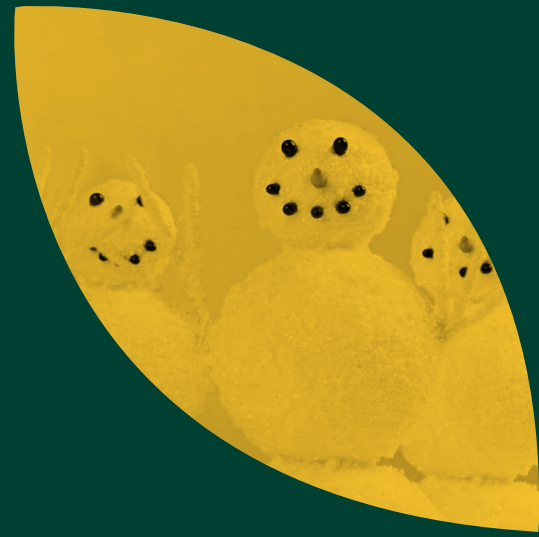




HOLIDAY ACTIVITY

GUIDE

Bring 4-H to your home this holiday season with 5 fun, hands-on activities!



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/

FOAMING FROSTY

SNOWMAN

Build snowy critters with baking soda, then dissolve them and watch them bubble away.



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





FOAMING FROSTY SNOWMAN

Build snowy critters with baking soda, then dissolve them down and watch them bubble away.

About the Activity

Be a chemist with household items to form mini snow creatures, then fizz them all away into a bubbly goo.

Supplies



Baking soda



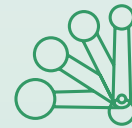
Vinegar



Liquid dish soap



Measuring cup



Tablespoon and teaspoon measuring spoons



Two mixing bowls



Sticky notes



A pen or pencil



Small plastic beads for decorating *(optional)*

Grades: 4-8

Topics: Chemistry, STEM

Time: 45 minutes





ACTIVITY STEPS

Even if you don't have snow on the ground, you can follow these steps to create a pair of snowy creatures in your kitchen!

1. Measure one cup of baking soda into each bowl.



Did You Know?

Baking soda, known to scientists as sodium bicarbonate, is a base. **Bases** are substances that, when placed in a watery solution, are slippery to the touch. Bases are often used in cleaning products, like soap and toothpaste.

2. Add three tablespoons of water to each bowl. This will create a baking soda dough that you can form.

3. Pour one teaspoon of dish soap **into just one of the bowls**. Using a sticky note, label the bowl that contains the soap, so you can keep track of it.



4. Mix together the baking soda doughs in each bowl. If they aren't holding together, you may need to add more water. Add just a few drops of water at a time, so you don't add too much!
5. Form your dough balls into a figure of your choice: a snowperson, a snow dog, or a snow cat – it's up to you! Then, add some decorations: beads, buttons, or googly eyes! Place your formed figures back into their bowls, keeping track of which figure contains soap.



Activity Steps Continued...

6. Once you've admired your creation (and shared a picture with us using [#4HHomefortheHolidays](#) on social media), it's time to destroy it!
7. Pour a cup of vinegar over the snow figure **made without soap**. What happens?
8. Now, refill the measuring cup with vinegar and pour it over the snow figure **made with soap**. What happens with this snow figure?

Did You Know?

Vinegar is a type of acid, called an acetic acid. **Acids** are substances that occur all around us – in citrus fruits like lemons and oranges, or even in our bodies!

Fun Fact

Combining baking soda and vinegar creates a chemical reaction: baking soda as the base neutralizes the acid in vinegar. The reaction releases carbon dioxide gas (the same gas that we breathe out of our bodies when we exhale), which makes it bubble and expand.



Bonus Activity

Got any leftover candy canes from the holidays? Using baking soda and vinegar, you can make them dance! Crush your candy canes and put them into a vinegar and water mixture in a tall, clear glass. Add a bit of baking soda and watch the candy canes go! You can experiment with the amount of candy canes, the strength of your vinegar and water mixture, and how much baking soda you add.





TEST YOUR KNOWLEDGE

See how much you've learned about the chemistry of fizzy snowmen!

- Which ingredient didn't contribute to the fizzy reaction in this activity?
 - Baking soda
 - Vinegar
 - Water
- Which is an example of an acid you might find in your home?
 - Water
 - Lemon juice
 - Soap
- What causes the bubbles in the reactions you observed today?
 - Carbon dioxide
 - Hydrogen peroxide
 - Sodium carbonate
- Which of these pairs might cause a fizzy reaction when combined?
 - Baking soda and dish soap
 - Baking soda and lime juice
 - Baking soda and chewing gum
- Soap is a base.
 - True
 - False

REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

- Did the two doughs feel similar or different?
- Did the mixture with the dish soap react differently to the vinegar than the one without? Why do you think it reacted that way?
- If you have any lumps remaining in your containers, what happens when you pour water over them? If you hold some of the residue in your hand over a bowl and pour more vinegar over it, how does it feel?



INVESTIGATE AND **EXPLORE**

Acids like vinegar and bases like baking soda are chemical opposites.

They each have different parts that can form water, or H₂O. In doing so, they release carbon dioxide, which makes the bubbly result you observed. When the dough containing the dish soap produced a foamy result, you witnessed surfactants at work. **Surfactants**, or surface-active agents, lower the surface tension of liquid so that bubbles don't burst as easily as they would if there were no soap. In this activity, when the soap spreads out over the liquid (vinegar), the gas being released from the acid-base chemical reaction becomes trapped as air bubbles and produces foam.



Share It!

If you're going to see some younger family members this holiday season, you could share this activity with them! A younger person could learn a lot from you about science, and they would be excited to do something fun with you.





CAREER CONNECTIONS

Meet Sarah, a police chemist from South Carolina! She uses her chemistry knowledge to help detectives solve crimes, but before that, she was a youth with a spark for chemistry!

She became interested in chemistry when she was a junior in high school. For the first time, a subject in school clicked with her and made sense. Because of her good grades and enthusiasm, she was selected to take organic chemistry in high school and continued to learn and grow! As her knowledge and her spark grew, she decided to study organic chemistry in college.

She loves that there is always more to discover in the field of chemistry. Whether it is research or new technology, science is constantly changing, and new things are being discovered daily! Maybe you'll make the next big chemistry discovery!





STAMPED

GIFT WRAP

Use stamps to create personalized gift wrap with a kind holiday message.



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STAMPED GIFT WRAP

Use stamps to create personalized gift wrap with a kind holiday message.

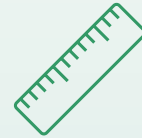
About the Activity

This fun activity uses multiple art techniques and math concepts to teach children how they can create their own personalized wrapping paper.

Supplies



Pencil



Ruler



Tape



Acrylic paint
(DecoArt Dazzling
Metallics Acrylic Paint in
Champagne Gold, 2 oz.)



Holiday rubber stamp
(Hero Arts Wood Mounted
Rubber Stamp Snowflake,
about 4 in.)



Paint roller
(Speedball Soft Rubber
Brayer, 2 in.)



Styrofoam plate



Scissors



Easel paper

Grades: Pre K-12

Topics: Creative Arts, Math

Time: 1-2 hours





ACTIVITY STEPS

Adding a personalized touch to a gift makes it extra special. With just a few simple materials, you will be able to create your own wrapping paper using rubber stamps.

1. Roll out the desired amount of paper onto a large, flat surface.
2. Tape the paper to the surface.
3. Using the ruler, draw a faint pencil line $7\frac{1}{2}$ inches down from the edge of the paper.

Did You Know?

A ruler measures length. You may sometimes hear people call a ruler a rule, scale, or line gauge.

4. On the line, locate points every 4 inches. Indicate by a dash on the horizontal line. This is the width of the wood on the back of most stamps. If your stamp is a different size, you'll want to locate and mark points the same width of the wood on your stamp.



Did You Know?

The term **horizontal** refers to a line that runs left to right, whereas the term **vertical** refers to a line that runs up and down.

5. Squeeze a line of gold paint onto the styrofoam plate.
6. Roll the paint roller into the paint to equally distribute the paint onto the roller.

Did You Know?

A **brayer** is used to thinly apply ink or paint to a surface. You can make your own brayer at home by wrapping a paper towel tube with plastic wrap!



Activity Steps Continued...

- Using the roller, apply a thin, even coat of paint to the raised sections of the stamp.



- Holding the stamp on the curved sides of the wood backing, carefully line up the top edge of the wood with the pencil line.
- Press down firmly without rocking.
- Continue applying the stamp down the length of the paper, using the pencil line as the guide for the top edge of the stamp.

Did You Know?

The oldest use of stamps didn't involve ink at all. Instead, people would press the stamps into wax to create a seal for important letters. Each stamp, or seal, was different and indicated who was sending the letter.

- For the most solid application of the stamp, use the roller to reapply paint between each press.
- When the desired pattern is complete, allow the paint to dry.
- Wash the stamp with warm, soapy water.
- Erase the pencil line from the paper.

Did You Know?

The Hall brothers, creators of the Hallmark Cards, Inc., invented modern-day gift wrap.





TEST YOUR KNOWLEDGE

See how much you've learned about making custom gift wrap!

1. A brayer is used to apply paint to a surface
 - a) Thinly
 - b) Horizontally
 - c) Quickly
2. A ruler can also be called...
(Select all that apply.)
 - a) Rule
 - b) Line gauge
 - c) Scale
3. Horizontal refers to a line that runs
 - a) Up and down
 - b) Back and forth
 - c) Left and right
4. Paint should be applied to the stamp...
 - a) Without rocking
 - b) Thickly
 - c) With a paint brush
5. The oldest use of stamps involved stamps and
 - a) Ink
 - b) Wax
 - c) Paint

REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

1. Today you used a ruler to create wrapping paper. What other kinds of art could you create using a ruler?
2. Why do you think a brayer was used to apply the paint to the stamp instead of dipping the stamp directly into the paint?
3. What are some things, other than stamps, you could use to create wrapping paper at home?
4. What other uses could your wrapping paper have besides being used to wrap a present?



INVESTIGATE AND **EXPLORE**

Take your new skills to the next level.

Search 'gift wrap ideas' and 'gift wrap art' to discover all of the fun and interesting ways you can use gift wrap to create beautiful and personalized works of art. Experiment with a brayer, brushes, and sponges to see how adding different textures and patterns create new and interesting designs. Use your skills with a ruler to measure the perfect place to hang your artwork.



Share It!

Don't stop today! Get creative and make your own wrapping paper using other decorations. Next time it's time to give a gift, tell the person receiving the gift why you created that specific design just for them. Adding a personalized touch to a gift will make receiving it that much more delightful. Teach others— a parent, babysitter, or younger sibling—how to make their own gift wrap.





CAREER CONNECTIONS

Julia is an artist who uses a special material called linoleum and X-acto knives to carve her own custom rubber stamps! She always loved drawing, and is always looking for ways to try new ways of making art. When she found out she could make stamps at home, she simply had to give it a try! Julia loves that stamp-making makes her art repeatable on lots of different types of surfaces.

Art is Julia's favorite way to express herself and communicate with others. Right now, Julia sells her art in an online store. She uses the extra money from selling her art to try even more new ways to create amazing art. Julia hopes to be able to sell her art in person soon and see what people like the most about what she makes.





STEM BINARY CODE

ORNAMENTS

Use binary code, art supplies, and your creativity to make a binary code holiday ornament!



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





STEM BINARY CODE ORNAMENTS

Use binary code, art supplies, and your creativity to make a binary code holiday ornament!

About the Activity

In this activity, you'll code without a computer, learn about the binary alphabet, and craft a simple ornament all in one great holiday STEM project.

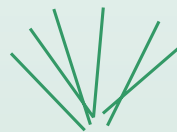
Supplies



Red, green, and white pony beads



Small pieces of fabric to use as a backing on the ornament (*optional*)



Red, green, and white pipe cleaners



White glue



Scissors



½ inch ribbon



Grades: 3-5, 6-8

Topics: Career Exploration, Creative Arts, Emotional Wellness, History

Time: 30 minutes



ACTIVITY STEPS

Combine coding and creativity by making your own binary alphabet ornament!

1. Read the binary alphabet below. You can also download and print it for quick reference!

BINARY CODE ALPHABET REFERENCE	
A 00001	N 01110
B 00010	O 01111
C 00011	P 10000
D 00100	Q 10001
E 00101	R 10010
F 00110	S 10011
G 00111	T 10100
H 01000	U 10101
I 01001	V 10110
J 01010	W 10111
K 01011	X 11000
L 01100	Y 11001
M 01101	Z 11010

Did You Know?

At the most basic level, computers use something called binary code to understand what humans want it to do. It is made up of zeros and ones. The zero represents "signal off" and the one represents "signal on." Different arrangements of these zeros and ones mean different things. In this activity, you'll use binary language for letters of the alphabet to write a word, just like a computer would!

2. Now, use the binary alphabet to write a word.

Here's an example:

The word "CLOVER" would look like this!

C	L	O	V	E	R
00011	0100	0111	10110	00101	10010

This may seem challenging, but keep working at it, and you'll get it! It may be helpful to fill out a table like the one below to help you match the binary codes to each letter. Use as many columns as you need to get all your letters.

Letters									
Binary Code									



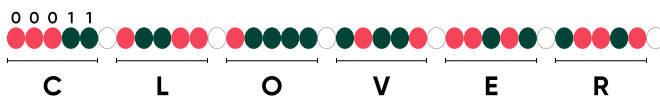
Activity Steps Continued...

3. Once you have chosen your word and matched each letter to its binary code, you will plan out your beads! For this activity, you'll use the colored beads to represent numbers, like this:

- Red beads = 0
- Green beads = 1
- White beads to separate out each letter

You'll probably want to use a word that is longer than 5 letters to make a reasonably-sized ornament.

A plan for the word "CLOVER" would look like this!



Did You Know?

Binary code uses a different number system than the one we use every day! The place value system we are used to seeing is a base ten system. That means it uses ten numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Binary uses a base two system. That means it only uses two numbers: 0 and 1!

Base Two Number	Value of Each Place Column	Base Ten Number
101	$4 + 0 + 1$	5
110	$4 + 2 + 0$	6
1001	$8 + 0 + 0 + 1$	9
11001	$16 + 8 + 0 + 0 + 1$	25
10111	$16 + 0 + 4 + 2 + 1$	23

4. Twist two pipe cleaners together to make one long piece.
5. Slide your beads onto the pipe cleaner, following the plan you made in Step 3. If you chose a long word, you may need to twist another pipe cleaner onto the end to give you more room for beads.

6. Twist the ends of the pipe cleaners together and make a holiday shape from your beaded pipe cleaner.
7. You can even finish off your binary code ornament by gluing some holiday fabric to the back of it! Let the glue dry, then trim the excess fabric.



8. Using ribbon, tie a bow at the top of your ornament so you can hang it up!

Did You Know?

The first ornaments used to decorate trees were things like paper flowers, cookies, fruits, and nuts! They were used to remind people that spring and life would come back to the Earth soon.





TEST YOUR KNOWLEDGE

See how much you've learned about binary code!

1. What do the zeros represent in binary code?
 - a) Signal on
 - b) Signal off
 - c) Go
2. How many numbers were in the binary codes for the letters?
 - a) Two
 - b) Ten
 - c) Five
3. What type of ornaments would you have found on early trees?
 - a) Glass ornaments
 - b) Candles
 - c) Fruits

REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

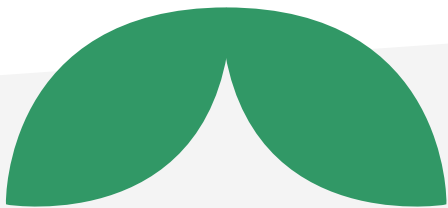
1. Many times, ornaments are hung on trees by people who celebrate Christmas, but not everyone celebrates Christmas during the holiday season. Could you find a friend or a community member who celebrates a different holiday and work together to create a binary code decoration for their home? If you don't celebrate Christmas, maybe you could create an ornament and give it to a friend who does!
2. Why do you think it was important to people long ago to be reminded that spring and life would return to the world after a cold winter?



INVESTIGATE AND EXPLORE

Did you enjoy learning about binary code and using it to create a word?

Take your binary learning to the next level by creating a binary code secret message! Find a friend or a family member and teach them what you learned today about binary code. Then, write a secret message to them in binary code and see if they can figure out what it says!



Share It!

Binary code may seem complicated, but anyone can learn it! Once you've mastered building your own binary code ornament, find a family member and create a binary code ornament together. You could even make a few binary code ornaments as gifts using the recipient's name!





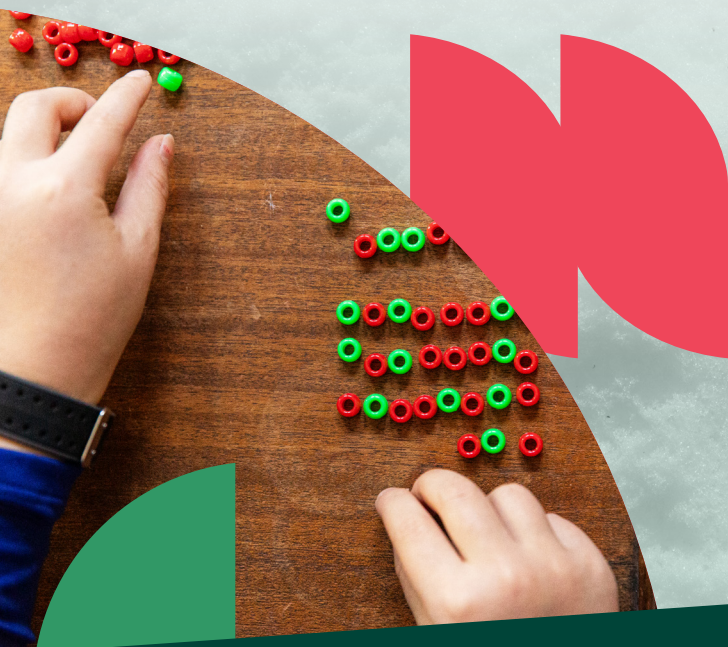
CAREER CONNECTIONS

Meet Jason, a computer programmer who uses binary code and other types of computer code to create computer programs that help people get the right medicine!

When Jason was younger, he loved to play video games, and he was curious to know how they worked. He found out that there is a lot of code behind video games, and he was interested to learn more!

When he graduated high school, he went to a technical school to learn more about how to program computers. Now, Jason works with computers to create the software pharmacies use to supply people with medicine. He uses a type of computer code called hexadecimal code to make computer programs. Hexadecimal code is a lot like binary code, but it uses fewer numbers.

Chances are, if you've ever gone with a parent or caregiver to pick up medicine at a pharmacy, the pharmacist was using the computer program Jason helped create!





TEA-LIGHT SNOWMEN

Light up a neighbor or friend's yard with these fun and decorative snowmen tea-lights!



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





TEA-LIGHT SNOWMEN

Light up a neighbor or friend's yard with these fun and decorative snowmen tea-lights!

About the Activity

This seasonal activity teaches children fine motor skills, hand-eye coordination, and lets them embrace the holiday spirit of giving.

Supplies



Battery-operated tea-lights



Black and orange permanent markers



Red ribbon
(for hat and scarf)



Black felt



Scissors



Glue gun

Grades: 3-8

Topics: Creative Arts, History

Time: 30 minutes





ACTIVITY STEPS

No snow is needed to make these snowmen! Decorate tea-lights to add a little light to your home and bring a smile to everyone's face with these adorable snowmen.

1. Using your black marker, draw coal eyes and mouth. Using your orange marker, color your tea-light's flame to make the carrot nose.



Did You Know?

Tea-lights were originally used in Japanese tea ceremonies. They served two functions – keeping the tea warm and measuring the passage of time.



2. Cut your snowman's top hat out of the black felt. Glue red ribbon on the hat for the band. Glue the hat onto your snowman's head. Make sure to always ask an adult for help when using the glue gun.





Activity Steps Continued...

Did You Know?

Felt can be made from a wide variety of materials, including wool, fur, and synthetic items.

3. Cut 8 inches of red ribbon for the scarf. Make a loop with the ribbon and glue the front pieces together to hold. Attach to your snowman.



4. Cut 12 inches of ribbon and tie the ends together. Attach to your snowman and hang up for all to see!



Did You Know?

Snowmen have entertained people for ages. Even the artist Michelangelo made one!





TEST YOUR KNOWLEDGE

See how much you've learned about tea-lights!

1. Tea-lights were first used in
 - a) Japan
 - b) China
 - c) Britain
2. This famous artist once famously made a snowman.
 - a) da Vinci
 - b) Michelangelo
 - c) Raphael
3. From which material can felt be made?
(Select all that apply.)
 - a) Wool
 - b) Fur
 - c) Synthetic material

REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

1. For this activity, you used brand new materials to create your snowman tea-light. Do you have any materials around your home that you could upcycle to create a snowman? Do you think it makes a difference if the snowman is made of upcycled or brand new materials?
2. What else could you decorate a tea-light to look like?
3. What other things could you turn into a snowman?



INVESTIGATE AND **EXPLORE**

Did you enjoy this activity? Why not make more snowmen!

Explore using different colors and materials to create unique snowmen. Remember to always ask an adult for help when using a glue gun.



Share It!

You can teach your entire family how to make these snowmen! Let everyone personalize their own snowman and then hang them on the tree or around the house as winter decorations! You can also make these to share. You or your class could make tea-light snowmen and give them to elder residents at a nursing or assisted living home. Ask the residents to share their memories of building a snowman with you.





CAREER CONNECTIONS

Felt is part of a larger art genre called fiber art or textile art. Although fiber art can be created to be viewed like other forms of art, it can also be used to create functional items, including items for the home, clothing, and medical equipment. If you are interested in learning more about careers in fiber art, reach out to a Textile Designer or Textile Scientist. In the meantime, explore all the ways in which you can use different fibers to create art and more!





NEW YEAR'S WISH **PILLOWS**

Craft a pillow to remind you of your wishes and dreams for the New Year.



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





NEW YEAR'S WISH PILLOWS

Craft a pillow to remind you of your wishes and dreams for the New Year.

About the Activity

In this activity, you'll set goals and make wishes for the upcoming year. Then, you will use your creativity to decorate a pillow and fill it with all your wishes!



Supplies



Piece of fabric
(about 12" x 12")



Paper and pen to
write with



Glue gun
(ask adult for help)



Markers or paint
(to decorate)



Scissors



Buttons, beads, sequins,
or anything else you
want to decorate your
pillow with!

Grades: 3-5, 6-8

Topics: Career Exploration, Creative Arts,
Emotional Wellness, History

Time: 30 minutes



ACTIVITY STEPS

Get creative and add some sparkle to your New Year by creating this wish pillow that you can keep all year long.

1. Fold your fabric in half so that there is an opening at the top. Using a glue gun with the help of an adult, glue the side and bottom into place. Be sure to leave the top open so you can stuff your wishes inside the pillow!

Did You Know?

Glue guns were originally used to bond soles onto shoes. Now they are an essential tool for most tradespeople and craft workers.

2. Using the scissors, cut the paper into strips. Make sure the strips are big enough to write on.
3. With your pen and paper, write out all your dreams and wishes for the New Year! Want to learn a new sport? Do better in school? Help friends more? Write it all down on strips of paper. Write as many wishes as you can think of!

Did You Know?

Studies have shown that you are 42% more likely to achieve your goals if you write them down!

4. Use the strips of paper to stuff your pillow. The more wishes and dreams, the better! When finished, use the glue gun to seal up the remaining seam.

Did You Know?

The first recording we have of people making New Year's resolutions comes from the ancient Babylonians. Part of their New Year festival included making promises to their gods.



5. Personalize! Decorate your wish pillow with paint, gems, glitter, or whatever your creativity desires!

Did You Know?

Sequins on clothing date back all the way to ancient Egypt! Solid gold discs were found sewn onto fabric inside King Tutankhamun's tomb.



TEST YOUR KNOWLEDGE

See how much you've learned about goal-setting!

1. How much more likely are you to achieve your goals if you write them down?
 - a) 27%
 - b) 42%
 - c) 74%
2. The use of sequins on garments dates back to:
 - a) Medieval Spain
 - b) Colonial America
 - c) Ancient Egypt
3. Glue guns were originally used in:
 - a) Building houses
 - b) Making shoes
 - c) Sealing water leaks
4. Who were the first people we know of to make New Year's resolutions?
 - a) Hewbrews
 - b) Chinese
 - c) Babylonians

REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

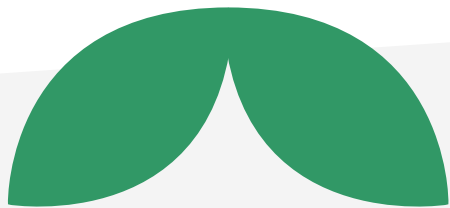
1. Why do you think people find it so hard to keep New Year's resolutions?
2. What could you do to help your friends keep theirs?
3. What are some things you can do throughout the year to remind yourself of your goals?



INVESTIGATE AND **EXPLORE**

Take your dreams further by writing action steps you can take to achieve each goal.

The more detailed that you are, the more likely it will be that you will reach your goals. Keep it going! "By keeping a journal, you can track your progress toward your goals and record the amazing experiences you have along the way!"



Share It!

You can encourage everyone in your family to make a wish pillow! Let them know all of the good things that come from writing down goals and help them come up with action steps to achieve theirs.

Make one of your goals to give back to the community. Many places need volunteers throughout the year. If volunteering is not available for you, commit to spending time with elderly family members and ask them about their most memorable New Year.





CAREER CONNECTIONS

Do you find the idea of setting goals and achieving them exciting? Do you want to help other people do that, as well? Consider careers in sports, coaching, teaching, and psychology. Talk to trusted adults in those fields and ask them what they love about their job. Be sure to find out what educational requirements you will need to meet and which things you can start doing now to prepare you for helping others achieve their goals.





COOKIE

SCIENCE

Make these tasty chocolate chip cookies, and see how food science makes them so delicious.



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





COOKIE SCIENCE

Make these tasty chocolate chip cookies, and see how food science makes them so delicious.

About the Activity

You'll discover how even the smallest changes to ingredients can make a major difference when it comes to baking.

Supplies



1 stick of butter, softened



1 cup of flour



½ packed brown sugar



½ tsp baking soda



1 cup chocolate chips



1 egg



½ cup white granulated sugar



1 tsp vanilla



1 cup quick-cooking rolled oats



Grades: 4-8

Topic: Cooking & Baking, STEM

Time: 30 minutes



ACTIVITY STEPS

By the end of this activity, you'll be able to bake your own batch of delicious cookies, but you'll also be able to identify the role key ingredients in cookie dough play in the final cookie. Then, you'll iterate upon a part of the cookie recipe to see how it impacts the final cookie.

The cookie recipe we're using is from Annie Fox from Tarpon Springs' Brooker Creek Explorers 4-H Club. Thanks, Annie!

1. Preheat the oven to 375°.



Did You Know?

For cookies to reach an attractive golden brown color, the minimum caramelization temperature is 356°.

2. Mix your softened butter with an electric mixer on medium for 30 seconds.



Did You Know?

Butter temperature makes a difference in your cookies' size and texture. Chunks of cold butter will produce a cakier cookie, while melted butter makes a chewier cookie with a larger diameter.



Activity Steps Continued...

3. Add the egg, flour, sugars, vanilla, and baking soda.



Did You Know?

You can use any size egg for most recipes that call for six eggs or less, like this one. The weight difference between egg sizes is only about $\frac{1}{4}$ ounce.

4. Beat the mixture on medium speed for two minutes. Scrape down the bowl with a flexible spatula as needed to incorporate all of the ingredients.



Did You Know?

Most recipes for chocolate chip cookies call for both granulated sugar and brown sugar, because each plays a role. Doughs with more granulated sugar will be more crisp, and doughs containing more brown sugar will be softer and chewier.

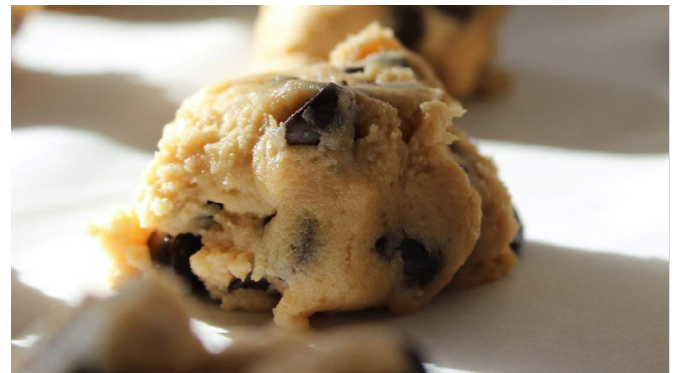
5. Fold the oats and chocolate chips into the batter until they are incorporated.



Did You Know?

You can substitute baking powder for the baking soda if you want a fluffier cookie – the carbon dioxide it releases puffs up the cookie.

6. Scoop out two tablespoons of dough onto cookie sheets lined with parchment paper, leaving about 2 inches between each mound of cookie dough.





Activity Steps Continued...

7. Turn on the oven light. Bake cookies for 8 to 10 minutes, or until lightly browned, peeking at them through the oven window after 1 minute.



8. Ask an adult for help to remove the hot cookie sheet from the oven. Protect your hand with an oven mitt or hotpad.



How did your cookies turn out? Baking can be hard to get right, so don't be discouraged if they aren't perfect. In the next section, you'll learn the role each ingredient plays in the final cookie. You might find a way to make your batch of cookies even better!

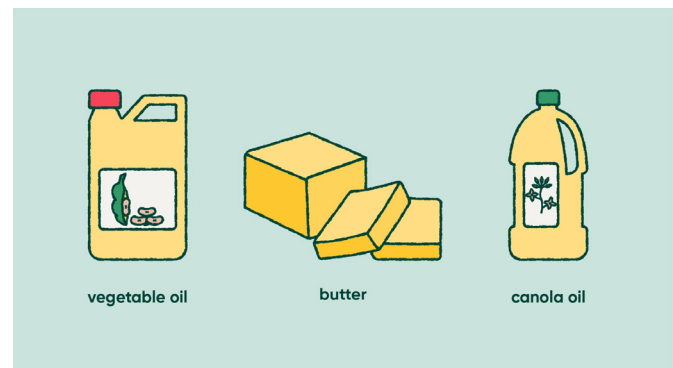
9. Learn about cookie science!

All throughout your cookie-making process in the last section, there was a lot of science going on! Each key component in a cookie recipe has its own role to play, and they interact with one another in different ways. Now you'll learn how butter, sugar, eggs, flour, and baking soda work together with heat to make the cookies we know and love!



The main ingredients in any cookie are fat, sugar, eggs, flour, and a leavening agent. In the recipe you used today, the fat was butter, and the leavening agent was baking soda, but there are other ways to incorporate fats and leavening agents in cookies!

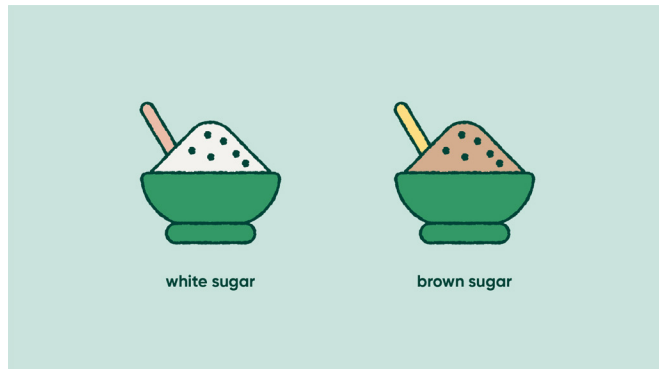
In a cookie recipe, fat can be a few different things. Vegetable oil, canola oil, and butter are all used to add flavor and smoothness to a cookie. Using butter makes the cookie fluffier and richer because it traps more air in the cake batter when it is beaten.





Activity Steps Continued...

Sugar adds sweetness to a cookie, but it does more than that! Sugar bonds to the water molecules in the cookie dough, making sure the cookie stays moist. The bond also gives the cookie its shape. Cookies with lots of brown sugar will be softer and chewier, while cookies with lots of white sugar will be more crisp.



Flour is the main ingredient in a cookie. Flour has gluten in it. That gluten catches the air bubbles from the leavening agent during rising.

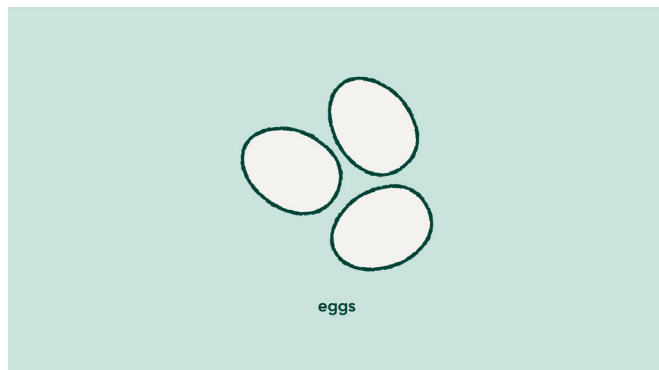


Cookies need a leavening agent. A leavening agent is anything used to make a dough rise. In your recipe, you used baking soda, but it is just one type of leavening agent. Baking powder is a combination of baking soda and cornstarch. It is an acid that releases air bubbles as the cookies bake.

Eggs have three jobs in cookie dough.

- They make sure all the other ingredients stick together.
- They help protect the moisture in the cookie.
- They help the cookie hold its shape.

When the egg is beaten, it coats the air bubbles and stops them from escaping. This is what makes fluffy pockets of air in cookies! The more you beat the eggs, the fluffier your final cookie will be!





Activity Steps Continued...

As you might guess, changing any of these ingredients changes how the final cookie looks and tastes!



Here's a quick summary of each ingredient and what it does for the cookie.

- **Fat** adds flavor and smoothness to a cookie.
- **Sugar** adds sweetness, moisture, and shape to cookies. White sugar makes cookies crispy, while brown sugar makes cookies chewy.
- **Eggs** help ingredients stick together, protecting the moisture and the shape of the cookie.
- The **leavening agent** makes the cookie dough rise.
- **Flour** helps to give cookies their shape.

Did You Know?

Iteration is the process of improving a product until it is the best it can be.

10. Make a new cookie recipe

You've learned a lot about baking and science, so now it is time to change up the recipe and make your own cookie! You'll take the original recipe, what you know about cookie ingredients, and your idea of the perfect cookie, and you'll make a new cookie! As a reminder, the original recipe is below.

It is now time to iterate upon a part of the cookie recipe to see how it impacts the cookie! Can you make the best cookie ever?

RECIPE CARD

COOK TIME 8-10 minutes

SERVINGS 4-6 people

INGREDIENTS

1 stick of softened butter
 1 cup of flour
 1/2 tsp baking soda
 1/2 cup packed brown sugar
 1/2 cup white granulated sugar
 1 cup chocolate chips
 1 egg
 1 tsp vanilla
 1 cup quick-cook rolled oats

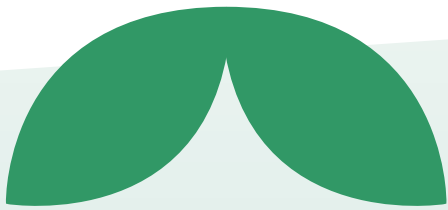
1. Preheat the oven to 375°.
2. Mix the softened butter using an electric mixer on medium for 30 seconds.
3. Add the egg, flour, sugars, vanilla, and baking soda.
4. Beat on medium speed for 2 minutes, scraping down the bowl as necessary.
5. Fold in oats and chocolate chips.
6. Scoop out two tablespoons of dough onto cookie sheets lined with parchment paper, leaving about 2 inches between each mound of cookie dough.
7. Bake the cookies for 8-10 minutes.



Activity Steps Continued...

Here's an example!

When Malik made his first batch of cookies, he wished they were chewier and fluffier. He knew that using more brown sugar than white sugar would make the cookies chewier, and he knew that if he beat his eggs longer, the resulting cookie should be fluffier! Malik altered the recipe to use $\frac{3}{4}$ cup of brown sugar and $\frac{1}{4}$ cup of white sugar, and he also beat the mixture for 3 minutes, instead of 2. Malik's second batch of cookies was much better than the first!



Bonus Activity

If you iterated upon your cookie design, you probably have a lot of leftover cookies! Take some of your extra cookies to people in the community who might enjoy one. You could even share your story of iterating upon the cookie and teach them what you learned today!

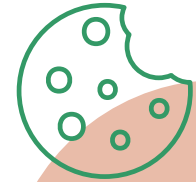




TEST YOUR KNOWLEDGE

See how much you've learned about cookie science!

1. Brown sugar makes cookies softer and chewier.
 - a) True
 - b) False
2. Which of these will not make a golden brown cookie?
 - a) Baking at 350 degrees
 - b) Baking at 360 degrees
 - c) Baking at 375 degrees
3. Baking powder makes cookies more puffy when it releases:
 - a) Hydrogen
 - b) Carbon dioxide
 - c) Oxygen
4. How can you make a chocolate chip cookie more crisp?
 - a) Baste cookie dough with melted butter
 - b) Use more white granulated sugar than brown sugar
 - c) Add more rolled oats
5. What size egg should you use with this recipe?
 - a) Jumbo
 - b) Medium
 - c) Any size will work



REFLECTION QUESTIONS • REFLECTION QUESTIONS • REFLECTION QUESTIONS

1. How did you feel about the way your first batch of cookies turned out? Baking may have been a new experience for you, and it is okay if your first batch wasn't exactly how you wanted it to be. With your new knowledge and some practice, your next batch of cookies will be even better!
2. Now that you've completed this activity, what's one goal you'd like to set? Maybe you really enjoyed baking and you'd like to get even better, or maybe you enjoyed learning about the science and you'd like to learn more! Could you set a goal to make a different type of a cookie? Maybe you're even ready to move on to more complex baking!
3. Why do you think that cookie dough, even though it is delicious, might not be good for your belly?



INVESTIGATE AND **EXPLORE**

The leavening agent in a cookie uses a chemical reaction to make the cookie rise. When this chemical reaction happens, air is released and bubbles are formed. If you'd like to see how this works on a large scale, you can search the internet for "NASA make a volcano." Have fun!

Take the two sugars, for example. Aside from the sweetening powers of both, white sugar contributes to cookie crispness when the cookies cool and harden and the sugar crystallizes. Brown sugar helps with a cookie's tenderness because it has molasses, and it has 35 percent more moisture than granulated. It's hygroscopic, meaning it easily absorbs moisture from its surroundings. Plus it contributes something else – even recipes for crisp chocolate chip cookies include brown sugar because it gives them that butterscotch flavor. Here's how butter temperature affects the cookie size: cold butter causes the cookies to spread slower as they bake, while dough with melted butter starts out more liquidy and spreads out faster. Butter temperature affects texture because of the air pockets left behind as it converts into gas – cold butter leaves bigger pockets for a cakier result, melted leaves more and smaller holes for a chewier result.



Share It!

If you iterated upon your cookie design, you probably have a lot of leftover cookies! Take some of your extra cookies to people in the community who might enjoy one. You could even share your story of iterating upon the cookie and teach them what you learned today!





CAREER CONNECTIONS

Though a lot of people enjoy baking as a hobby, it is an exciting career field full of chemistry, math, and creativity! If this was something you enjoyed, you can practice baking at home to develop your skills and experiment with various recipes. When you finish high school, consider enrolling in a culinary school or a baking program to gain formal training and learn the science behind baking.



4-H *at*
HOME



Holiday Cookie Making



Explore over 20 cookie recipes from 4-H'ers to add some sweetness to your holiday traditions.

To discover a wide selection of 4-H activities and experiences, visit 4-H.org/4HatHome



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No Bake Cookies 24

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▶ Possible allergens in this recipe include butter, egg, flour, oats, chocolate chips. See Glossary for substitutions.



Chocolate Chip Oatmeal Cookies

Annie Fox, Tarpon Springs, FL
Brooker Creek Explorers 4-H Club

Prep: 15 minutes

Bake: 10 minutes

"Cookies are a fun part of our family! Our club has hosted a Creative Contest each January, which has allowed our son and daughters to learn the art of cookie baking. In October, we also make cookies for local law enforcement officers and K-9s as a way of saying "Thank you for your service!" We made these cookies for our recent county 4-H awards banquet."

Ingredients

1 stick of butter, softened	1 tsp vanilla
1 egg	½ tsp baking soda
1 cup flour	1 cup quick-cooking rolled oats
½ cup sugar	1 cup chocolate chips
½ packed brown sugar	

Directions

1. Preheat oven to 375°.
2. Mix butter in electric mixer on medium for 30 seconds.
3. Add egg, flour, sugar, brown sugar, vanilla, and baking soda.
4. Beat on medium speed for 2 minutes. Scrape down as needed.
5. Add oats and chocolate chips and mix until blended.
6. Place by tablespoons on cookie sheets lined with parchment paper, leaving about 2 inches between cookies.
7. Bake cookies for 8 to 10 minutes or until lightly browned.



Mallory's Magnificent Chip Cookies

Mallory Hall, Johnson County Missouri 4-H
Royal Clover's 4-H Club

Prep: 15 minutes
Bake: 10 minutes

Ingredients

- 1 cup margarine, softened
- 1 cup shortening
- 1 ½ cup granulated sugar
- 1 ½ cup packed brown sugar
- 2 eggs
- 4 ½ cups flour
- 2 tsp baking soda
- 1 tsp salt
- 4 cups chips (either chocolate, white chocolate or butterscotch)
- 2 cup nuts, if desired (cashew, pecan, walnut)

Directions

1. Preheat oven to 375°.
2. In large mixing bowl, beat softened margarine and shortening with granulated and brown sugars on medium speed until fluffy, scraping side of bowl occasionally.
3. Beat in eggs until smooth.
4. Stir in flour, baking soda and salt until blended (dough will be stiff).
5. Stir in chips and nuts.
6. Put mixture in refrigerator overnight (my preferred way but not necessary).
7. Onto ungreased cookie sheet, drop dough by rounded tablespoonfuls 2 inches apart.
8. Bake for 10 minutes or until light brown (center will be soft).
9. Cool 1 minute; remove from cookie sheet to cooling rack.
10. Cool completely.
11. Store covered in airtight container.



The Best Chewy Chocolate Chip Cookies

Sarah Camp - Lawrence County, Tennessee

Bake: 15 minutes

Ingredients

½ cup granulated sugar
¾ cup brown sugar, packed
1 tsp salt
½ cup unsalted butter, melted
1 egg
1 tsp vanilla extract
1 ¼ cup all-purpose flour
½ tsp baking soda
4 oz milk or semi-sweet chocolate chunks
4 oz dark chocolate chunk, or your preference

Directions

1. Preheat oven to 350°. Line a baking sheet with parchment paper.
2. In a large bowl, whisk together the sugars, salt, and melted butter until a paste forms with no lumps.
3. Whisk in egg and vanilla, beating until light ribbons fall off the whisk and remain for a short while before falling back into the mixture.
4. Sift in the flour and the baking powder, then fold the mixture with a spatula. (Be careful to not overmix, which would cause the gluten in the flour to toughen resulting in caliber cookies.)
5. Fold in the chocolate chunks and refrigerate for at least 30 minutes. If you leave in the fridge longer, the Flavor becomes more intense.
6. Scoop the dough with an ice cream scoop onto a parchment paper-lined baking sheet leaving at least four inches in between the cookies and two inches from the side of the pan.
7. Bake for 12-15 minutes or until the edges have barely started to brown.
8. Cool completely before serving.



Peanut-Butter Chocolate Chip Cookies

Olivia Miller
Indiana Penn Townships, 4-H Club

Bake Time: 12 minutes

Ingredients

- 1 cup white sugar
- 1 cup brown sugar
- 1 ½ tsp vanilla
- 2 eggs
- 1 cup
- 1 cup butter*
- 2 ½ cups flour
- ½ bag chocolate chips
- 1 ½ tsp soda
- ½ tsp salt

*NOTE:

Substitute another nut butter such as Nutella provided you are not also tree nut sensitive.

Directions

1. In a large bowl mix butter, peanut butter, brown sugar and white sugar
2. Add in eggs and vanilla, then mix until well blended
3. In a separate bowl, sift flour, salt, and baking soda.
4. Combine dry and wet ingredients into the larger bowl, and then add in the chocolate chips
5. On a parchment lined baking sheet, scoop 2 Tbsp sized cookie dough balls onto sheet.
6. Chill 30 minutes.
7. Preheat oven to 350°
8. Bake cookies for 8-12 minutes, or until slightly brown on the bottom and the top just loses the wet cookie dough look.
9. Remove from oven and let cool for 5 minutes.



Grandma's Chocolate Chip Cookies

Cole Langhofer, Kansas, Plains Livewires



Prep: 10 minutes

Bake: 11 minutes

Ingredients

1 cup shortening	2 1/4 cups flour
1/2 cup sugar	1 tsp baking soda
1 cup brown sugar	1 tsp salt
1 tsp vanilla	1 cup chocolate chips
2 eggs	

Directions

1. Preheat oven to 375°.
2. In a large bowl, cream together shortening, sugars, and vanilla with mixer.
3. Stir in the chocolate chips and raisins.
4. Drop by heaping tablespoonfuls 2 inches apart onto ungreased baking sheets.
5. Bake for 9-11 minutes or until edges are firm.
6. Cool for 5 minutes; before removing to wire racks to cool completely.



The “Perfect” Chocolate Chip Cookies

Kate Yaughn

Prep: 15 minutes

Bake: 15 minutes

Ingredients

- 1 cup bread flour
- 3/4 cup all-purpose flour
- 1 tsp salt
- 1 tsp baking soda
- 2 sticks unsalted butter
- 1 cup dark brown sugar
- 1/2 cup white sugar
- 2 tsp vanilla extract
- 1 large egg
- 1 large egg yolk
- 1/2 cup semi-sweet mini chocolate chips
- 1/2 cup dark chocolate chips

Directions

1. Melt butter over medium heat. Bring it to a boil, while stirring frequently. Stir constantly, until butter is foamy, and a nice, nutty brown.
2. Pour into a glass measuring cup or bowl and refrigerate until cool/room temperature.
3. While the butter is cooling, mix together the flours, baking soda, and salt in a separate, medium-sized bowl.
4. In the large bowl of a stand mixer, cream together the cooled butter, sugars, and vanilla until fluffy.
5. Add the egg and egg yolk. Beat just until these are incorporated.
6. Add the dry ingredient mixture by the spoonful, making sure not to overload the mixer. It's okay if there's a little bit of flour left on the edge of the bowl. It'll get mixed in later.
7. Use a wooden or silicone spoon or spatula and fold in the chocolate chips, incorporating the rest of the flour from the edges of the bowl.
8. Scoop cookies onto a parchment-lined sheet and refrigerate overnight (you can get away with just 1 hour of refrigeration, but the flavor is much better if they're refrigerated overnight).
9. When you're ready to bake them, preheat the oven to 350°.
10. Bake for 12-15 minutes.
11. Let them cool for 8-10 minutes on the baking sheet before transferring to a wire cooling rack.



Good Gluten Free Chocolate Chip Cookies

Amanda Gifford & Paul Beaumier, Fairfax, Vermont
High Hopes 4-H Club

Prep: 10 minutes

Bake: 12 minutes/Batch

Ingredients

- *2 1/4 cups Gluten Free all-purpose flour (recommend King Arthur brand's Measure for Measure GF flour)*
- *1 tsp baking soda*
- *1 tsp salt*
- *1 cup (2 sticks) real dairy butter, softened (ideally straight from 4-H cows!)*
- *1/2 cup + 2 Tbsp granulated sugar*
- *1/2 cup + 2 Tbsp lightly packed brown sugar*
- *1 tsp vanilla extract*
- *2 large 4-H poultry project eggs whipped to soft peaks*
- *2 cups 60% bittersweet chocolate chips – good chips, made with real cocoa butter!*

Directions

1. Preheat oven to 375°.
2. Cream butter, sugars and vanilla in a large mixing bowl.
3. Whip the eggs to soft peaks.
4. After whipping the eggs, gently work them into the butter mixture.
5. Add dry ingredients (mixed in a separate bowl) gradually.
6. Stir in chocolate chips.
7. Drop by rounded Tbsp onto parchment lined baking sheets (be sure the sheets are cool), bake 12 or so minutes, slide parchment off baking sheet immediately after taking the pan out of the oven.
8. Eat an apple while allowing the cookies to cool so as not to burn your mouth taste testing!

GF baking is mostly alchemy, so it might be necessary to make a few batches to dial in your own oven and considerations for humidity, room temperature, etc.



▶ Possible allergens in this recipe include peanut butter and an egg. See Glossary for possible substitutions.



Gluten Free Peanut Butter Cookies

Elanor Hodgkin, 4-H Parent, Maine

Ingredients

- 1 cup peanut butter
- 1 cup sugar
- 1 egg
- 1 tsp vanilla

Prep: 10 minutes
Bake: 10 minutes/batch
Yield: 1-2 dozen

Directions

1. Preheat oven to 375°.
2. Mix ingredients together, roll into 1-2 inch balls, and flatten with a sugared fork.
3. Bake for 8-10 minutes or until golden brown.



Peanut-Butter Chocolate Chip Cookies

Olivia Miller, Indiana Penn Townships, 4-H Club

Bake: 12 minutes

Ingredients

- 1 cup white sugar
- 1 cup brown sugar
- 1 1/2 tsp vanilla
- 2 eggs
- 1 cup peanut butter
- 1 cup butter
- 2 1/2 cups flour
- 1/2 bag chocolate chips
- 1 1/2 tsp soda
- 1/2 tsp salt

Directions

1. In a large bowl mix butter, peanut butter, brown sugar and white sugar
2. Add in eggs and vanilla, then mix until well blended
3. In a separate bowl, sift flour, salt, and baking soda.
4. Combine dry and wet ingredients into the larger bowl, and then add in the chocolate chips
5. On a parchment lined baking sheet, scoop 2 Tbsp sized cookie dough balls onto sheet.
6. Chill 30 minutes.
7. Preheat oven to 350°
8. Bake cookies for 8-12 minutes, or until slightly brown on the bottom and the top just loses the wet cookie dough look.
9. Remove from oven and let cool for 5 minutes



Fairy Cookies

Sara Fox, Tarpon Springs, FL
Brooker Creek Explorers 4-H Club

"Cookies are a fun part of our family! Our club has hosted a Creative Contest each January, which has allowed our son and daughters to learn the art of cookie baking. In October, we also make cookies for local law enforcement officers and K-9s as a way of saying "Thank you for your service!" We made these cookies for our recent county 4-H awards banquet."

Ingredients

- 1 package chocolate cake mix (15 oz)
- 2 Tbsp instant pudding mix
- 1 stick unsalted butter melted
- 1 large egg
- 1/3 cup confectioner's sugar
- Sprinkles or sparkling sugar

Prep: 15 minutes

Bake: 12 minutes

Directions

1. Preheat oven to 350°
2. In a large bowl combine cake mix, pudding mix, butter, and egg until ingredients come together in a ball.
3. Place confectioner's sugar in a pie pan or shallow dish.
4. Form cookie dough into 1-inch balls
5. Roll each ball in the confectioner's sugar
6. Decorate generously with sprinkles or sparkling sugar.
7. Place cookies on a baking sheet 2 to 3 inches apart.
8. Bake for about 10 - 12 minutes or until they are firm around the edges, but puffed up and soft in the center, about 10 to 12 minutes.
9. Remove from oven and let cookies cool on sheets for 5 minutes, then cool completely on wire racks.



▶ Possible allergens include the brownie mix, butter, eggs, and chocolate chips. See Glossary for possible substitutions.



Brownie Drops

Paul Fox, Tarpon Springs, FL
Brooker Creek Explorers 4-H Club

Ingredients

Prep: 15 minutes

- 1 package brownie mix (21 oz.)

Bake: 10 minutes

- 8 Tbsp butter, melted

Yield: 40 cookies

- 2 large eggs

- 1 tsp vanilla

- 1 cup chocolate chips

- 1 cup white chocolate chips

Directions

1. Preheat oven to 350°.
2. Mix brownie mix, butter, eggs, vanilla together until well combined.
3. Add chocolate chips, and stir until batter is thick, about 30 seconds.
4. Drop the batter by tablespoons onto baking sheets lined with parchment paper, leaving 2 inches between cookies.
5. Bake cookies for 8 to 10 minutes until they are firm around the edges but still soft in the middle.
6. Remove from oven and allow to cool for 5 minutes.
7. Place white chocolate chips in a microwave safe bowl.
8. Heat white chocolate chips in microwave on low for about 30 seconds, stirring, until completely melted.
9. Drizzle white chocolate over cookies.



German Chocolate Cookies

Bailey Nickels, Garfield County, Enid 4-H Club, Age 11

Prep: 5 minutes
Bake: 11 minutes/batch
Yield: 3 ½ dozen

Ingredients

- 1 package German chocolate cake mix (regular size)
- 1/2 cup butter, melted
- 1/2 cup quick-cooking oats
- 2 eggs
- 3/4 cup mini semisweet chocolate chips

Directions

1. Preheat oven to 350°.
2. In a large bowl, combine the cake mix, butter, oats and eggs until well blended.
3. Stir in the chocolate chips and raisins.
4. Drop by heaping tablespoonfuls 2 inches apart onto ungreased baking sheets.
5. Bake for 9-11 minutes or until edges are firm.
6. Cool for 5 minutes; before removing to wire racks to cool completely.



Rocky Road Bars

Katharine Girone, Illinois, 4-H Alumni of Bell Plain Hustlers,
Tazwell County 4-H Program Coordinator

Ingredients

- 1 cup butter, softened
- ¾ cup sugar
- ¾ cup packed brown sugar
- 2 large eggs, room temperature
- 1 teaspoon vanilla extract
- 2 ¼ cups all-purpose flour*
- 1 teaspoon baking soda
- 1 teaspoon salt
- 2 cups miniature marshmallows
- 1 ½ cups semisweet chocolate chips*

Prep: 15 minutes

Bake: 30 minutes

*NOTE:

You can replace the ¼ cup of flour with cocoa powder if you want extra chocolate. You can mix & match chips; peanut butter chips and chocolate chips are a favorite of mine.

Directions

1. Preheat oven at 350°
2. In a large bowl, cream butter and sugars until light and fluffy.
3. Add eggs, one at a time, beating well after each addition. Beat in vanilla.
4. Combine the flour, baking soda and salt; gradually add to creamed mixture and mix well.
5. Stir in the marshmallows and chips.
6. Spread into a greased 13-in. x 9-in. baking pan.
7. Bake for 25-30 minutes or until golden brown.
8. Cool on a wire rack.
9. Cut into bars and serve.



Flourless Chocolate Walnut Cookies

Linda Thiele, Illinois, Champaign Mixed Clovers 4-H Club

Yield: ~3 dozen

Ingredients

Parchment paper
2 ½ cups walnut halves
3 cups confectioner's sugar
½ cup + 3 Tbsp unsweetened cocoa powder
¼ tsp salt
4 egg whites
1 Tbsp vanilla extract

Directions

1. Position 2 racks in the upper and lower thirds of the oven.
2. Heat oven to 350°.
3. Line 2 large baking sheets with parchment paper.
4. Place walnuts on a work surface and finely chop. Transfer to a separate large baking sheet and toast until fragrant, about 9 minutes. Let cool.
5. Mix sugar, cocoa and salt in a bowl. Stir in walnuts. Add egg whites and vanilla; beat with a fork or an electric mixer on medium until batter is just moistened. (Do not overbeat batter or it will stiffen.)
6. Drop batter by the teaspoonful onto parchment paper on baking sheets in evenly spaced mounds.
7. Bake cookies until tops are lightly cracked and glossy, about 15 minutes. Repeat with remaining batter.
8. Store in an airtight container at room temperature for up to 1 week.



▶ Possible allergens in this recipe include butter, egg, flour, oats, chocolate chips. See Glossary for possible substitutions.



Chocolate Chip Oatmeal Cookies

Annie Fox, Tarpon Springs, FL, Brooker Creek Explorers 4-H Club

Prep: 15 minutes

Bake: 10 minutes

Ingredients

- 1 stick of butter, softened
- 1 egg
- 1 cup flour
- 1/2 cup sugar
- 1/2 packed brown sugar
- 1 tsp vanilla
- 1/2 tsp baking soda
- 1 cup quick-cooking rolled oats
- 1 cup chocolate chips

Directions

1. Preheat oven to 375°.
2. Mix butter in electric mixer on medium for 30 seconds.
3. Add egg, flour, sugar, brown sugar, vanilla, and baking soda.
4. Beat on medium speed for 2 minutes. Scrape down as needed.
5. Add oats and chocolate chips and mix until blended.
6. Place by tablespoons on cookie sheets lined with parchment paper, leaving about 2 inches between cookies.
7. Bake cookies for 8 to 10 minutes or until lightly browned.



Grandma's Cowboy Cookie Recipe

Kim Dailey, Wadena County 4-H, Minnesota

Cookies are named for Kim's grandmother who was a 4-H leader for more than 30 years!

Prep: 20 minutes

Bake: 10 minutes/batch

Yield: 2 dozen

Ingredients

- 1 cup lard (the real stuff)
- 1 cup sugar
- ½ cup brown sugar
- 1 egg
- ½ tsp salt
- 1 ½ cups flour
- 1 tsp baking soda
- 1 tsp baking powder
- ¾ cup coconut
- 1 ¼ cups oatmeal

Directions

1. Preheat oven to 350°.
2. Cut lard into sugars with a pastry cutter.
3. Mix in egg.
4. Combine the remaining dry ingredients (may be easiest to do with your hands).
5. For average sized cookies, bake for 8-10 minutes.



Purple Maple Syrup Oaties

Kathy Stuever Foerster, Capac, Michigan, 4-H Alum

Ingredients

- 1 cup old-fashioned oatmeal
 - 1½ cup pure maple syrup
 - 1¾ cup brown sugar
 - 1¾ cup butter
 - 1 egg
 - 1 tsp vanilla
 - 12 ½ cup all-purpose flour
 - 1 tsp salt
 - 1 tsp baking soda
 - 1½ cup chopped walnuts
- Prep:** 10 minutes
Bake: 12 minutes/batch
Yield: 5 dozen

Directions

1. Combine pure maple syrup and oatmeal in small saucepan; bring to a boil and simmer three minutes. Set aside to cool.
2. Cream brown sugar and butter; add egg and vanilla.
3. Sift together flour, salt, and soda. Add flour mixture to creamed mixture alternately with maple/oatmeal mixture. Stir in nuts.
4. Drop by teaspoonful on greased baking sheet. Bake at 375° for 8-12 minutes or until golden. Remove immediately from baking sheet to cool.



Great-Grandma Steegee's Sugar Cookies

Kristie Kushe, Iowa

Prep: 10 minutes

Bake: 10 minutes

Yield: ~ 3½ dozen

Ingredients

- 1 cup powdered sugar
- 1 1/4 cup sugar
- 1 cup margarine
- 1 cup oil
- 2 eggs
- 1 tsp vanilla
- 1 tsp salt
- 1 tsp baking soda
- 1 tsp cream of tartar
- 4 cups of flour

Directions

1. Preheat oven to 375°.
2. Cream the following ingredients with an electric mixer: powdered sugar, 1 cup sugar, margarine and oil.
3. Add the following ingredients to the bowl and mix: eggs, vanilla, salt, baking soda, cream of tartar, and flour.
4. Roll into balls the size of a walnut.
5. Roll in remaining sugar.
6. Bake for 10 minutes.



Grandma Ada Thompson's Persimmon Cookies

Edwina "Winnie" Thompson McConnell, Mt. Olympus 4-H Club

Prep: 10 minutes

Bake: 15 minutes/batch

Yield: 3-4 dozen

Ingredients

- 1 cup soft shortening
- 1 cup brown sugar
- 1 cup white sugar
- ½ cup persimmon pulp
- 2 eggs
- 2 ½ cup sifted flour
- 1 tsp soda
- ½ tsp salt
- 1 cup nuts (optional)

Directions

1. Preheat oven to 350°.
2. Cream shortening and sugars.
3. Add beaten eggs and persimmon pulp, then add dry ingredients and mix well. Add nuts (optional).
4. Bake at for 12 to 15 minutes.

This is a very moist cookie, which will need to be stored in an airtight container with wax paper between layers. Enjoy!



Allergen Free Cookies

**Egg-free, Gluten-free, Soy-free, Dairy-free*

Sarah G. Noel, 4-H Virginia, Loudoun County, Virginia
Leaps 'n Squeaks Rabbit & Cavy Club

Prep: 20 minutes active, 2 hours chilling

Bake: 10 minutes/batch

Yield: ~2 dozen

Ingredients

- 2 sticks dairy free margarine
(Make sure it's a harder stick form such as Earth's Balance or Fleischmans unsalted Margarine or dough will be too soft.)
- 1/2 cup packed brown sugar
- 1/2 cup white sugar
- 2 tsp vanilla
- 2 Tbsp vinegar
- 2 1/4 cup all-purpose gluten free flour + 1/2 tsp xanthum gum (we used Bob's Red Mill all-purpose gluten free baking flour)
- 2 tsp baking soda
- 1 tsp cream of tartar
- 1/2 tsp salt
- Your favorite jam for decorating cookies

Directions

1. Cream margarine and sugars
2. Add vinegar & vanilla to the sugar mix
3. In a separate bowl, gently mix flour, baking soda and cream of tartar
4. Add flour mixture to the margarine mixture and mix just until soft dough forms.
5. Do not over mix.
6. Cover and chill for at least 2 hrs. Dough may be made ahead and refrigerated, covered tightly.
7. Now preheat oven to 375°.
8. Roll out the dough on to a floured surface to 1/2 inch thickness. Remember to use gluten free flour.
9. Cut shapes with cookie cutter and place on ungreased cookie sheet. Putting flour on the cookie cutter helps.
10. Bake 6 minutes until almost cooked. Indent middle and place a small amount of jam in the indentation
11. Return cookies to oven to continue cooking 3 more minutes until golden brown on edges.
12. Let stand for 1 minute and remove to cooling rack.



Vinegar Sugar Cookies

Charlotte Spires, Cleveland County Oklahoma, Trailblazers 4-H Club

Ingredients

- 1 cup butter, softened
- $\frac{3}{4}$ cup sugar
- 1 Tbsp white vinegar
- $\frac{1}{2}$ tsp vanilla extract
- 2 cups all-purpose flour
- 1 tsp baking soda
- Colored sugar

Prep: 35 minutes

Bake: 10 minutes

Yield: 3 1/2 dozen

Directions

1. Preheat oven to 350°.
2. In a large bowl, cream butter and sugar until light and fluffy.
3. Beat in vinegar and vanilla.
4. Combine flour and baking soda; gradually add to creamed mixture and mix well.
5. Roll into 1-inch balls.
6. Place 2 inches apart on greased baking sheets.
7. Flatten to 1/4-inch thickness; sprinkle with colored sugar.
8. Bake for 8-10 minutes or until edges are lightly browned.
9. Cool for 1 minute before removing from pans to wire racks.
10. Store in an airtight container.



Lemon Snickerdoodles With Cashews

Nick Sloan, Illinois, The Explorers

Bake: 10 minutes

Ingredients

- 1 stick unsalted butter (softened)
- 1/2 cup vegetable shortening
- 1 cup sugar
- 2 eggs
- 2 Tbsp lemon juice
- 1 tsp lemon zest
- 2 3/4 cups all purpose flour
- 2 Tbsp cream of tartar
- 1 tsp baking soda
- 1/2 tsp fine salt
- 1/2 cup chopped cashews

Directions

1. Preheat your oven to 400°. Line a cookie sheet with parchment paper.
2. In a small bowl mix items for lemon sugar and set aside.
3. Drop the butter, shortening, sugar, and lemon zest into the bowl of your mixer. Cream on medium high for about 1 minute or until it's light and fluffy.
4. Add eggs and lemon juice and mix again on medium until it's all well incorporated and a light yellow in color.
5. In a separate bowl, sift together the flour, cream of tartar, baking soda, cashews and salt. Slowly add the dry mixture into the mixer bowl. Continue to mix on medium (add mixture in several small patches) mix until just incorporated. Do not over mix.
6. Form the dough into small balls and place on baking sheet, you should have 12 cookies per sheet.
7. Using a fork press on top of each cookie. Top with the lemon sugar.
8. Bake for 10 minutes at 400°.
9. Careful to not over bake.

These are good with hot chocolate!



Gingerdoodle Cookies

Jenna Lindsay, Michigan
Ranger's 4-H Club In Livingston County

Prep: ~15 minutes

Bake: 14 minutes

Yield: 22 Cookies

Ingredients

- 1 stick unsalted butter, at room temperature
- 1/2 cup granulated sugar
- 1/2 cup dark brown sugar, packed
- 1/3 cup molasses
- 1 large egg
- 1 1/2 tsp. ground ginger
- 1 tsp. ground cinnamon
- 1/4 tsp. ground cloves
- 1/2 tsp. fine salt
- 1 tsp. cream of tartar
- 1/4 tsp. baking soda
- 2 1/4 cups all-purpose flour

For Rolling

- 1/2 cup granulated sugar
- 1 tsp. ground cinnamon

Directions

1. Preheat the oven to 350°. Line baking sheets with parchment paper.
2. In the bowl of a mixer, beat the butter, granulated sugar, and brown sugar until light and fluffy, about 2 minutes.
3. Add the molasses and egg and beat until combined.
4. Add in the ginger, cinnamon, cloves, salt, cream of tartar, baking soda, flour, and mix until just combined.
5. Mix the 1/2 cup granulated sugar with the cinnamon in a shallow dish or bowl.
6. Shape the dough into 1 1/2 tablespoon sized balls.
7. Roll in the cinnamon sugar and place on the prepared baking sheets.
8. Flatten slightly with the palm of your hand.
9. Bake for 12 to 14 minutes, or until set.
10. Let cool on the baking sheets for 5 minutes before removing to cooling racks to cool completely. Cookies can be stored in an airtight container at room temperature for up to 5 days.



▶ Possible allergens in this recipe include cocoa, milk, butter, peanut butter, oatmeal. See Glossary for suggested substitutions.



No Bake Cookies

Kaylen Langhofer, Kansas, Plains Livewires

Prep: 20 minutes

Ingredients

- 2 cups sugar
- 1/4 cup cocoa
- 1/2 cup milk
- 1 stick butter
- 1 tsp vanilla
- 1/2 cup creamy peanut butter
- 3 cups oatmeal

Directions

1. In a medium size saucepan, heat sugar, cocoa, and milk. Bring to a boil.
2. Remove from heat and add vanilla and peanut butter.
3. Stir together and gradually add oatmeal.
4. Add butter and stir well.
5. Place in balls on wax paper.
6. Let dry and harden.



▶ Possible allergens in this recipe include cocoa, milk, butter, peanut butter, oatmeal. See Glossary for suggested substitutions.



Horse Poptarts (Cookies for Your Horse)

Charlotte Spires, Cleveland County, Oklahoma
Trailblazers 4-H Club



Prep: 15 minutes

Bake: 12 minutes, 4 hours cooling

Ingredients

2 cups of flour

6 ounces of molasses

1 tsp of ground cinnamon

Cookie icing

Directions

1. Preheat oven to 325°
2. Use a mixer to combine the flour and cinnamon
3. While the mixer is running, slowly pour in the molasses (*You can add a little more molasses to moisten the dough if you wish.*)
4. The dough will be sticky! Flour a cutting board and rolling pin, then roll out and shape the dough into a large square (about 1/4 inch thick).
5. Cut the dough into small, bite-sized shapes.
6. Place the cookies on a non-stick baking sheet and bake for 12 minutes.
7. When done, let them cool for 5- 10 minutes and then frost them with cookie frosting.
8. Let the cookies and icing harden for at least 4 hours before stacking them.



COMMON SUBSTITUTIONS FOR INGREDIENTS IN BAKING THAT ARE ALLERGENS

The most important thing to do if you have food allergies is to read the label. Today, there are many products to help with specific allergens such as gluten free or lactose-free but you will have to be diligent in label reading to avoid ingredients you are allergic to.

Cake or Pudding Mixes Prepared Commercially: Commercially prepared cake and pudding mixes are tricky as they may contain hidden flour or other ingredients. Read the label - look for mixes that say gluten-free. However, these substitute mixes may not give a satisfactory product.

Chocolate Chips/Chocolate Chunks/Cocoa Powder/Mini Chocolate Chips: Chocolate Chips may have gluten in them and dairy, depending on their ingredients. If you have an allergy to these, be sure to buy only allergen-free chips. <https://www.spokin.com/chocolate-top-allergy-friendly-baking-products>

Coconut: Coconut is a tree nut but allergies to this are rare.

Eggs: There are many substitutes for eggs; one of the easier is to stir together 1 tablespoon ground flaxseed in 3 tablespoons water until thick and gelatinous. https://www.pccmarkets.com/taste/2013-03/egg_substitutes/

Also: <https://www.spokin.com/top-allergy-friendly-products-for-baking#allergy-friendly-egg-replacer>

Flour (Gluten allergy): For gluten-free, Use same amount of commercially prepared measure-for-measure gluten-free flour.

Lactose Intolerant (such as Butter, Milk Chocolate Chips, Milk): Use the same amount of dairy-free margarine. Make sure it's a harder stick form such as Earth's Balance or Fleischmans unsalted Margarine or dough will be too soft.) Most milk substitutes can be switched 1 for 1 with a plant-based milk when in a baking recipe, just make sure that you're using dairy-free options that have a similar thickness to dairy milk (steer away from watery varieties like rice or potato milks) to avoid a texture difference in your final product.

Margarine: Be sure margarine is dairy-free if you are lactose intolerant. use the same amount of dairy-free margarine. Make sure it's a harder stick form such as Earth's Balance or Fleischmans unsalted Margarine or dough will be too soft.

Nuts/Nut Butter (Cashews, Walnuts, etc.): If allergic to tree nuts or peanuts, consider what will happen if eliminated in the recipe as nuts are often optional. Consider using roasted seeds instead. It may take some experimentation. Consider Sunbutter, Wowbutter or soynut butter if no allergy to peanuts or tree nuts.

Oats/Oatmeal: Oats in and of themselves are not a source of gluten but cross contamination may be a factor. Read the label.

Peanut Butter: Substitute a tree nut butter or soy butter if not allergic to those. consider Sunbutter, Wowbutter or soynut butter if no allergy to peanuts or tree nuts.

ANSWER KEY



► To discover a wide selection of 4-H activities and experiences, visit 4-H.org/clover/





Foaming Frosty Snowmen

See how much you've learned about the chemistry of fizzy snowmen!

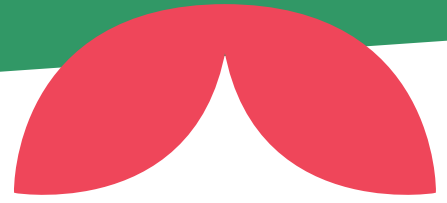
1. Which ingredient didn't contribute to the fizzy reaction in this activity?
 - a) Baking soda
 - b) Vinegar
 - c) Water**
2. Which is an example of an acid you might find in your home?
 - a) Water
 - b) Lemon juice**
 - c) Soap
3. What causes the bubbles in the reactions you observed today?
 - a) Carbon dioxide**
 - b) Hydrogen peroxide
 - c) Sodium carbonate
4. Which of these pairs might cause a fizzy reaction when combined?
 - a) Baking soda and dish soap
 - b) Baking soda and lime juice**
 - c) Baking soda and chewing gum
5. Soap is a base.
 - a) True**
 - b) False



Stamped Gift Wrap

See how much you've learned about making custom gift wrap!

1. A brayer is used to apply paint to a surface
 - a) Thinly
 - b) Horizontally
 - c) Quickly
2. A ruler can also be called...
(Select all that apply.)
 - a) Rule
 - b) Line gauge
 - c) Scale
3. Horizontal refers to a line that runs
 - a) Up and down
 - b) Back and forth
 - c) Left and right
4. Paint should be applied to the stamp...
 - a) Without rocking
 - b) Thickly
 - c) With a paint brush
5. The oldest use of stamps involved stamps and
 - a) Ink
 - b) Wax
 - c) Paint



STEM Binary Code Ornaments

See how much you've learned about binary code!

1. What do the zeros represent in binary code?
 - a) Signal on
 - b) Signal off**
 - c) Go
2. How many numbers were in the binary codes for the letters?
 - a) Two
 - b) Ten
 - c) Five**
3. What type of ornaments would you have found on early trees?
 - a) Glass ornaments
 - b) Candles
 - c) Fruits**

Tea Light Snowmen

See how much you've learned about tea lights!

1. Tea lights were first used in
 - a) Japan**
 - b) China
 - c) Britain
2. This famous artist once famously made a snowman.
 - a) da Vinci
 - b) Michelangelo**
 - c) Raphael
3. From which material can felt be made?
(Select all that apply.)
 - a) Wool**
 - b) Fur
 - c) Synthetic material**



New Year's Wish Pillows

See how much you've learned about goal-setting!

1. How much more likely are you to achieve your goals if you write them down?
 - a) 27%
 - b) 42%**
 - c) 74%
2. The use of sequins on garments dates back to:
 - a) Medieval Spain
 - b) Colonial America
 - c) Ancient Egypt**
3. Glue guns were originally used in:
 - a) Building houses
 - b) Making shoes**
 - c) Sealing water leaks
4. Who were the first people we know of to make New Year's resolutions?
 - a) Hewbrews
 - b) Chinese
 - c) Babylonians**



Cookie Science

See how much you've learned about cookie science!

1. Brown sugar makes cookies softer and chewier.
a) True
b) False
2. Which of these will not make a golden brown cookie?
a) Baking at 350 degrees
b) Baking at 360 degrees
c) Baking at 375 degrees
3. Baking powder makes cookies more puffy when it releases:
a) Hydrogen
b) Carbon dioxide
c) Oxygen
4. How can you make a chocolate chip cookie more crisp?
a) Baste cookie dough with melted butter
b) Use more white granulated sugar than brown sugar
c) Add more rolled oats
5. What size egg should you use with this recipe?
a) Jumbo
b) Medium
c) Any size will work