Bridging the Gap

Day 13: End the Suspense!

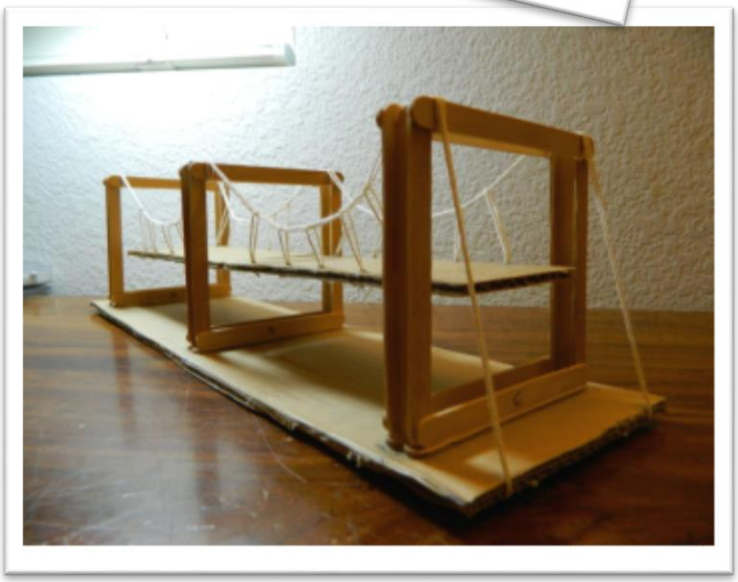
This guide details the highlights of the process in making your very own suspension bridge out of simple, cheap materials. To make the suspension bridge in the sample, the builder/creator (jamesabt007) used the following materials and tools:

Materials

- Cardboard
- Popsicle Sticks (24 for a bridge with 1 deck, 36 for 2 decks, etc.)
- String
- Scotch Tape

Tools

- Large Nail, Hobby Knife or Box cutter
- Scissors
- Ruler
- Pen/Pencil
- Sand Paper
- Elmer's Glue or Craft Glue



First, We'll Make the Pylons

For each pylon (Picture 1-Upper Left), you will need 12 Popsicle sticks. Make two I beams, two L beams (Picture 2-Upper Right). And then combine them with each other **and** two separate Popsicle sticks.

Use the following series of images for reference as you complete the previous steps and make a pylon.

Make at least three pylons.

Image Notes
1. Your goal.

Image Notes
1. Your second goal

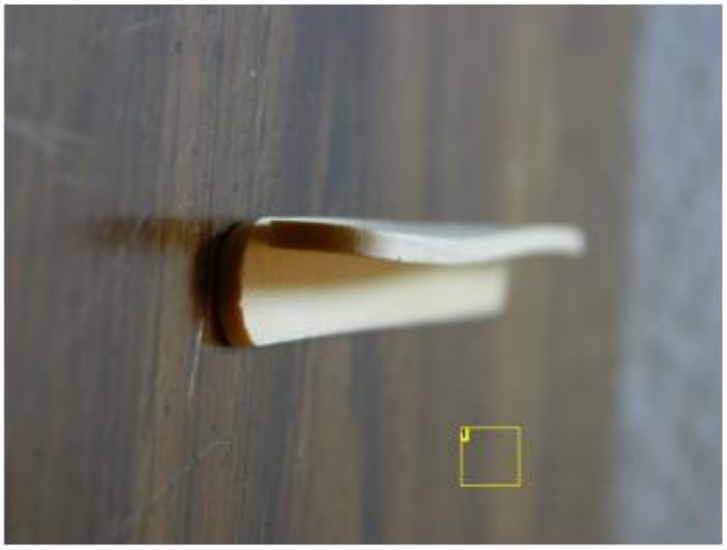


Image Notes
1. This sidewayness really bothers me, sorry if it also bother you.

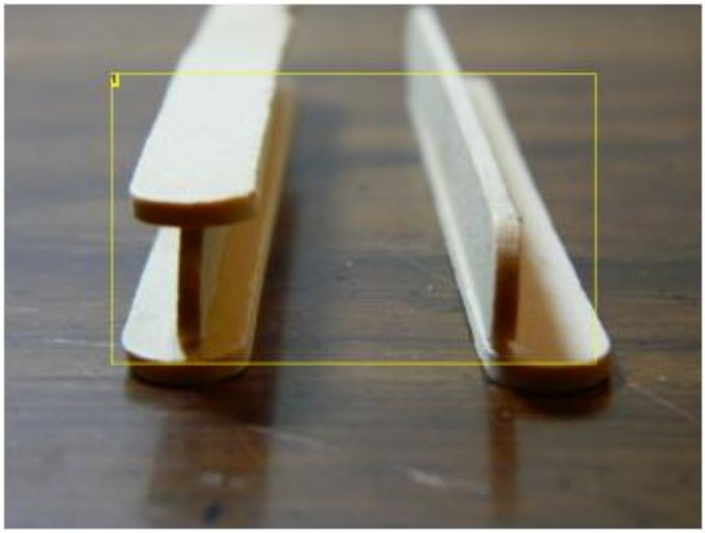


Image Notes
1. Your end result.

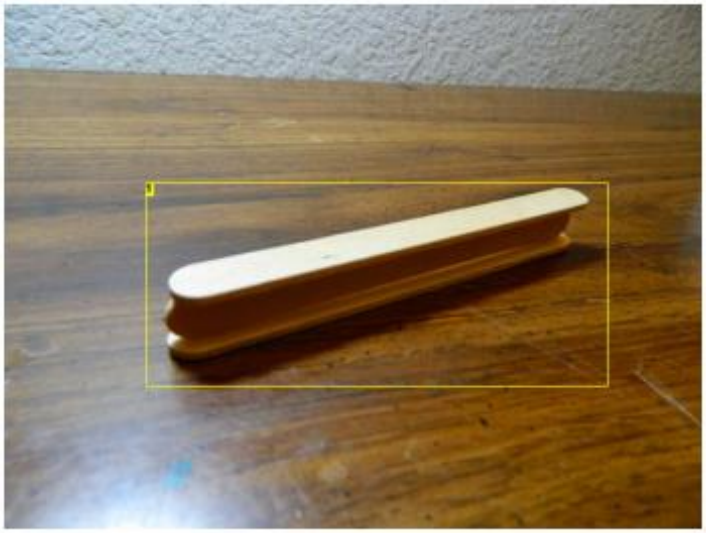
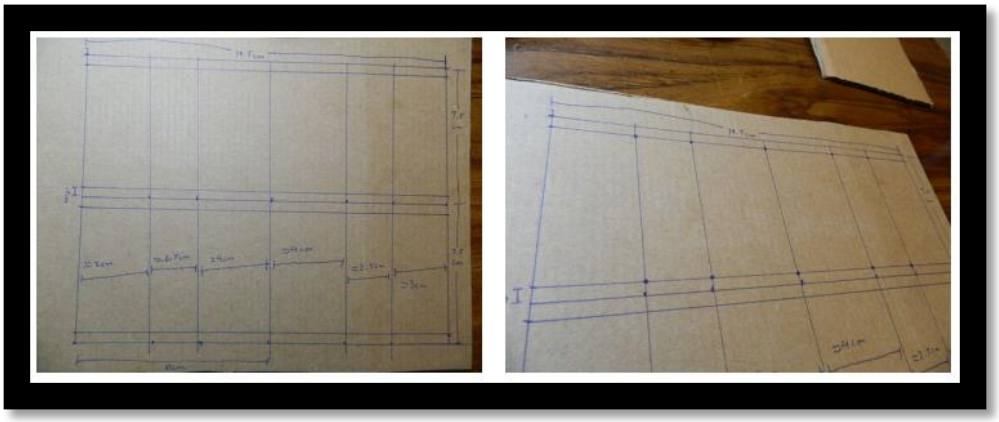


Image Notes
1. Your I-beam, sort of looks like a hot-dog if you ask me...

Making the Deck(s)

To make the deck for the bridge, start out with a relatively medium sized cardboard. The piece in the following images was large enough to fit two decks.

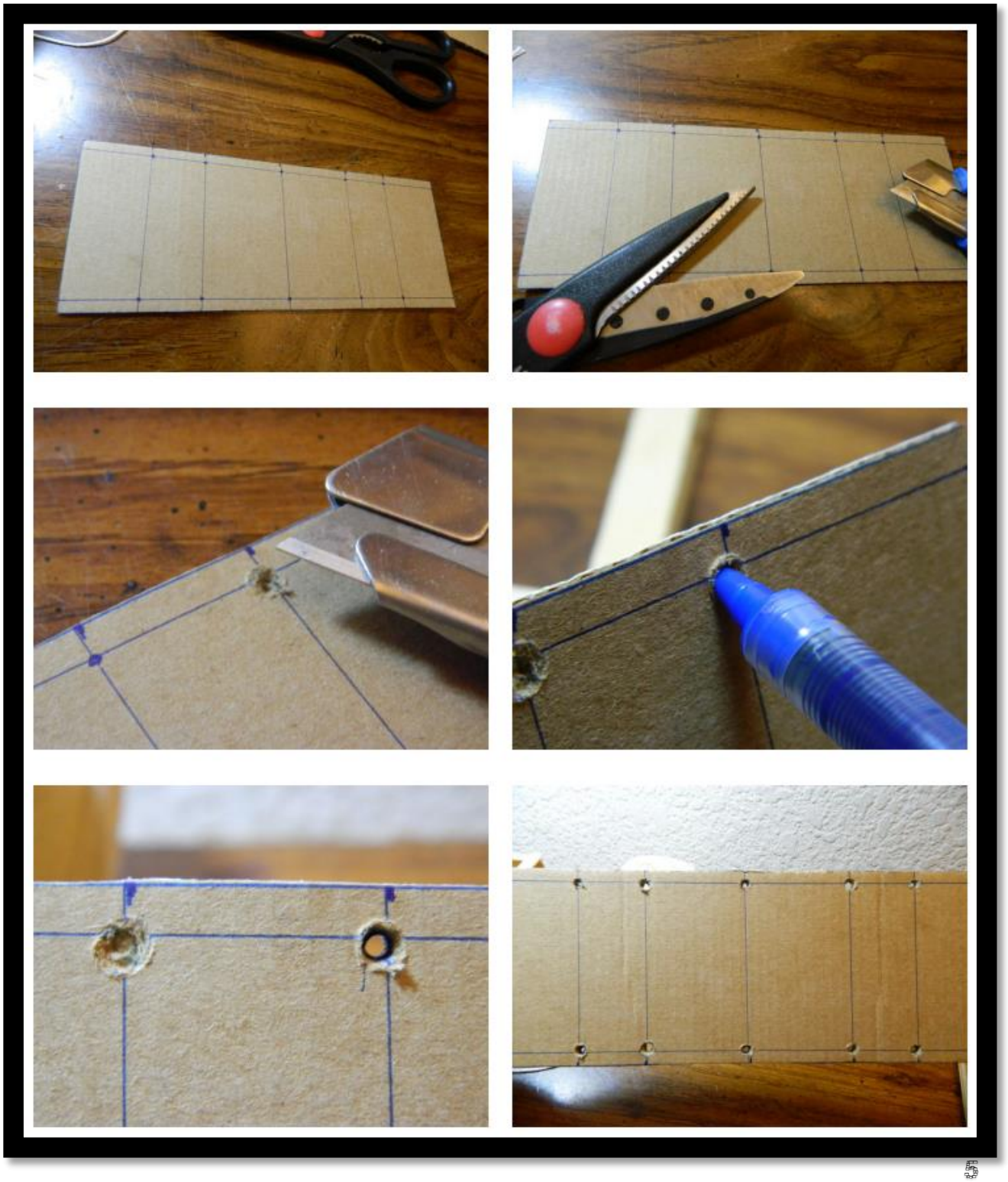


Depending on how many decks you want your bridge to have, you can make more or less.

Measure out the deck, mark the holes from the intersections to where

you will punch holes for the suspension cables to go through, cut the piece.

Tip: if you are using a knife to punch the holes for students, be sure to have students clean them by either making them larger than needed or by forcing the material aside such that there is a distinct hole with a pen or pencil or large nail. This is to ensure that the string can easily be threaded through the holes and will make the process a lot easier to make the decks.



String

Your lengths of string can vary depending on the distance from pylon to pylon, your total span of the bridge, and your height you want the decks to be above the ground. Use a ruler and explore with different lengths to see which bridge looks nicer or more realistic.

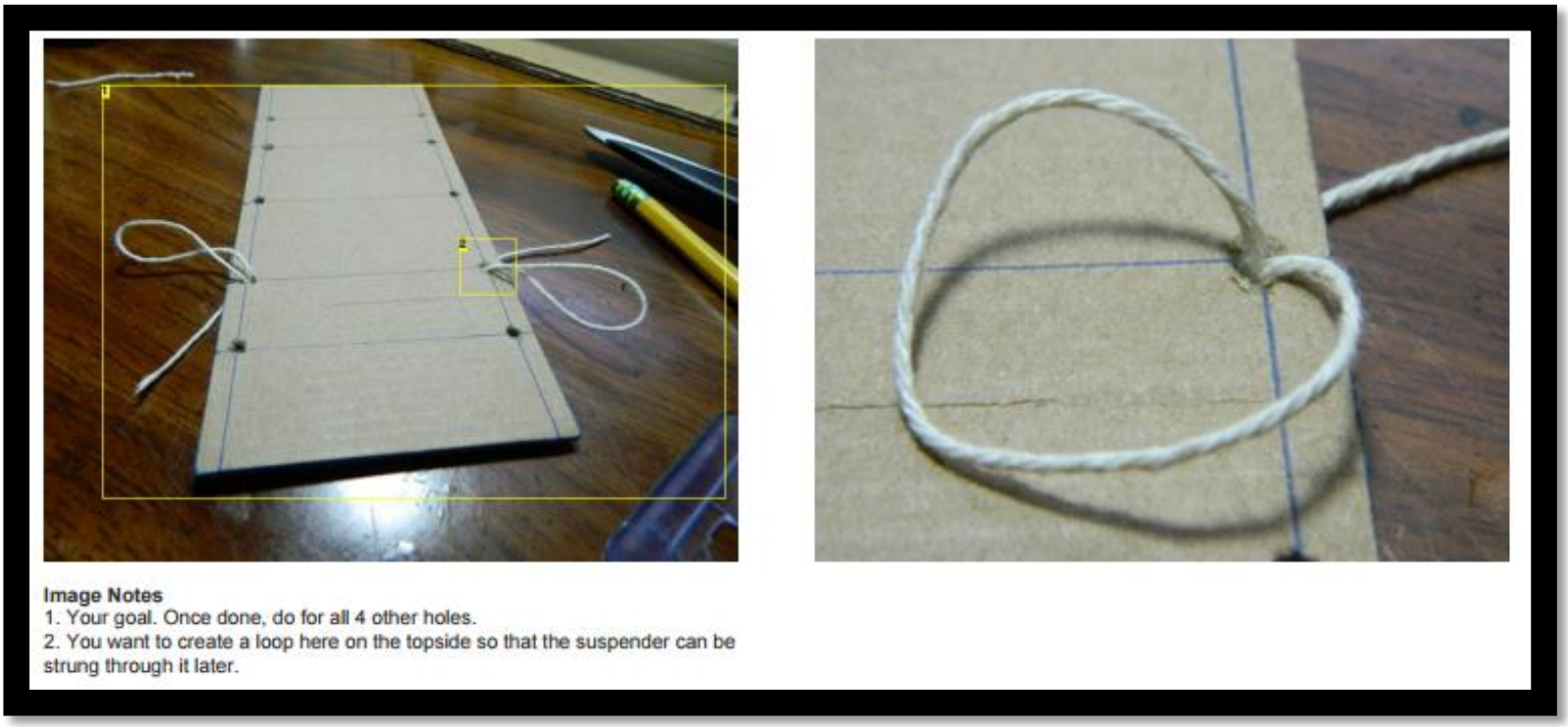
Stringing the deck(s)

This part of the process is placing the string you determined from the previous step into the holes of the deck. There are many ways to do this step.

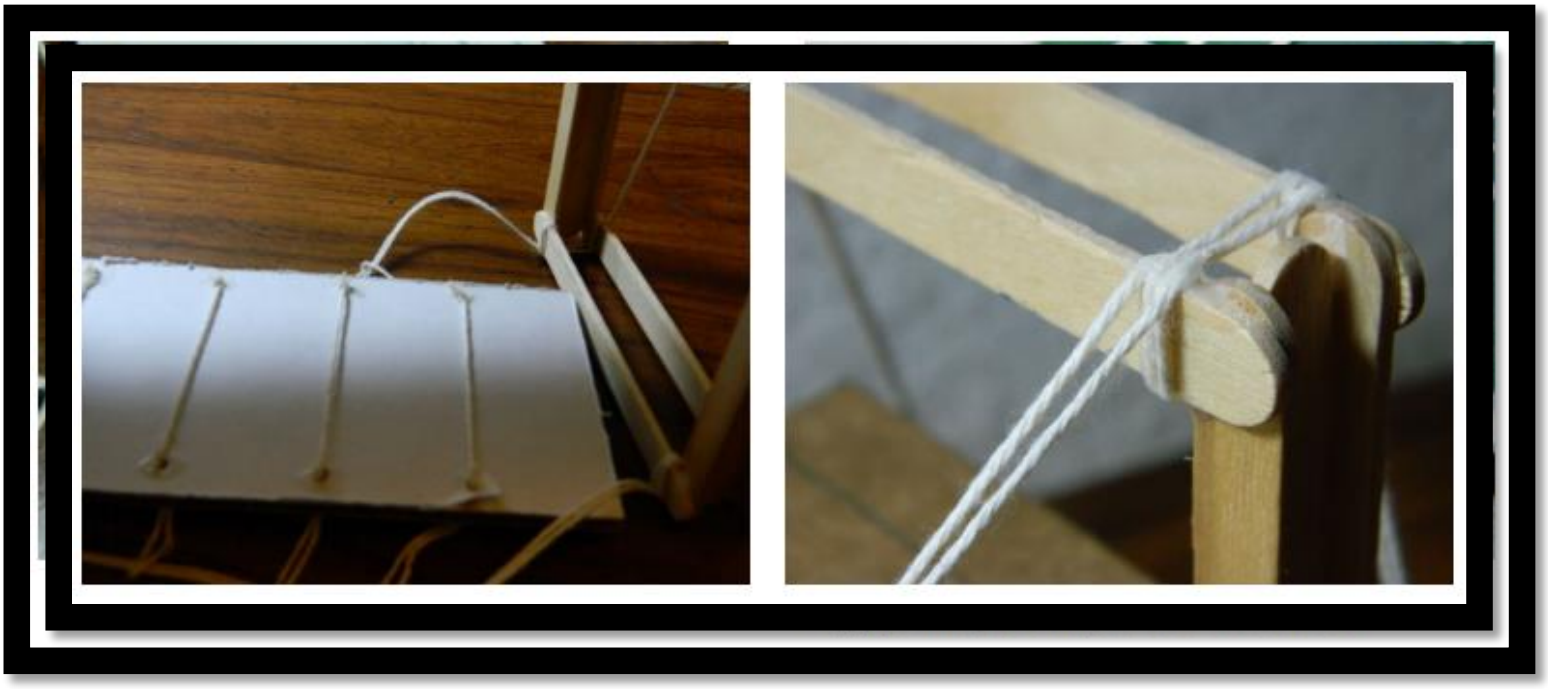
Just remember that if you have 5 total suspenders on each side of the deck, you'll need to make the 4 holes on each corner of the deck have longer loops than the one in the middle since the cable droops slightly, like the curve of a parabola with a positive a coefficient (y=ax2 +bx+c).

Tip!

If you hold a piece of string from both ends and let it hang downwards with nothing attached to it, it will create the shape that your finished suspension bridge's cable should have- you can then copy this shape to a piece of paper or cardboard and use it to figure out how long the suspender cables should be. This shape is also the shape of an ideal arch bridge upside down.



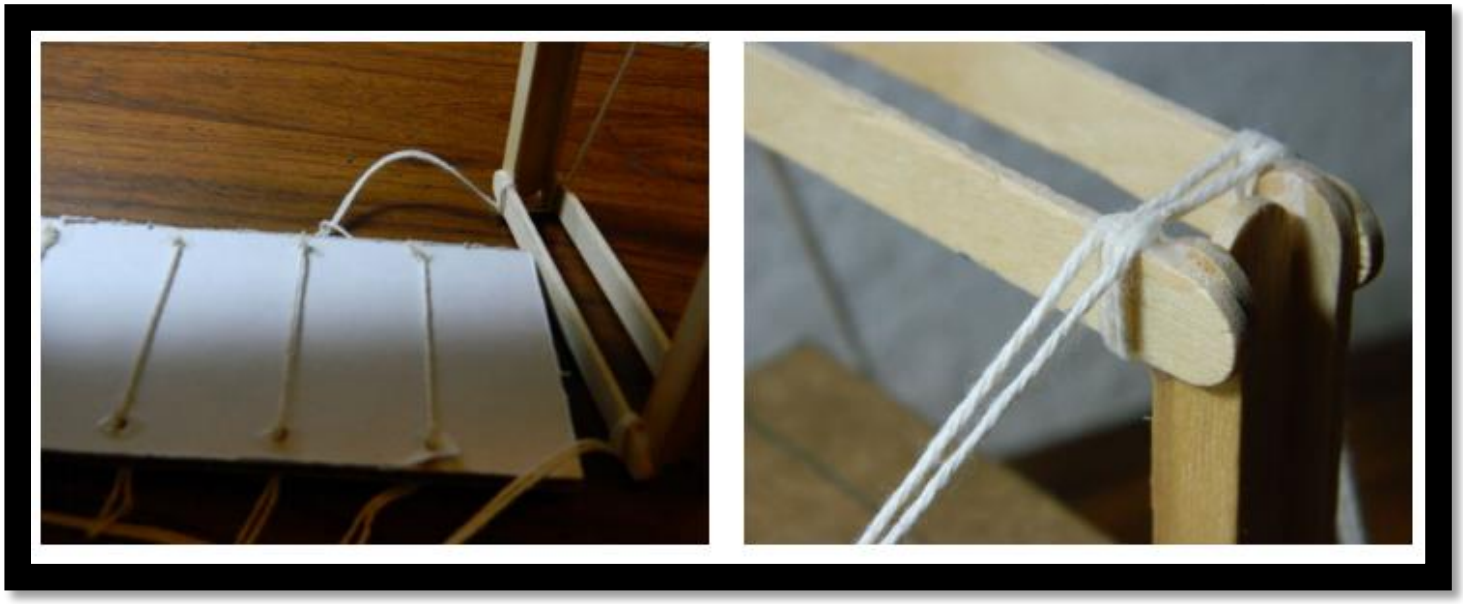
Top of Bridge Deck- a look into how to start the stringing process.



Bottom of Bridge Deck- a look into how to start the stringing process.

Bringing it together

These are a few images and close ups of a completed model. Remember that this is a very open ended project with no real set guidelines on the lengths and distances just like suspension bridges in real life. There are many ways this bridge can be built!

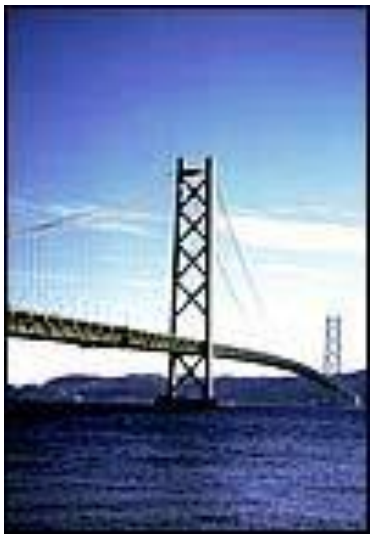


Spanning the Distance:

Akashi Kaiyko Bridge: The Longest Bridge in the World (so Far)

Bridges are the lifeline of Japan. Since the 1930s, the island nation has dreamt of linking its many parts as a whole. But WWII diverted the incredible resources needed to accomplish this, and only since 1960 has the dream moved again, slowly, toward reality. The final step in this massive undertaking was the Akashi-Kaikyo Bridge, currently the longest single-span suspension bridge in the world. This marvel of architectonics stands as a testament to the genius of Asian engineering and, judged in a context that perhaps the Japanese understand best, as the most beautiful bridge in the world.

In 1998, Japanese engineers stretched the limits of bridge engineering with the completion of the Akashi Kaikyo Bridge. Currently the longest spanning suspension bridge in the world, the Akashi Kaiyko Bridge stretches 12,828 feet across the Akashi Strait to link the city of Kobe with Awaji-shima Island. It would take four Brooklyn Bridges to span the same distance! The Akashi Kaikyo Bridge isn't just long -- it's also extremely tall. Its two towers, at 928 feet, soar higher than any other bridge towers in the world.

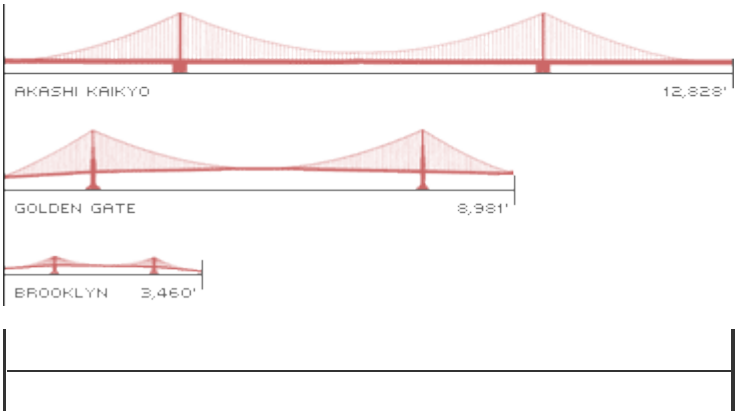


The Akashi Strait is a busy shipping port, so engineers had to design a bridge that would not block shipping traffic. They also had to consider the weather. Japan experiences some of the worst weather on the planet. Gale winds whip through the Strait. Rain pours down at a rate of 57 inches per year. Hurricanes, tsunamis, and earthquakes rattle and thrash the island almost annually.

How did the Japanese engineers get around these problems? They supported their bridge with a truss, or complex network of triangular braces, beneath the roadway. The open network of triangles makes the bridge very rigid, but it also allows the wind to blow right through the structure. In addition, engineers placed 20 tuned mass dampers (TMDs) in each tower. The TMDs swing in the opposite direction of the wind sway. So when the wind blows the bridge in one direction, the TMDs

sway in the opposite direction, effectively "balancing" the bridge and canceling out the sway. With this design, the Akashi Kaikyo can handle 180-mile-per-hour winds, and it can withstand an earthquake with a magnitude of up to 8.5 on the Richter scale!

Here's how this bridge stacks up against some of the longest-spanning bridges in the world. (Total length, in feet)



Akashi Kaikyo Bridge 12,828'

Fast Facts:

- The bridge is so long, it would take eight Sears Towers laid end to end to span the same distance.
- The length of the cables used in the bridge totals 300,000 kilometers. That's enough to circle the earth 7.5 times!
- The bridge was originally designed to be 12,825 feet. But on January 17, 1995, the Great Hanshin Earthquake stretched the bridge an additional three feet.
- The bridge holds three records: it is the longest, tallest, and most expensive suspension bridge ever built.

Vital Statistics:
Location: Kobe and Awaji-shima, Japan
Completion Date: 1998
Cost: $4.3 billion
Length: 12,828 feet
Type: Suspension
Purpose: Roadway
Materials: Steel
Longest Single Span: 6,527 feet
Engineer(s): Honshu-Shikoku Bridge Authority

The Longest Suspension Bridge in The World

Option: Watch selected clips from *Modern Marvels - The World's Longest Bridge* (by the History Channel) if available and/or clips from [The Longest Suspension Bridge in The World] by Big, Bigger, Biggest.

Day Thirteen K-8 Standard Alignment

K

- 7.T/E.2 Apply engineering design and creative thinking to solve practical problems.
- 7.T/E.3 Use tools to measure materials and construct simple products.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of suspension bridges.

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- 7.T/E.1 Describe how tools, technology, and inventions help to answer questions and solve problems.
- 7.T/E.3 Identify appropriate materials, tools, and machines that can extend or enhance the ability to solve a specified problem.
- 7.T/E.5 Apply a creative design strategy to solve a particular problem.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of suspension bridges (working to overcome challenges and problems they encounter as they build). They will also be met as students learn about the Akashi Kaikyo bridge and how engineers met the challenges of construction and what approaches they took and tools and technology they used to solve their problems.

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- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.

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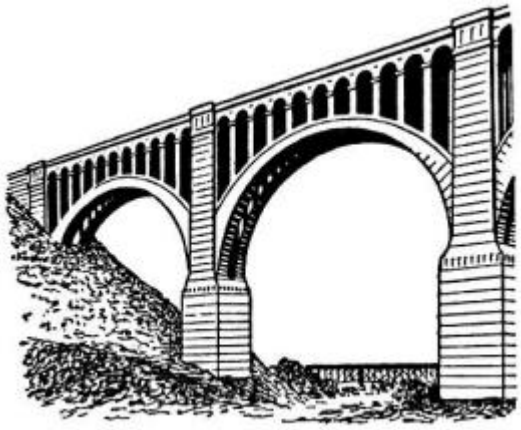
Days 14-15: Going to Build a Bridge Now, Going to Build a Bridge Now. Oh! Look! I See a...

When engineers are building a new road they try to pick a route with the fewest number of huge obstacles. Sometimes such a path is impossible to find, especially if a long river, large lake, or deep valley is in the region. When this problem occurs, civil engineers must find a way to safely cross the obstacle according to specifications provided by the town or state. Sometimes the best solution is a tunnel. Sometimes the best solution is a bridge.

Since ancient times, engineers have designed three major types of bridges to withstand all forces of nature. The main three are arch bridges, beam bridges, and suspension bridges (each with variations on the theme). All three have some similar features. Each has a deck (the horizontal surface you drive on) supported by piers (the vertical parts). The span is the distance between the piers. Abutments support the bridge on either side of the span and connect to the ground on either side. The type of bridge selected for a site will depend on the distance the bridge needs to cover, how much weight the bridge must support, and the natural factors (e.g., wind, earthquakes) the bridge must survive.

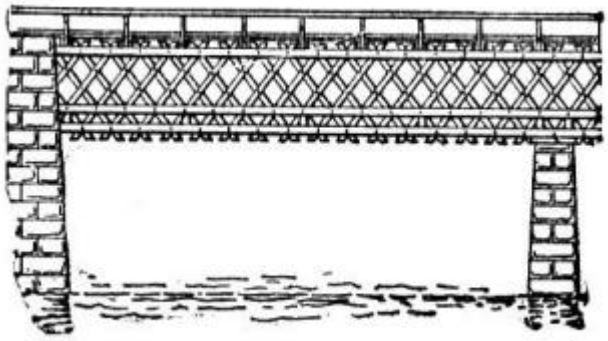
Quick Review:



An arch bridge has a deck supported by an arch underneath. The arch is built from either side with a keystone placed at the center of the arch. The weight of the bridge is thrusted into the abutments at either side. The Romans were famous for creating bridges using this design. The earliest known arch bridges were built by the Greeks and include the Arkadiko Bridge. Some examples of their work still stand today. These bridges are good for shorter spans.

A beam bridge is a horizontal deck surface supported by piers or supports on either side of the stream. Weight on top of the beam pushes straight down on the piers at either end of the bridge. The earliest beam bridges were simple logs that sat across streams and similar simple structures. In modern times, beam bridges are large box steel girder bridges.

Building Truss



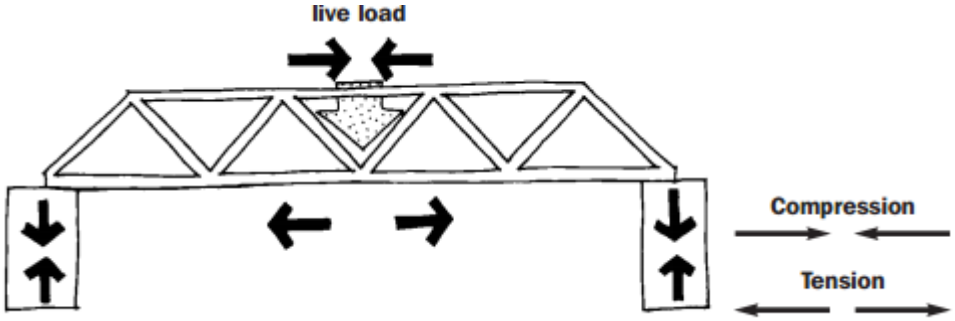
One important example of a beam bridge is a truss bridge (which are often put into their own category of bridges as well). Wooden truss bridges were used as early as the 1700s, but the first metal one was completed in 1841. They are very strong and have been used for railroad bridges mainly because of the heavy loads they can support. A truss, a rigid support structure that is made up of interlocking triangles, holds up the roadbed and is set between two piers. The triangle is used because it is the only shape that is inherently rigid.

Truss bridges are composed of connected elements. They have a solid deck and a lattice of pin-jointed girders for the sides. A truss is a structure made up of triangles. The triangular shape makes a truss very strong to support its weight. Historically, these trusses were made from wood and, to prevent decay, the bridge would be covered. Now, trusses are made of steel to withstand the weather.

Pros and Cons of Truss Bridges

Pros: Very strong; frequently used as a draw bridge

Cons: Difficult to construct; high maintenance; difficult to widen if necessary; generally not considered attractive.



Compression and Tension

Compression: As traffic pushes down on the roadway, compression acts on the upper horizontal members of the truss structure.

Tension: Tension acts on the bottom horizontal members of the truss structure. The forces of tension and compression are shared among the angled members.

Cantilever: Cantilever bridges are built using cantilevers — horizontal beams that are supported on only one end. Most cantilever bridges use two cantilever arms extending from opposite sides of the obstacle to be crossed, meeting at the center.

Truss Bridge Challenge

In this activity from TryEngineering.org (Developed by IEEE as part of TryEngineering), students will explore why trusses are used in bridges to add strength and stability. Truss bridges are constructed by connecting a framework of triangles. Trusses are a key engineering concept because they do not change when force is applied. The triangular shapes help to spread the force evenly around the three sides.

Introduce the activity by asking students if they think a triangle is sturdier or stronger than a square. Many students may initially predict that a square will be sturdier since it has more sides. Provide each student with 2 plastic drinking straws. Instruct the students to create an equilateral triangle shape with one and a square shape with the other. Use tape to secure the two ends and complete the shape. Allow students to apply force to one corner of the square and note how the shape changes into a diamond shape. Apply force to one corner of the triangle and discuss how the shape doesn't change as easily because the three sides distribute the force more evenly.

Divide the students into small groups of 3 or 4. Provide each group with the following materials:

- Graph paper to design their bridge
- Craft sticks (100 sticks per group)
- Heavy-duty scissors or wire cutters for cutting the craft sticks
- Elmer's Glue-All or Craft Glue
- Binder clips
- Truss Bridge Challenge (handout)

Show the students a sample bridge or pictures of truss bridges. Point out that the sides of the bridge are made up of many triangles that add stability. Instruct the students to follow the instructions on the handout to construct their own truss bridge. Remind them that engineers must stay within a budget when building bridges.

Truss Bridge Challenge!

The Problem: The National Railroad Company has added a new fleet of trains to transport goods across the country. A narrow river runs through a deep valley in one section of the railroad plan. A new bridge must be constructed to accommodate the railroad addition. The bridge must be stable enough to keep the train level as it crosses the valley.

The Challenge: A representative from the city has contacted you to design a model of a truss bridge that will be stable enough to keep the train level as it crosses the valley.

The Materials: You can only use craft sticks and Elmer's Glue-All to construct the bridge. You may use binder clips to hold the craft sticks in place until the glue dries, but they must not be included in the final bridge design.

The Cost: Your truss bridge must be cost-efficient to build. You have a budget of $100,000 to construct it. Using the cost of materials below, calculate the cost of your bridge.

Beams (craft sticks) = $1000 each

Iron joints (glue) = $5000/bottle

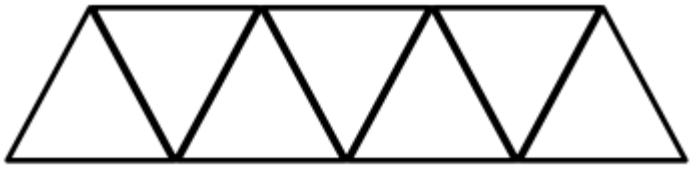
Brainstorm, Design and Build!

What design do you think would be the best for this challenge? Sketch your bridge design on a piece of paper and identify some ways that you might make it stable enough and strong enough to support the train while staying within your budget. Build your model and test it to see if you will get the job!

With a few craft sticks, some Elmer's Glue-All, and a lot of patience you can build an amazing truss bridge. Here are some tips to get you started.

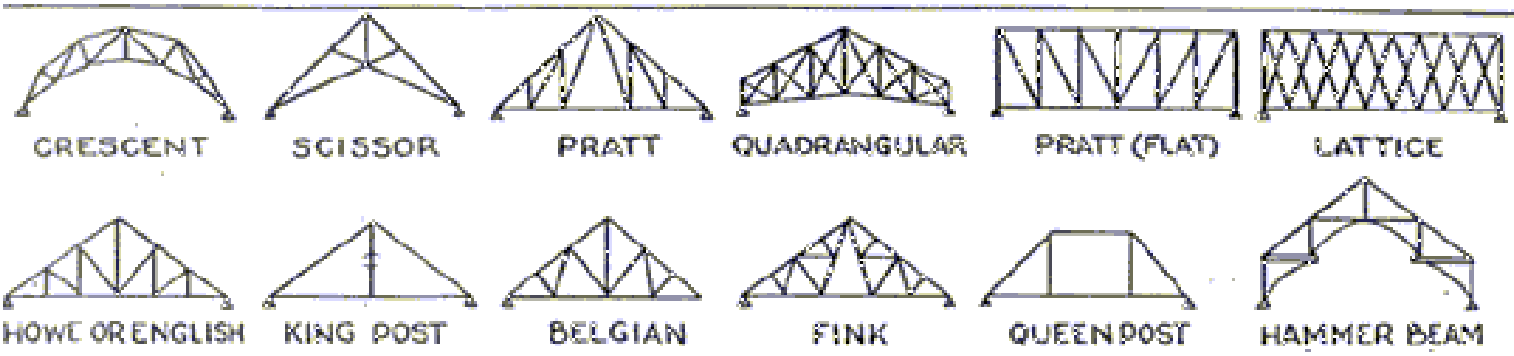
1. Begin by building the side trusses. Start by building the top, bottom and sides in the shape of an isosceles trapezoid. Use four craft sticks on the bottom, three on the top and one on each side. Make sure the top and bottom are straight, glue them side pieces in place, and let them dry.

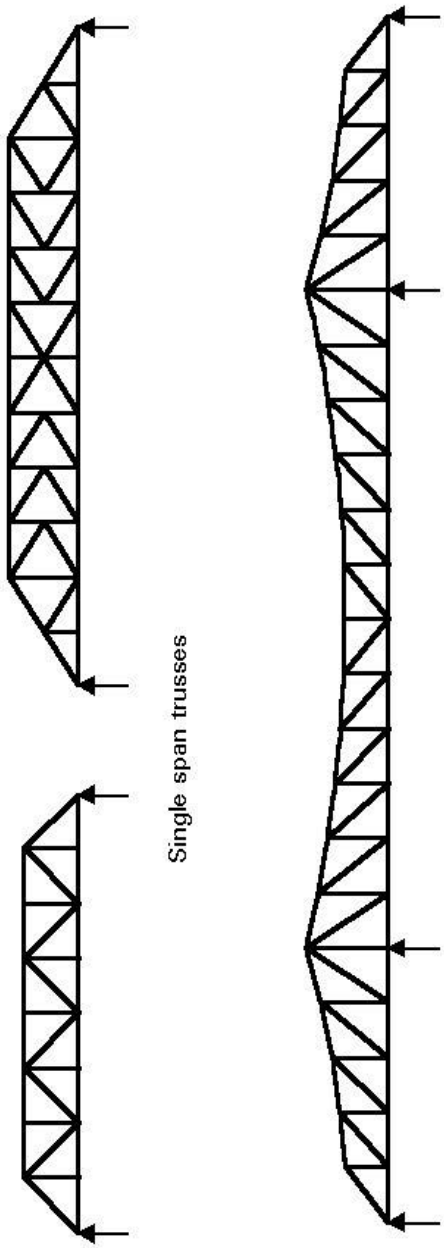
2. Next, add a stick to each joint to create the trusses inside.

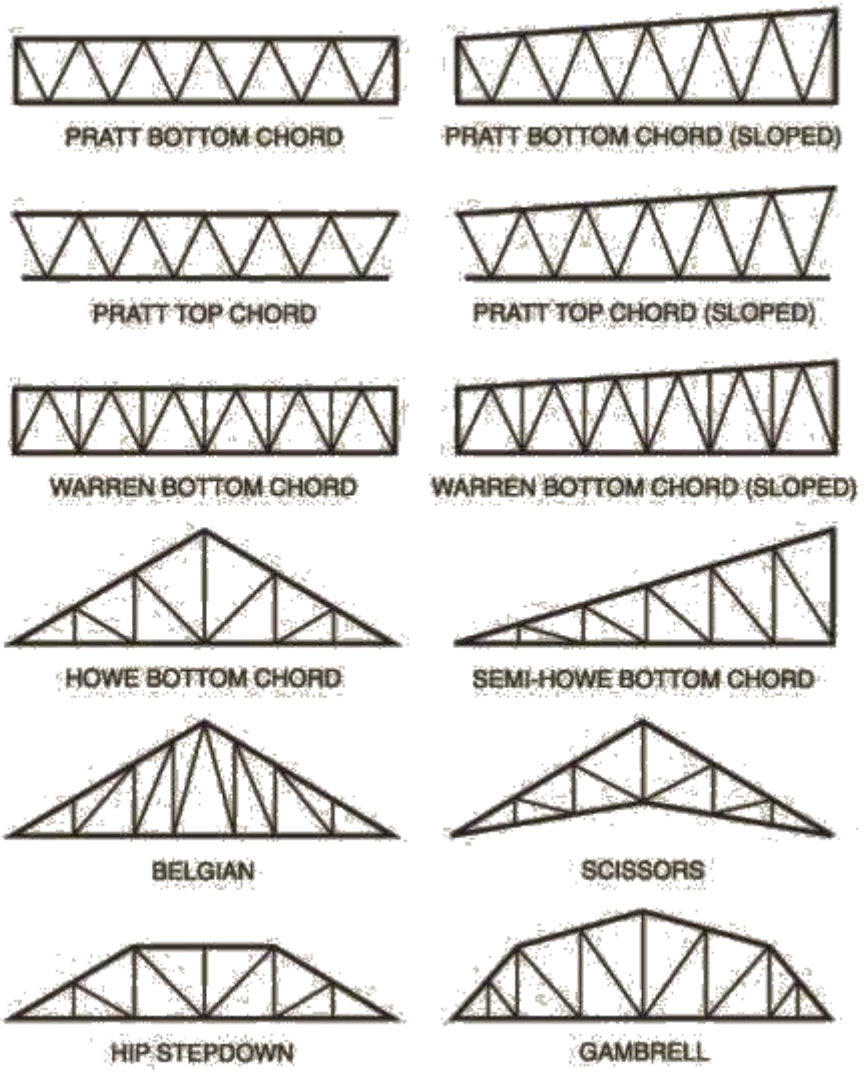


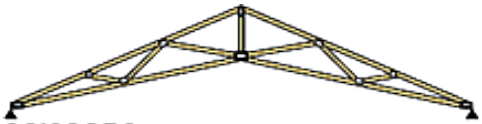
3. Lean the side pieces against thick heavy books so that you can add the top of the bridge. Construct the top of the bridge by connecting the sides with a craft stick at each joint.
4. Decide the best way to construct the top and the bottom of the bridge and attach the sides. Remember, you must stay under budget and your bridge must be sturdy enough to support the train and keep it level.

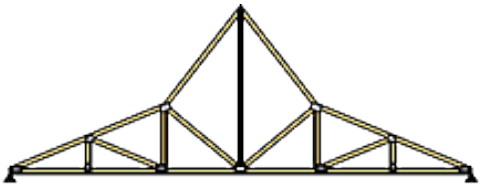
STRUCTURAL-GENERAL-TRUSSES








SCISSORS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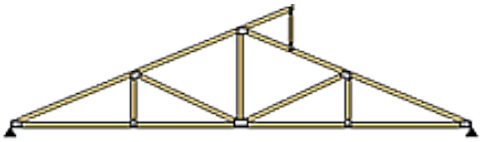
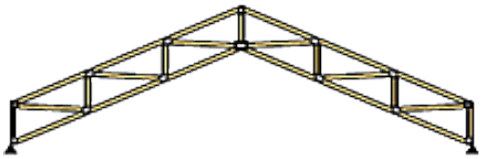
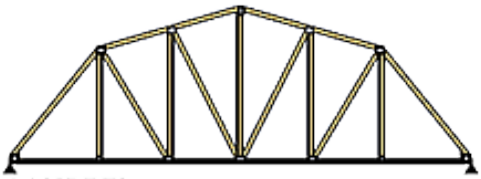
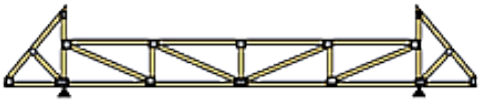
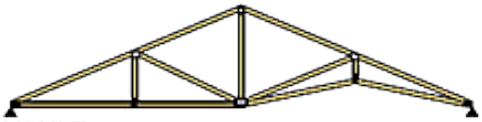
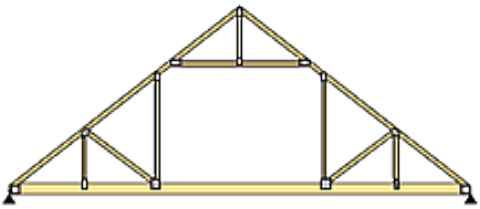

CLERESTORY


VAULTED PARALLEL CHORD

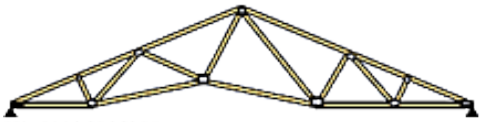

GAMBREL

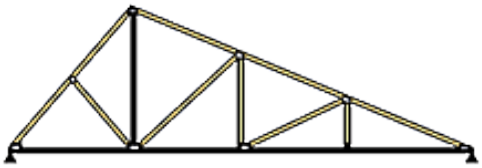

CANTILEVERED MANSARD W/PARAPETS

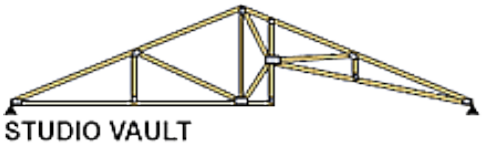

VAULT


ROOM-IN-ATTIC


HIP


FLAT VAULT

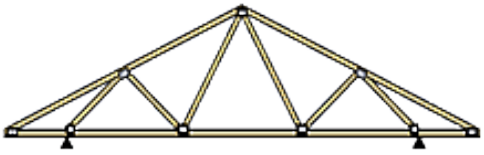

DUAL PITCH

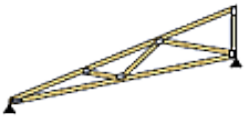

STUDIO VAULT


BOWSTRING

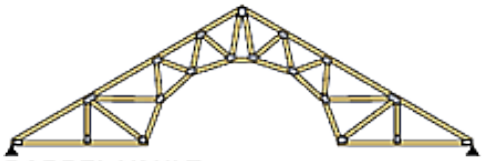

MONO

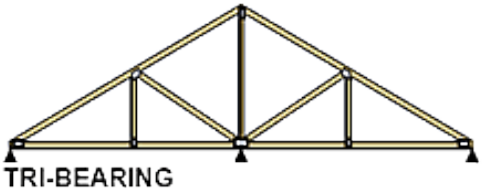

TRAY OR COFFER

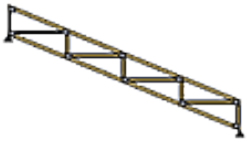

DOUBLE CANTILEVER

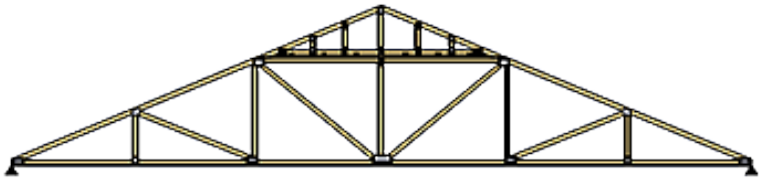

HALF SCISSORS


HALF HIP

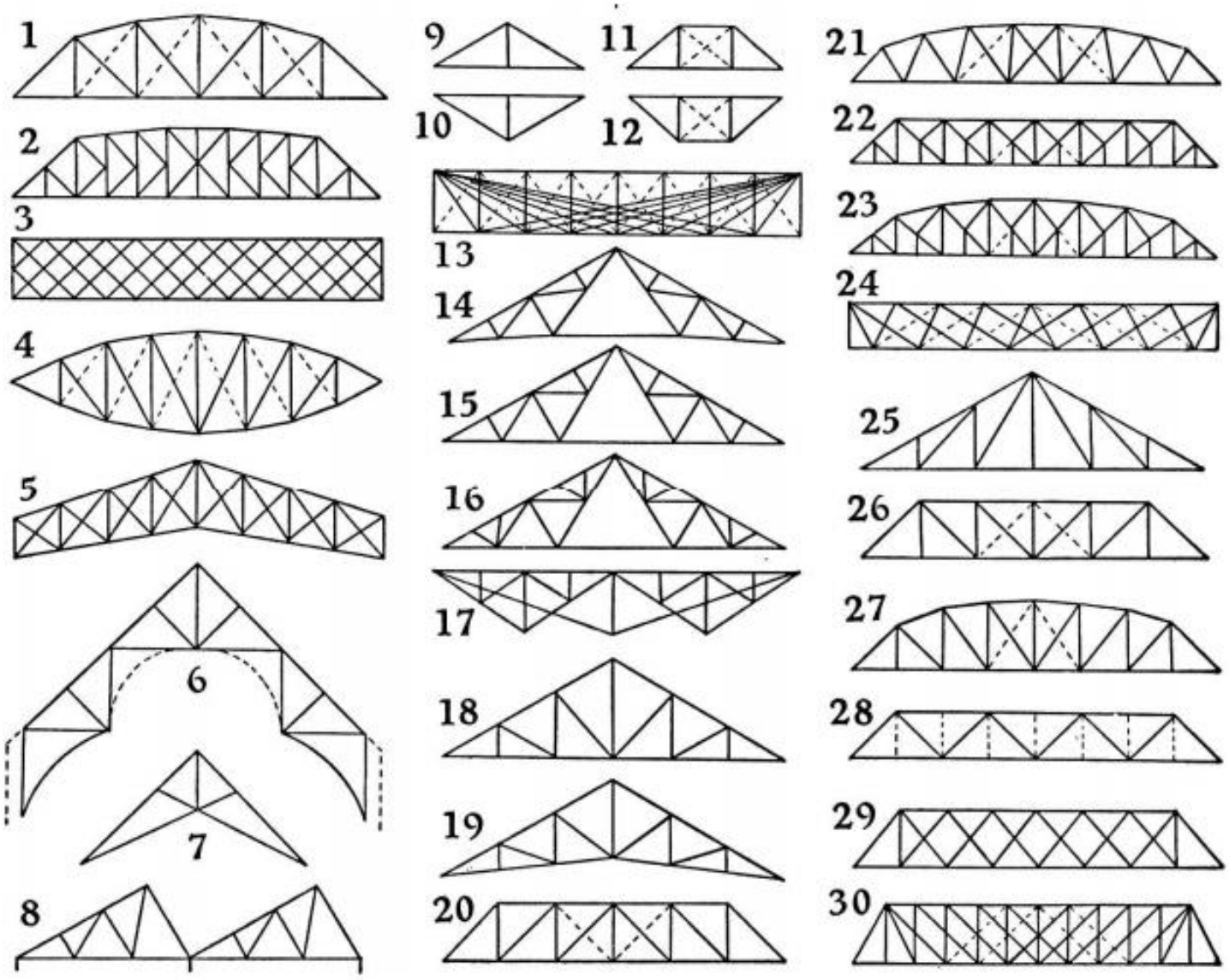

BARREL VAULT


TRI-BEARING


SLOPING FLAT


MULTI-PIECE


DOUBLE INVERTED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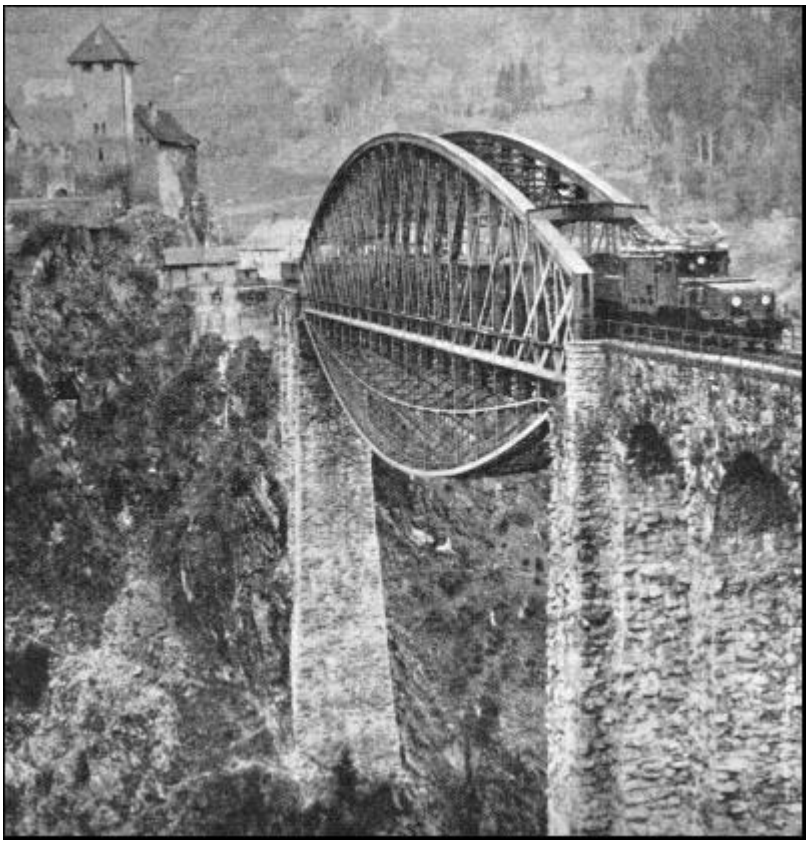
Tip: There is no specific reason that we have to only consider "upward options". We could try something like this:

or even this:



Or a design of our own invention!

Day Fourteen K-8 Standard Alignment

K

- 7.T/E.2 Apply engineering design and creative thinking to solve practical problems.
- 7.T/E.3 Use tools to measure materials and construct simple products.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

1

- 7.T/E.2 Apply engineering design and creative thinking to solve practical problems.
- 7.T/E.3 Use tools to measure materials and construct simple products.

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2

- 7.T/E.2 Apply engineering design and creative thinking to solve practical problems.
- 7.T/E.3 Use tools to measure materials and construct simple products.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

3

- 7.T/E.2 Design a tool or a process that addresses an identified problem.
- 7.T/E.5 Apply a creative design strategy to solve a particular problem.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

4

- 7.T/E.2 Design a tool or a process that addresses an identified problem.
- 7.T/E.5 Apply a creative design strategy to solve a particular problem.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

5

- 7.T/E.2 Design a tool or a process that addresses an identified problem.
- 7.T/E.5 Apply a creative design strategy to solve a particular problem.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

6

- 7.T/E.1 Use appropriate tools to test for strength, hardness, and flexibility of materials.
- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

7

- 7.T/E.1 Use appropriate tools to test for strength, hardness, and flexibility of materials.
- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

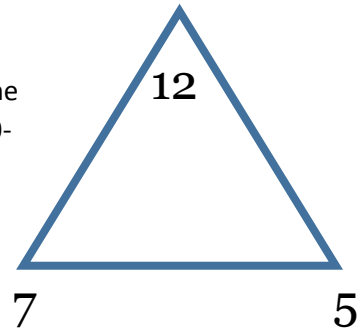
8

- 7.T/E.1 Use appropriate tools to test for strength, hardness, and flexibility of materials.
- 7.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.
- 2.1.1 Apply a decision making process to personal or group financial choices.

These standards will be met and reinforced (and used as a guideline for student outputs and expectations) while students work as bridge engineers and build models of truss bridges to meet the parameters of the challenge while trying to stay within budget.

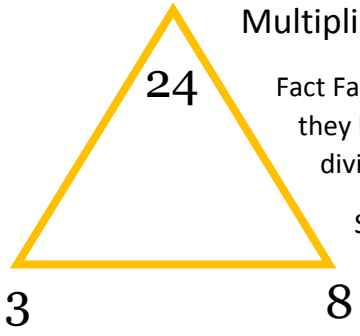
Day 16: Building Strong! Triangle Math

Addition and Subtraction



Fact families help students to see how addition and subtraction are related to one another. (For example: If 6+4=10, then 4+6=10. Furthermore, if 10-6=4, then 10-4=6.) Show children a triangle of related numbers, e.g. 12 7 5

Teams then race to be the first to write the 2 addition facts and 2 subtraction facts in the family, i.e. 7+5=12, 5+7=12, 12-5=7, 12-7=5.



Multiplication and Division:

Fact Families are sets of three numbers that can be divided or multiplied together and they help develop the understanding of the relationship between multiplication and division.

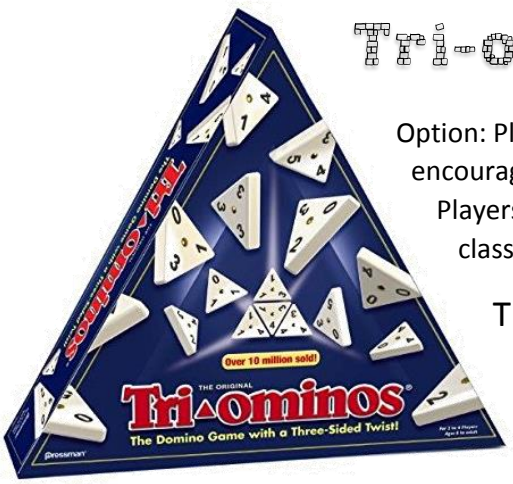
Show students a triangle of related numbers, e.g. 24 3 8

Children then race to be the first to write the 2 multiplication facts and 2 division facts in the family, i.e. 3x8=24, 8x3=24, 24÷3=8, 24÷8=3.

Resource: The print-outs at this link from Donna Young are triangle flash cards. These cards are smaller than commercial cards. They measure about 4 inches along each of the sides. There are 9 flash cards on each of the print-outs with the exception of the 3x3=9 card, which has only 6 flash cards.

No math fact is repeated, so in order to get all the math facts from either the addition/subtraction group or the multiplication/division group, you'll need to print all the cards.

The addition and subtraction cards cover the facts from 0+1=1 to 9+9=18 and the multiplication and division cards cover the facts from 1x1 to 12x12. Use the blank cards if you want to make custom cards.



Tri-ominos

Option: Play the classic three-sided dominoes game which uses and encourages logic and reasoning skills that are good for any grade level. Players match two or three numbers, using addition to keep score. The classic rule sheet is included on a page farther on.

Tri-Ominoes Multiplication & Subtraction Variations:

Preparation:

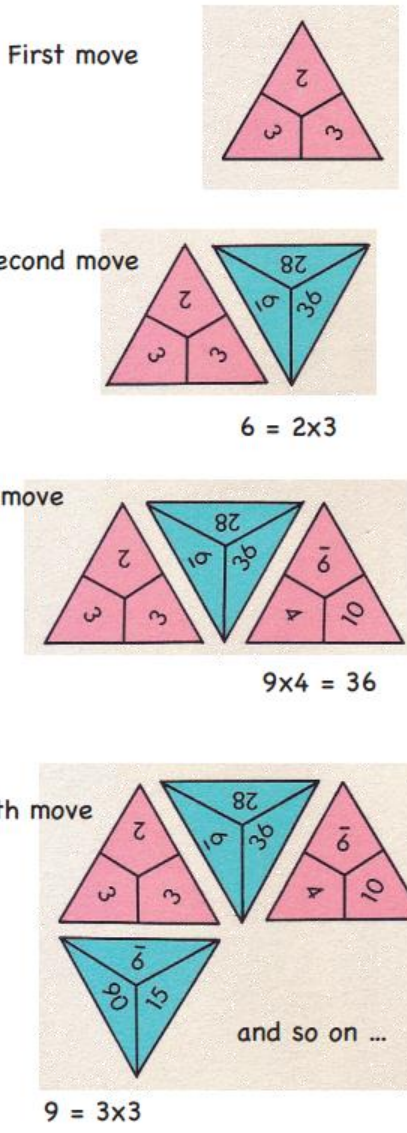
You need to print the sets of tri-ominoes with each page of each set printed in a different colors on cardstock and then cut them out

along the dotted lines. For multiplication you will have 20 in each color. One set have two numbers on the sides and the other set have one number. There are three sets of subtraction cards.

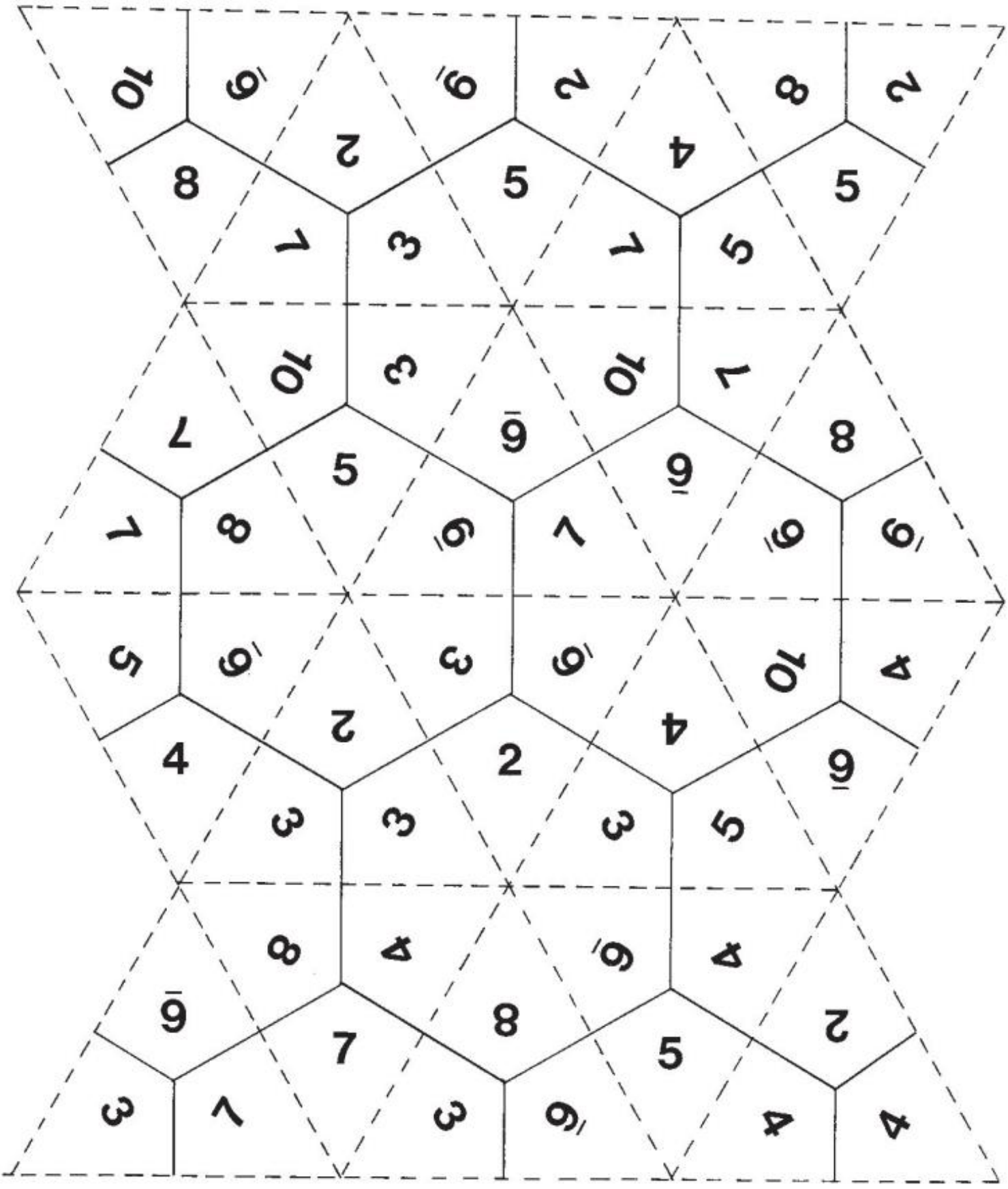
How to play:

1. Work in groups of two, three or four. Shuffle and share out the forty tri-ominoes.
2. Throw a die to decide who should start.
3. The first player puts a tri-omino on the table.
4. The second player must put a different colored tri-omino alongside so that the product of the two numbers is equal to the single number.
5. If a player cannot place a tri-omino then they miss a turn.
6. The winner is the player to use up all their tri-ominoes

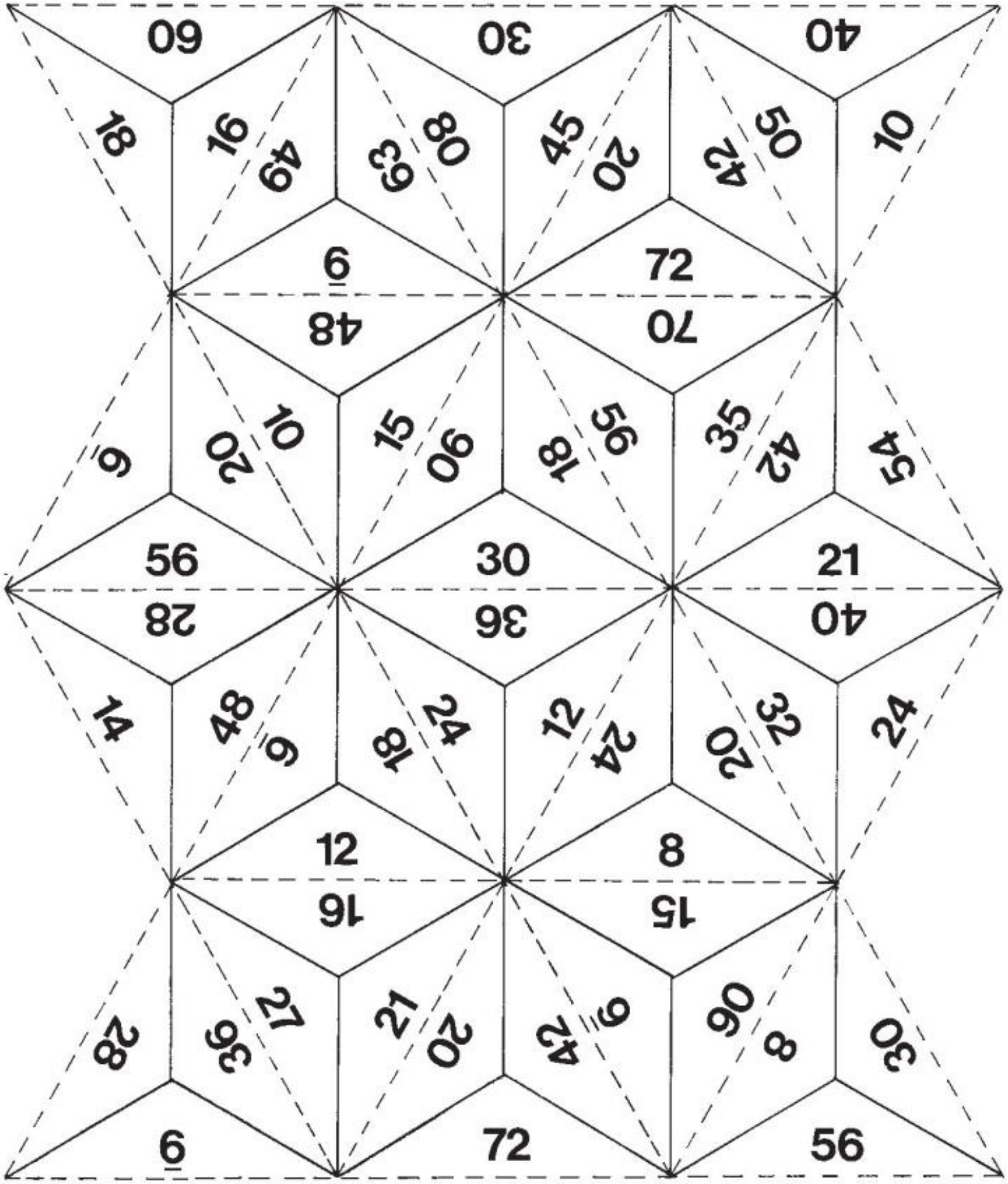
Sample Game:

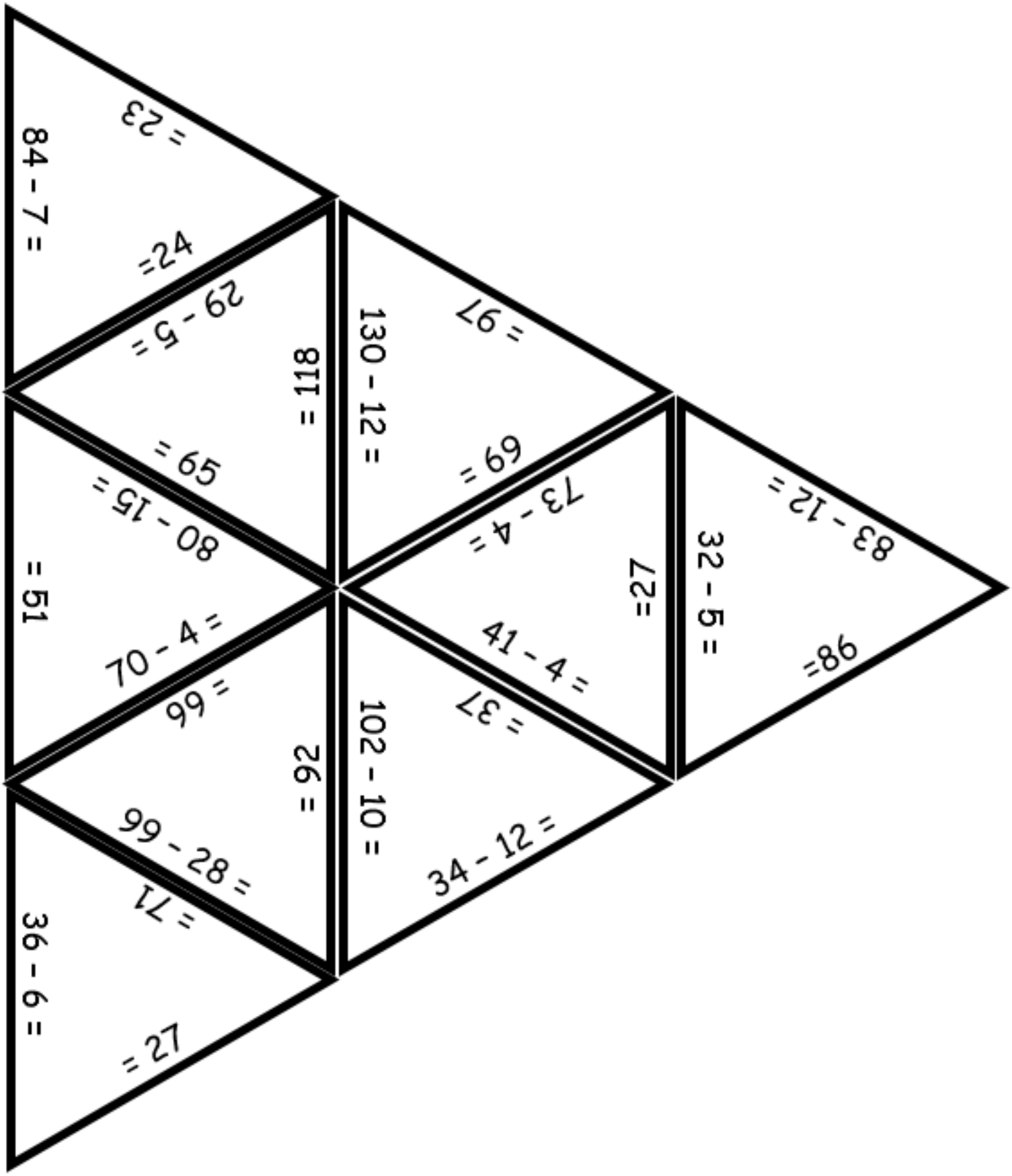


Tri-Ominoes Multiplication First Set

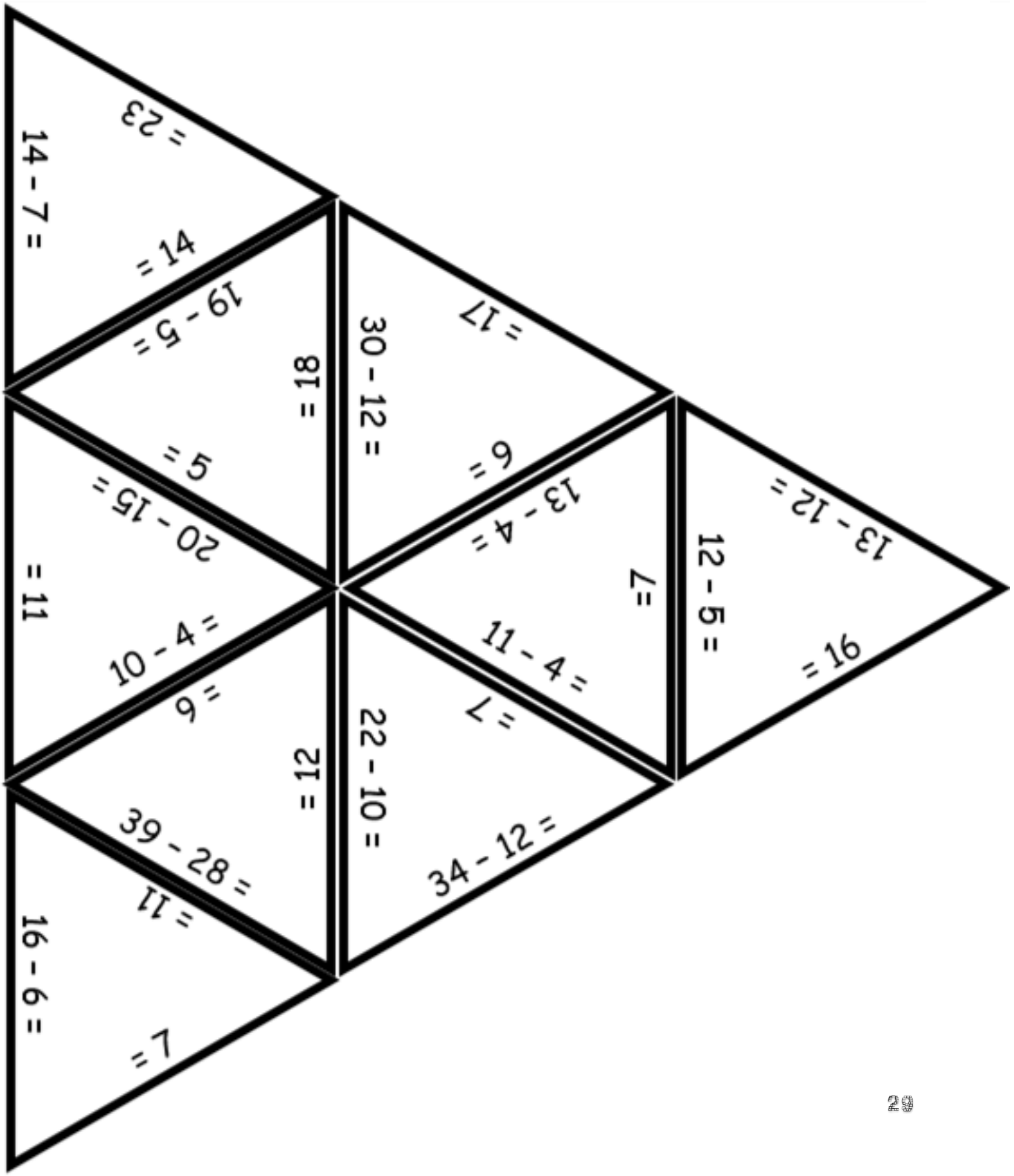


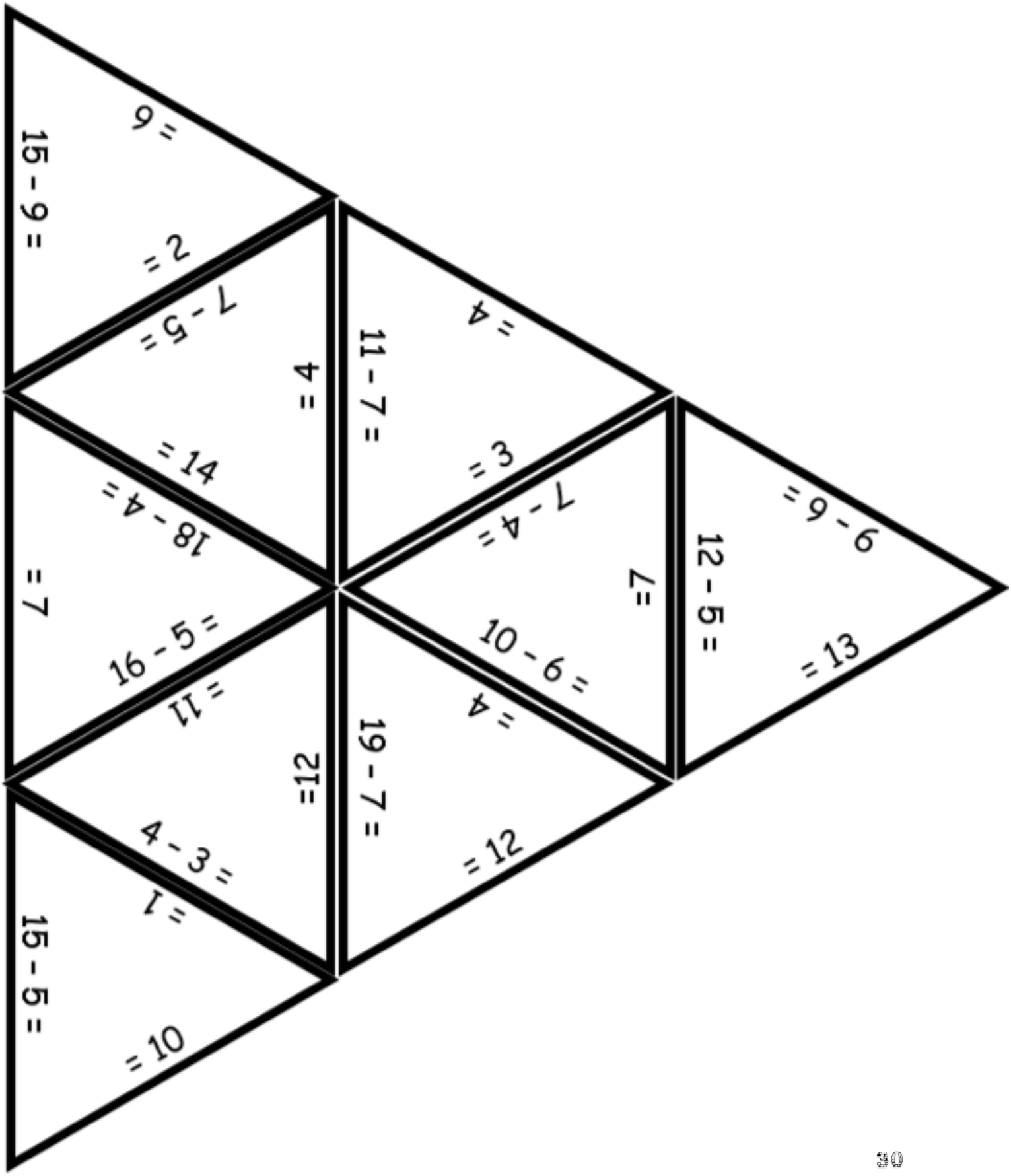
Tri-Ominoes Multiplication Second Set




84 - 7 =
= 23
=24
29 - 5 =
= 118
130 - 12 =
= 97
= 65
80 - 15 =
= 69
73 - 4 =
= 27
83 - 12 =
32 - 5 =
= 98
= 51
70 - 4 =
= 99
= 92
102 - 10 =
41 - 4 =
= 37
99 - 28 =
= 71
34 - 12 =
36 - 6 =
= 27

Tri-Ominoes Subtraction Variation Second Set




15 - 9 =
= 6
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7 - 5 =
= 4
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18 - 4 =
= 7
16 - 5 =
= 11
= 12
4 - 3 =
= 1
15 - 5 =
= 10
11 - 7 =
= 4
= 3
7 - 4 =
= 7
10 - 6 =
= 4
19 - 7 =
= 12
12 - 5 =
9 - 6 =
= 13

Deluxe Tri-Ominos®

For 2 to 4 players
Ages 8 to adult

OBJECT: Be the first player to score 400 points. Each game consists of several rounds.

CONTENTS: 56 Tri-Omino tiles, 4 Racks.

SET UP: Place the Tri-Ominos face down and mix them. On a piece of paper, write down the name of each player. As each play is made, the scorekeeper will add or subtract points in the proper column.

Each player takes the required number of Tri-Ominos as follows:

2 players	9 each
3 to 4 players	7 each

Players place the tiles on the rack with the numbers facing them. Do not let the other players see your tiles.

PLAYING: The player that has the Tri-Omino with three of the same highest numbers starts the round by placing the Tri-Omino face up on the table. Three 5's is the highest, then three 4's, etc. The starting player receives the total of the three numbers on the Tri-Omino plus a 10 point bonus. If three 0s start, there is a 30 point bonus, plus the normal 10 point bonus.

Example:

4 x 3 = 12 + 10 = 22 points

The player that has the starting Tri-Omino ***and*** the three 0s has the option of playing either one. If this player chooses to start with the three 0s to score the additional bonus points, he must show the other players the Tri-Omino with the same highest number on it.

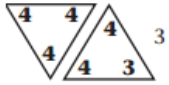
If no player has a Tri-Omino with three of the same number on it, the player with the highest total on one Tri-Omino starts. This player scores the total of the numbers on that Tri-Omino, but does not score any bonus points.

Example:

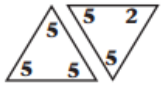
5 + 4 + 3 = 12 points

In clockwise order, the next player tries to match any two numbers on the starting player's Tri-Omino with one of his Tri-Ominos. If the player can do this, he scores the total of the three numbers on his Tri-Omino.

Examples:



3 + 4 + 4 = 11 points



5 + 5 + 2 = 12 points

PICKING FROM THE "WELL": If you can't make a match, pick from the "well" (remaining Tri-Ominos that are face down). Keep these Tri-Ominos separate from the other Tri-Ominos in your hand until you pick a match. For each Tri-Omino picked from the well, the scorekeeper deducts 5 points from your score. After the deduction is made, the scorekeeper adds the total sum of points from the matching Tri-Omino to your score.

If you can't match any Tri-Omino in your hand and there are none in the well, ten points are deducted from your score and play continues.

WINNING A ROUND: The first player to play all of his Tri-Ominos wins the round and receives a 25 point bonus plus the total points of all Tri-Ominos left in the other players' hands. The other players do not deduct these points from their score.

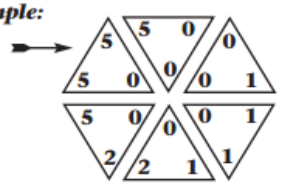
If all players have passed, the game is blocked and the player with the least amount of Tri-Ominos wins the round. All points from the other players' hands are added to this players' score, but there are no bonus points. This player must also deduct the total number of points that were left in his hand from his score.

To begin a new round, turn all the Tri-Ominos face down, mix them and each player picks new ones. Every round is played the same way as the first, beginning with the player who now has the Tri-Omino with the same highest number on it.

WINNING: The first player to reach 400 points wins the game. If a player reaches 400 points in the middle of a round, continue playing until the round is over. If more than one player passes 400 points during the round, the winner of that round wins the game.

BONUS SCORING: If a player matches all three numbers of a Tri-Omino and forms a closed hexagon, add the sum of the three numbers plus a 50 point bonus to his score.

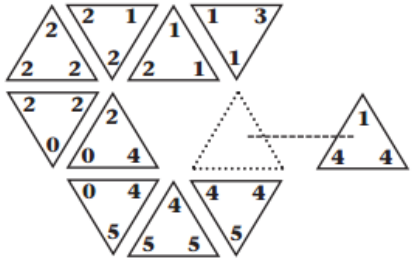
Example:



0 + 5 + 5 = 10 + 50 = 60 points

If a player matches a Tri-Omino and forms a bridge, add the sum of the three numbers plus a 40 point bonus to his score. A bridge is formed by matching one side of a Tri-Omino and the point opposite.

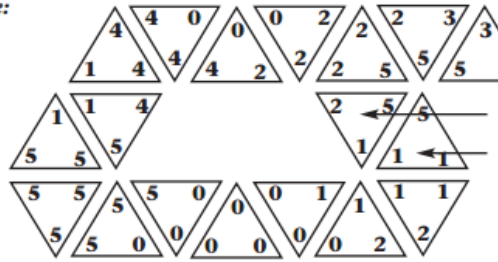
Example:



1 + 4 + 4 = 9 + 40 = 49 points

After a bridge has been formed and a player matches two sides of a Tri-Omino, he receives the sum of the three numbers plus a 40 point bonus.

Example:



1 + 1 + 5 = 7 + 40 = 47 points

Visit our Website at:
www.pressmantoy.com

We appreciate your comments on this game. Please address your correspondence to:
Pressman Toy Corp. • Dept: TRI-OMINOS • 121 New England Avenue • Piscataway, NJ 08901
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Calls are accpeted Monday through Friday from 10:00 AM until 4:00 PM EST

Pressman®

4418/0710

Day Sixteen K-6 Math Skills

The following are selected from the comprehensive list of the math skills students learn in each grade. Remember, these skills build on each other. They are assuming that students have mastered all the ones in the previous grades.

The skills are organized into categories: As you read (and complete) the activities in the plan, keep in mind the specifics skills your students need to practice and master in the different grade levels you work with. Use their needs to guide your approach in how you'll modify and present the activities and what specific tasks you will have the students do.

K

Adding

- I.1 Addition with pictures - sums up to 5
- I.2 Add two numbers - sums up to 5
- I.3 Addition sentences - sums up to 5
- I.4 Ways to make a number - sums up to 5
- I.6 Addition with pictures - sums up to 10
- I.7 Add two numbers - sums up to 10
- I.8 Addition sentences - sums up to 10
- I.9 Ways to make a number - sums up to 10
- I.10 Addition word problems - sums up to 10

Subtracting

- J.1 Subtract with pictures - numbers up to 5
- J.2 Subtraction - numbers up to 5
- J.3 Subtraction sentences - numbers up to 5
- J.5 Subtract with pictures - numbers up to 10
- J.6 Subtraction - numbers up to 9
- J.7 Subtraction sentences - numbers up to 10

Skip-counting

- F.1 Skip-count by twos
- F.2 Skip-count by fives
- F.3 Skip-count by tens
- F.4 Skip-count by twos, fives, and tens

Positions

- K.1 Inside and outside
- K.2 Left, middle, and right
- K.3 Top, middle, and bottom
- K.4 Above and below

1

Addition

- B.1 Addition with pictures - sums to 10
- B.5 Ways to make a number using addition
- B.6 Ways to make a number - addition sentences
- B.7 Adding zero

- B.8 Adding doubles
- B.9 Addition facts - sums to 10
- B.10 Addition facts - sums to 18
- B.11 Addition word problems - sums to 18
- B.12 Complete the addition sentence
- B.13 Adding three numbers
- B.16 Addition facts - sums to 20
- B.17 Add tens
- B.19 Add a one-digit number to a two-digit number - without regrouping
- B.20 Regrouping tens and ones
- B.22 Add a one-digit number to a two-digit number - with regrouping

Subtraction

- D.1 Subtraction with pictures - numbers up to 10
- D.2 Subtraction sentences - numbers up to 10
- D.5 Ways to make a number using subtraction
- D.7 Ways to subtract from a number - subtraction sentences
- D.8 Subtracting zero and all
- D.9 Subtracting doubles
- D.10 Subtraction facts - numbers up to 10
- D.11 Subtraction facts - numbers up to 18
- D.16 Subtract tens
- D.17 Subtract one-digit numbers from two-digit numbers

Counting and number patterns

- A.15 Skip-counting patterns - with tables
- A.16 Sequences - count up and down by 1, 2, 3, 5, and 10

Addition - one digit

- E.1 Review - add one-digit numbers - sums to 10
- E.2 Review - ways to make a number - sums to 10
- E.3 Review - writing addition sentences - sums to 10
- E.4 Add one-digit numbers
- E.5 Addition with pictures - sums to 20
- E.6 Write addition sentences to describe pictures - sums to 20
- E.7 Addition input/output tables - sums to 20
- E.8 Add zero
- E.9 Addition word problems - one digit
- E.10 Complete the addition sentence - one digit
- E.11 Write the addition sentence - one digit
- E.12 Balance addition equations - one digit
- E.13 Add three or more one-digit numbers

Subtraction - one digit

- F.1 Review - subtract one-digit numbers - up to 10

- F.2 Review - ways to subtract - up to 10
- F.4 Subtract a one-digit number from a two-digit number up to 18
- F.5 Subtraction with pictures
- F.8 Subtract zero/all
- F.12 Balance subtraction equations - up to 18

Subtraction - two digits

- H.1 Subtract multiples of 10
- H.2 Subtract a one-digit number from a two-digit number - without regrouping
- H.3 Subtract a one-digit number from a two-digit number - with regrouping
- H.4 Subtract two two-digit numbers - without regrouping
- H.5 Subtract two two-digit numbers - with regrouping
- H.8 Ways to make a number using subtraction
- H.12 Balance subtraction equations - up to two digits

Subtraction - three digits

- J.1 Subtract multiples of 100
- J.2 Subtract three-digit numbers
- J.7 Balance subtraction equations - up to three digits

Multiplication

- W.1 Multiplication sentences
- W.2 Multiplication tables up to 5
- W.3 Multiplication tables up to 10

Addition

- C.1 Add two numbers up to three digits
- C.2 Addition input/output tables - up to three digits
- C.4 Complete the addition sentence - up to three digits
- C.5 Balance addition equations - up to three digits
- C.6 Add three or more numbers up to three digits each
- C.8 Addition patterns over increasing place values
- C.9 Add two numbers with four or more digits
- C.12 Complete the addition sentence - four or more digits
- C.13 Balance equations - four or more digits
- C.14 Add three or more numbers with four or more digits

Subtraction

- D.1 Subtract numbers up to three digits
- D.4 Subtraction patterns over increasing place values
- D.5 Balance subtraction equations - up to three digits
- D.7 Subtract numbers with four or more digits

Multiplication

- E.1 Multiplication sentences
- E.2 Multiplication - facts to 12
- E.4 Missing factors - facts to 12
- E.6 Squares up to 20

- E.7 Multiplication patterns over increasing place values
- E.8 Multiply by a multiple of ten
- E.9 Multiply numbers ending in zeroes
- E.10 Multiply a one-digit number by a larger number
- E.12 Multiply three or more numbers

4

Addition

- B.1 Add numbers up to millions
- B.3 Addition: fill in the missing digits
- B.4 Properties of addition
- B.5 Add 3 or more numbers up to millions
- B.6 Addition patterns over increasing place values
- B.7 Choose numbers with a particular sum
- B.8 Estimate sums
- B.9 Estimate sums: word problems

Subtraction

- C.1 Subtract numbers up to millions
- C.3 Subtraction: fill in the missing digits
- C.4 Subtraction patterns over increasing place values
- C.5 Choose numbers with a particular difference
- C.6 Estimate differences

Multiplication

- D.1 Multiplication facts to 12
- D.2 Missing factors - facts to 12
- D.3 Choose the multiples of a given number up to 12
- D.4 Identify factors
- D.5 Multiply 1-digit numbers by larger numbers
- D.7 Properties of multiplication
- D.8 Estimate products
- D.10 Multiply a 2-digit number by a 2-digit number: complete the missing steps
- D.11 Multiply a 2-digit number by a 2-digit number
- D.13 Choose numbers with a particular product
- D.15 Multiply a 2-digit number by a larger number
- D.17 Multiply numbers ending in zeroes
- D.19 Multiply 3 numbers up to 2 digits each

5

Addition and subtraction

- D.1 Add and subtract whole numbers up to billions
- D.5 Complete addition and subtraction sentences
- D.6 Fill in the missing digits
- D.7 Choose numbers with a particular sum or difference
- D.8 Properties of addition
- D.10 Estimate sums and differences of whole numbers
- D.11 Estimate sums and differences: word problems

Multiplication

- F.1 Multiply by 1-digit numbers
- F.3 Multiplication patterns over increasing place values
- F.4 Multiply numbers ending in zeroes
- F.6 Properties of multiplication
- F.7 Choose numbers with a particular product
- F.8 Estimate products
- F.10 Multiply by 2-digit numbers: complete the missing steps
- F.11 Multiply a 2-digit number by a 2-digit number
- F.12 Multiply a 2-digit number by a larger number
- F.14 Multiply three or more numbers up to 2 digits each
- F.15 Multiply by 3-digit numbers
- F.16 Multiply three numbers up to 3 digits each

6

Add and subtract integers

- I.1 Review - add and subtract whole numbers
- I.3 Properties of addition
- I.4 Integer addition and subtraction rules
- I.7 Subtract integers - using counters
- I.8 Subtract integers

Multiplication

- K.1 Multiply whole numbers
- K.3 Multiply whole numbers with four or more digits
- K.4 Multiply numbers ending in zeroes
- K.6 Multiply three or more numbers
- K.8 Estimate products
- K.9 Properties of multiplication
- K.10 Solve for a variable using properties of multiplication
- K.11 Integer multiplication rules
- K.12 Multiply integers

7

Operations with integers

- E.1 Integer addition and subtraction rules
- E.2 Add and subtract integers using counters
- E.3 Add and subtract integers
- E.6 Integer multiplication and division rules
- E.7 Multiply and divide integers

8

Operations with integers

- C.1 Integer addition and subtraction rules
- C.2 Add and subtract integers using counters
- C.3 Add and subtract integers
- C.4 Add and subtract three or more integers
- C.6 Integer multiplication and division rules
- C.7 Multiply and divide integers

Sample Academic Vocabulary to Reinforce Week 4

K

- Job
- Addition
- Needs
- Subtraction
- Tools
- Pattern
- Parts
- Location

1

- Property
- Push
- Pull
- Invent
- History
- Length
- Weight
- Property

2

- Type
- Distance
- History
- Natural Resources
- Multiplication
- Compare
- Contrast
- Landmark
- River

3

- Landforms
- Natural resources
- Tools
- Conclusion
- Factor
- Capacity
- Force

4

- Expansion
- Weather(ing)
- Exploration
- Accuracy
- Relationship
- Remainder

5

- Region
- View
- Model
- Core
- Gravity
- Solution
- Reconstruct
- Historian

6

- Technological
- Cause
- Effect
- Triangle
- Prototype
- Design Constraint

7

- Impact
- Topography
- Speed
- Function
- Property
- Juncture

8

- Human impact
- Variation
- Angles
- Tension
- Infrastructure
- Element

Sample Supply List Bridging the Gap Week 3

Day 13

- Access to videos & links
- Cardboard
- Popsicle Sticks (24 for a bridge with 1 deck, 36 for 2 decks, etc.)
- String
- Scotch Tape
- Large Nail, Hobby Knife or Box cutter
- Scissors
- Ruler
- Pen/Pencil
- Sand Paper
- Elmer's Glue or Craft Glue

Day 14 & 15

- Sample images of trusses & patterns
- Craft sticks
- Glue
- Optional: Binder Clips
- Paper & Pencils (for keeping track of budget)
- Optional: Toy train for testing

Day 16

- Fact families triangles
- Whiteboard
- Whiteboard markers
- Tri-ominoes Game (chosen variation(s))
- Printouts on Cardstock
- Paper
- Pencils

SOURCES& REFERENCES

- http://www.instructables.com/id/Simple-Suspension-Bridge-Model/
- http://www.pbs.org/wgbh/buildingbig/bridge/index.html
- http://www.pbs.org/wgbh/buildingbig/wonder/structure/akashi_kaikyo.html
- https://www.youtube.com/watch?v=N9fbRcRJY34
- http://tryengineering.org/lessons/popsiclebridge.pdf