

STEM ESCAPE ROOM

Add in a STEM-themed escape room at your next science fair or STEM event!

Escape rooms are games that ask groups to think critically, problem-solve, troubleshoot, and work collaboratively to “escape” a room before the clock runs out. Teams follow clues and work together to solve puzzles leading them towards a successful escape. This concept has been modified to be practical in a classroom environment. Instead of escaping a room, students will be solving STEM-related puzzles to unlock a very special box!

In our version, six puzzles are provided, each with a STEM-theme that will open six different locks protecting the contents of a special box. From computer programming to DNA sequencing, teams will need to work together to solve all of the STEM puzzles to successfully open the box at the front of the room. Each puzzle leads to a letter or number code or takes students and families to a key hidden in the room. We crafted all of the puzzles and provide some tips for you to add this exciting activity to your next science fair or STEM event!

Leading up to the event

Build a breakout box!

Acquire the listed materials. Space out six pairs of brackets along the cash box. With each pair, one bracket should be placed on the lid and the other on the base. The two brackets should meet where the box closes to create a padlock. Glue them in place to the box and repeat along the box. This enables you to have six hooks for your six different locks.

You will need:

- (x2) [3-Number combination lock](#)
- (x2) [5-dial word/number combination](#)
- (x1) [4-digit word combination](#)
- (x1) [Padlock with key](#)
- (x1) [Cash Box](#)
- (x1) [Super glue](#)
- (x12) [90-Degree bracket to add other locks](#)



Leading up to the event

The locks will need to be pre-programmed with the combinations (answers) ahead of time. If you want to write the station number on the back of each lock to keep track, you can. But leaving them unmarked may force students to try different locks adding to the challenge! Answers are listed in the station list.

Determine what students are breaking out of the box!

Some escape rooms have a storyline or theme to help groups immerse themselves in the experience. You may want to frame your breakout box to include a stolen mascot hidden inside, pose a riddle at the start with the answer in the box, have candy or prizes, or brainstorm a fun storyline that involves teachers at the school and STEM. You could even have several different storylines and ideas throughout the night.

Decide how you want to run your breakout room/box. Each station was designed to take 1-2-minutes.

Option 1:

Setup all six stations and invite small groups to sign up and work through all of the stations. You could turn this into a challenge and time each team from start to finish. The fastest group could win a prize. Teams may split up and tackle puzzles separately. This option could take 6-16 minutes for the room to complete. This estimate does not include any introductory framing or organization of participants.

Option 2:

Setup all six stations and assign small groups to each complete one station. This allows many families to visit your STEM-themed breakout room. This option could take 6-10 minutes for the room to complete. This estimate does not include any introductory framing or organization of participants.

Do the puzzles!

Work through the puzzles yourself so you can help families if they get stuck!



Day of the event

- ☐ Test out all of the locks to make sure you programmed each of them to coordinate with the provided answers in the directions. Hide whatever you are breaking out in the box.
- ☐ Post the animal signs around the room. Hide the key behind the horse picture. Tape the key to the wall and cover it with the horse picture.
- ☐ Space out the six stations around the room. Decide if you want to laminate the station signs to prevent families from writing on them OR provide a fresh set of station puzzles each round.

During the event

- ☐ Welcome families to the breakout room/box! Frame the challenge and explain the directions depending on if you selected option 1 or 2 to facilitate.
- ☐ Walk around the room to help with any questions.
- ☐ Be ready to reset the key behind the horse picture and replace or return whatever is in the box in between sessions.



Station Overviews and Answers

Station 1: Directional

Students will use commands to navigate a maze that will identify a 4-digit code.

Answer: 1, 9, 3, 4

Station 2: Programming

Groups will use the ASCII Binary Alphabet to unlock a 5-letter word.

Answer: Flask

Station 3: Gene Code

Groups will compare an unknown gene sequence to identify the species. They will look for that animal around the room to find a key hidden behind the picture. Animal images to print are provided in this guide.

Answer: Horse

Station 4: Law of Superposition

Groups will list the order of layers from oldest to youngest to obtain a series of five letters.

Answer: P,K,M,S,R

Station 5: Solid, Liquid, or Gas

Groups will categorize matter into the different states to reveal a three-digit code.

Answer: 3, 5, 5

Station 6: Ratios

Groups will solve a puzzle that involves ratios. They will use their simplest ratio to uncover a 3-digit code.

Answer: 3:72 1:24 Combo 1,2,4













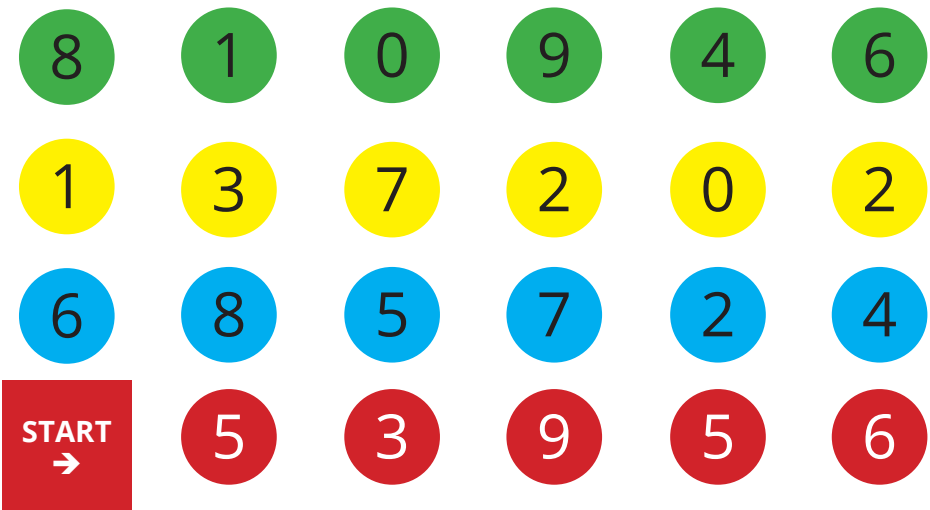






Station 1

Use the commands to navigate a maze that will help you identify a 4-digit code.



START Move forward 4	START Move forward 1	START Move forward 3	START Move forward 3
Turn left , Move forward 2	Turn left , Move forward 3	Turn left , Move forward 2	Turn left , Move forward 2
Turn left , Move forward 3	Turn right , Move forward 2	Turn left , Move forward 3	Turn right , turn right , Move forward 1
Turn right , Move forward 1	Turn right , Move forward 3	Turn right , turn right , Move forward 1	Turn left , Move forward 2,
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Station 2

Use the ASCII Binary Alphabet to unlock a 5-letter word.

Letter	ASCII Code	Binary	Letter	ASCII Code	Binary
a	097	01100001	A	065	01000001
b	098	01100010	B	066	01000010
c	099	01100011	C	067	01000011
d	100	01100100	D	068	01000100
e	101	01100101	E	069	01000101
f	102	01100110	F	070	01000110
g	103	01100111	G	071	01000111
h	104	01101000	H	072	01001000
i	105	01101001	I	073	01001001
j	106	01101010	J	074	01001010
k	107	01101011	K	075	01001011
l	108	01101100	L	076	01001100
m	109	01101101	M	077	01001101









Letter	ASCII Code	Binary	Letter	ASCII Code	Binary
n	110	01101110	N	078	01001110
o	111	01101111	O	079	01001111
p	112	01110000	P	080	01010000
q	113	01110001	Q	081	01010001
r	114	01110010	R	082	01010010
s	115	01110011	S	083	01010011
t	116	01110100	T	084	01010100
u	117	01110101	U	085	01010101
v	118	01110110	V	086	01010110
w	119	01110111	W	087	01010111
x	120	01111000	X	088	01011000
y	121	01111001	Y	089	01011001
z	122	01111010	Z	090	01011010

0100 0110	0110 1100	0110 0001	0111 0011	0110 1011
_____	_____	_____	_____	_____



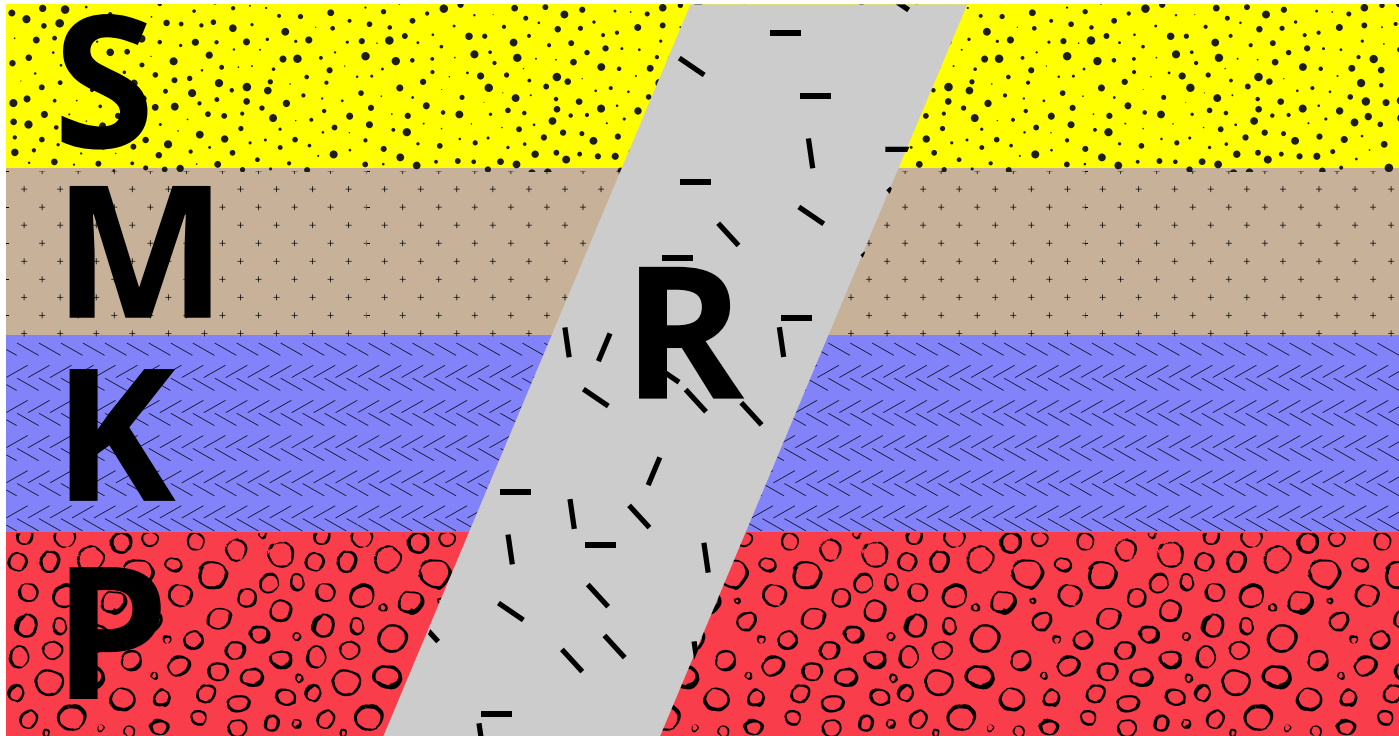
Station 3

Compare the unknown gene sequence to identify the species. Once you think you have found the unknown species, look around the room! Check behind the image of the correctly identified species for a key!

Unknown	T	C	C	C	C	G	G	C	G
Trout 	C	A	T	T	A	C	C	G	A
Butterfly 	T	C	C	C	G	T	T	C	G
Cobra 	T	C	C	G	G	T	T	C	C
Cockroach 	C	A	T	T	A	G	C	G	A
Horse 	T	C	C	C	C	G	G	C	G
Dog 	C	A	T	T	T	G	C	G	A
Jellyfish 	C	A	T	A	T	C	G	G	A
Shark 	T	C	C	G	C	G	G	G	C

Station 1














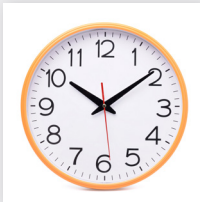







Relative dating is the science of determining the relative (or comparative) order of past events. In general, the oldest units are on the bottom and the youngest units are on the top. Using the cross-section below, what is the sequence of events from oldest to youngest? Use that sequence to unlock one of the combinations.



1	2	3	4	5
_____	_____	_____	_____	_____

Station 5


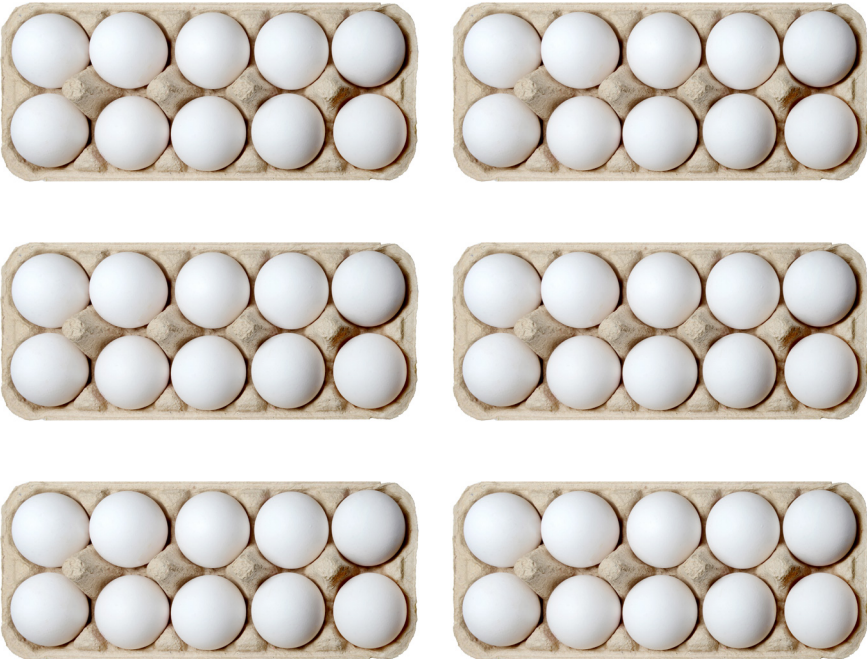
Categorize matter into the different states to reveal a 3-digit code!

How many examples in this column represent a solid?	How many examples in this column represent a liquid?	How many examples in this column represent a gas?
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Station 6

Simplify the ratio of brown eggs to white eggs.

	
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