow students to explore principles of flight and wind. Common classroom objects are used to test air pressure using the scientific process.

File 7: **Geography**
Students use maps to explore the Silk Road, which may have spread the use of kites around the world.



File 8: **Build a Kite**
Students will read about sled kites, and then read and follow directions to build one of their own.



File 9: **Posters**
Posters (about 11X17) help students in their study of kites.

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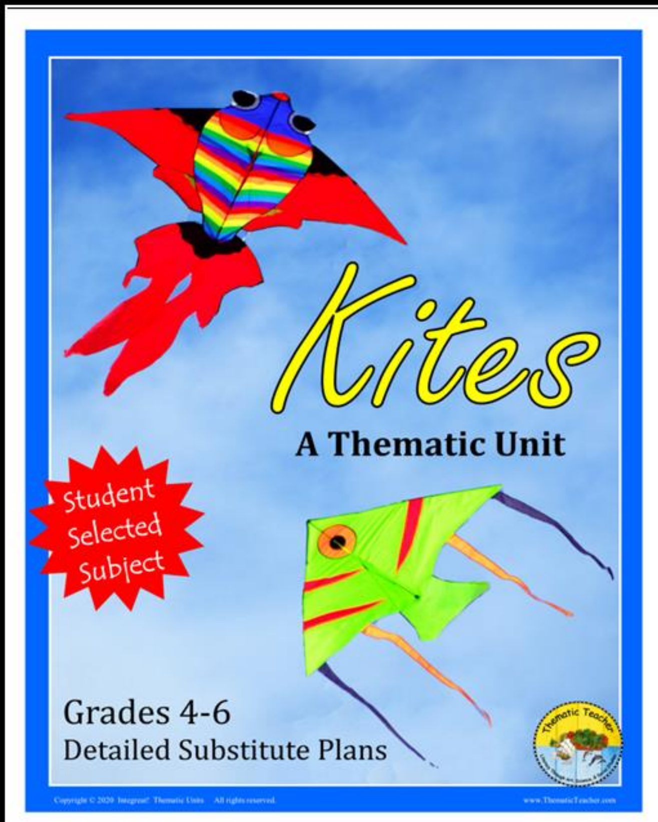
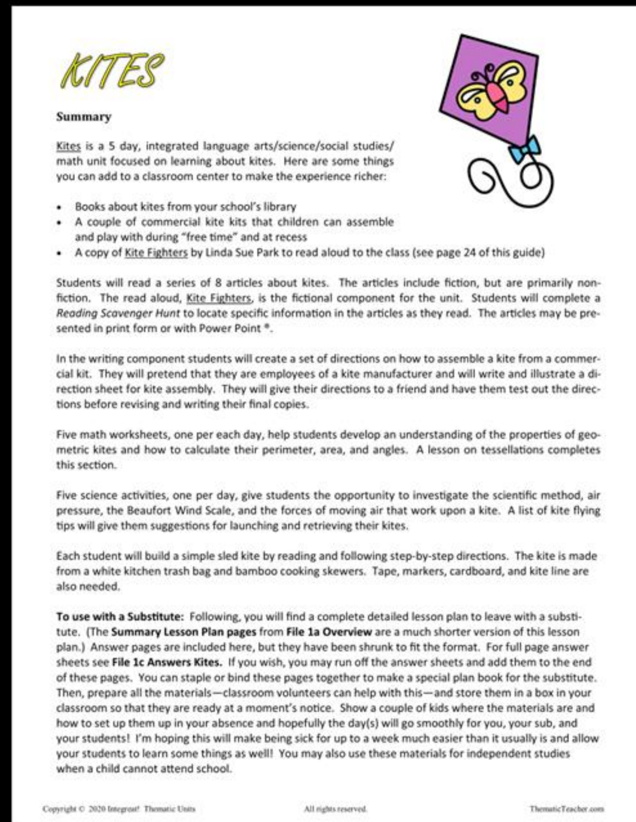
Substitute Lesson Plans





KITES

Summary

Kites is a 5 day, integrated language arts/science/social studies/ math unit focused on learning about kites. Here are some things you can add to a classroom center to make the experience richer:

- Books about kites from your school's library
- A couple of commercial kite kits that children can assemble and play with during "free time" and at recess
- A copy of Kite Fighters by Linda Sue Park to read aloud to the class (see page 24 of this guide)

Students will read a series of 8 articles about kites. The articles include fiction, but are primarily non-fiction. The read aloud, Kite Fighters, is the fictional component for the unit. Students will complete a *Reading Scavenger Hunt* to locate specific information in the articles as they read. The articles may be presented in print form or with Power Point ®.

In the writing component students will create a set of directions on how to assemble a kite from a commercial kit. They will pretend that they are employees of a kite manufacturer and will write and illustrate a direction sheet for kite assembly. They will give their directions to a friend and have them test out the directions before revising and writing their final copies.

Five math worksheets, one per each day, help students develop an understanding of the properties of geometric kites and how to calculate their perimeter, area, and angles. A lesson on tessellations completes this section.

Five science activities, one per day, give students the opportunity to investigate the scientific method, air pressure, the Beaufort Wind Scale, and the forces of moving air that work upon a kite. A list of kite flying tips will give them suggestions for launching and retrieving their kites.

Each student will build a simple sled kite by reading and following step-by-step directions. The kite is made from a white kitchen trash bag and bamboo cooking skewers. Tape, markers, cardboard, and kite line are also needed.

To use with a Substitute: Following, you will find a complete detailed lesson plan to leave with a substitute. (The **Summary Lesson Plan pages** from **File 1a Overview** are a much shorter version of this lesson plan.) Answer pages are included here, but they have been shrunk to fit the format. For full page answer sheets see **File 1c Answers Kites.** If you wish, you may run off the answer sheets and add them to the end of these pages. You can staple or bind these pages together to make a special plan book for the substitute. Then, prepare all the materials—classroom volunteers can help with this—and store them in a box in your classroom so that they are ready at a moment's notice. Show a couple of kids where the materials are and how to set up them up in your absence and hopefully the day(s) will go smoothly for you, your sub, and your students! I'm hoping this will make being sick for up to a week much easier than it usually is and allow your students to learn some things as well! You may also use these materials for independent studies when a child cannot attend school.

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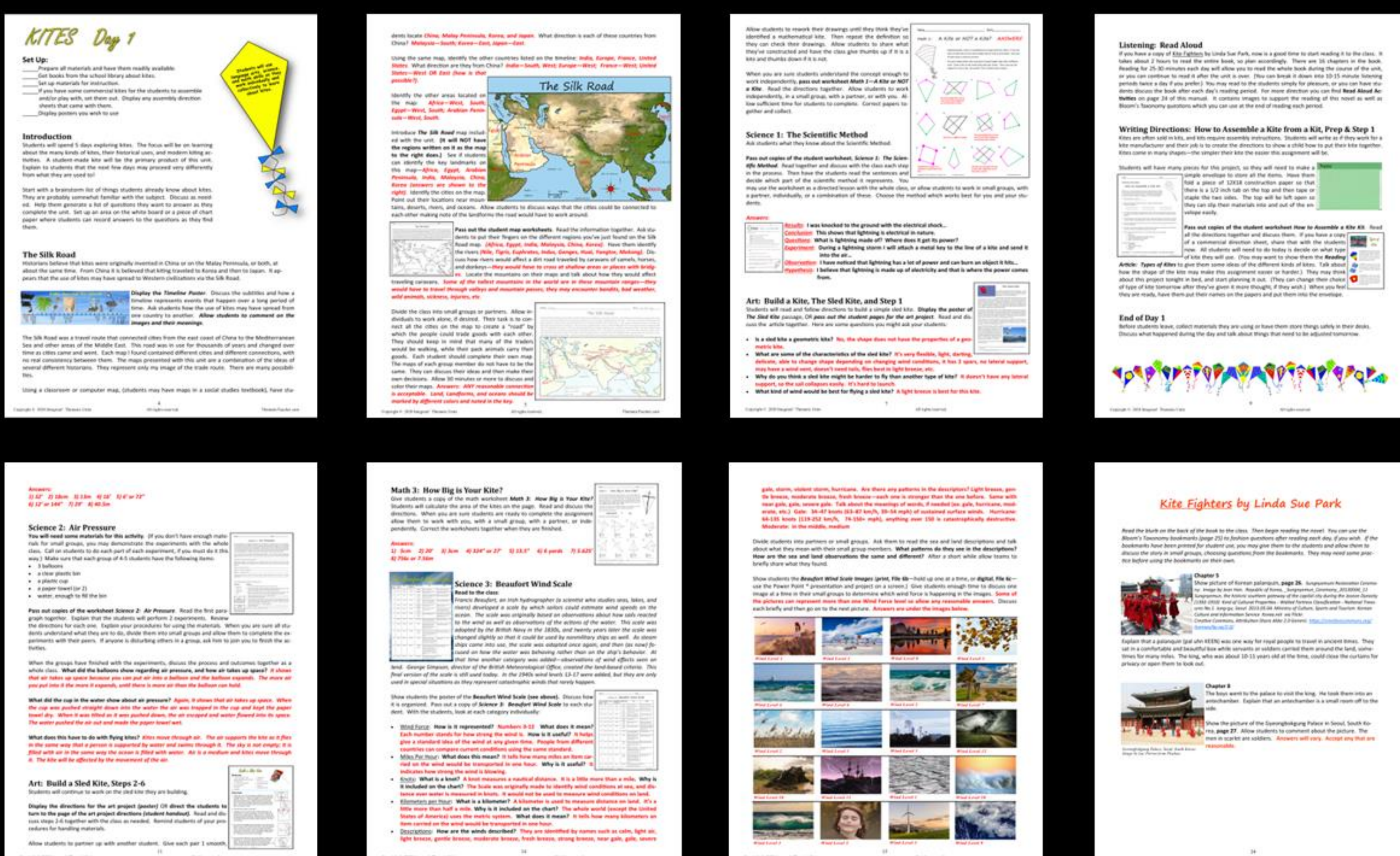

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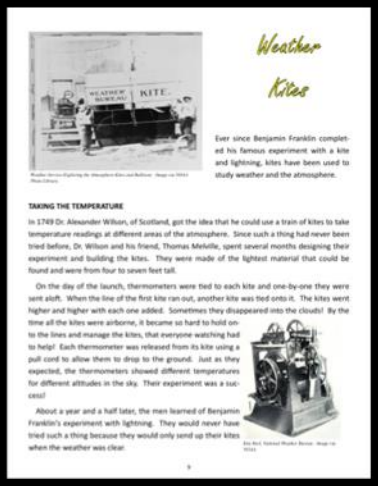

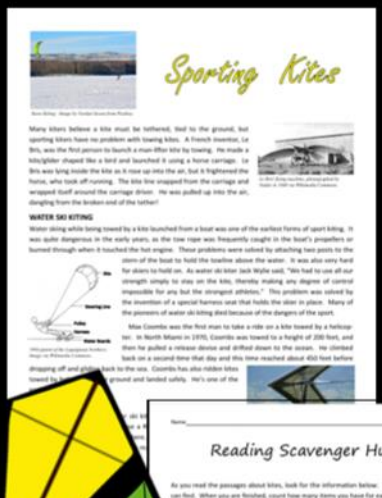

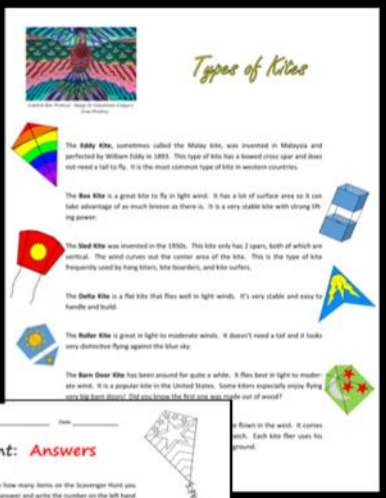

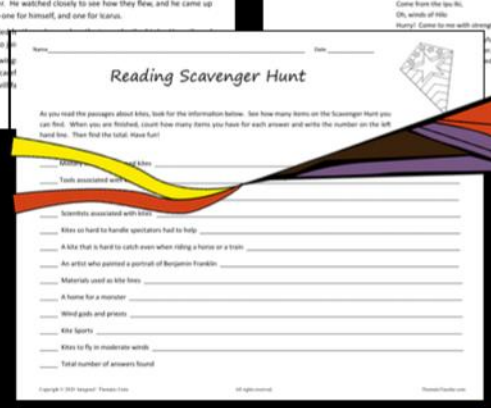

Student Readers: Articles

Students read a collection of 8 articles which include the history of kites, their uses, myths, and types. There are 2 versions of the articles—print and digital (PDF). Students fill out a Reading Scavenger Hunt as they read the articles.

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Kites of the Ancients

Kites have been in use for thousands of years, but they haven't always been toys. In fact, the first kites were one of the earliest forms of technology!

CHINA

Historians believe kites may have come into use sometime around 770-476 BC (BCE) in China. The first written story of kite flying tells about a Chinese general named Han Hsin. He used a kite to capture a town! His warriors had surrounded the walls and needed to find a way in. He flew a kite, probably carrying a man, above the wall so that he could find out how wide the wall was. Then he knew how far the troops would have to dig to tunnel underneath. They dug the tunnel, snuck into the town, surprised the townspeople, and won the battle!

Chinese Architecture: Image by Linnaea Mallette via PublicDomainPictures.net.

Another story tells of Emperor Huan Theng of the Han Dynasty. His palace was surrounded by enemy soldiers so he ordered every person in the place to make a kite specially designed to make noise as it flew. Hundreds of kites were sent up in the dark, moonless sky, over the camp of the enemy where they moaned and groaned all night long, frightening the foe so much that they ran away.

Mu Zi, a master of joinery (a carpenter) spent three years building a kite strong enough to lift up a man. It was called the Wooden-Black-Eard-Kite. At least one other Chinese carpenter, Lu Ban, built a kite from the same design. Chinese armies used this type of kite to lift a spy up into the air and fly him over enemy camps to gather information.

In the early days, Chinese peasants were not allowed to fly kites. Too often they ran across planted fields, destroying the farmer's crops. The penalty for this was death, by starvation. Of course the farmers may have starved to death, too, because their crops were ruined!

Korean Village: Image by tau nguyen from Pixabay.

KOREA

News of these strange flying objects traveled from China to other countries. The people of Korea began to experiment with kites during the period of the Three Kingdoms (4-645 AD/ACE). The battle group of General Gim Yu-sin was sent in to put down a revolt. The night before the battle his troops saw a

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shooting star and refused to fight the next day. They believed the star had fallen from the sky to the earth. That night the general attached a ball to a kite, set it afire, and launched it into the air. The fireball went out high up in the sky and the general told his men, "See, the star has returned to the sky." The soldiers rejoiced and put down the rebellion the next day.

Woodblock print of kite flying by Japanese artist Suzuki Harunobu via Wikimedia Commons.

JAPAN

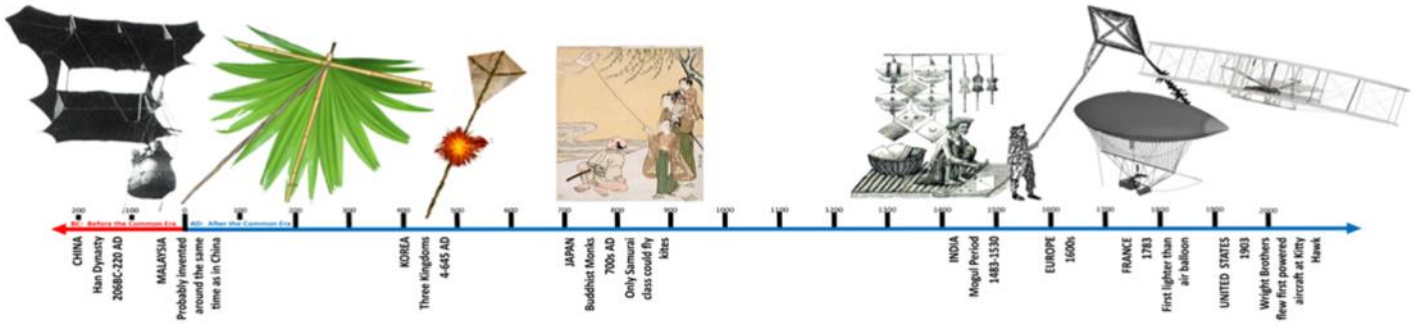
Buddhist monks brought kites to the land of Japan in the 700s. They believed the kites would ward off evil spirits. For hundreds of years, only members of the warrior Samurai class were allowed to fly kites. In the 1600s, regular Japanese citizens began to use them. Many families flew kites over their houses every night to keep evil spirits away. Today kite festivals are held all over Japan, and families often fly fish kites to announce the birth of a baby.

MALAYSIA

Wind is a powerful force of nature in tropical areas, and ancient people who lived on the Malaysian Peninsula long ago worshipped the wind as a god. Island natives sent large leaf kites high into the sky as gifts to him. Foreigners sailing to the islands reported seeing lots of these objects floating in the air above the trees, but they were nowhere to be found once the sailors had landed. All that was left was some broken wreckage floating in the ocean. From the wreckage, visitors learned these strange flying things were made of palm fronds tied to bamboo frames. The kite strings were made of twisted vines. Later the people of Malaysia used cloth to make kites as tall as men with long tails decorated with feathers and flowers, although these kites didn't need tails because they had a bowed frame. Today, kites made with a bowed frame are called Malay or Eddy kites. Some historians believe kites were invented in both China and Malaysia at near the same time.

EUROPE

Flat kites did not become popular in Europe until the 16th century. They were mainly used to create fireworks in the sky and were called firedrakes. The kite was made of fabric and covered in oil and gunpowder. Fire crackers were tied onto the tail, which was also sprinkled with gunpowder. At night, the kite was lifted into the sky and the fire crackers were lit. They went off one by one, with the fire traveling up the tail of the kite until it at last reached the kite itself, igniting a huge flare of flame. Some religious leaders used these fire-drakes to scare the people into obeying them.



Yolen, Will. The Complete Book of Kites and Kite Flying. Simon and Schuster: New York, 1976.

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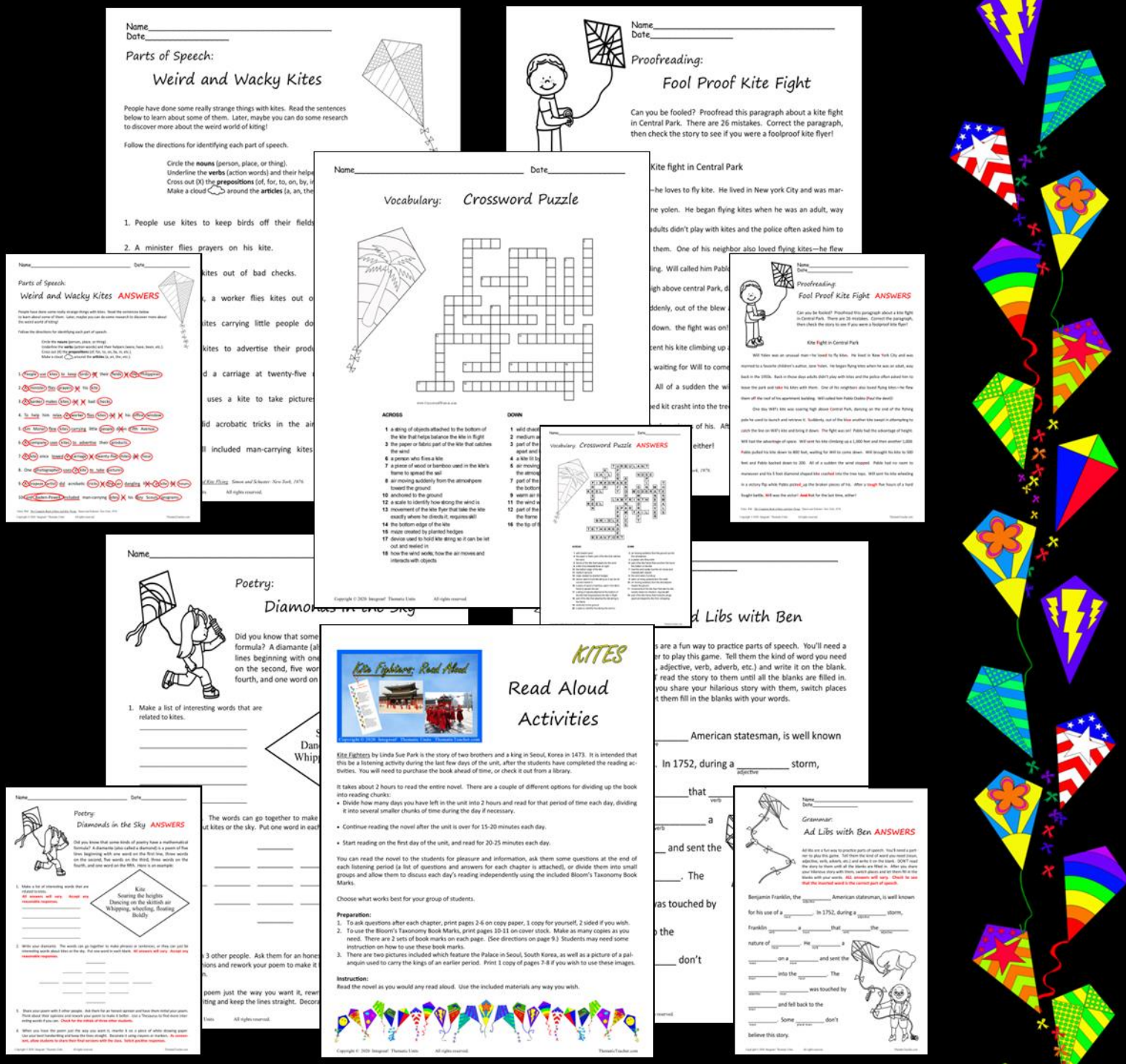

Language Arts

Students practice proofreading, parts of speech, poetry, and vocabulary.

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Name_____ Date_____

Writing Directions:

How to Assemble a Kite Kit

Pretend you are a kite manufacturer and you are making kite kits for children. It is your job to create the direction sheet to show how to put the kite together. Choose the type of kite you wish to use. (A simple kite is easiest.) Then follow the steps below to write the directions for your kit. You may include drawings. We will work on this for several days.

1. What kind of kite is in your kit?
   _____
2. Make a list of all the parts that are in your kit. Include the materials needed to put the kite together.
   _____ _____ _____
   _____ _____ _____
   _____ _____ _____
3. On another sheet of paper make a separate drawing of each part of the kite. Make the drawings large enough so that you can cut them out and actually put them together. Then cut them out! You will use them to help you write your directions.
4. Use the kite pieces from step 3 to help you write step-by-step directions to show and tell a child how to build the kite. Include drawings for each step.
5. Share the rough draft of your directions with a friend. Give them the pieces of your kite and ask them to try out your directions by "building" the kite as you watch.
6. Use what you learned when your friend tried your instruction sheet. Revise your directions to make them more clear and easier to understand. Have your friend check out your revisions.
7. Write the final copy of your directions on white drawing paper. Be sure to include:
   ____ A Title
   ____ List of Parts
   ____ List of materials needed—include items that your kit does not have
   ____ Step-by-step directions with drawings
   ____ Where to call if h… needed (You can make this up!)
8. Edit you…

Congratu… …b with a kite manufacturer! Well, maybe not a paying job!

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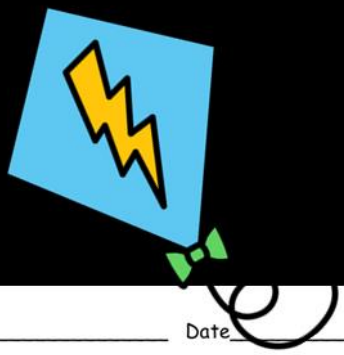

_____ Date_____

…ns:

…ssemble a Kite Kit **ANSWERS**

…facturer and you are making kite kits for children. It is your job to create the …to put the kite together. Choose the type of kite you wish to use. (A simple …he steps below to write the directions for your kit. You may include draw… …r several days.

…ur kit?
…y kind of kite is acceptable. A simple kite style is preferred for this activity.

…ts that are in your kit. Include the materials needed to put the kite together.
…t most will include paper or fabric, wood, string, line reel, tail, tail ties, glue or staples.

…er make a separate drawing of each part of the kite. Make the drawings large enough so that you can …y put them together. Then cut them out! You will use them to help you write your directions. **Stu… …make these pictures large enough to manipulate. They do not need to be as large as the actual kite**

…step 3 to help you write step-by-step directions to show and tell a child how to build the kite. Include …**Each student's draft will be different.**

…your directions with a friend. Give them the pieces of your kite and ask them to try out your direc… …te as you watch. **Circulate around the room and monitor as necessary.**

…hen your friend tried your instruction sheet. Revise your directions to make them more clear and eas… …your friend check out your revisions. **Circulate around the room and monitor as necessary.**

…our directions on white drawing paper. Be sure to include:

…ls needed but not included in your kit
…irections with drawings
…f help is needed
…t include each of the above.

____ Capital letters
____ Usage—clear directions
____ Punctuation
____ Spelling

Evaluate the final copies on a scale of 1-4 based on
1) Are all parts included?
2) How clear are the directions?
3) How clear are the illustrations?
4) Could a child assemble the kite using these instructions?
5) How correct is the editing job?

Congratulations! You are ready for a job with a kite manufacturer! Well, maybe not a paying job!

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Writing

Students write and illustrate a direction sheet explaining how to assemble a kite kit purchased from a kite manufacturer.

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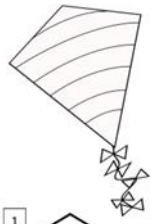
Name_____ Date_____

Math 1: A Kite or NOT a Kite?



Mathematically, a kite is a quadrilateral (a shape with four sides). It has two pairs of sides that are the same length and are next to each other. Each pair of sides share a vertex (a corner).

For each shape below color each pair of equal length sides with a different color. Draw a dot on the vertex that each pair shares. Then cross out the shape if it is not a kite. Be careful! This is trickier than it looks!

1 2 3 4

Name_____ Date_____

Math 2: On the Edge

The perimeter is the distance around the outside of a shape. Since a kite is the name of a geometric shape that has two pairs of sides that are the same length, you only need to know the length of two lines. Which two lines must you know the length of in order to figure out the perimeter?

_____

If you only know the length of two lines, how can you know the length of all four lines?

_____

How can you find the distance around the outside edge of a whole kite?

_____

Calculate the perimeter for each of the following kites:

3 cm

5 m

5 feet

10'

Perime

Perime

number.) _____

7

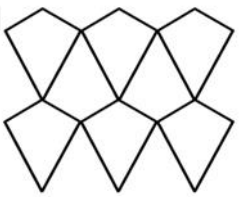
Name_____ Date_____

Math 5: Topsy Turvy Tessellations

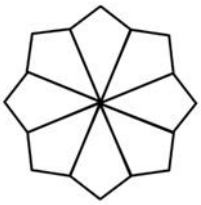
Tessellations (also called tilings) are an interesting twist on geometry. A tessalation is an arrangement of one or more shapes that fit together with no gaps and no overlaps. Kites can tessellate! You can turn a kite or move it to form a tessellation. In image A, two kites have been placed next to each other, sharing one vertex. Then a kite is turned upside down and fit into the gap between the first two shapes. How many kites can you see in the first tessellation? _____

In tessellation B the shapes have been rotated on their end points and placed next to each other. There are 2 vertices and one edge shared between each 2 shapes. How many kites are in tessellation B? _____ Mark the shared vertices with a dot. How many shared vertices are there? _____

A



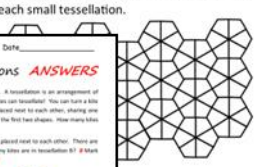
B



1. You can find many kinds of tessellations in real life. Bathroom walls, kitchen floors, even ceiling tiles are fit together in ways to create beautiful patterns. Take a quick look around your classroom or schoo
lations you can find.

ex: restroom floor

2. Here is a tessellation inside a tessellation. Color each kite shape with a different color in each small tessellation.



left), use a pattern your
make your own kite
of this paper trace the
nd flip it to make your
hen you have a pattern
lean sheet of paper and

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Name_____

Math 3: How Big is Yo

Area is the measurement of space inside of a shape. It
You need to know the length of each diagonal line (the
when connecting the four vertices of the shape). The
angles where they cross. These diagonal lines can be l
onal$_2$. They may also be labeled as line segments usi
points ($\overline{AB}$, $\overline{CD}$). Diagonal$_1$ is $\overline{AB}$. Diagonal$_2$ is $\overline{CD}$.

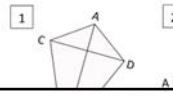
To find the area of a kite you multiply the length of
length of the other diagonal line. Then you divide that

Here's what the formula looks like:

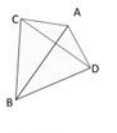
$$\frac{\text{diagonal}_1 \times \text{diagonal}_2}{2} \quad \text{OR}$$

Calculate the area of the following kites:

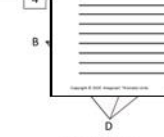
1 2



3 4



$\overline{AB}$ = 3 m
$\overline{CD}$ = 2 cm
Area= _____



$\overline{AB}$ = 36 inches
$\overline{CD}$ = 18 inches
Area= _____

eet
et

B

D

yards
yards

Number ____ Why? _____

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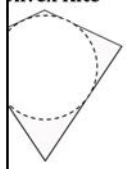
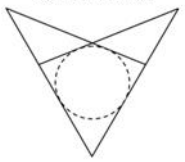
Name_____ Date_____

Math 4: What's Your Angle?

onvex Kite

Concave Kite





e kite. Both types of mathematical kites contain a circle
s. It's called a ***tangential circle***. Mark the point the circle
. Do you think the points will always be at the same loca-
nt sizes? _____

_____

are marked with a curved line (see number 1 below). Mark each of the inside angles on the
. Then use a protractor to measure the angles. Round to the nearest 5° and write the
ach angle in each corner. Then add the measurements of the four angles together and

1 2 3

360°

What patterns do you notice in the angle measurements? _____

_____

Do you know what a convex kite is called in the kiting world? _____

Do you know what a concave kite is called in the kiting world? _____

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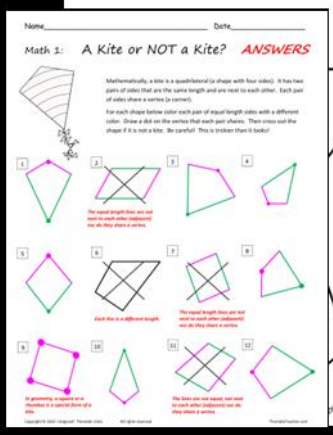
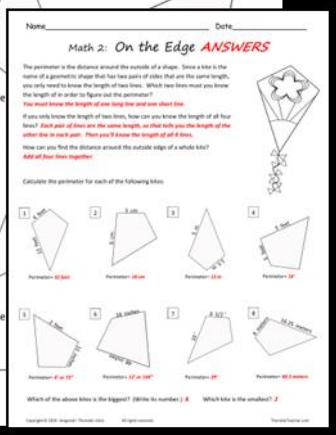


Name_____ Date_____

Math 1: A Kite or NOT a Kite? ANSWERS

Mathematically, a kite is a quadrilateral (a shape with four sides). It has two pairs of sides that are the same length and are next to each other. Each pair of sides share a vertex (a corner).

For each shape below color each pair of equal length sides with a different color. Draw a dot on the vertex that each pair shares. Then cross out the shape if it is not a kite. Be careful! This is trickier than it looks!



Name_____ Date_____

Math 2: On the Edge ANSWERS

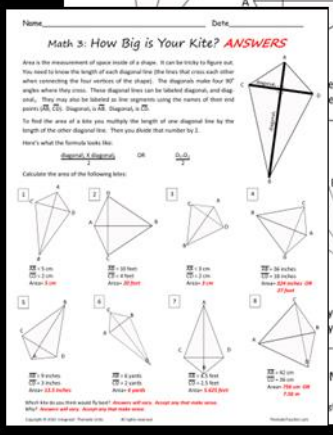
The perimeter is the distance around the outside of a shape. Since a kite is the name of a geometric shape that has two pairs of sides that are the same length, you only need to know the length of two lines. Which two lines must you know the length of in order to figure out the perimeter?
You must know the length of one long line and one short line.

If you only know the length of two lines, how can you know the length of all four lines? *Each pair of lines are the same length, so that tells you the length of the other line in each pair. Then you'll know the length of all 4 lines.*

How can you find the distance around the outside edge of a whole kite?
Add all four lines together.

Calculate the perimeter for each of the following kites:

Which of the above kites is the biggest? (Write its number.) 8 Which kite is the smallest? 2



Name_____ Date_____

Math 3: How Big is Your Kite? ANSWERS

Area is the measurement of space inside of a shape. It can be tricky to figure out. You need to know the length of each diagonal line (the lines that cross each other when connecting the four vertices of the shape). The diagonals make four 90° angles where they cross. These diagonal lines can be labeled diagonal$_1$ and diagonal$_2$. They may also be labeled as line segments using the names of their end points ($\overline{AB}$, $\overline{CD}$). Diagonal$_1$ is $\overline{AB}$. Diagonal$_2$ is $\overline{CD}$.

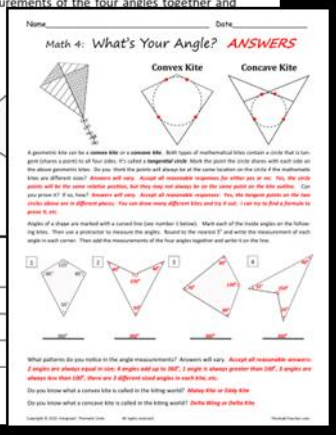
To find the area of a kite you multiply the length of one diagonal line by the length of the other diagonal line. Then you divide that number by 2.

Here's what the formula looks like:

$$\frac{\text{diagonal}_1 \times \text{diagonal}_2}{2} \quad \text{OR} \quad \frac{b \times h}{2}$$

Calculate the area of the following kites:

Which kite do you think would fly best? *Answers will vary. Accept any that make sense.*
Why? *Answers will vary. Accept any that make sense.*



Name_____ Date_____

Math 4: What's Your Angle? ANSWERS

A geometric kite can be a **convex kite** or a **concave kite**. Both types of mathematical kites contain a circle that is tangent (shares a point) to all four sides. It's called a ***tangential circle***. Mark the point the circle shares with each side on the above geometric kites. Do you think the points will always be at the same location on the circle if the mathematic kites are different sizes? *Answers will vary. Accept all reasonable responses for either yes or no. Yes, the circle points will be the same relative position, but they may not always be on the same point on the kite outline.* Can you prove it? If so, how? *Answers will vary. Accept all reasonable responses. Yes, the tangent points on the two circles above are in different places. You can draw many different kites and try it out. I can try to find a formula to prove it, etc.*

Angles of a shape are marked with a curved line (see number 1 below). Mark each of the inside angles on the following kites. Then use a protractor to measure the angles. Round to the nearest 5° and write the measurement of each angle in each corner. Then add the measurements of the four angles together and write it on the line.

What patterns do you notice in the angle measurements? *Answers will vary. Accept all reasonable answers: 2 angles are always equal in size; 4 angles add up to 360°; 1 angle is always greater than 180°; 3 angles are always less than 180°; there are 2 different sized angles in each kite, etc.*

Do you know what a convex kite is called in the kiting world? *Mutley Kite or Eddy Kite*

Do you know what a concave kite is called in the kiting world? *Delta Wing or Delta Kite*

The Mathematics of Kites

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Name_____ Date_____

Science 1: The Scientific Method

Scientists often use a process called the Scientific Method to design and perform experiments. There are several steps to this process:

Observation: They notice something that makes them wonder.

Question: What are they wondering about?

Hypothesis: What they think the answer may be.

Experiment: They then plan an experiment to prove or disprove the hypothesis.

Results: They observe what happened during the experiment and write it down.

Conclusion: A statement about the outcome of the experiment and what it means.

Read the sentences below. Decide which part of the scientific method it is and then write the label in the blank.

- I was knocked to the ground with the electrical shock as it hit my body. The Leydon Jar gave off a spark. Results
- This shows that lightning is electrical in nature. Conclusion
- What is lightning made of? Where does it get so much power? Question
- During a lightning storm I will attach a metal key to the string of a kite and send it into the air. I will place a Leydon Jar on the ground with the end of the kite string in the jar. Experiment
- I have noticed that lightning has a lot of power and can burn an object it hits. I wonder what is in lightning that causes this. Observation
- I believe that lightning is made up of electricity and that is where the power comes from. Hypothesis

Name_____ Date_____

Science 2: Air Pressure

Air takes up space, it has weight, and therefore it exerts pressure on the objects that are in and below it. How strong the pressure is depends on how much air is pressing on or against an object. If you are standing on a mountain top, the pressure on your body will be much less than if you are standing on an ocean beach. That's because the mountain top is much higher up in the atmosphere, so there is not as much air above you as there would be if you were playing on the ocean's shore. Kites, airplanes, and rockets all are impacted by the amount of air pressing against them. The higher up they go in the atmosphere, the less pressure there will be.

You can see the results of air pressure when you blow up a balloon. The more air that is forced into the balloon, the greater the pressure will be. If you fill up a balloon with more air than it can hold, what will happen to it? _____

How does this prove that air takes up space? _____

Blow up three balloons. Put a little air in one, a moderate amount of air in the next, and a lot of air in the third. Don't tie off the ends, just hold them shut and look at each closely. What do you notice about each balloon?

Balloon 1, least amount of air: _____

Balloon 2, moderate amount of air: _____

Balloon 3, most amount of air: _____

Lining up the balloons you and your friends are holding, release the

Name_____ Date_____

Science 2: Air Pressure ANSWERS

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You can see the results of air pressure when you blow up a balloon. The more air that is forced into the balloon, the greater the pressure will be. If you fill up a balloon with more air than it can hold, what will happen to it? The balloon will burst because there is not enough room to hold all the air forced into it.

How does this prove that air takes up space? The balloon keeps expanding as you put more air into it.

Blow up three balloons. Put a little air in one, a moderate amount of air in the next, and a lot of air in the third. Don't tie off the ends, just hold them shut and look at each closely. What do you notice about each balloon? All answers will vary. Accept all that are reasonable.

Balloon 1, least amount of air: darker color, smaller size, not as flexible as when empty, soft exterior, etc.

Balloon 2, medium amount of air: lighter in color, larger in size, soft walls, can be easily poked, etc.

Balloon 3, most amount of air: lightest color of the three, largest size, very firm and stiff, etc.

Lining up the balloons you and your friends are holding, release the balloons all at the same time. What did you observe? All balloons flew off, largest balloon sailed the farthest, smallest went almost nowhere, etc.

Materials:
- plastic bin
- plastic cup
- paper towel
- water

Directions:
1. Fill a plastic bin with enough water to cover the cup.
2. Place a wad of paper towel in a plastic cup and push it down into the bottom of the cup. Turn the cup upside down and make sure the paper doesn't fall out.
3. Hold the cup upside down over the water and quickly push it down to the bottom of the bin. Wait a few seconds and then pull it straight up out of the water.
4. Take the paper towel out of the cup. What happened? The paper is dry. Why do you think this happened? The air pressure inside the cup kept the water out.
5. Put the paper towel back into the cup and do the same thing again, but this time tilt the cup as you push it all the way down into the water. Watch the cup carefully as you push it down. What do you see? Bubbles are coming out.
6. Take the paper towel out. What happened? The towel is wet. Why did it happen? Tilting the cup allowed air to be pushed out by the water.

What does all this tell you about air pressure? Air takes up space and exerts pressure wherever it is placed. It can fill objects, break objects, move objects. It is a powerful force, etc.

Name_____

Science 3: Beaufort W

WIND FORCE	MILES PER HOUR	KNOTS	KILOMETERS PER HOUR	DESCRIPTION	
0	0-1	0-1	0-1	Calm	Sea like a m
1	1-3	1-3	2-6	Light Air	Ripples that without foa
2	4-7	4-6	7-11	Light Breeze	Small waves pronounced look and do
3	8-12	7-10	13-19	Gentle Breeze	Large waves break. Foa May have s
4	13-18	11-16	20-30	Moderate Breeze	Small waves some white
5	19-24	17-21	31-39	Fresh Breeze	Moderate w horses are f
6	25-31	22-27	40-50	Strong Breeze	Large waves foam crests are difficult to use; experienced stunt kite fliers only.
7	32-38	28-33	51-61	Near Gale	Sea heaps up with breaking waves; white foam begins to blow in streaks in the direction of the wind.	Whole trees in motion; inconvenient to walk against the wind.
8	39-46	34-40	62-74	Gale	Moderately high waves that are getting longer; edges of crests begin to break into spray. The foam blows in clear streaks in the direction of the wind.	Breaks twigs off trees; wind makes it very hard to move forward.
9	47-54	41-47	75-87	Severe Gale	High waves. Heavy streaks of foam in the direction of the wind. Wave crests begin to topple, tumble, and roll over. Spray begins to affect visibility.	Slight structural damage occurs; chimney pots and slates removed.
10	55-63	48-55	88-102	Storm	Very high waves with long overhanging crests. Foam blows in dense white streaks in the direction of the wind. The surface of the sea looks all white. Very hard to see.	Trees uprooted; lots of structural damage occurs.
11	64-72	56-63	103-117	Violent Storm	Exceptionally high waves; small and medium-size ships get lost in wave troughs. The sea is completely covered with long white patches of foam lying in the direction of the wind. Everywhere the wave crests are blown into froth. Visibility very impaired.	Very rarely experienced on land; wide-spread damage.
12	73+	64+	118+	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility seriously impaired.	Devastation.

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Name_____ Date_____

Science 5: Let's Go Fly a Kite!

Kites can be a lot of fun, but they can also be frustrating. Getting them up in the air and keeping them there can be a lot harder than it looks! Here are some tips to make your kite flying more successful.

Use the ***Beaufort Wind Scale*** to decide if it's a good day to fly a kite. Wind levels of 1-3 are best for beginners.

Choose an open area—your school's grassy field area may be a good choice. Check to make sure there are no power lines, trees, or light posts that your kite may snag on. Beaches, hilltops, meadows, and deserts are all open spaces good for kite flying. Anywhere hot air rises from the ground will provide good lift for your kite.

Determine which direction the wind is coming from. You can watch how the wind blows blades of grass, the leaves on a tree, observe what direction smoke is blowing, or just turn your body until the wind is blowing your hair away from your face. That's where the wind is coming from!

Turn around so your back is facing the wind. (Then your hair will blow into your face.) Let out some of your kite line and let the line hang loose. Hold the kite by the bridle so that the wind blows into the kite. Lift it up and let the air grab onto it.

If you're flying a sled kite, it may be hard to keep it open when you are trying to launch. If that happens, work with a friend. Give them the kite while you work the line. They can use two hands to help hold the sail open as they lift it up and toss it gently into the air. You will need to tug on the line, or pump it a little, to give the kite some lift and thrust. You also might want to plead with your kite a little to give it some encouragement. Getting your kite off the ground can be a challenge!

Once your kite is in the air, try slowly letting out more line to see what happens. Then try slowly reeling in some of the line. If your kite starts to dive, quickly pull on the line to give it more lift. It will take some experimentation to learn how best to maneuver a kite.

To land your kite, slowly reel the line in, wrapping it on the reel as you go. You don't want a tangled mess of line! When you are more advanced you may be able to pull the kite right into your hands without bouncing it off the ground at all.

Let's go fly a kite!

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Date_____

4: Air Forces in Flight

forces that come into play in making a kite (or any aircraft) fly: nd drag. Understanding a little of how these forces work may ur kite!

s your kite up into the air, is caused by changes in pressure as air your kite. Moving air creates more lift, so it's easier to fly your breeze. Of course as your kite moves, more air will flow over and

s. Take one of the fourths and hold it lengthwise in front of your of the paper next to your mouth. Gently blow across the top of of the paper as you blow? _____

ppens? _____

he paper. What happens? _____

happens? _____

s is called Bernoulli's Principle.

Weight

The weight of your kite works against the lift as gravity constantly pulls the kite downward while the air moving across it tries to lift it upward. The heavier your kite is, the more lift you will need to get it into the air. The lighter your kite is the less lift you need. To keep your kite in t the weight of your kite. That's why it's helpful to make your kite ou How is weight shown in the experiment above? _____

Thrust

Thrust is the force that moves the kite forward and causes it to sp some help from the wind, provides thrust for a kite. What do you t kite's line? _____

What do you think will happen as you let slack out (or loosen) the ki

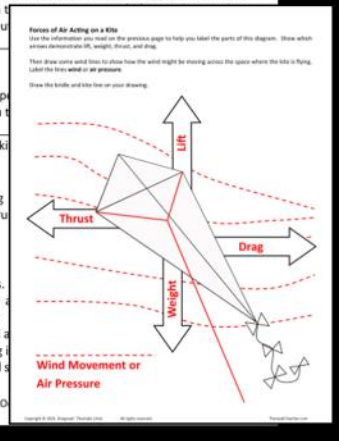
Drag

Drag is the force that comes from air resistance—the air moving wards and works against thrust. To move the kite forward, the thru

WIND AND AIR PRESSURE

Wind, which is moving air, travels across the sky in different ways. depending on the landscape—water, trees, cities, forests: they different temperature, and a different pressure, than cooler air. warm air and cool air meet, it causes wind. All of these things will You can get a little feel of this yourself: the next time you're riding will feel a little like a kite itself as the wind knocks it around. You'll

Opheim, Amy. Getting Curious about the Science of Kites. Website: Accessed O



Science Activities

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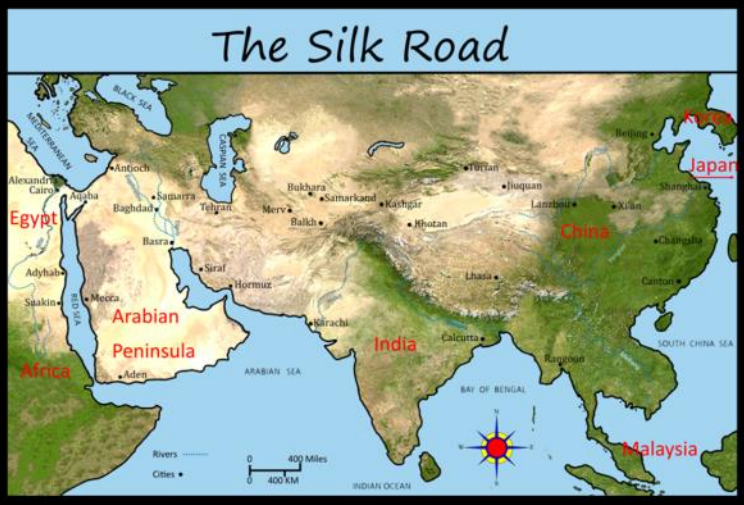

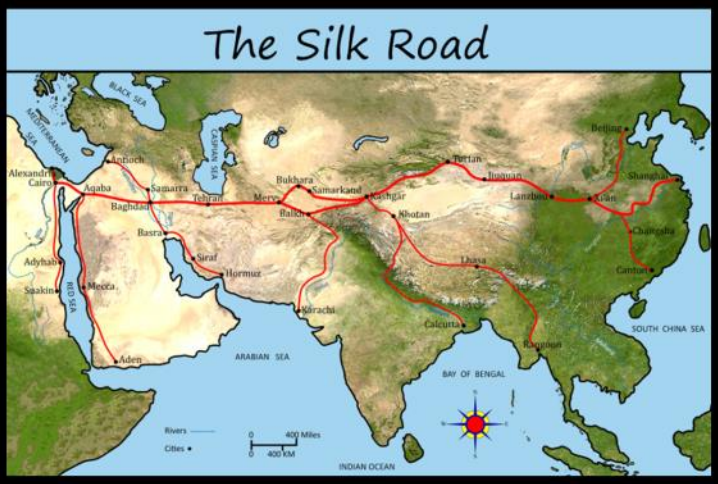

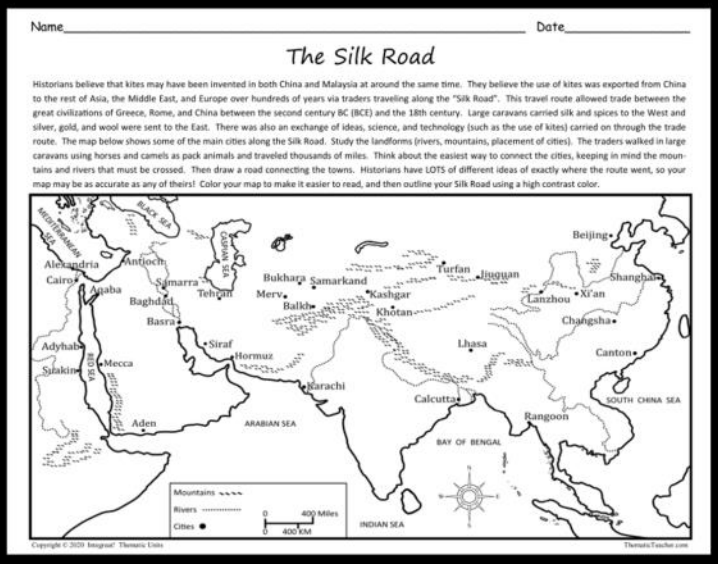

Name_____ Date_____

The Silk Road

Historians believe that kites may have been invented in both China and Malaysia at around the same time. They believe the use of kites was exported from China to the rest of Asia, the Middle East, and Europe over hundreds of years via traders traveling along the "Silk Road". This travel route allowed trade between the great civilizations of Greece, Rome, and China between the second century BC (BCE) and the 18th century. Large caravans carried silk and spices to the West and silver, gold, and wool were sent to the East. There was also an exchange of ideas, science, and technology (such as the use of kites) carried on through the trade route. The map below shows some of the main cities along the Silk Road. Study the landforms (rivers, mountains, placement of cities). The traders walked in large caravans using horses and camels as pack animals and traveled thousands of miles. Think about the easiest way to connect the cities, keeping in mind the mountains and rivers that must be crossed. Then draw a road connecting the towns. Historians have LOTS of different ideas of exactly where the route went, so your map may be as accurate as any of theirs! Color your map to make it easier to read, and then outline your Silk Road using a high contrast color.

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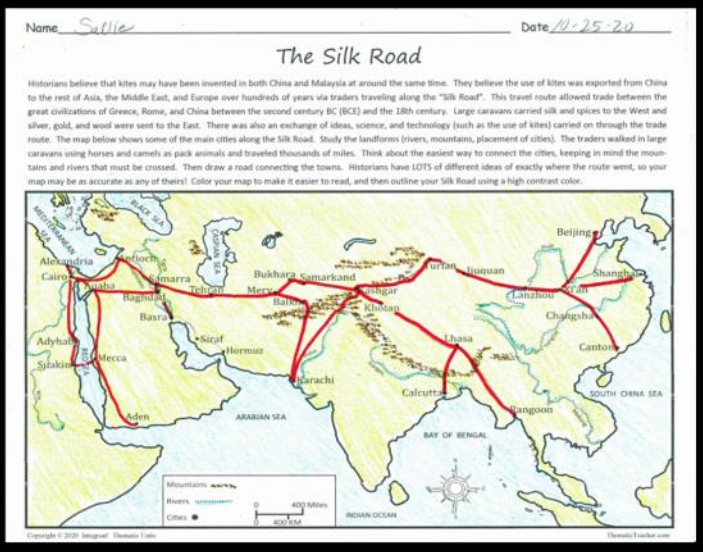

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Geography

Students explore possible paths of the Silk Road as they learn about the spread of kites around the world.

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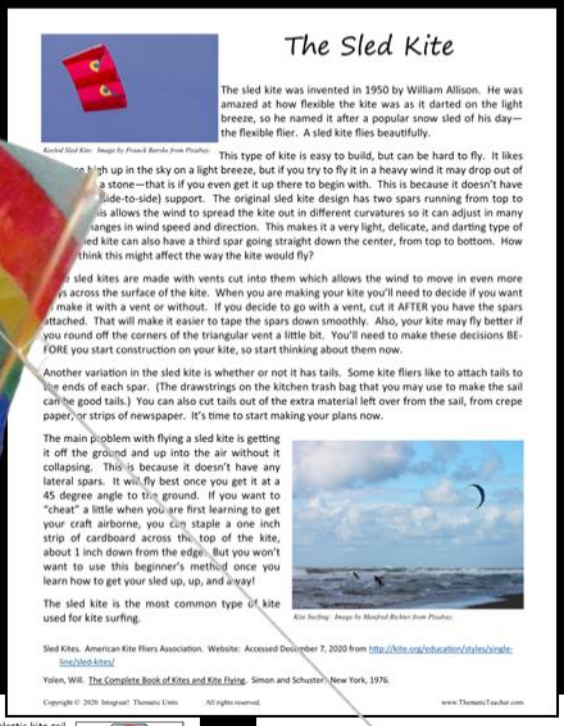

The Sled Kite

The sled kite was invented in 1950 by William Allison. He was amazed at how flexible the kite was as it darted on the light breeze, so he named it after a popular snow sled of his day—the flexible flier. A sled kite flies beautifully.

This type of kite is easy to build, but can be hard to fly. It likes ...gh up in the sky on a light breeze, but if you try to fly it in a heavy wind it may drop out of ... a stone—that is if you even get it up there to begin with. This is because it doesn't have ...side-to-side) support. The original sled kite design has two spars running from top to ...is allows the wind to spread the kite out in different curvatures so it can adjust in many ...anges in wind speed and direction. This makes it a very light, delicate, and darting type of ...ed kite can also have a third spar going straight down the center, from top to bottom. How ... think this might affect the way the kite would fly?

...sled kites are made with vents cut into them which allows the wind to move in even more ...s across the surface of the kite. When you are making your kite you'll need to decide if you want ... make it with a vent or without. If you decide to go with a vent, cut it AFTER you have the spars ...ttached. That will make it easier to tape the spars down smoothly. Also, your kite may fly better if you round off the corners of the triangular vent a little bit. You'll need to make these decisions BEFORE you start construction on your kite, so start thinking about them now.

Another variation in the sled kite is whether or not it has tails. Some kite fliers like to attach tails to ...e ends of each spar. (The drawstrings on the kitchen trash bag that you may use to make the sail can be good tails.) You can also cut tails out of the extra material left over from the sail, from crepe paper, or strips of newspaper. It's time to start making your plans now.

The main problem with flying a sled kite is getting it off the ground and up into the air without it collapsing. This is because it doesn't have any lateral spars. It will fly best once you get it at a 45 degree angle to the ground. If you want to "cheat" a little when you are first learning to get your craft airborne, you can staple a one inch strip of cardboard across the top of the kite, about 1 inch down from the edge. But you won't want to use this beginner's method once you learn how to get your sled up, up, and away!

Kite Surfing. Image by Manfred Richter from Pixabay.

The sled kite is the most common type of kite used for kite surfing.

Sled Kites. American Kite Fliers Association. Website. Accessed December 7, 2020 from http://kite.org/education/styles/single-line/sled-kites/

Yolen, Will. The Complete Book of Kites and Kite Flying. Simon and Schuster. New York, 1976.

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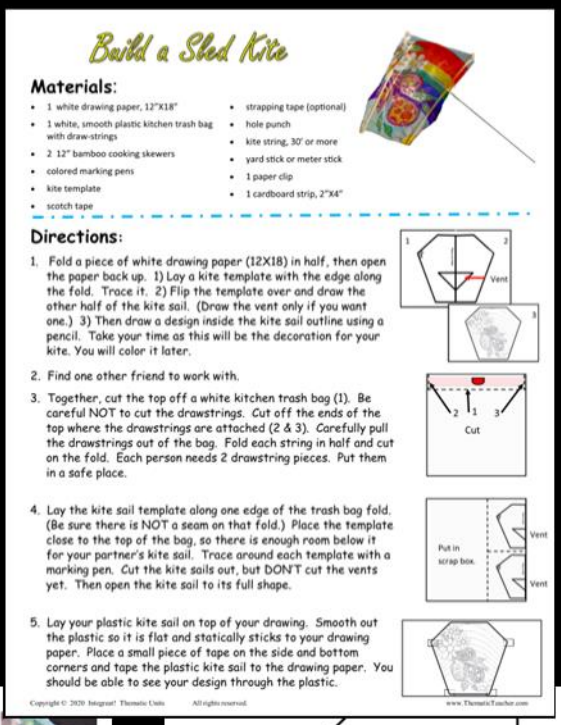

Build a Sled Kite

Materials:

- 1 white drawing paper, 12"X18"
- 1 white, smooth plastic kitchen trash bag with draw-strings
- 2 12" bamboo cooking skewers
- colored marking pens
- kite template
- scotch tape
- strapping tape (optional)
- hole punch
- kite string, 30' or more
- yard stick or meter stick
- 1 paper clip
- 1 cardboard strip, 2"X4"

Directions:

1. Fold a piece of white drawing paper (12X18) in half, then open the paper back up. 1) Lay a kite template with the edge along the fold. Trace it. 2) Flip the template over and draw the other half of the kite sail. (Draw the vent only if you want one.) 3) Then draw a design inside the kite sail outline using a pencil. Take your time as this will be the decoration for your kite. You will color it later.

2. Find one other friend to work with.
3. Together, cut the top off a white kitchen trash bag (1). Be careful NOT to cut the drawstrings. Cut off the ends of the top where the drawstrings are attached (2 & 3). Carefully pull the drawstrings out of the bag. Fold each string in half and cut on the fold. Each person needs 2 drawstring pieces. Put them in a safe place.

4. Lay the kite sail template along one edge of the trash bag fold. (Be sure there is NOT a seam on that fold.) Place the template close to the top of the bag, so there is enough room below it for your partner's kite sail. Trace around each template with a marking pen. Cut the kite sails out, but DON'T cut the vents yet. Then open the kite sail to its full shape.

5. Lay your plastic kite sail on top of your drawing. Smooth out the plastic so it is flat and statically sticks to your drawing paper. Place a small piece of tape on the side and bottom corners and tape the plastic kite sail to the drawing paper. You should be able to see your design through the plastic.

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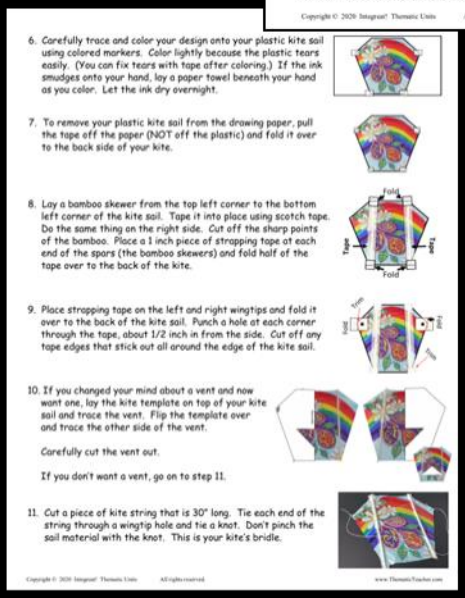

6. Carefully trace and color your design onto your plastic kite sail using colored markers. Color lightly because the plastic tears easily. (You can fix tears with tape after coloring.) If the ink smudges onto your hand, lay a paper towel beneath your hand as you color. Let the ink dry overnight.

7. To remove your plastic kite sail from the drawing paper, pull the tape off the paper (NOT off the plastic) and fold it over to the back side of your kite.

8. Lay a bamboo skewer from the top left corner to the bottom left corner of the kite sail. Tape it into place using scotch tape. Do the same thing on the right side. Cut off the sharp points of the bamboo. Place a 1 inch piece of strapping tape at each end of the spars (the bamboo skewers) and fold half of the tape over to the back of the kite.

9. Place strapping tape on the left and right wingtips and fold it over to the back of the kite sail. Punch a hole at each corner through the tape, about 1/2 inch in from the side. Cut off any tape edges that stick out all around the edge of the kite sail.

10. If you changed your mind about a vent and now want one, lay the kite template on top of your kite sail and trace the vent. Flip the template over and trace the other side of the vent.

Carefully cut the vent out.

If you don't want a vent, go on to step 11.

11. Cut a piece of kite string that is 30" long. Tie each end of the string through a wingtip hole and tie a knot. Don't pinch the sail material with the knot. This is your kite's bridle.

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12. Fold the kite sail in half so that the wingtip holes are lined up. Paper clip them together.

13. Pull the bridle string tight so that it is folded exactly in half. Tie a loop at the end of the folded string. This is the bridle point and will hold your kite line.

14. Cut a slit on one long side of a piece of cardboard that is 2"X4".

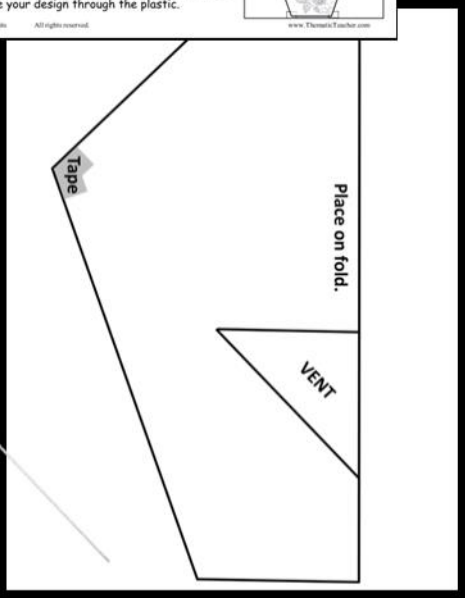
15. Cut a line for your kite that is 10 yards or 10 meters long.

16. Slide one end of the kite line into the slit and tie the string onto the cardboard. Cover the slit with a piece of strapping tape. Wrap the string around the cardboard, leaving the other end of the line loose.

17. Tie the loose end of the kite line to the loop in the bridle at the bridle point. Tie a knot.

18. If you want tails on your kite, firmly tape the plastic tails (the ties you saved from the trash bag) to the bottom of the spars. Tails are only needed in very strong wind. Once you attach them, they may be hard to remove.

"Oh, let's go...oh, fly a kite!"



Art Project

Students read about sled kites, and then follow written directions to build a sled kite of their own.

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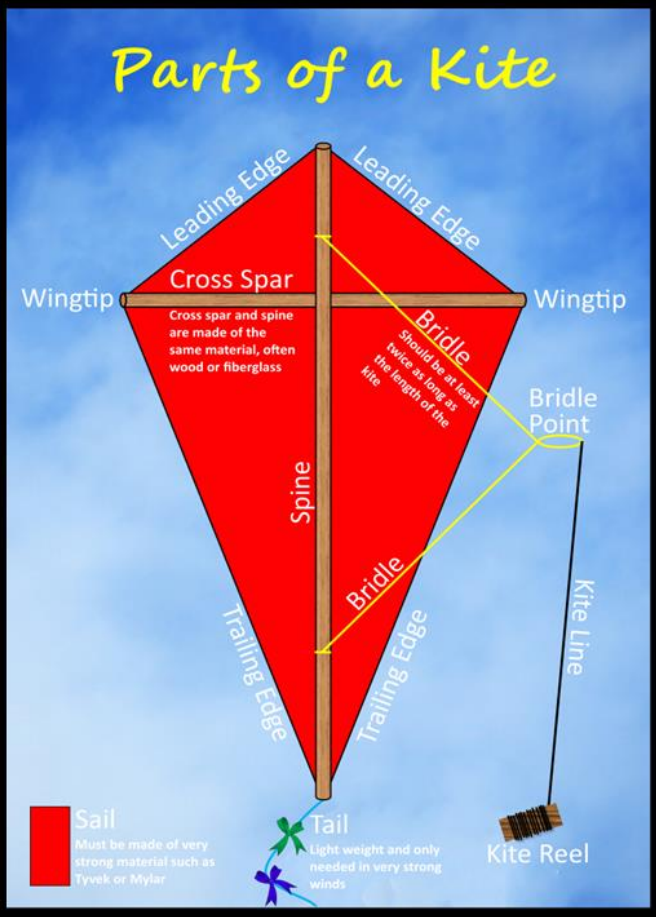
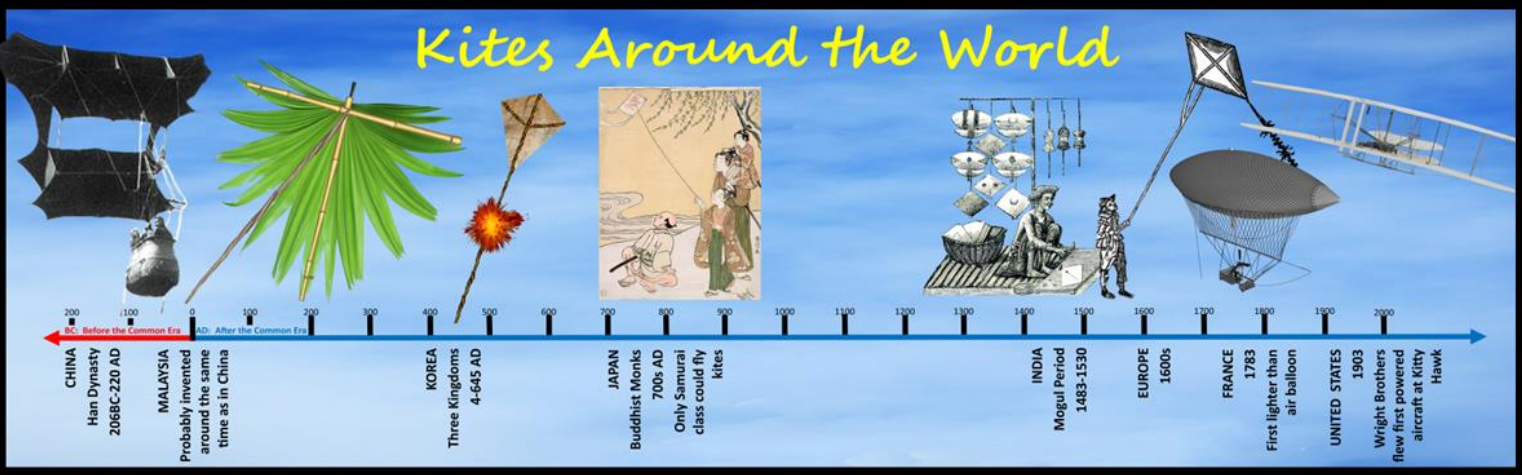
WIND FORCE	MILES PER HOUR	KNOTS	KILOMETERS PER HOUR	DESCRIPTION	SEA	LAND
0	0-1	0-1	0-1	Calm	Sea like a mirror; glassy.	Calm; smoke rises straight up.
1	1-3	1-3	2-6	Light Air	Ripples that look like scales, but without foam crests.	Smoke drifts in direction of wind, but doesn't move wind vanes.
2	4-7	4-6	7-11	Light Breeze	Small wavelets, still short, but more pronounced. Crests have a glassy look and do not break.	Wind felt on face; leaves rustle; weather vanes moved by wind.
3	8-12	7-10	13-19	Gentle Breeze	Large wavelets. Crests begin to break. Foam has a glassy look. May have scattered white horses.	Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	20-30	Moderate Breeze	Small waves, becoming larger; some white horses.	Raises dust and loose paper; small branches are moved.
5	19-24	17-21	31-39	Fresh Breeze	Moderate waves; many white horses are formed.	Small trees in leaf begin to sway; medium sized branches move; medium weight kite string breaks.
6	25-31	22-27	40-50	Strong Breeze	Large waves begin to form; white foam crests are everywhere.	Large branches in motion; whistling heard in telegraph wires; umbrellas are difficult to use; experienced stunt kite fliers only.
7	32-38	28-33	51-61	Near Gale	Sea heaps up with breaking waves; white foam begins to blow in streaks in the direction of the wind.	Whole trees in motion; inconvenient to walk against the wind.
8	39-46	34-40	62-74	Gale	Moderately high waves that are getting longer; edges of crests begin to break into spray. The foam blows in clear streaks in the direction of the wind.	Breaks twigs off trees; wind makes it very hard to move forward.
9	47-54	41-47	75-88	Severe Gale	High waves. Heavy streaks of foam in the direction of the wind. Wave crests begin to topple, tumble, and roll over. Spray begins to affect visibility.	Slight structural damage occurs; chimney pots and slates removed.
10	55-63	48-55	89-102	Storm	Very high waves with long over-hanging crests. Foam blows in dense white streaks in the direction of the wind. The surface of the sea looks all white. Very hard to see.	Trees uprooted; lots of structural damage occurs.
11	64-72	56-63	103-117	Violent Storm	Exceptionally high waves; small and medium-size ships get lost in wave troughs. The sea is completely covered with long white patches of foam lying in the direction of the wind. Everywhere the wave crests are blown into froth. Visibility very impaired.	Very rarely experienced on land; wide-spread damage.
12	72-83	64-71	118+	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility seriously impaired.	Devastation.





Posters

Posters (about 11X17) help students learn interesting and useful information about the world of kiting.

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