



STEM

ACTIVITY BOOK

WHAT IS ‘STEM’?

STEM stands for science, technology, engineering and math. Learning in STEM is all about asking questions, searching for answers, and discovering new ways to look at the world! Marine biologist, architect, astronomer, nuclear engineer and software developer are all examples of jobs in STEM fields. STEM skills make creators, thinkers, problem solvers, doers, innovators and inventors.

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SECRET MESSAGES

MATERIALS

- 4 sheets white printer paper
- Cup
- Cotton swab or paintbrush
- Tablespoon
- Lemon juice (fresh squeezed or bottled)
- Hair Dryer
- Other sources of heat (ask a parent for help!)

Credits
Image from 'BeardedScienceGuy' on Youtube
https://www.youtube.com/watch?v=poCnU_crpjQ

INSTRUCTIONS

1. Add about 1 tablespoon of lemon juice or cut and squeeze fresh lemon to the cup.
2. Soak an end of the cotton swab or put the paint brush into the lemon juice. You'll use this to write your message.
3. Write a message on each sheet of paper.
4. Let the lemon juice message dry completely to make your message invisible; you'll be able to see the message as long as the paper is wet.
5. Use a source of heat, like a hair dryer, to reveal your secret message. Try a different heat source on each sheet of paper and record what happens in the

table below to see which one works best! Since heat rises, it's best to start at the bottom of your message and work your way up.

Possible sources of heat: hair dryer; light bulb; heating vent; hold it over the toaster while making toast; what else can you think of? **Ask an adult for help!**

Heat source	What happened? Could you read the message clearly?
Hair Dryer	



TURN MILK INTO PLASTIC!

INTRODUCTION

Have you ever heard that plastic can be made out of milk? If this sounds like something made-up to you, you may be surprised to learn that from the early 1900s until about 1945, milk was commonly used to make many different plastic ornaments, including buttons, decorative buckles, beads and other jewelry, fountain pens, the backings for hand-held mirrors, and fancy comb and brush sets. Milk plastic (usually called casein plastic) was even used to make jewelry for Queen Mary of England!

Credits

Teisha Rowland, PhD, Science Buddies | Sandra Slutz, PhD, Science Buddies
www.sciencebuddies.org

MATERIALS

- Milk (1 cup)
- White vinegar (4 teaspoons)
- Measuring cup
- Measuring spoons
- Mug or other heat-resistant cup large enough to hold at least 1 cup of milk
- Paper towels
- Spoon
- Stovetop oven and pan or microwave and microwaveable container
- Optional: Cookie cutters, glitter, food coloring, markers



INSTRUCTIONS

1. Pour 1 cup of milk into a pot of microwaveable container.



2. Heat the milk in the microwave or on the stove until it is steaming.



3. Add 4 teaspoons of white vinegar to a mug.



4. Add the hot milk to the mug with the vinegar.



5. Stir the mixture with a spoon.



6. Stack 4 layers of paper towels on a surface that is safe to get damp.



8. Fold the paper towels over the curds and press down to absorb excess liquid.



9. Knead all the curds together into a ball of dough.

10. Color the dough as you like. You can use glitter, food coloring, markers.



11. You can use cookie cutters to shape your dough or sculpt it with your hands.



12. Put all your creations on a paper towel and let them dry overnight.



NAKED EGG

MATERIALS

- An egg (not hard boiled, just a regular egg)
- Vinegar
- A jar or tall glass (large enough to hold the egg)
- Flashlight
- Corn syrup (optional)

Credits

www.sciencebuddies.org

Images from Hungry SciANNtist: <https://www.youtube.com/watch?v=xv-LJZrnkPg/>

Sick Science!: <https://www.youtube.com/watch?v=vyOnGA0cmp0>

INSTRUCTIONS

1. Gently place the egg in the tall glass or jar.
2. Add vinegar to the jar so that the egg is completely covered.
3. Look closely at the egg; note the tiny bubbles forming on the shell.



INSTRUCTIONS *(continued)*

4. Leave the egg in the vinegar for 24 hours.
5. Replace the vinegar; carefully pour the old vinegar down the drain and cover the egg with fresh vinegar.
6. Place the glass with the vinegar and egg in a safe place for a week (7 days). Don't disturb the egg, but pay close attention to the bubbles forming on the egg's surface.
7. After a week, pour out the vinegar and carefully rinse off the egg with water. What do you see? Try shining a flashlight through the egg. Record your observations on the 'Notes' page at the back of this book.
8. OPTIONAL: Did you notice that your egg grew in size? Put your naked egg into a glass or jar of corn syrup next and watch how its size changes.



HERE'S WHAT HAPPENED

The shell is gone! There's now a delicate membrane surrounding the egg white and yolk, allowing you to see inside the egg. The vinegar had a chemical reaction with the egg shell that released carbon dioxide—the little bubbles you saw on the surface of the egg.

The egg looks translucent when you shine a flashlight through it because the hard outer shell is gone, leaving a thin (semipermeable) membrane.

Did you notice that your egg got a little bigger after soaking in the vinegar? Household vinegar is 96% water. Some water traveled through the egg's membrane in an effort to make an even concentration of water on both sides of the membrane (the flow of water through a semipermeable membrane is called osmosis). Since corn syrup has a lower concentration of water than the egg does, placing the egg in corn syrup causes water to move out of the egg through the membrane and into the corn syrup in efforts to equalize the water concentration.

STAR PROJECTOR

MATERIALS

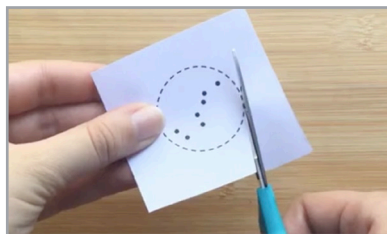
- Paper cup
- Dot sticker (or tape)
- Big Dipper printout (cut it out from this page)
- Scissors
- Push pin
- Flashlight

Credits

<https://mysteryscience.com/sky/mystery-5/stars-daily-patterns/128?r=74040094#slide-id-0>

INSTRUCTIONS

1. Cut out your Big Dipper picture (on this page) by cutting around the dotted lines.

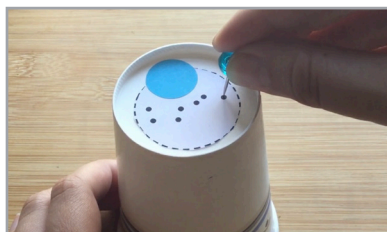


INSTRUCTIONS *(continued)*

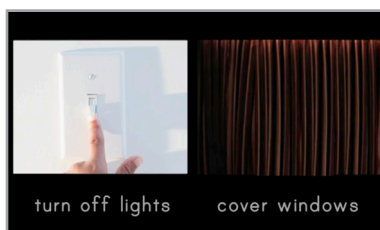
2. Turn your paper cup upside down; use a piece of tape or sticker to attach your big dipper picture to the bottom of the cup.



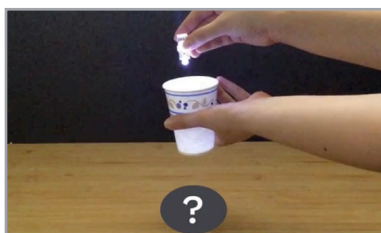
3. Use a push pin to carefully poke a hole in each star of the Big Dipper. Be sure your hole goes through both the Big Dipper picture and the bottom of the cup.



4. Make sure the room you're in is dark—turn off the lights and close any curtains or blinds.



5. Point your cup at a plain, flat surface like a table or a wall. Shine your flashlight inside the cup. Move the flashlight around until you can see the entire big dipper on the table or wall.



6. Have someone turn on the lights; what happens to your Big Dipper? If you position your big dipper right next to another light source (a light, lamp, or another flashlight), what happens? Try moving your big dipper slowly away from another light source, and then back towards it. What do you observe?

HERE'S WHAT HAPPENED

Just like you saw with your model, the stars in our sky are harder to see when there's another bright light. The stars in our sky are always there, but the sun is so bright during daytime that the stars seem to disappear from the sky.

'STEM' WORD SEARCH

SCIENCE

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

Find the following words in the puzzle.

- LABORATORY
- BEAKER
- CHEMICAL
- EXPERIMENT
- RESEARCH
- SCIENTIST
- TELESCOPE
- THEORY

TECHNOLOGY

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

Find the following words in the puzzle.

- CODE
- PROGRAM
- SOFTWARE
- COMPUTER
- DEVICE
- TECHNICIAN
- KEYBOARD
- ELECTRONIC

WORD SEARCH (continued)

ENGINEERING

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

Find the following words in the puzzle.

- BUILD
- CONSTRUCTION
- MACHINE
- ROBOT
- MECHANIC
- TOOLS
- ENGINE
- BLUEPRINT

MATHEMATICS

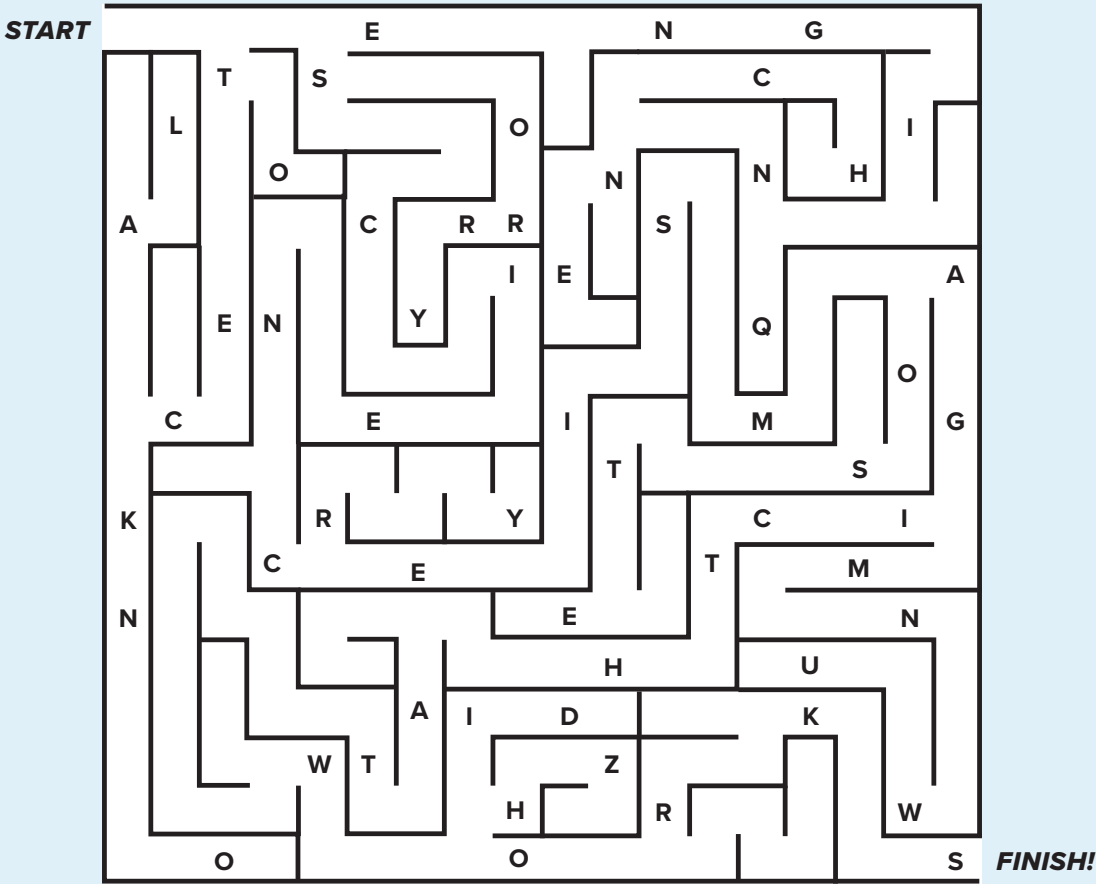
K W O X D E G D S U B T R A C T P Y
E V I Z P U C B E N O K S B C W H O
X G R A P H G W W Q P K T R G Y G N
L D Q C M R W I P M U J S R G C Z U
W N Y A G E V M A Z D A I O Y W Q M
I Q Q H I H A T B D J Q T B R A B B
O O A D I A T S H N D I V I D E O E
U P E K J F J R U Z G C Q H O B K R
R X W N L W R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

Find the following words in the puzzle.

- MEASURE
- NUMBER
- EQUATION
- ADD
- SUBTRACT
- MULTIPLY
- DIVIDE
- GRAPH

‘SECRET MESSAGE’ MAZE

There’s a secret message hidden inside the maze!

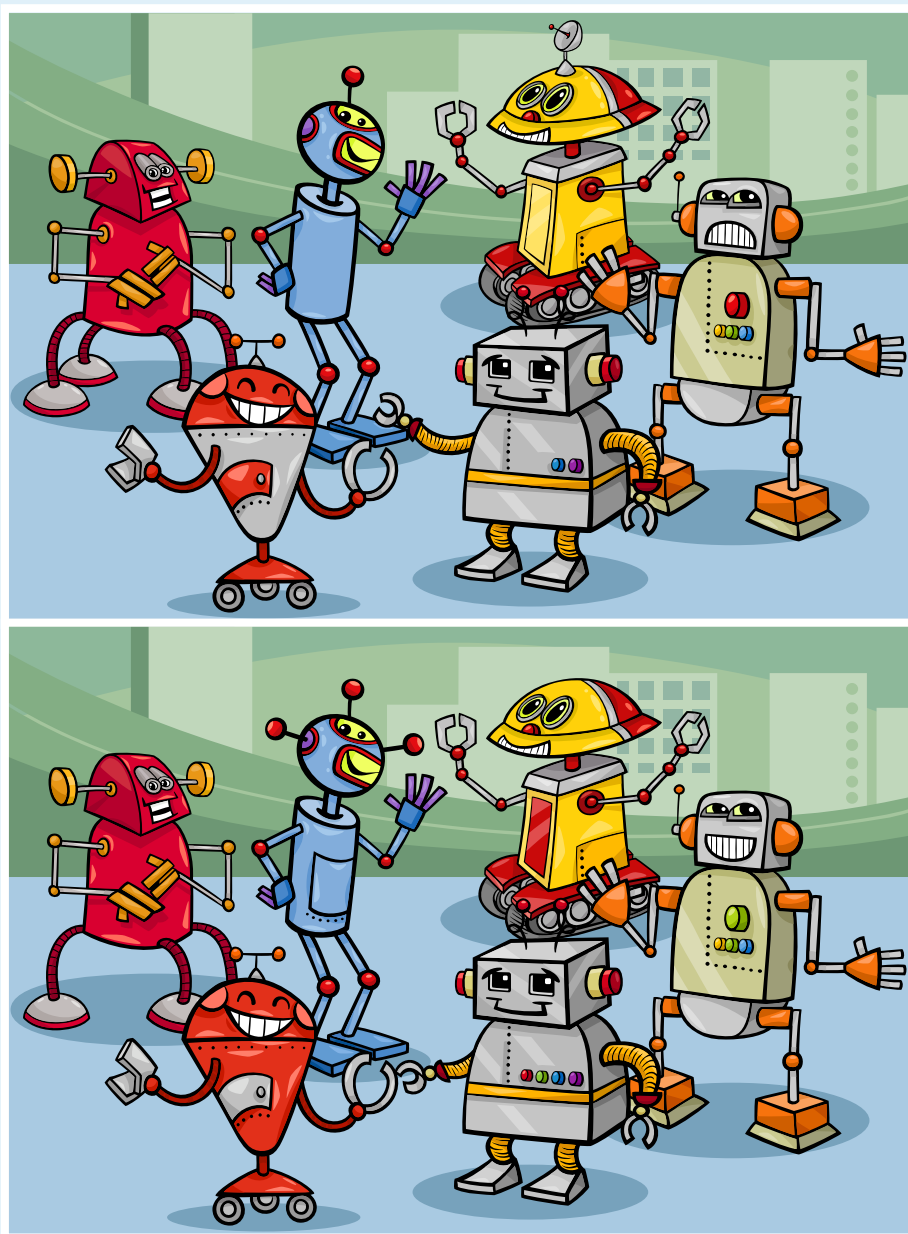


What’s the secret message?

“ _____ ”
_____ .
- Kurt Vonnegut

SPOT THE DIFFERENCE!

Find 10 differences.



CRAZY MATH MAZE

Help Hailey find her way out of this maze by solving math problems!

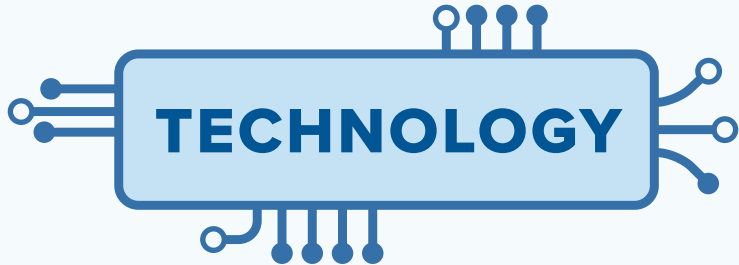


START

	2	×	4	=	8	+	3	=	9	×	0	
+		×		+		+		+		=		
13	+	13	=	28	=	6	=	12	=	21		
=		=		=		=		=		×		
5	=	11	+	36	÷	6	=	1	×	3		
×		÷		+		=		×		=		
7	×	55	=	45	+	10	=	23	-	63		
=		-		=		=		=		-		
35	-	17	=	18	=	4	÷	40	=	42		
-		=		÷		+		×		=		
30	=	6	×	2	=	9	×	1	=	9		FINISH

FINDING WORDS IN 'TECHNOLOGY'

Make words using only the letters in the word 'Technology.' How many can you make?
(Words need to be at least 3 letters)



Hot

<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

POINTS

- 3 letter word - 3 points
- 4 letter word - 4 points
- 5 letter word - 5 points

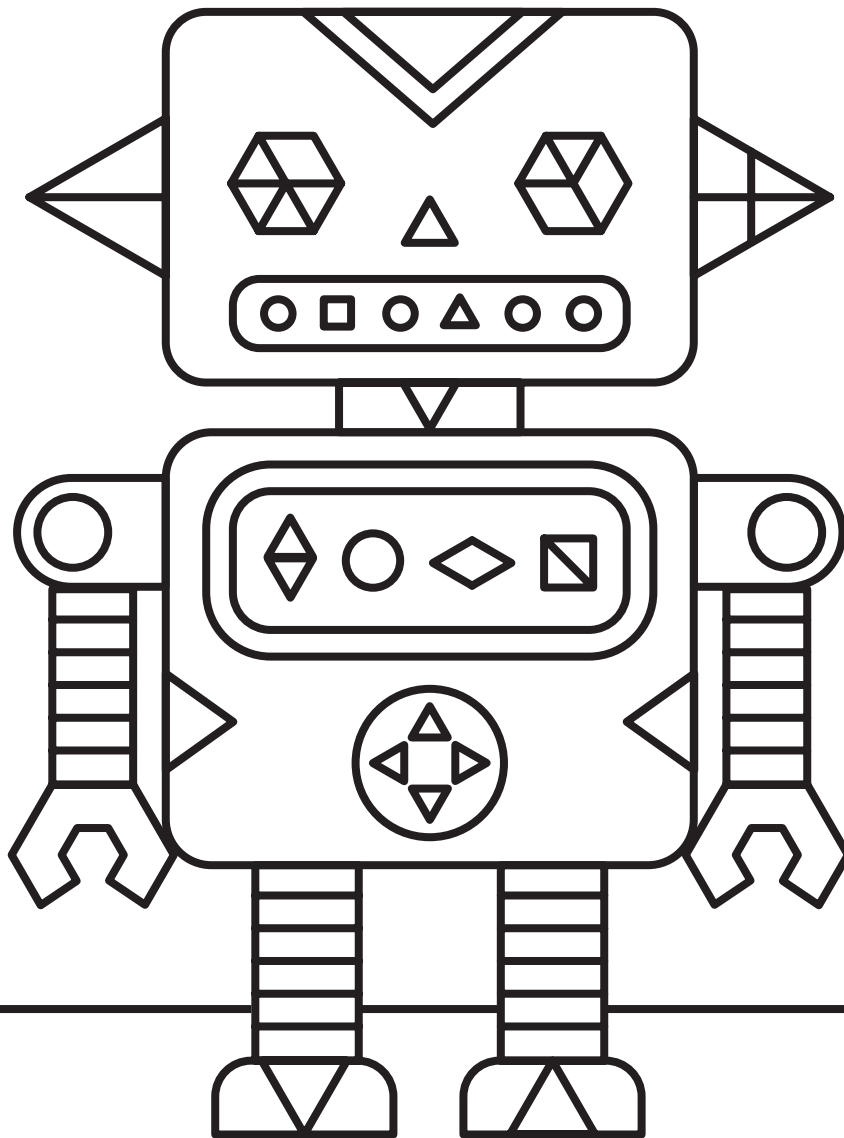
Calculate your
points below:

Total Points:

MR. ROBO

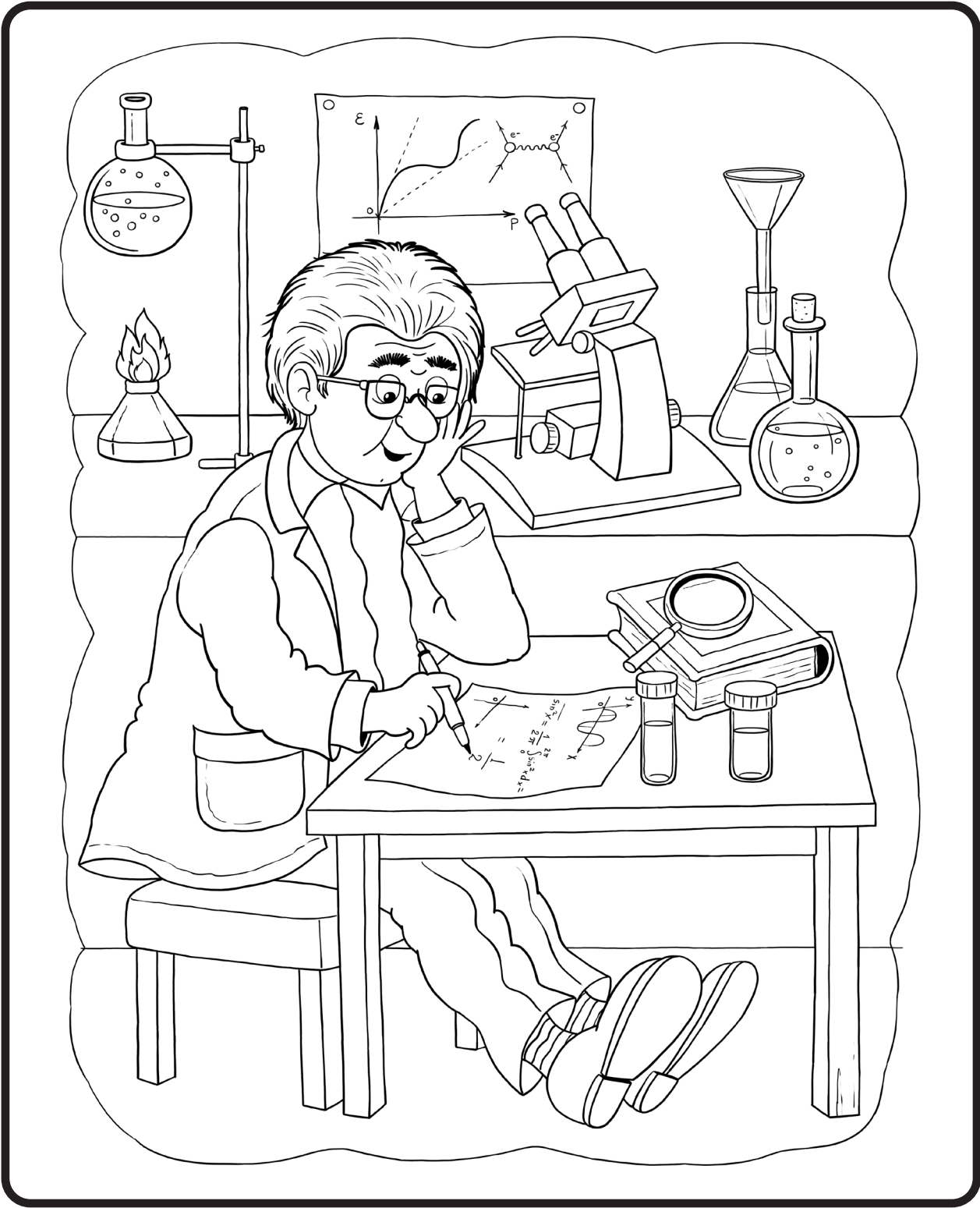
How many triangles can you find on Mr. Robo?

Answer: _____



CREATE YOUR OWN INVENTION!

What does your invention do?





Handwriting practice area with 20 horizontal dotted lines.

Notes

Handwriting practice area consisting of 20 horizontal dotted lines.

Notes

Handwriting practice area with 20 horizontal dotted lines.

Notes

Answers

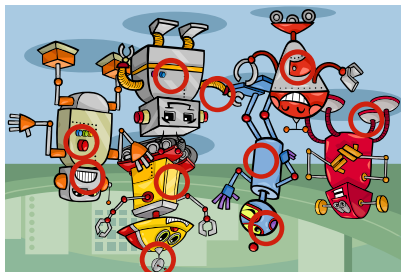
Word Search: STEM

Science

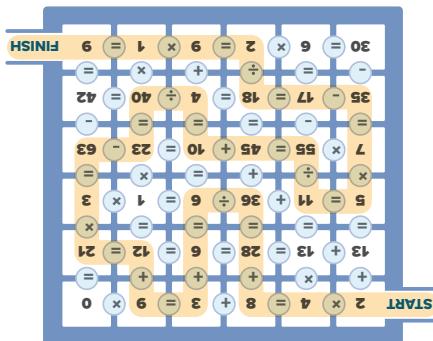
“Science is Magic that Works.”

'Secret Message' Maze:

Spot the Difference:



Crazy Math Maze:



Triangles on Mr. Robo

32

Mathematics

Engineering

Technology

Science

Word Search: STEM

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