STEM@HOME

Girl Scouts of Virginia Skyline

Girl Scouts of Virginia Skyline is excited to bring our **"STEM@HOME" virtual subscription box** to the Lexington Science Festival & Maker Faire!

Included are activity packets covering the four themes of STEM:

SCIENCE
TECHNOLOGY
ENGINEERING
MATHEMATICS

This "virtual subscription box" was originally released as a summer series for at-home activities. You can find even more STEM ideas and get all 3 original virtual subscription boxes for free at gsvsc.org/vsb.

To learn more about Girls Scouts and to become a member, visit gsvsc.org.

STEM@HOME

Science - Technology - Engineering - Mathematics

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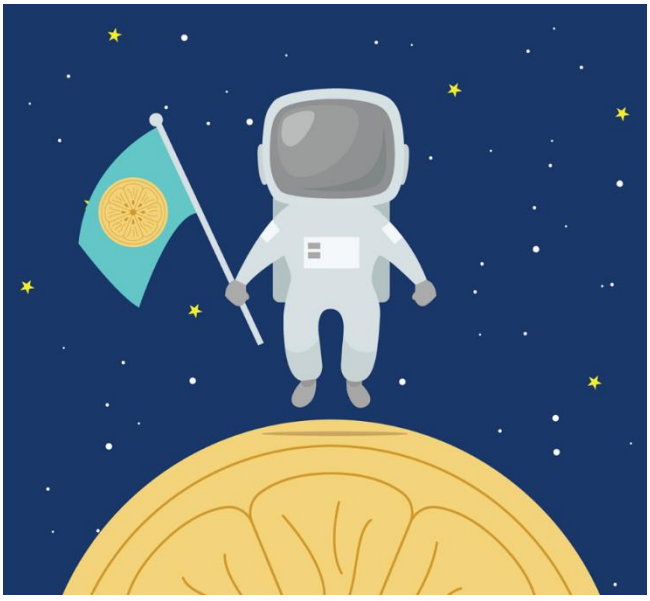
Week 1: SCIENCE

Girl Scouts are always reaching for the stars, and to commemorate this we'll be focusing on the beauty and magic of outer space, with nods to space science exploration, astronomy and the solar system, and all things rockets! It'll be a blast-off!



OBSERVE THE MOON

Moon Phases Glue Resist Watercolor Painting

It's not just a phase! We love learning about the moon! Check out this super cute activity by the *Chalk Academy*. Learn about the moon and all of its phases with this creative craft using just a glue stick and water colors.
It's super insight-FULL!

Materials:

Watercolor paint, watercolor textured paper, glue, puffy paint, paintbrush, pencil, and circle stencil

Steps:

1. Cut watercolor paper into rectangles.
2. Draw circles and moon phase outlines.
3. Write moon phase names
4. Trace moon phase words with white puffy paint.
5. Fill in moon phases with white glue.
6. Paint with black watercolor paint.
7. If white glue (moon) becomes too dark from the black watercolor paint, use a wet towel to wipe off excess paint. Moon should appear whiter and brighter!
8. Let dry
9. When dry, child can enjoy feeling the texture of the bumpy (crater-filled) moon and words!

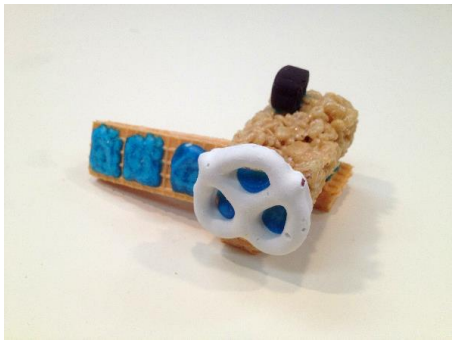
EDIBLE ACTIVITIES

Edible Spacecraft

You'll be reaching new heights with this NASA-approved activity! Raid your pantries and get to work on your very-own spacecraft! Just remember: every satellite must include the following basic things: a power source for electricity, a communication device to communicate with Earth, an orientation device to help you navigate, scientific instruments (like a camera or recording device) and a "container" to keep all of your high-tech gadgets safe. Get ready for lift-off!

Materials:

Rice crispy treats, sugar wafers, graham crackers, pretzels, gummy worms/candy, licorice twists, frosting, brownies, and toothpicks



Steps:

1. Unwrap the rice crispy treat and use that as your container.
2. Use graham cracker for power source.
3. Add gummy worm pieces and pretzels as your instruments.
4. Use a pretzel to make your antenna.
5. Use gummy candy for your orientation finder.
6. Use the toothpicks and frosting to assemble your spacecraft and keep it all together!

Candy Constellation Game

Don't take this activity too Sirius! This Candy Constellation challenge is a great way to learn about our shining friends while also working to earn Step 4 of the Brownie Space Science Adventurer badge.

Materials:

Cardstock, scissors, coloring/drawing supplies, small hole punch, canning jar rings, glue, small round candies of your choice

Steps:

1. Print the constellation template linked or draw your own using the canning rings as your guide.
2. Punch holes out of the stars on your constellations.
3. Glue your circle inside the canning ring
4. Place 1 candy in the lid for each star space
5. Tilt the lid around until you can get all the candies to settle in the stars.

EXPLORE SPACE SCIENCE

Get Inspired

To the moon, Girl Scout! Check out this great Ted-Ed talk that details the work and mission of female Software Engineer, Margaret Hamilton the brainchild of Apollo 11.

NASA has SO MANY incredible resources for girls and adults. Get inspired by their Official Live Stream on YouTube and then dive head first into the many innovative and informative educational materials that will engage your girls in science, technology, engineering, and math (STEM). The sky's the limit!

Book Riot is a fantastic resource with tons of pre-themed lists. Check out their *25 Must-Read Children's Books About Space* and expand YOUR horizon.

Build Your Own Rocket

This activity will allow you to get hands-on with space science by building your own rocket. Use all you've learned to create a rocket out of common household items and then put it to the test with a launch. Shoot for the moon, Girl Scout!

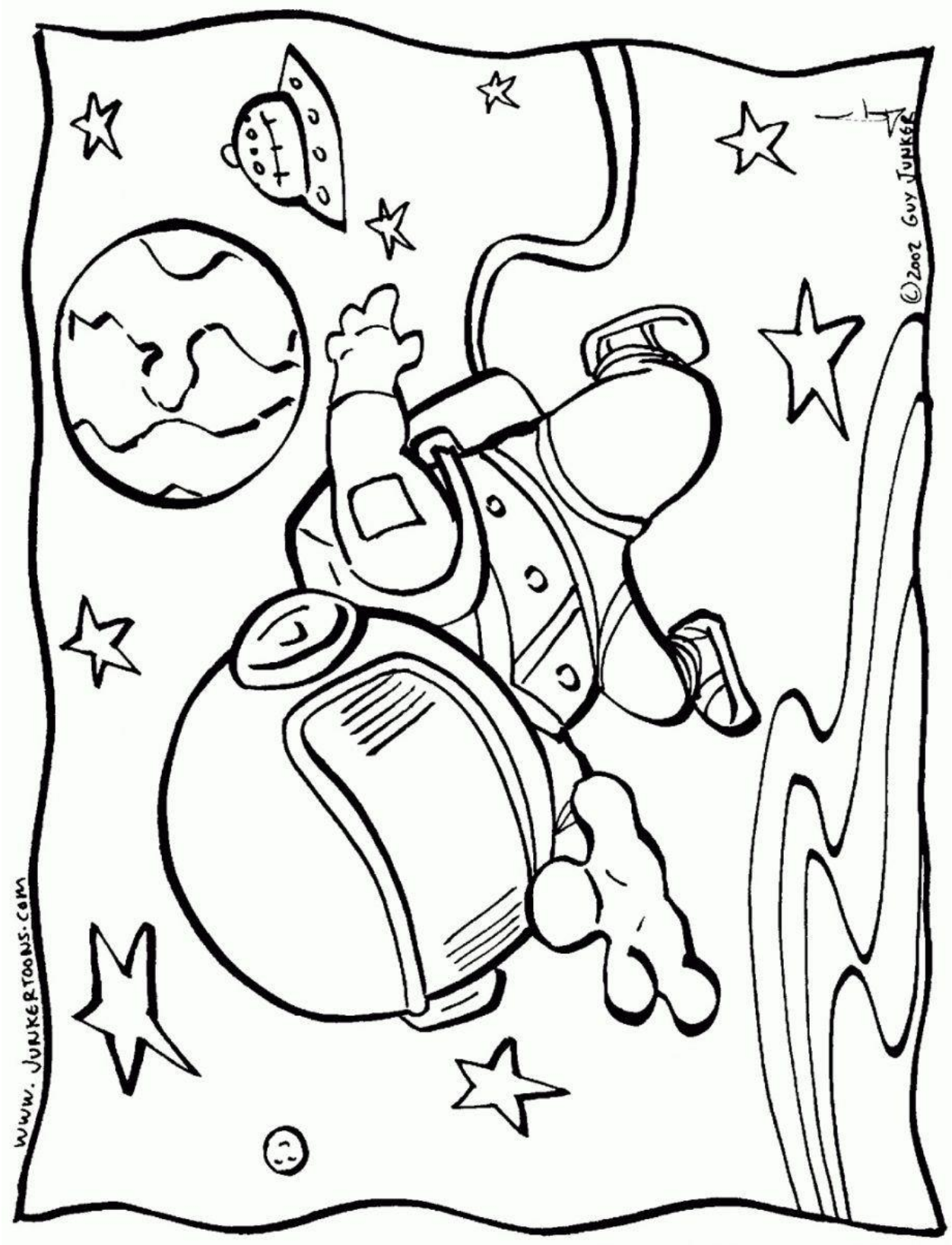
Materials:

Empty 2-liter soda bottle, 3 pencils, duct tape, a cork for the bottle, paper towels, baking soda, large bottle white vinegar

Steps:

1. Prepare your rocket by attaching the pencils to the bottle with duct tape – arrange them so the pencils support the bottle standing upside down
2. Make a "packet" of baking soda in a paper towel, folding the paper towel so it's small enough to fit inside the bottle
3. Pour about 2 inches of vinegar in your bottle
4. Quickly add the baking soda packet and cork the bottle (not too tight)
5. See how high your rocket is launched

The Science behind it: When baking soda & vinegar mix, it creates a chemical reaction that produces gas. Pressure builds up in the bottle, causing it to eventually release out of the hole & launching the rocket into the sky!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LINKS

Moon Painting:
https://chalkacademy.com/moon-phases-glue-resist-watercolor-painting/

Candy Constellation Game:
https://www.handmadecharlotte.com/candy-constellation-game-printable/

Edible Spacecraft:
https://spaceplace.nasa.gov/build-a-spacecraft/en/

STEM Coloring Book:
https://www.girlscouts.org/en/girl-scouts-at-home/activities-for-girls/stem/coloring-book-activity.html

TED-Ed Talk:
https://www.ted.com/talks/matt_porter_and_margaret_hamilton_nasa_s_first_software_engineer_margaret_hamilton?utm_campaign=tedspread&utm_medium=referral&utm_source=tedcomshare

Book Riot:
https://bookriot.com/2019/02/22/childrens-books-about-space/

NASA Livestream:
https://www.youtube.com/watch?v=21X5lGlDOfg

Build a Rocket:
https://frugalfun4boys.com/epic-bottle-rocket-flew-higher-2-story-house/

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Week 2: TECHNOLOGY

Girl Scouts are innovators and risk takers who love the internet, but they are also responsible and knowledgeable.
Cyber security is an integral part of using technology. We are going to explore how to stay safe, talk to others when we are confused and what or who could be a risk.

Girls will understand how their online activities will impact them and others. They will also understand how to ask for help in a constructive manner from peers, adults, and other authority figures as well as provide it for questionable situations.

To learn more about Girls Scouts and to become a member, visit gsvsc.org.
Find us on social media for more ways to #GoVirtualwithGSVSC & use the hashtag to share!

21ST CENTURY GIRL SCOUTS

Online privacy

A broad term that usually means the ability to control what information you share about yourself online, who can see, and share it.

Digital footprint (or digital presence)

Your digital footprint is all the information about you that appears online. This can mean anything from photos, audio, videos, and texts to "likes" and comments you post on friends' profiles. Just as your footsteps leave prints on the ground while you walk, what you post online leaves a trail as well.

Reputation

The ideas, opinions, impressions, or beliefs that other people have about you something that you can't be totally sure about but that you usually want to be positive or good.

Personal information

Information that identifies a specific person. For example, your name, street address, phone number, Social Security number, email address, etc., are called personal (or sensitive) information. Really think carefully before sharing this kind of information online.

Oversharing

Sharing too much online — usually, this is about sharing too much personal information or just too much about yourself in a certain situation or conversation online.

Settings

This is the area in any digital product, app, website, etc., where you can define or adjust what you share and how your account is handled — including your privacy settings.

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CYBER SAFETY

We are digital citizens; we share the internet all at once. But, just like when you are in your troop, with your friends, or out and about, we have to be careful about what we do when we are online.

Remember to be SMART and THINK!

Watch:
https://youtu.be/X9Htg8V3eik

S – Safe: Keep your passwords private, don't share personal information, keep

M – Meeting: Do not meet people you don't really know.

A – Accepting: Be careful on what you click, open, subscribe, and apps you download.

R – Reliable: Know who you talk to and websites your use. Remember that some people and companies will lie to get you

T -Tell: Say something if it seems weird.

But let's see how much you know now!

http://www.safekids.com/quiz/

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KNOW WHO YOU CAN TRUST

Not everyone on line is who they say they are. We have to be careful who we talk to, what we post, what we click on, and what information we give.

https://www.youtube.com/watch?v=H0Qg1_-Xmr8

Remember to protect your passwords, not to meet people you don't really know and be careful about what we post.

When in doubt – Talk it Out! If you are not sure about something –Ask! Ask a troop leader, parent, grandparent, or other trusted person – it keeps us all safe. ☺

Privacy: Is it a secret? Know what to share!
https://youtu.be/0-CiVZt6BrE

What we share says a lot about us.
https://youtu.be/MjPpG2e71Ec

"Know your threat level" with Miles Bess- Cadette/Junior/Senior/Ambassadors:
https://youtu.be/VlYjtWg4Thw

Daisy/Brownie: Draw a Picture: Draw a picture of one person you would share your passwords with? Draw a picture of one person you can talk to when you are not sure if something on line is right? Talk it out - How do you know a website is bad?

ACTIVITIES

Cadette/Junior/Senior/Ambassador: Let's play! Internet Awesome Game – Cadettes, Junior, Ambassador, and Senior – Level 1: Can you keep your stuff safe in Interland? https://beinternetawesome.withgoogle.com/en_us/interland

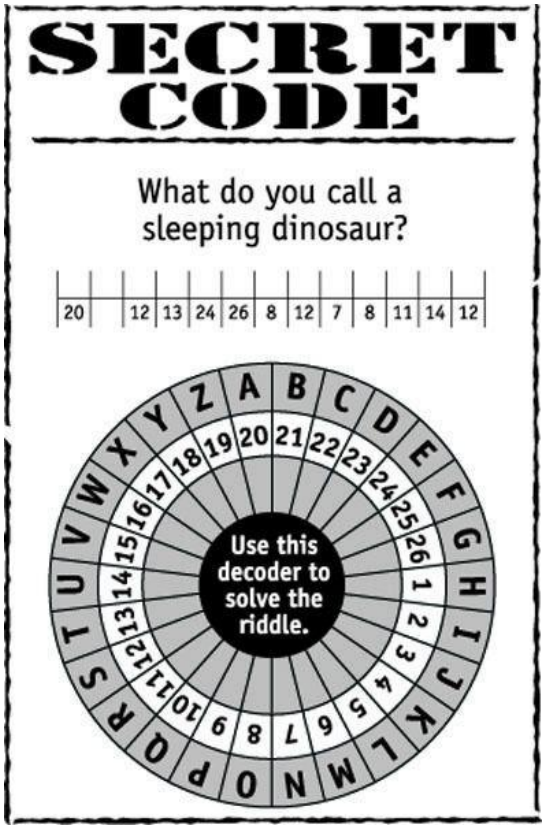
Secret Ink! We need to keep our passwords safe from other people. How can we do that when we have to remember so many?

Easy invisible ink:

Supplies: lemon juice or milk
Q-Tip
Paper
Lightbulb/oven/iron/microwave

Dip the Q-Tip in lemon juice or milk and write your password down on the piece of paper. Let it dry. When you need to remember your password, heat up the paper by warming it in the microwave (15-30 seconds), holding it up to a lightbulb, or ironing it (with help). The lemon juice or milk will turn brown on the paper from the heat.

Decypher the Dino



Code Stick

To make a code on a code stick, you need a long strip of paper, and a pen, walking stick or a broomstick.

First you wind the strip of paper tightly around the pen or broomstick.

Then you write your message all the way down the stick (you can write it on several lines).

When you unwind the message, no-one can read it unless they have the same stick as you! But if they have the stick, they can read the message just by winding the strip of paper around it again.

CYBERSECURITY WORD SEARCH

P O H B V I Y N T N I R P T O O F L A T I G I D Y P Z P G X
Q R N S G N I T T E S C F J C N P S I R G F F C U S Q A V S
H N O S P B C O S F M H B K B O A Q T I S N A P Q K Q S X R
O Q V T Q U S I D S G F I Z A A O W N Y N V S D X P B S T I
X P X W E Q S Y T N D B O K E H G K K B I C O O M L C W J B
D B N P O C X A I K Q I A V F L O B I R L F W G R H N O W K
U K E M P H T R G T T E T T F N Q S P E W D I X N T Y R A P
M B B S W E A I G P W I M J M U N B C H S E B Q G W J D N J
I Q E O U H O O O U X V F T S V G A Z X L U I O X Q H J W E
X T E U S L B B D N O M V B J Q U D J E U T V K T M N O Y O
W G E R A B R O W S E R Y V A X G P B D F O S O N R K D Y E
R G E N Z C C P H T V Q T T B L Y P K D E X O U Y E A Z A L
D V J Y R T E H C V V E G A I S M F W W R Z P J R X O V V Z
O Z R Z P E D Q E J I V S P M Q Y B S A A A K F F T L E V S
I K S Q B G T K K Q Y C H A B S Z O N H C R K Q B F L S I Z
N S D N F U T N O V D I R H H X C F K H F V J G U V I L J B
U V C G J D J I I W S T N V G I M Y A N J N W M I I O G N Z
E Y T T W B Z U Y H K E U P A W R U K I H K K X T M W N R J
I T T D U W Y I I G L J Y L B L P V Y M P P G S U U W I J D
V V S I W P R N X F D Q E N G Q O A K N I Q T Z R M X Y T W
T B X X R J G D D A K N I H T V K G D J F T Y C Z Z W L R M
D P D K V U R Z Z S G H O F N Q L Y F C O M M Z Y H K L M H
S P A M D I C O N I E H S R M Q G E D L W I U I O I W U C N
V M C H N R Z E N L Z T A S O W T Z I I K L D N B T R B T D
L Y H T E K B E S H J M F A V U T I G D V O B O K Q H R N W
K Z X M M J E G N R N V E F O Q H E M Q G B T M H L C E W C
L F M A B R S K N Y E Y T V E X D S X X S D R G E L B B E O
Z E U V I Z U A E H H B Y P D N I I J T N W K A T S I Y B D
G V E N H W B Q Q Y R F Y O I B U B Z I L Y P J I H Y C Q Z
N D G I R L S C O U T S S C V F O T K U K D Y O E U M W W A

BROWSER
CAREFUL
COOKIES
CYBERBULLYING
CYBERSECURITY
DIGITALFOOTPRINT
GIRLSCOUTS
INTERNET
KIND
OVERSHARING
PASSWORD
PHISHING
PRIVACY
PROTECTION
SAFETY
SETTINGS
SMART
SOCIALENGINEERING
SPAM
TEXT
THINK
TRUST
VIDEO
WEB

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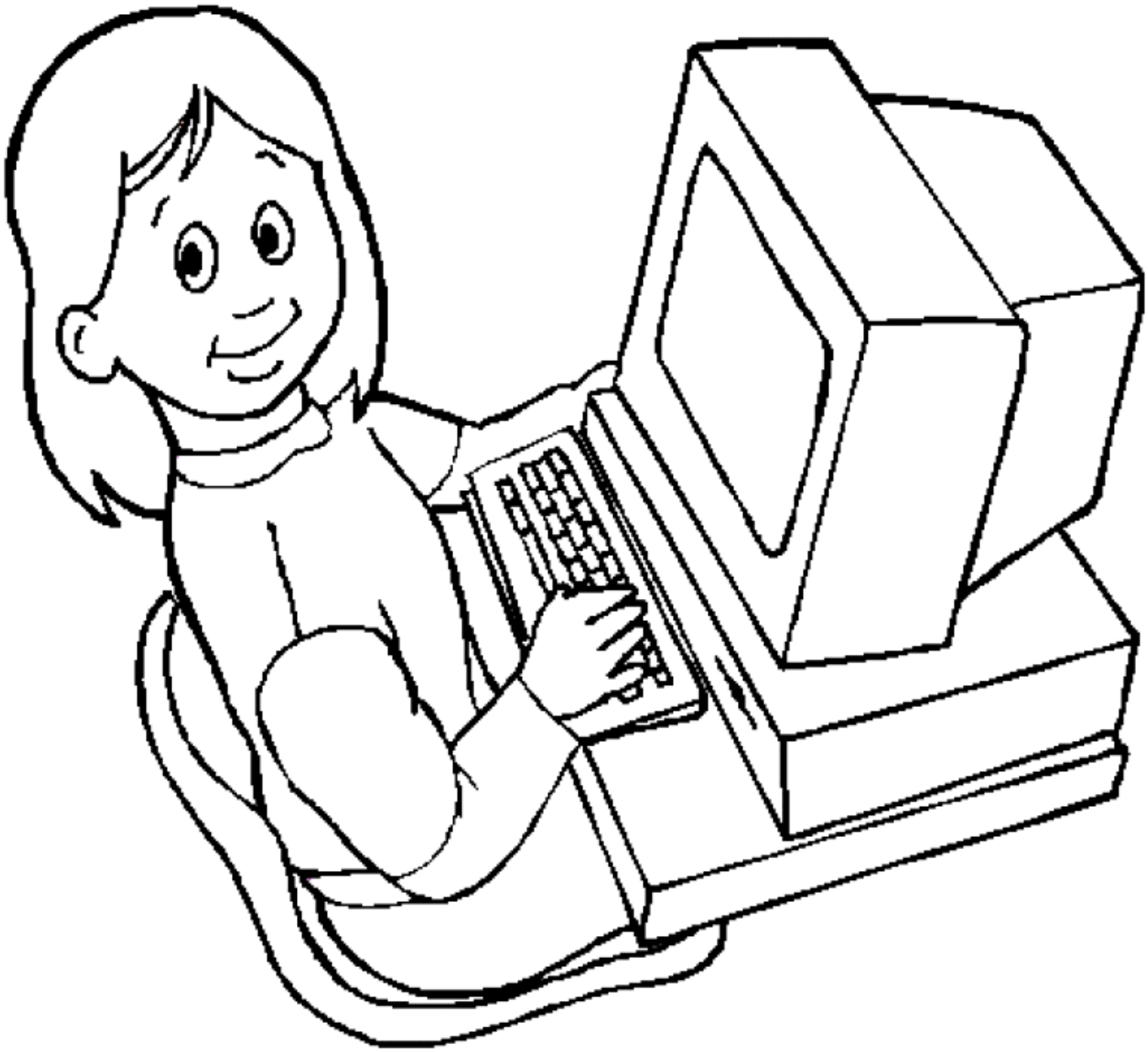

LINKS & EXTENSIONS

Be Kind: Girl Scouts make the world a better place – and that starts with kindness and respect.

Watch: https://youtu.be/UzwFqHDn4Aw

Girl Scouts Set an Example

- Use the power of the Internet to spread positivity.
- Stop the spread of harmful or untrue messages by not passing them on to others.
- Respect others' differences.
    - Block mean-spirited or inappropriate behavior online.
    - Make an effort to provide support to those being bullied.
    - Encourage others to speak up.

Social Engineering

Daisy/Brownie: Use your body online-- https://youtu.be/X_duZ-1LApg

Activity: Can you draw an internet spy? Will it be a phish, troll, spammer, or something else? How will you trap it?

Junior/Cadette/Ambassador/Senior: https://youtu.be/R12_y2BhKbE

Let's see how you do - take the phishing quiz: https://phishingquiz.withgoogle.com/

Girl Scout Cyber Pledge:

https://www.girlscouts.org/en/help/help/internet-safety-pledge.html

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Week 3: Engineering

Bridging is a very special time for a Girl Scout, celebrating all the achievements from the past year and moving forward to new & exciting challenges. In that spirit, this week will be all about building bridges!

Learn about the engineering concepts that go into designing and building strong bridges, then get creative by imagining the bridge you want to build. Create your design and then use your critical thinking skills to determine what materials will be best to use. From paper, to popsicle sticks to toy bricks, what you use to build is completely up to you!

Once you've built your bridge, you'll put it to the test - starting small and discovering how sturdy your bridge is before it tumbles down! An important part of engineering is learning through trial & error, so don't be discouraged! After testing it's limits, learn from your first bridge build to create an even stronger version!

Multiple participation options will be included along the way, choose whichever is most appropriate for age & skill level.

BRIDGE BASICS

Let's start by learning about the different types of bridges. You can make your own "engineer's notebook" to keep track of what you learn. Use this notebook to add your ideas, remember important words, and draw sketches along the way!

When designing a bridge, engineers must determine how they will carry the **load** that needs to cross it. This can mean either carrying light loads such as people (pedestrian bridges), moderately heavy loads like vehicle traffic, or even heavier loads like cargo trains.

The load a bridge carries creates two forces:

1) **Compression** is when the weight (load) on a bridge *pushes* parts of the bridge towards each other.
2) **Tension** is when the weight (load) *pulls* parts of the bridge apart.

Learn basic bridge designs here, and in the matching activity on the next pages. Then, explore unique bridge designs from around the world.

Compression & Tension

Test these concepts yourself:

- Take a ball of silly putty and slowly pull it apart > the silly putty stretches out and will eventually break apart, demonstrating **tension**.
- Take a piece of spaghetti and slowly push the two ends together > The noodle bends at first, then eventually breaks, demonstrating **compression**.

Test out what you've learned:

Online Bridge Challenge

More Fun: In your Engineer's Notebook, list some of the types of bridges you're familiar with from your everyday life & local area. See if you can find out more about a bridge near you.

- What year was the bridge built or last rebuilt?
- What materials is the bridge made out of?
- What is the bridge's height and length?
- How much weight can the bridge support?

You may not be able to answer all of these questions, but find out as much information as you can. You may be surprised at what you discover! For older bridges, see if you can find a very old photo! And, if you're able to visit the bridge safely, see if you can discover more about it there. Is there a historical marker from its construction? Make a sketch & take notes of what you observe in your notebook

These photos show the dedication ceremony in 1925 for Memorial Bridge in Roanoke, Virginia!
Can you identify what type of bridge this is? Photo credit: http://historicgrandinvillage.com/history/

Print out this page and cut into individual cards. Have a family member or friend read you the descriptions while you match each one to the correct photo card (next page). Discuss the pros & cons of each bridge type as you go along. *Only read the hints if you need additional help!*

BEAM BRIDGES

Beam bridges are the oldest known bridges and tend to be the simplest to design and build. They consist of vertical piers and horizontal beams. A beam bridge's strength depends on the strength of the roadway and can be increased by adding additional piers.

Pros: Easy to build & inexpensive

Cons: Boats can't pass underneath & the design isn't considered visually attractive

Hint 1: Beam bridges can be open along the sides or have handrails that aren't specifically load-bearing

Hint 2: Beam bridges can be very plain looking, especially when using basic materials like concrete.

ARCH BRIDGES

Arch bridges were built by the Romans and have been in use ever since. They are often chosen for their strength and appearance. Arch bridges can be built from various materials, including wood, stone, concrete, and steel.

Pros: Can be made from a wide variety of materials, are visually attractive, very strong

Cons: Expensive to build, can only be built in certain locations that will support the weight distribution

Hint 1: Some arch bridges consist of just one arch, but longer arch bridges combine many arches for strength as well as looking visually attractive.

Hint 2: Classic arch bridges do not have support structures above the main roadway.

TRUSS BRIDGES

Truss bridges are very strong and have been used for railroad bridges mainly because of the heavy loads that they can support. A truss is a support structure that is made up of multiple interlocking triangles.

Pros: Extremely strong, often used for railroad bridges

Cons: Difficult to build and challenging to maintain

Hint 1: Many truss bridges use steel or iron and can be industrial in appearance as opposed to visually impressive.

Hint 2: Truss bridges include lots of triangles to give them strength.

SUSPENSION BRIDGES

Suspension bridges are very strong and can span long distances. They are expensive because they take a long time to build and require a large amount of material. The primary elements of a suspension bridge are a pair of main cables stretching over two towers and attached at each end to an anchor. Smaller cables attached to the main cables support the roadway.

Pros: Can be built across long distance & high enough for boats to cross beneath, design is visually attractive

Cons: Very expensive and they take a long time to build

Hint 1: Suspension bridges are made of a variety of materials, the most distinctive being the draping cables.

Hint 2: Suspension bridges look very unique and interesting.

CABLE STAYED BRIDGES

Cable-stayed bridges are a relatively new style of bridge & were developed as an economical way to span long distances. The first modern cable-stayed bridge was completed in 1956. Cable-stayed bridges have one or more towers, each of which anchors a set of cables attached to the roadway.

Pros: Less expensive and faster to build than suspension bridges, but still visually attractive

Cons: While less expensive than suspension bridges, still more expensive than most other types

Hint 1: While they look similar to suspension bridges, the cables appear more rigid as opposed to draping.

Hint 2: Can be built very high so boats can pass underneath.

TIED ARCH BRIDGES

A tied-arch bridge is a type of arch bridge where the weight of the bridge is on the roadway instead of the ground or the bridge foundations. They can be seen as a cross between a traditional arch bridge and a suspension bridge.

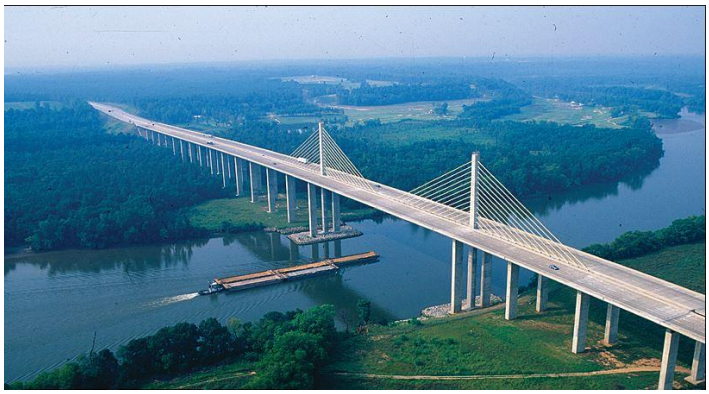
Pros: Doesn't require a strong foundation & can be built on loose soil or elevated piers, can be built off-site and transported later, considered visually attractive

Cons: Can be expensive & repairs are time-consuming

Hint 1: Another name for tied-arch bridges are bowstring arch bridges because their shape resembles an archer's bow.

Hint 2: Some tied-arch bridges have just one arch, others can have multiple arches with piers beneath where the arches meet.

Print this page & cut the photos into individual cards, then match them with the descriptions on the previous page.
Answer key is included on the links page



Varina Enon Bridge
Henrico, Virginia

Nokesville Bridge
Prince William County, Virginia

River's Edge Pedestrian Bridge
Roanoke, Virginia

Buchanan Bridge
Buchanan, Virginia

Cumberland Blue Bridge
Allegheny County, Maryland

James River Bridge
Richmond, Virginia

DESIGN & BUILD

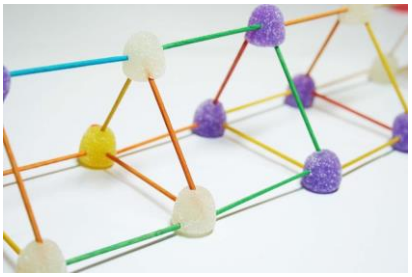
Easier

IDEAS

Harder

Toothpick Bridge

Build a bridge using toothpicks as your main building material. Connect them together either with glue, or something more fun like gumdrops! See what types of bridges you can build with toothpicks.



Cardboard/Paper

Build a bridge using paper & tape. Experiment with how to make your paper as strong as possible, like rolling it into tubes.

LEGO

Use LEGO or other brick toys to create a colorful and strong bridge. See what types of bridges you are able to create.

Craft Sticks & Glue

Using these materials, see how strong a bridge you can create. Use your engineering skills to determine what type of bridge you can create that will support the heaviest load.

All Natural Materials

Make a fun, outdoor bridge, using only materials you can find outdoors. For example: how would you stack stones in such a way that they form an arch bridge? Can you use twine to tie sticks together forming a bridge?

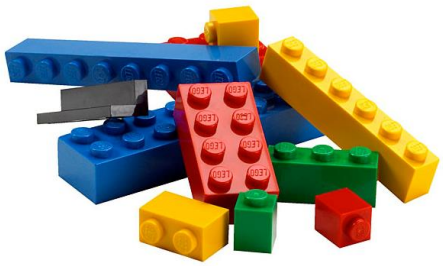
Recycled Materials

See how sustainable your bridge building materials can be by reusing as many things as possible like toilet paper rolls and empty boxes.

SUPPLIES

- Printer (optional)
- Sketchpad, drawing paper and/or notebook
- Coloring supplies and/or drawing materials of your choice

- **Building materials of your choice:**
  - Cardboard
  - Paper
  - Gumdrops & toothpicks
  - Mini-marshmallows & spaghetti
  - Popsicle sticks
  - Glue
  - LEGO
  - Outdoor materials: sticks, rocks, etc.
  - Recycled materials: cardboard or toilet paper rolls, empty cereal boxes, etc.



- **Weighted objects of choice:**
  - Toys – cars/animal figurines/action figures > anything to cross your bridge will do
  - Small weights
  - Rocks
  - Bucket and sturdy string
  - Your choice! ☺

Depending on what type of bridge you've built, you may need to transfer to a different location to test its strength.

- Some bridges will need to have weight stacked on top of them to test
- Some bridges may be best tested by suspending a bucket from the middle of the bridge with a strong string and slowly adding weight to the bucket.
- Be very careful when testing the weight your bridge can hold, and ask an adult for assistance.

TEST YOUR BRIDGE & REBUILD

Start slowly by seeing if your bridge can hold a toy car/truck. Then see how many it can hold before it falls down.

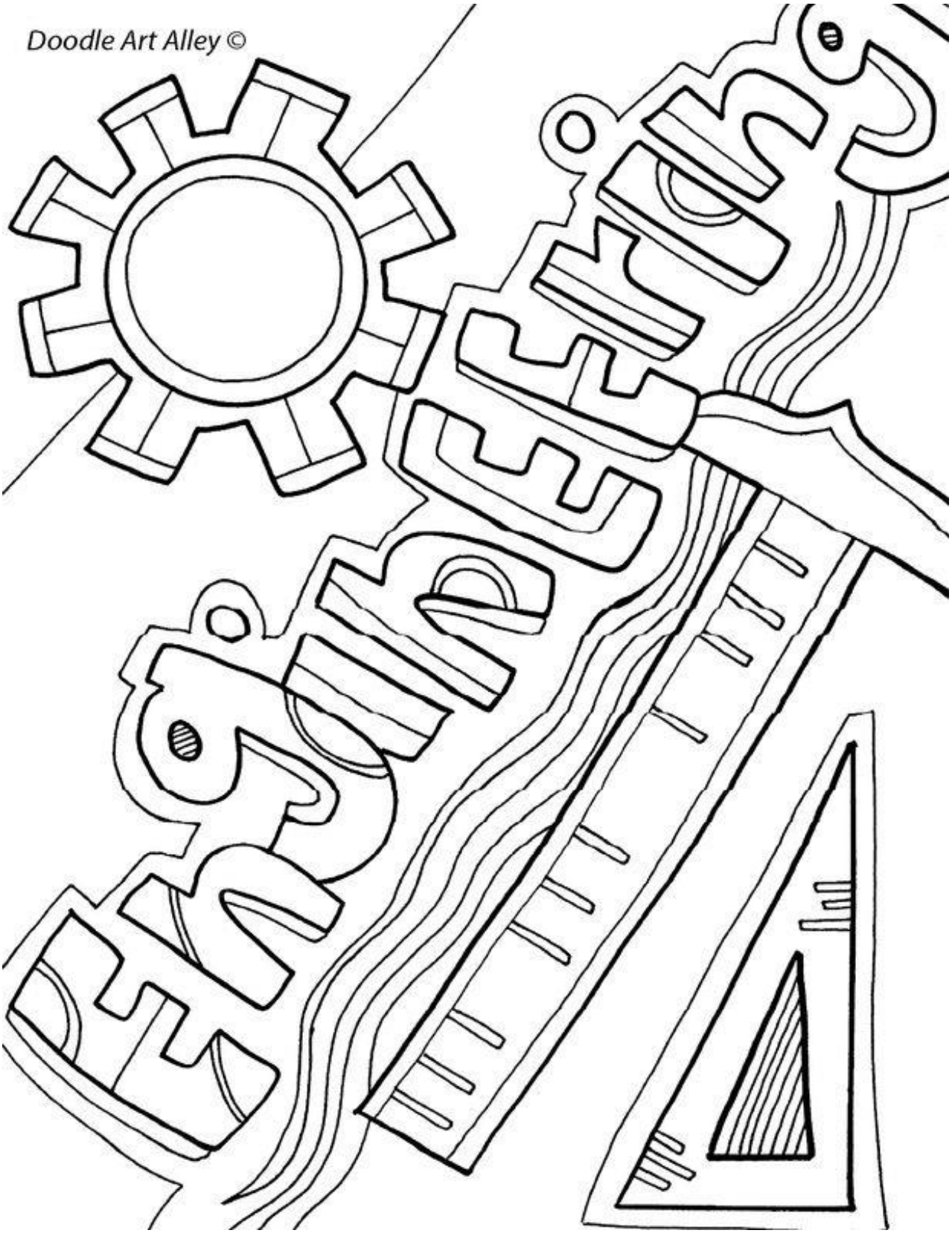
Measure your "weights" on a scale beforehand to keep a record. See how much it will hold before it breaks.

Reflect on how your bridge performed and take notes:

- What worked well?
- Where did it break first and why?
- What should you do differently next time?

Use what you've learned to build a new bridge:

- Use the same materials and see if you can re-build your bridge stronger!
- Use new materials to build a stronger bridge.


Doodle Art Alley ©
ENGINEER

LINKS

Girl Scout Bridging:
https://www.girlscouts.org/en/about-girl-scouts/traditions/ceremonies.html#bridging

Tension & Compression:
https://youtu.be/c-V_8_qmJbE

Bridge Basics:
http://www.pbs.org/wgbh/buildingbig/bridge/basics.html

Bridges around the World:
https://www.nationalgeographic.com/travel/lists/activities/best-bridges-in-world/

Bridge Challenge:
http://www.pbs.org/wgbh/buildingbig/bridge/challenge/indexp.html?4

Bridge Building Ideas:
https://www.ehow.com/how_6321787_make-strong-paper-bridge.html
https://creativeqt.com/blogs/news/family-steam-challenge-engineering-lego-bridges
https://frugalfun4boys.com/lego-bridge-building-challenge/
https://teachbesideme.com/popsicle-stick-bridge/
https://craft.ideas2live4.com/2018/08/11/how-to-make-a-fairy-garden-bridge/

Answer Key to Matching Activity: Rivers Edge Pedestrian Bridge: Beam Bridge — James River Bridge: Arch Bridge — Nokesville Bridge: Truss Bridge — Buchanan Bridge: Suspension Bridge — Varina Enon Bridge: Cable Stayed Bridge — Cumberland Blue Bridge: Tied-Arch Bridge

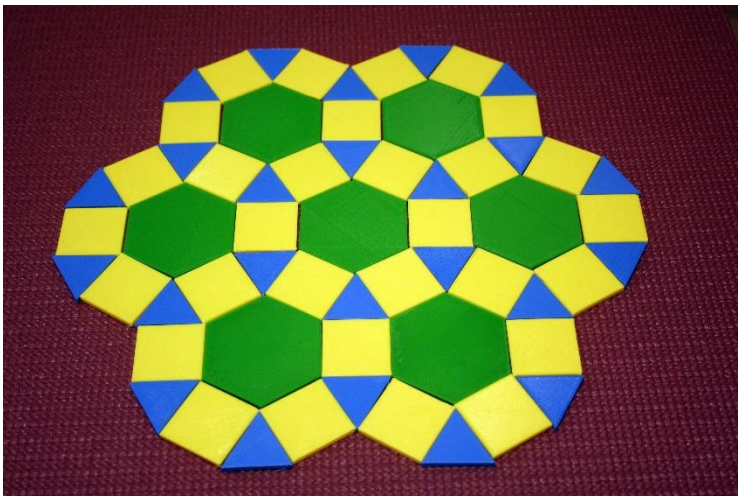
STEM@HOME

Science - Technology - Engineering - Mathematics

girl scouts of virginia skyline

Week 4: Mathematics

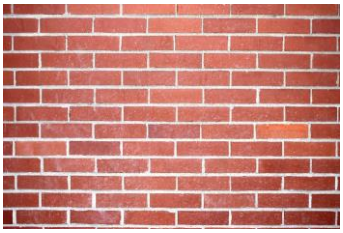
Mathematics is the theoretical science of quantity, number and space, and can be abstract or applied. These are not math lessons, but fun activities to show the importance of mathematics. We are going to make math come alive through art!



TESSELLATIONS

A RHYTHMIC SEQUENCE OF IMAGES

A **tessellation** is a combination of shapes that fit together perfectly without any gaps, much like a jigsaw puzzle. The result is a symmetric design of repeating patterns, which may feature animals, persons or anything else. Brick walls, tiled floors and the honeycomb pattern in beehives are all tessellations.



Daisy/Brownie:

LEGO Tessellation Activity

These little colored plastic bricks are awesome learning tools, as this tessellation activity from Little Bins for Little Hands shows us. The symmetry of a Lego brick lends itself perfectly to this activity! Keep it fun and easy while creating this beautiful piece of math art.

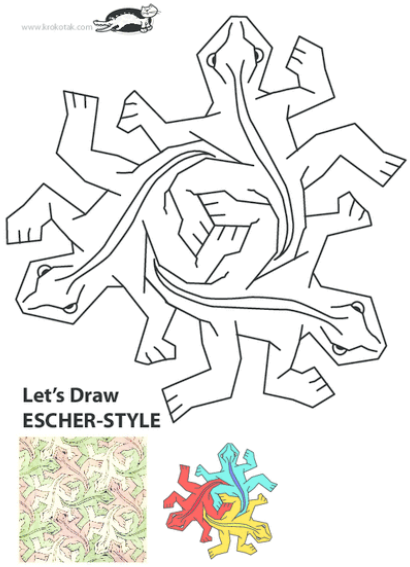
Watch: Video

Junior:

M.C. Escher Tessellation Activity

Maurits Cornelis Escher, usually referred to as M.C. Escher, was a Dutch graphic artist known for his often mathematically inspired woodcuts, lithographs and mezzotints. Although Escher did not have mathematical training—his understanding of mathematics was largely visual and intuitive—his art had a strong mathematical component, and his pieces were filled with symmetrical forms perfectly complementing each other.

Link: "Escher-style" coloring pages



TANGLE OF TRIANGLES

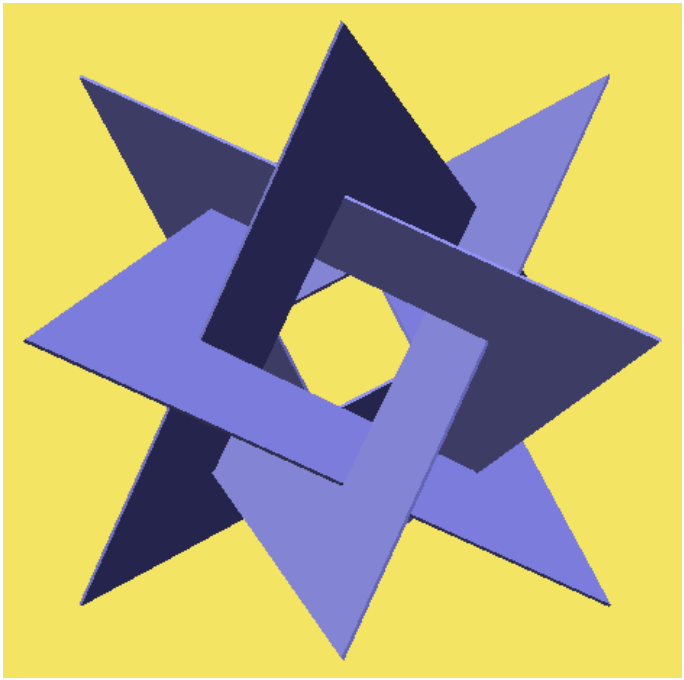
Cadette/Senior/Ambassador:

Tangle of Triangles Activity

A geometric model of paper can become a work of sculpture art! We will take four equilateral (same-sized), hollow triangles and interlink them together to make an orderly tangle. It is quite simple yet very difficult at the same time. This puzzle allows you to learn spatial reasoning as well as persistent problem solving. It is artful geometry!

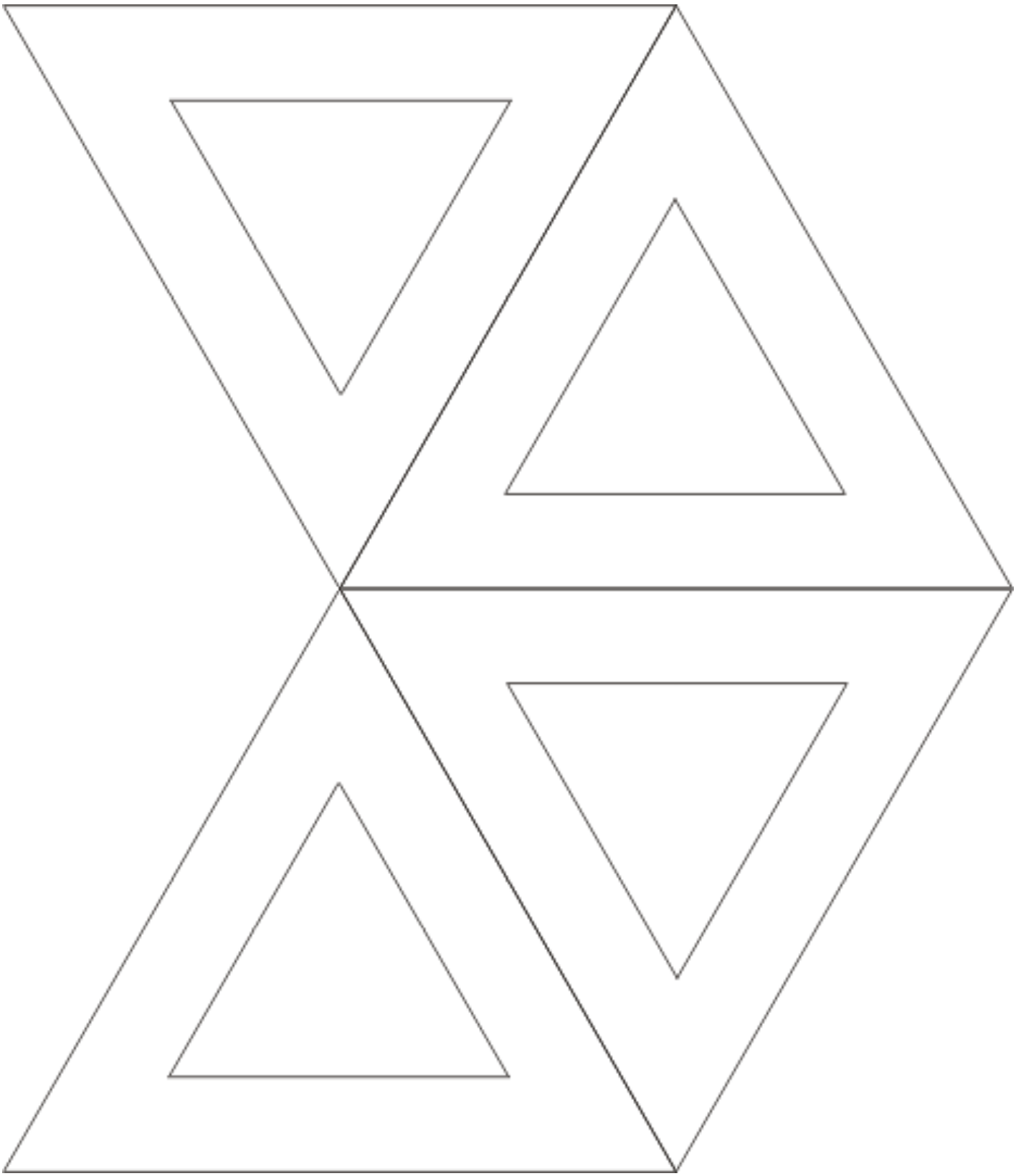
Materials:

- Paper, cardstock or some sort of thicker/heavier paper
- Template (included on next page, or additional templates here)
- Clear tape
- Scissors or X-Acto knife

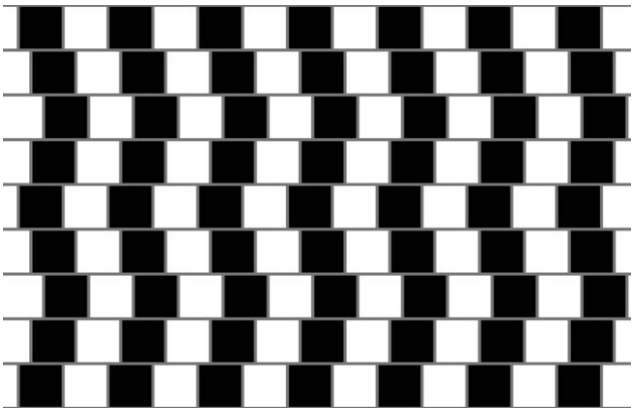


Steps:

1. Print the template onto cardstock
2. Color/decorate the triangles
3. Cut out triangles & their holes (it will also be necessary to slit "open" one or two triangles to fasten them together – use the tape to seal them after
4. Going one at a time, assemble the triangles together so they match the figures on the right – you may need to bend the papers as you go. The edge of each triangle should be nested in the "V" of another triangle when you are finished.
5. Use help if you need extra hands.
6. Tape any slits in the triangles to create your finished product.

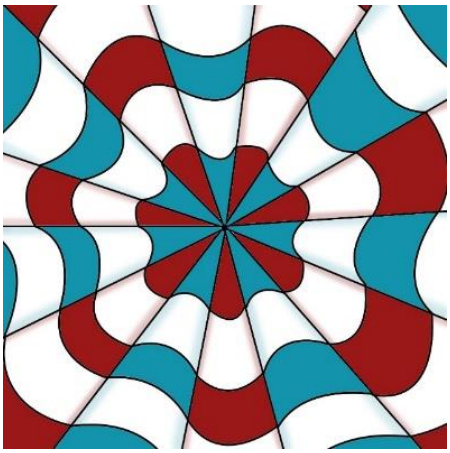


OPTICAL ILLUSIONS



Do you like to draw? How about combining math into your artwork—drawing various shapes on paper can create a beautiful optical illusion. For example, in the image on the left, the horizontal lines appear to be bent, but are actually perfectly parallel!

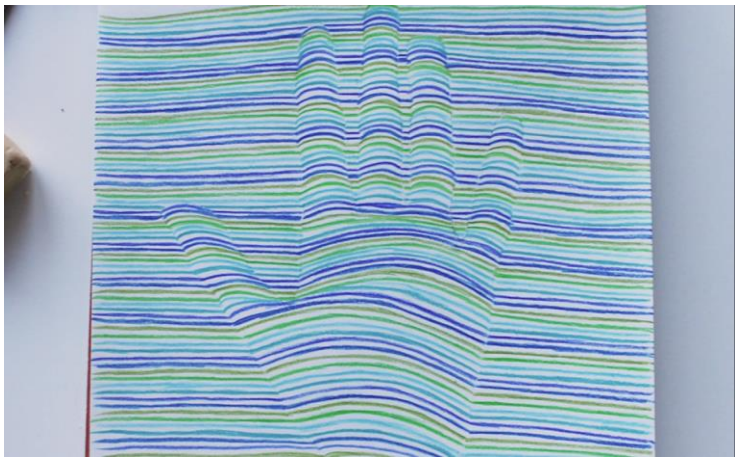
Draw your own Optical Illusion:



The image on the right is just smiley faces and frowny faces drawn and then colored in. Using complimentary colors creates a 3D effect.

How To:

1. Draw a dot at the center of your page.
2. Draw 6 straight lines through the center of the dot.
3. Draw "happy face" curved lines in every other cone-shaped section.
4. Then, color in every other section with marker, alternating one colored, one blank. Use a pencil to shade along the edges of the blank sections.
5. Next, draw "sad face" curved lines in the remaining cone-shaped sections.
6. Color in these sections with marker, alternating one colored, one blank, using a complimentary color to the first. Use a pencil to shade the blank edges.



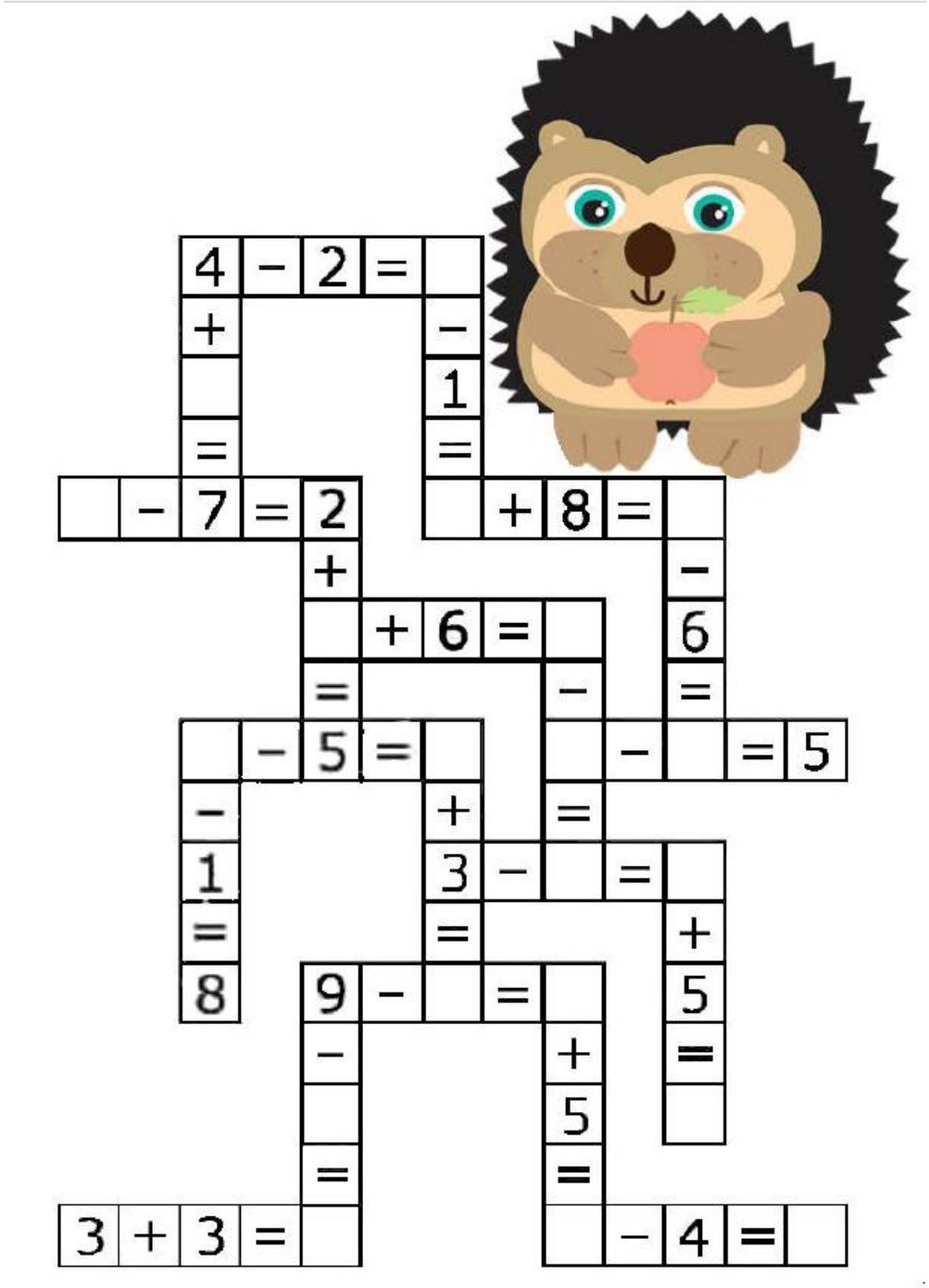
More Optical Illusions:

Use straight lines for the background and slightly curved lines for the outline of your hand to create this optical illusion! More details here.

Draw a 3D Ladder
Draw 16 Optical Illusions

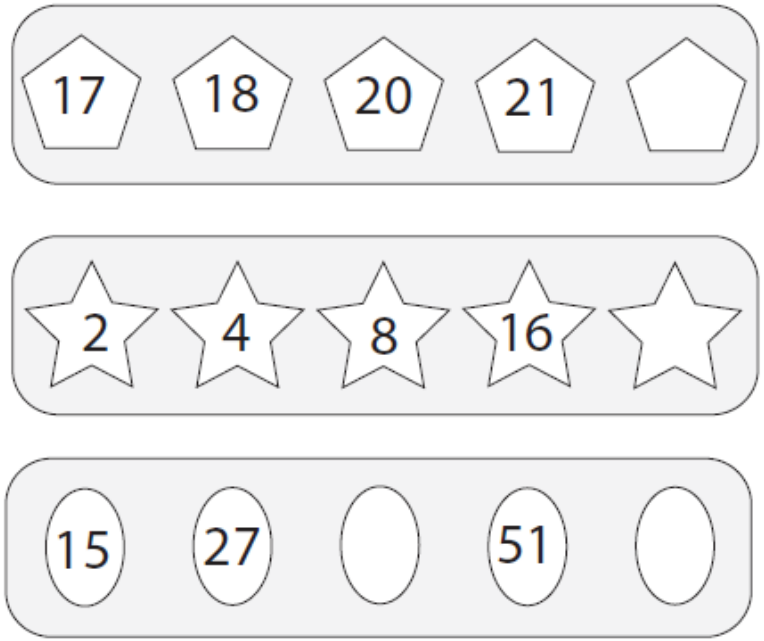
MATH PUZZLES

Math puzzles can be so much fun! These activities are just simple number games. Try your hand and see if you can be a puzzle-solver!



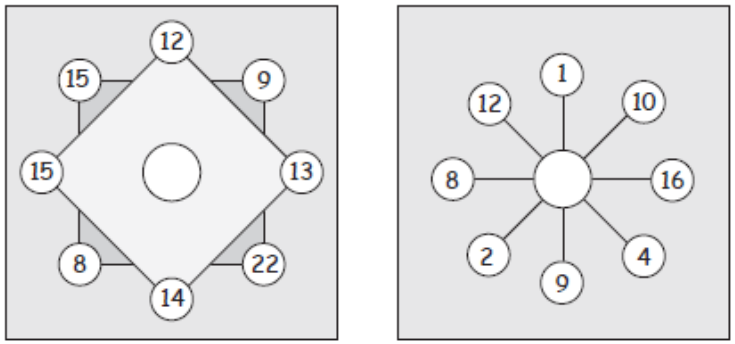
Mixed patterns!

Each row follows a different rule. Fill in the blanks.



Find the pattern!

The numbers in each square follow a pattern. Try to figure out which number comes in in the middle. For the first square, analyze the square and the diamond.



Square Mania!

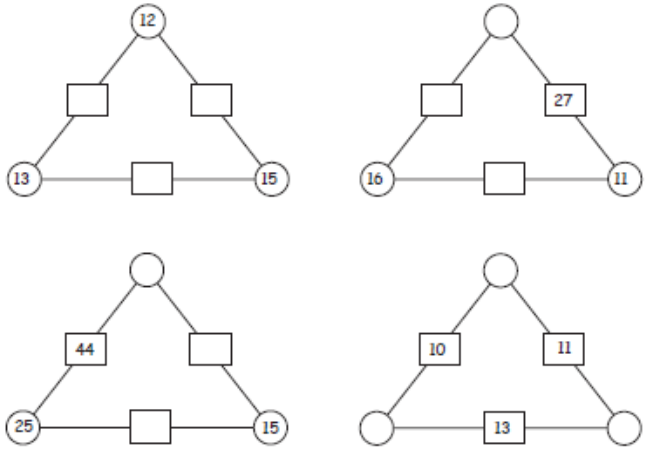
Fill in the blank so that all equations are correct.

6	+		=	14
+		+		+
	+	9	=	16
=		=		=
13	+		=	

20	-	12	=	
+		+		+
25	-		=	13
=		=		=
	-		=	

Triangle magic!

For each triangle the 2 numbers in the circles add up to the number in the rectangle between them! Fill in the blanks.



Answer key on last page

2	9	6	8	6	~~0~~	~~2~~	~~1~~	~~9~~	~~7~~	8	7	3	1	3
2	4	0	3	0	1	5	9	5	9	4	9	6	5	0
1	1	5	2	8	3	6	7	0	5	6	4	4	7	6
5	7	2	4	2	2	6	5	2	7	6	9	1	2	7
0	9	1	6	1	0	5	7	2	5	0	8	6	3	4
2	7	3	5	4	0	3	6	9	1	3	2	2	4	7
9	5	2	5	2	6	0	9	6	9	4	8	9	3	1
4	3	9	6	7	1	4	2	7	4	7	4	8	7	5
8	5	9	8	5	3	7	5	6	9	2	5	3	2	0
3	6	7	1	9	4	2	3	5	0	7	2	7	6	9
1	1	8	6	0	6	7	0	7	3	8	6	8	3	1
8	1	4	6	7	2	2	6	8	1	5	5	3	5	7
4	3	8	9	1	4	6	7	1	3	4	8	9	2	5
9	2	0	5	9	1	3	0	8	6	1	6	4	7	0
4	8	9	8	6	7	2	1	3	0	6	0	6	6	8

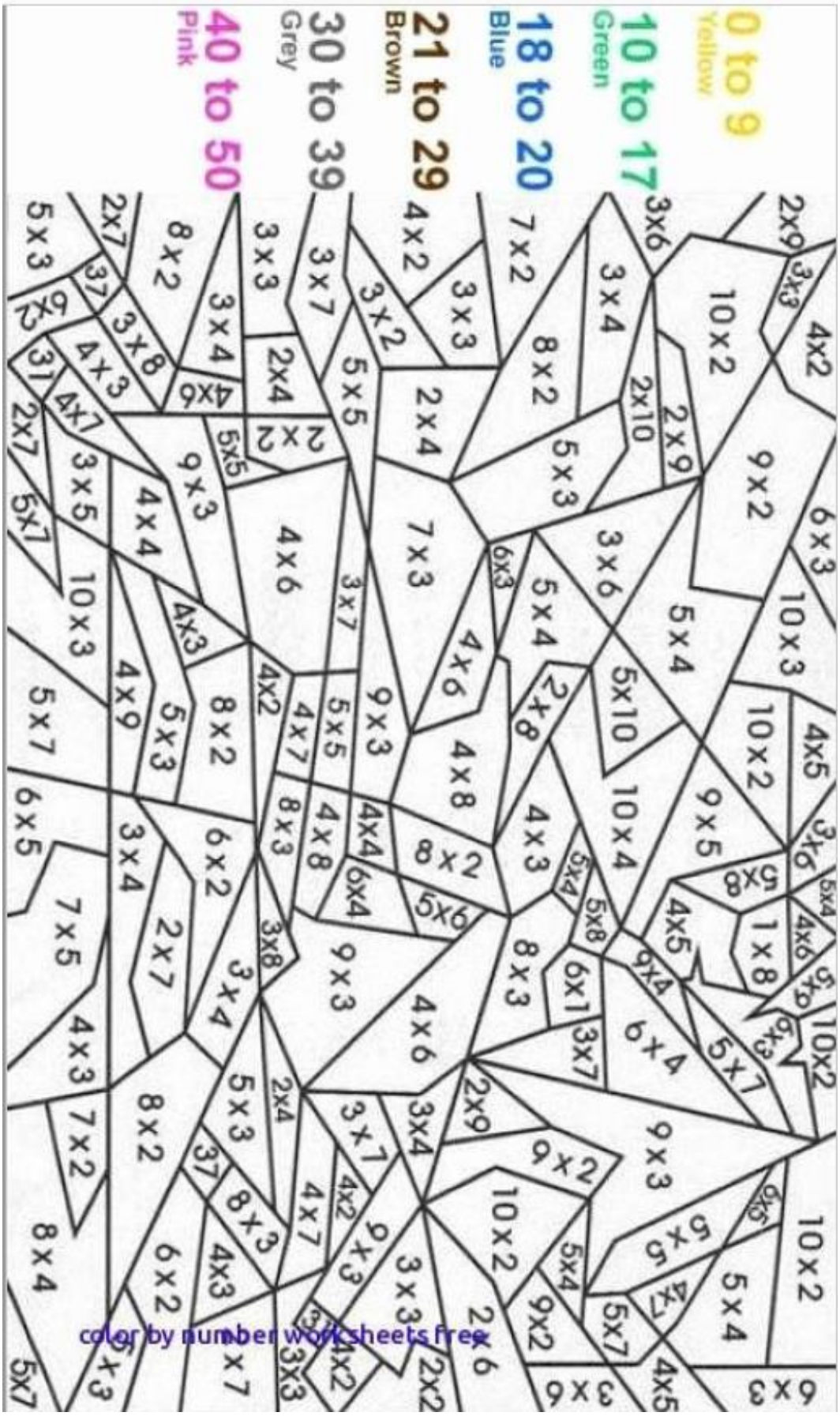
~~02197~~	57242	086164	501619
10627	62548	138492	654761
21306	73540	201939	763825
35490	74715	343275	805719
41737	80976	420597	934693
53882	95103	452736	958062

Free Math sheets, Math games and Math help
MATH-SALAMANDERS.COM

Number Search

Color by Numbers!

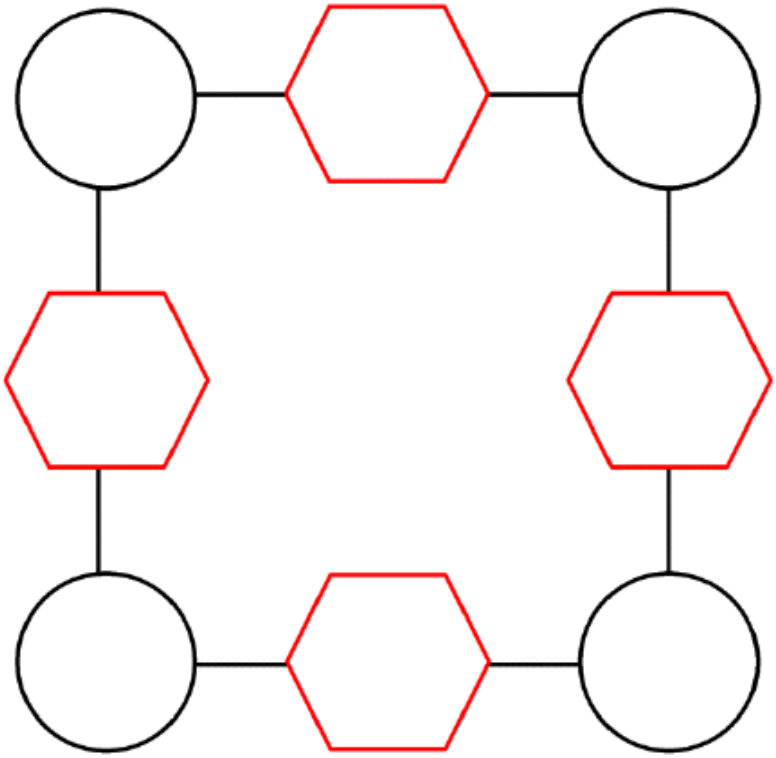
Complete the math problems and & then color spaces in based on the key to the left.



Quadra's Addition Circle

(there are multiple possible solutions to this puzzle)

Write the digits 1, 2, 3, 4, 5, 6, 7 and 8 so that the numbers in the hexagon are equal to the two numbers in the circles added together either side.



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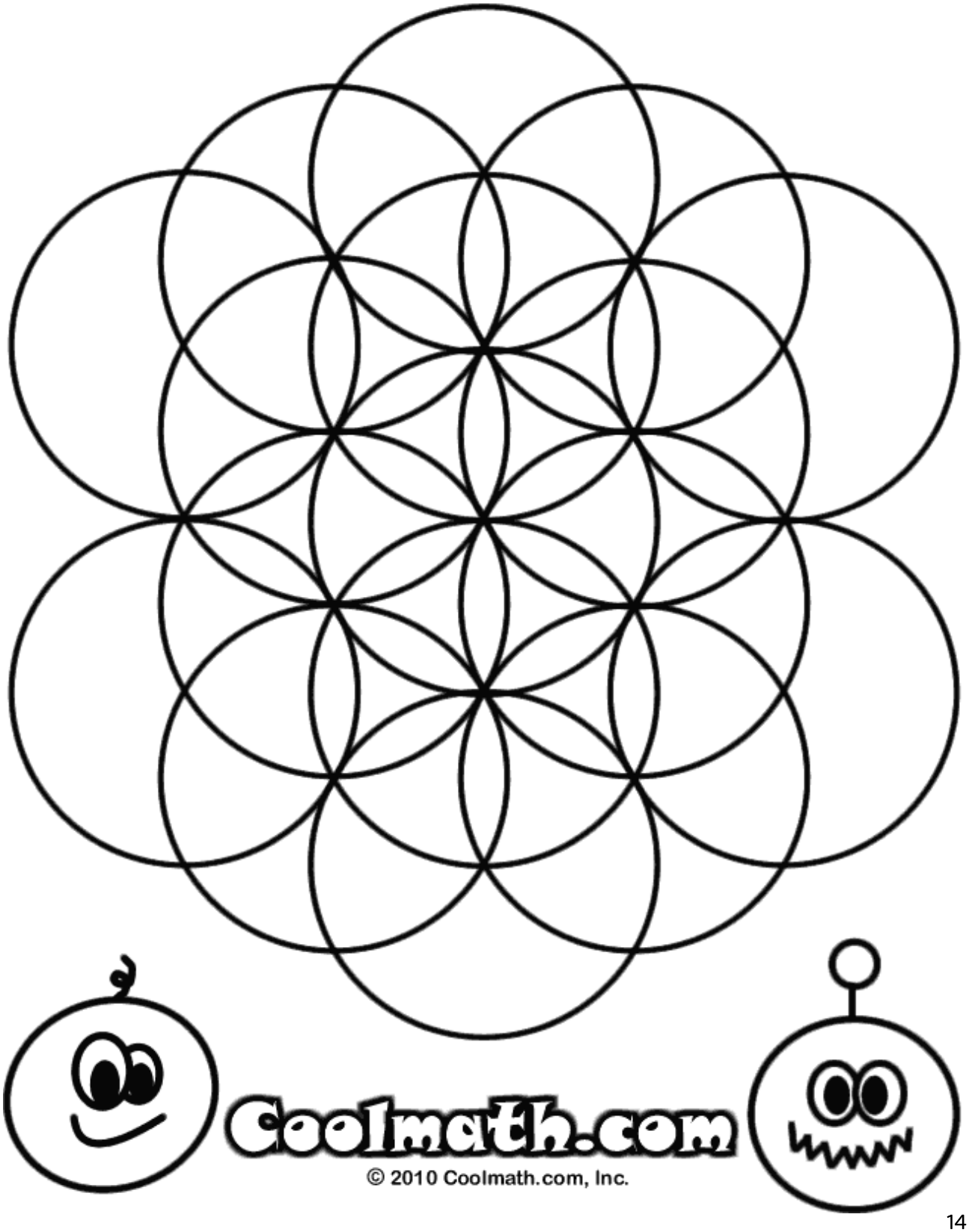
Coloring Page



LINKS

Women in Stem Coloring Book
www.girlscouts.org/en/girl-scouts-at-home/activities-for-girls/stem/coloring-book-activity.html

LEGO Tessellation
https://littlebinsforlittlehands.com/lego-tessellation-activity-kids-steam/

M.C. Escher Tessellation
https://youtu.be/Ca5J_moee7U
http://print.krokotak.com/q?q=escher

Tangle of Triangles
https://www.georgehart.com/orderly-tangles-workshop/paper-polylinks.html

Optical Illusions
https://www.rundesroom.com/2011/09/optical-illusions-in-art-class.html
www.mybluprint.com/project/its-alive-the-mind-bending-3d-optical-illusion-anyone-can-draw
https://youtu.be/OAq2X-0FbGM
https://youtu.be/mSMszev7jQU

Answers to Page 10 Puzzles: