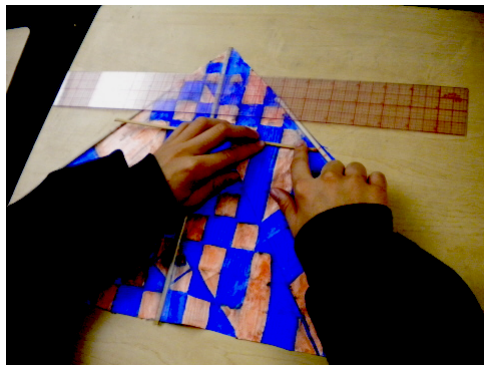


ARTS IMPACT—ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-MAP)

SEVENTH GRADE—LESSON FOUR: Kites: Craftsmanship and Construction

Artist-Mentor – Meredith Essex

Grade Level: 7th



Enduring Understanding

Craftsmanship in accurate measuring, cutting and assemblage of symmetrical components can create stability and balance in construction.

Math

Target: Calculates measurements for structural elements.

Criteria: Measures and labels length of spine and spars on paper.

Art

Target: Attaches scalene triangle to isosceles triangle on line of symmetry and makes attachment point for line.

Criteria: Adheres longest side of keel to sail symmetrically, securely, and flush on both sides; reinforces and punches hole.

Art and Math

Target: Attaches structural elements using craftsmanship.

Criteria: Places spine and spar symmetrically and tapes securely.

Art and Math

Target: Attaches the spreader.

Criteria: Uses calculations to mark attachment points; measures and attaches securely.

Art

Target: Attaches tails in balance using craftsmanship.

Criteria: Makes fringes with precise parallel cuts; tapes continuous edge of kite tail flush to base of kite.

Session I

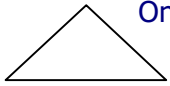
Materials

Pencils, small rulers, scissors, 3/4 inch invisible tape (one roll for two students), pre-cut 4mm bamboo (one 12-inch spine, two 13-inch spars per student), hole punches, My Kite Journal (MKJ)

Learning Targets

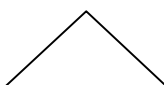
- Measures and labels length of spine and spars on paper.
- Adheres longest side of keel to sail symmetrically, securely, and flush on both sides; reinforces and punches hole.
- Attaches structural elements using craftsmanship.

Do Now



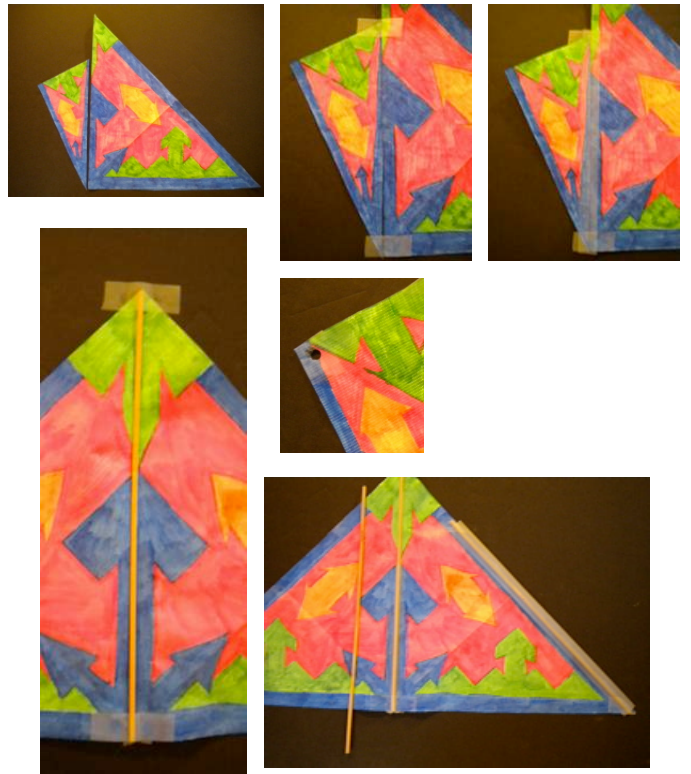
On kite diagram label parallel and perpendicular lines. On scalene triangle keel diagram label 90 degree angle, sides, and attachment point. MKJ 8-11

Activities/Prompts

- Why is craftsmanship and symmetry important in kite building?
- Using our Delta formula, multiply the height (12 inches) of sail to calculate:
spine: 12 inches x 100% = 
spar(s): 12 inches x 109% =
spreader attachment: 12 inches x 81% =
MKJ 8-12
- Round off and convert to inches. Spine is 12", spars are 13", spreader attachment point = 9 3/4". Measure, draw, label lengths. MKJ 8-12
- Fold sail (match all edges) on line of symmetry. Place keel longest side/hypotenuse adjacent to fold, tape top and bottom with short tape, then tape full length. Repeat this process on other side. MKJ 8-13
- Reinforce the keel: Take two 1-1/2 inch pieces of tape and fold over 90 degree vertex. Punch a hole at 1/4 inch from edges of Tyvek. MKJ 8-13
- Add kite spine: Use same taping technique (short, top and bottom; long to fill in). MKJ 8-14
- Place spars symmetrically and parallel to sides of sail each with ends touching kite base. Use same taping technique. MKJ 8-15

Big Math and Art Ideas

Balance, parallel, perpendicular, congruence, craftsmanship, hypotenuse, right angle, right scalene triangle, symmetry



Closure/Self Assessment

Students self-check to confirm that keel is attached symmetrically, reinforced, and punched, and that spine and spars are attached securely and in balance. Students store kite with spine, spars, and keel attached in student zipper bags.

Assessment Criteria

- Measures and labels length of spine and spars on paper.
- Adheres longest side of keel to sail symmetrically, securely, and flush on both sides; reinforces and punches hole.
- Places spine and spar symmetrically and tapes securely.

Next Steps/Follow up Needs If needed, pre-cut 18 x 24 inch plastic tail material, one per student.

Session II

Materials Pencils, small rulers, scissors, 3/4 inch invisible tape (one roll for two students), one spreader (10 inches approximately and custom trimmed to fit during class), 18x24" plastic for tails, kite winders (one per student), My Kite Journal (MKJ)

Learning Targets

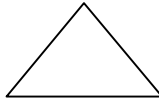
- Attaches the spreader.
- Attaches tails in balance using craftsmanship.

Do Now

Write down three safety rules you can think of that apply to flying kites. MKJ 8-16

Activities/Prompts

- Mark the spreader attachment point on both spars at $9\frac{3}{4}$ " measured from the base of sail. Measure, mark spreader bamboo to fit tight between spars, teacher will cut (bevel). MKJ 8-16
- Now add tails to give "drag" or stability as the kite flies.
- Tape the edge of your 18 x 24 inch plastic all the way across kite base. MKJ 8-17
- Make a light line on plastic 2 inches and parallel with base for your "no cut zone". MKJ 8-18
- Use a long ruler, to cut parallel fringe in symmetry stopping at the "no cut zone". Add your signature to the tail.
- Share your ideas about kite safety. MKJ 8-16



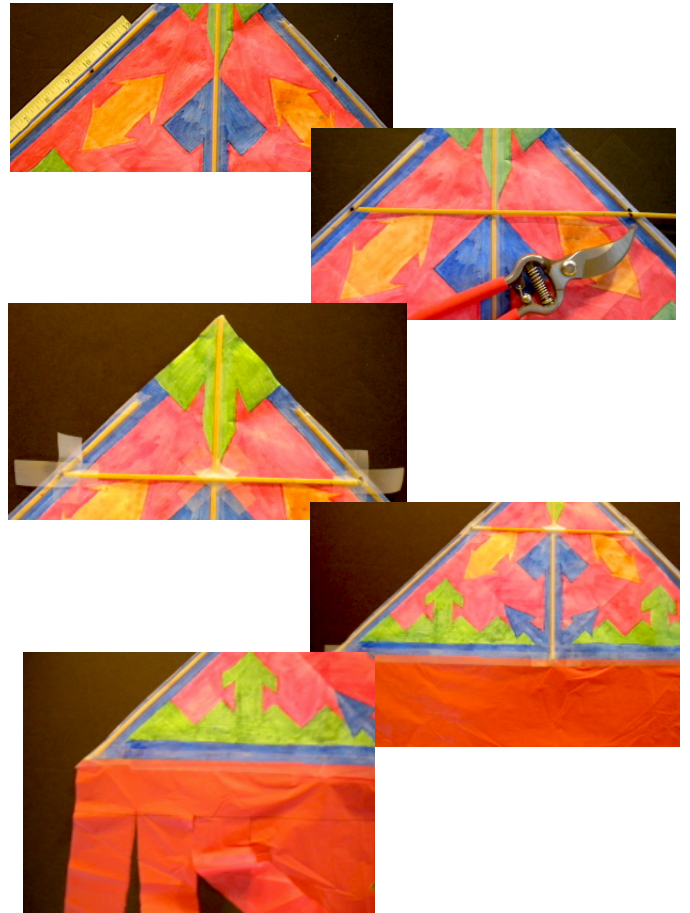
Remember:

- **Never fly kites in rain or storms—especially thunderstorms!**
- **Never fly near power lines. If kite gets stuck in power lines, drop string and call the power/utility company.**
- **Never fly near streets.**
- **Keep kites under control—know where you and your kite are going and be careful of others nearby.**
- Attach winders by running string through keel hole and tying 4-5 strong knots.

FLY FLY FLY FLY FLY FLY FLY FLY

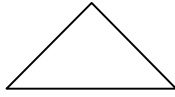
Big Math and Art Ideas

Balance, parallel, perpendicular, congruence, craftsmanship, hypotenuse, right angle, right scalene triangle, symmetry



Closure/Self Assessment

Students self assess. Post flight reflection: *How did your math influence how well your kite flew? Where did you notice balance problems? Tip to tail? Side to side? How about the craftsmanship in constructing your kite? How did that affect stability and strength in the air?* MKJ 8-18



Assessment Criteria

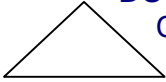
- Uses calculations to mark attachment points; measures and attaches securely.
- Makes fringes with precise parallel cuts; tapes continuous edge of kite tail flush to base of kite.

Next Steps/Follow up Needs Students fly kites and reflect, then bring kites and MKJ home.

Session I

Teaching and Learning Strategies

DO NOW WARM-UP



On kite diagram below label parallel and perpendicular lines. Note the names of the structural bamboo parts of the kite. On scalene triangle keel diagram label 90 degree angle, longest side/hypotenuse, shortest side and medium sides on keel. What parts of the sail does the keel touch? Draw a small square and circle at the 90 degree angle where the kite string will attach. MKJ 8-11

1. Asks students to extend concept of visual balance seen in reflection of kite shape and designs to physical balance in construction and aerodynamics. *Prompts: What do all airplanes have in common? What do all birds have in common? We are about to put our kites together: we want to be sure that we do it in a way where our kite flies well. How does **craftsmanship** affect the stability of constructions? What happens if our kites are not balanced? Kites also balance tip to tail, so our placement of our horizontal **structural elements** as well as **symmetry** are important. We are going to be adding the keel and bamboo sticks that gives the kite a form or structure.*

Student: Participates in discussion.

2. Guides students in calculating, measuring lengths, and drawing lines for spar, spine and spreader attachment points. *Prompts: Using our Delta formula, we **multiply the height (12 inches) of our sail design by the following percentages** to calculate the dimensions for our spine, spars, and spreader attachment point.* MKJ 8-12

Structural Dimensions:

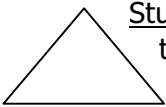
spine height: 12 inches x 100% = _____

spar(s) length: 12 inches x 109% = _____

spreader attachment point: 12 inches x 81% = _____.

As a group, round off and convert to inches. Correct answers: Spine = 12 inches, spars = 13 inches, spreader attachment point = 9 ¾ inches.

Student: Calculates spar, spine, and spreader attachment point dimensions, rounds off, converts to inches and measures, draws and labels corresponding lines on MKJ page 12.

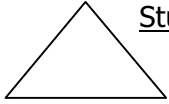


3. Demonstrates attaching the keel to the line of symmetry on the front of the kite and reinforcing the attachment point. *Prompts: Share your findings from My Kite Journal page 11. Decide which side of the kite design is the front and which is the back. The back faces the sky when it is being flown. The keel, our scalene triangle, attaches to the line of symmetry on the front of the kite: the back of the kite will be facing the sky when we fly it. The vertex where the two longest sides of the scalene triangle (keel) intersect, touches the base of the isosceles triangle at the mid-point (bottom edge of spine or line of symmetry) and is taped along the line of symmetry. Line up edges and **fold your sail precisely along the line of symmetry**.*

Lay the keel **longest side/hypotenuse** adjacent to the fold and tape top and bottom with short lengths of tape to hold pieces in place; tape the full length with the seam approximately in the middle of the width of the tape. I am now repeating this process on the other side of the keel. This is where the kite is most

likely to fall apart if not securely taped. When you tape, rub it down so it is strong! Tape will change from being visible to invisible when it is securely attached.

Reinforce freely with invisible tape as needed: test strength of seam by holding kite upside-down by the keel. Make sure that all taping is symmetrical so weight is evenly balanced. Now **reinforce the keel:** take two 1 ½ inch pieces of tape and fold over vertex (90 degree point of keel where short and medium sides come together on the edge of both sides). Punch a hole at ¼ inch from edges of Tyvek—this is the attachment point for the line that you use to fly your kite. Your keel must be attached correctly; otherwise your kite will not fly.



Student: Attaches keel, reinforces point of keel with tape going two directions and punches hole for attachment point using step by step guide. MKJ 8-13.

Embedded Assessment: Criteria-based self assessment

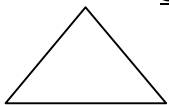
4. **Distributes and demonstrates attaching pre-cut bamboo spine.** Prompts: We are going to add the **kite spine for structure and stability**. The spine is the same length as the height/line of symmetry and is attached to the line of symmetry on the back of the kite. Use small lengths of tape top and bottom (just like keel) to hold bamboo in place. Fill in with long lengths of tape. Reinforce tip of sail by folding tape over the top of spine.



Student: Attaches spine using step by step guide. MKJ 8-14

Embedded Assessment: Criteria-based teacher checklist

5. **Distributes and demonstrates attaching pre-cut bamboo spars.** Prompts: Place **spars symmetrically and parallel** to sides of sail each with ends touching kite base. Use small lengths of tape top and bottom (just like keel) to hold bamboo in place. Fill in with long lengths of tape.



Student: Attaches spars along congruent sides of isosceles triangle/sail making sure that they touch the base of the kite and are parallel to the sides. MKJ 8-15

Embedded Assessment: Criteria-based teacher checklist

Session II

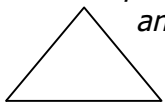
Teaching and Learning Strategies

DO NOW WARM-UP



Write down three safety rules you can think of that apply to flying kites. MKJ 8-16

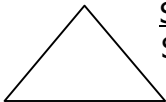
1. **Demonstrates marking spreader attachment points on spars, then measuring and marking bamboo horizontal spreader, and sealing whole spreader structure in place.** Prompts: Watch as I **mark the spreader attachment point** on both spars using my calculations. Remember that you have already measured and labeled $9 \frac{3}{4}$, the distance of the spreader attachment point. (MKJ 8-12) That distance, $9 \frac{3}{4}$ inches, is measured from the base of the spar/sail. If the spreader is attached too high or low, it upsets the balance of the kite tip to tail. I am measuring horizontally across the kite between where my attachment points are: notice I am being careful to keep my ruler parallel with the base of the kite. Mark the spreader and have a teacher/artist cut bamboo for spreader at 45 degree angle/bevel both ends. Make sure the spreader fits tight between the spars, not on top of spars. I am folding invisible tape over the attachment points of the spreader in two directions for strength. Be sure to burnish tape down very securely! Make an X from tape over the perpendicular intersection of spreader and spine.



Student: Measures and marks spreader. MKJ 8-17

Embedded Assessment: Criteria-based peer review

2. Describes the need for tails or fringe to create “drag” when the kite is being flown. Demonstrates cutting 18x24 inch tail material out of bags or other plastic using a template (or distributes plastic if pre-cut). *Prompts: We need to add one more element to our kites to give stability as the kite flies. Why do tails or fringe need to be in balance? Prompts: Line up template over plastic and cut out if needed; line up the long side of your plastic next to, but not overlapping, your kite base and tape the edge of your 18 x 24 inch plastic all the way across—continuously--across your kite base. (MKJ 8-17) Now make a light line (with a pencil) on the plastic tail material about two inches from (and parallel with) the base all the way across the plastic. This area on the tail next to the base is your “no cut zone”. (MKJ 8-18) Using a long ruler, cut parallel fringe in symmetry stopping at the “no cut zone”. When your kite is complete, **add your signature to the tail of your kite:** small, clear and easy to read. If you tail is black--sign with tiny letters along the base of your kite and complete your self assessment checklist. Make an X of tape over the perpendicular intersection of spreader and spine. (MKJ 8-17)*



Student: Observes demonstration and (cuts out) attaches, and fringes tail pieces in symmetry. Signs kite. Self assessment. MKJ 8-18.

Embedded Assessment: Student self-assessment checklist

3. Discusses safety rules for kite flying. (MKJ 8-19) Safety rules are also provided in the MKJ Family Letter portion (in four languages at the back of the booklet). Winders are tied to kites when conditions are right to test fly them. *Prompts: Share some of your ideas from My Kite Journal page 16 about safety in kite flying. Have students read Ben Franklin Society rules for kite flying. Please remember:*

- **Never fly kites in rain or storms—especially thunderstorms!**
- **Never fly near power lines. If kite gets stuck in power lines, drop string and call the power/utility company.**
- **Never fly near streets.**
- **Keep kites under control—know where you and your kite are going and be careful of others nearby.**



Tie your string through the keel hole and tie four or five knots to be super secure

Student: Participates in discussion about kite flying safety. MKJ 8-16. Ties kite string/winder to keel.

4. After flying, facilitates criteria-based critique examining cause and effect. Sends MKJ home with kite. *Prompts: How did your math influence how well your kite flew? Where did you notice balance problems? Tip to tail? Side to side? How did your craftsmanship affect its stability and strength in the air?* Student: Participates in criteria-based critique.

Embedded Assessment: Criteria-based class critique

Vocabulary	Materials and Community Resources	WA Essential Learnings & Frameworks
<p><u>Arts Infused:</u> Balance Diagonal Horizontal Symmetry Vertical</p> <p><u>Math:</u> Angle Intersect Isosceles triangle Parallel Perpendicular Reflection Right angle Scalene triangle Side Triangle Vertex</p> <p><u>Art</u> Burnishing Craftsmanship</p> <p><u>Kite:</u> Back Base Front Keel Sail Spar Spine Spreader Attachment point</p>	<p>Museum Artworks</p> <p>Additional Resources: <i>The Making of Japanese Kites: Tradition, Beauty and Creation</i> by Masaaki Modegi Japan Publications Trading Co., 2007</p> <p><i>Kites for Everyone: How to Make and Fly Them</i> by Margaret Gregor Dover Books, 2000</p> <p>Delta Kite Design Formula by Tony Cyphert</p> <p>Art Materials: pencils large rulers 4mm bamboo (www.drachen.org):</p> <ul style="list-style-type: none"> • one spine per student: cut to 12 inches • two spars per student: cut to 13 inches • one spreader: 10 inches approximately custom bevel trimmed to fit each kite during class <p>¾ inch invisible tape Pruning shears to cut bamboo spreaders to size hole punches</p> <p>18 x24 inch tail template and plastic bags/tableclothes or Plastic (bags or tablecloths) cut to 18 x 24 inches for tail:</p> <ul style="list-style-type: none"> • one per student <p>Winder pre-wound with string (www.drachen.org)</p> <ul style="list-style-type: none"> • one per student 	<p>Arts State Grade Level Expectations AEL 1.1 concepts <i>Geometric shape</i> <i>Scale</i> AEL 1.1.2 composition <i>Proportio</i> <i>Symmetry/balance</i> AEL 1.2 skills and techniques <i>Measuring</i> <i>Taping</i> AEL 4.2 connections between the arts and other content areas <i>Explains relationships between the arts and other content areas</i></p> <p>Math State Grade Level Expectations 7.2.A proportionality and similarity <i>Mentally adds, subtracts, multiplies, and divides simple fractions, decimals, and percents</i></p> <p>7.2.B proportionality and similarity <i>Solves single- and multi-step problems involving proportional relationships and verifies the solutions</i></p> <p>7.2.C proportionality and similarity <i>Describes proportional relationships in similar figures and solves problems involving similar figures</i></p> <p>7.2.D proportionality and similarity <i>Makes scale drawings and solves problems related to scale</i></p> <p>7.2.H proportionality and similarity <i>Determines whether or not a relationship is proportional and explains reasoning</i></p>

ARTS IMPACT—ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-MAP)
SEVENTH GRADE—LESSON FOUR: Kites: Craftsmanship and Construction
ASSESSMENT WORKSHEET

Disciplines	MATH	ART AND MATH						Total 7 Points
Concept	Ratio: Proportion	Balance and Craftsmanship						
Students	Calculates structural elements	In Construction						
	Measures and draws length of spine and spars on paper	Adheres longest side of keel to the sail symmetrically, securely, and flush on both sides	Reinforces and punches hole	Places spine and spar symmetrically and tapes securely	Uses calculations to mark attachment points; measures and attaches securely	Makes fringes with precise parallel cuts	Tapes continuous edge of kite tail flush to base of kite	
1.								
2.								
3.								
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25.								
26.								
Total								
Percentage								

Criteria-based Reflection Questions: (Note examples of student reflections.)

How did your math influence how well your kite flew? Where did you notice balance problems? Tip to tail? Side to side? How about the craftsmanship in constructing your kite? How did that effect its stability and strength in the air?

Thoughts about Learning:

Which prompts best communicated concepts? Which lesson dynamics helped or hindered learning?

Lesson Logistics:

Which classroom management techniques supported learning?

Teacher: _____

Date: _____