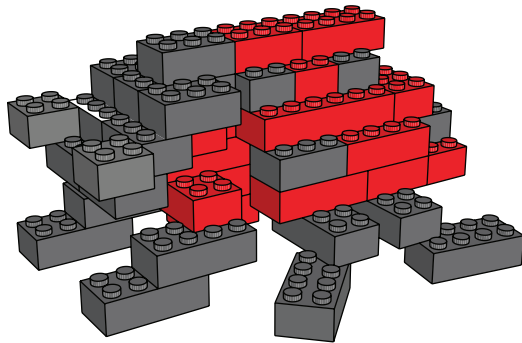



6 PROJECT

The Beetle

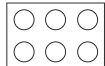


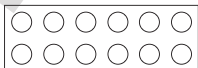
Build a beetle and learn about the special adaptations of this group of insects.

MATERIALS:

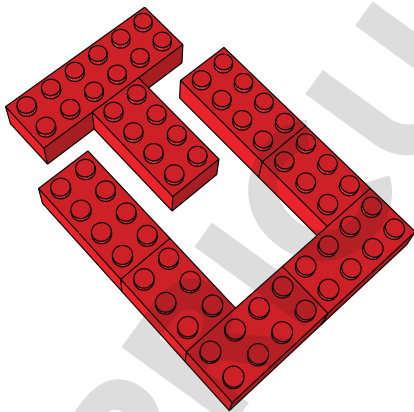
5  2x2 bricks

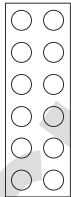
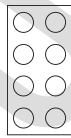

28  2x4 bricks

14  2x3 bricks

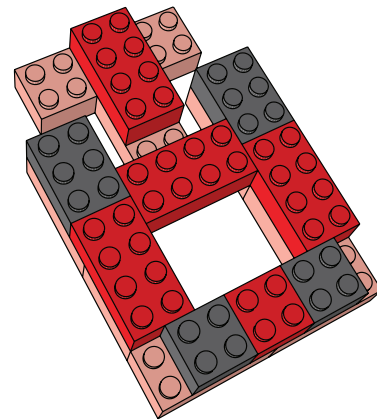
4  2x6 bricks

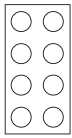
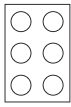

1



1  2x6 brick
5  2x4 bricks
2  2x3 bricks

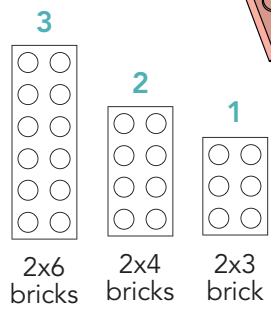
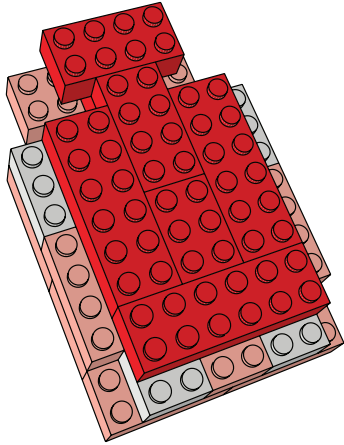
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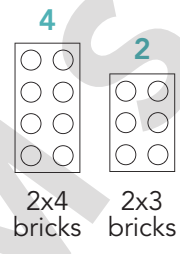
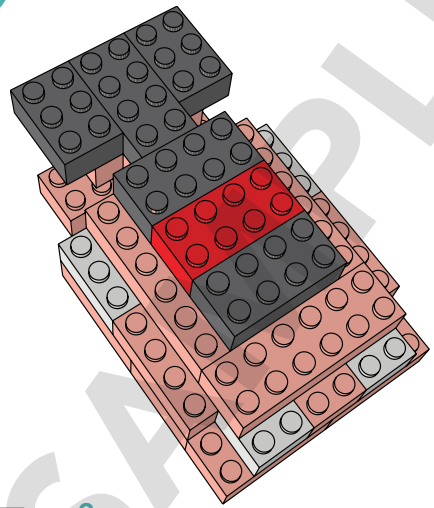
4  2x4 bricks
2  2x3 bricks
3  2x2 bricks

Project 6: The Beetle

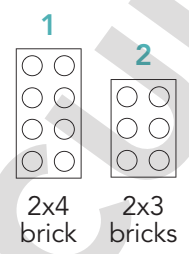
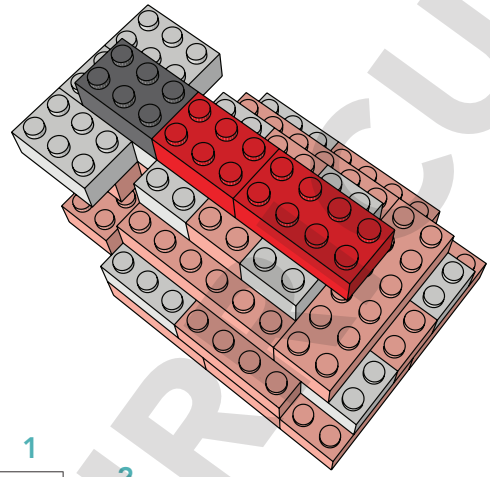
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4

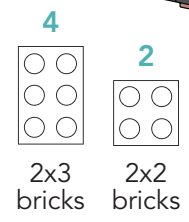
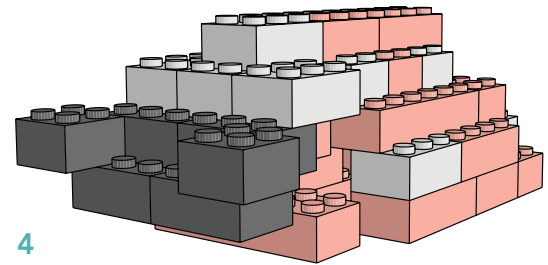
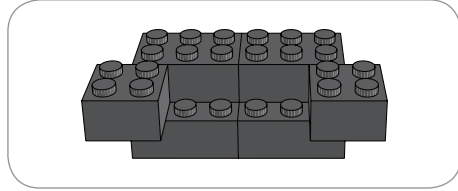


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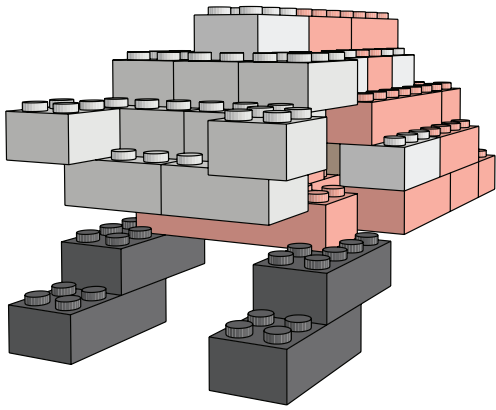
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Build this first.

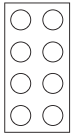


Project 6: The Beetle

7

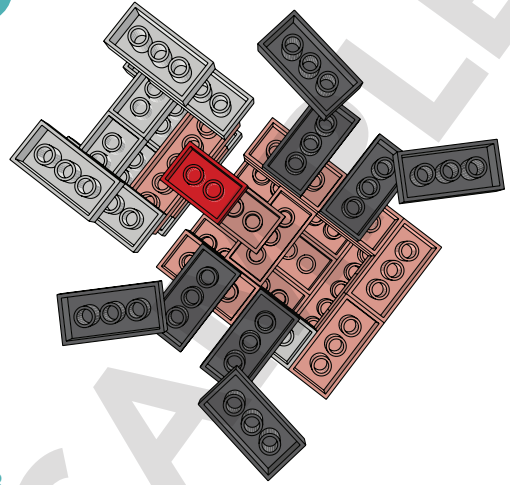


4



2x4
bricks

8

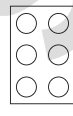


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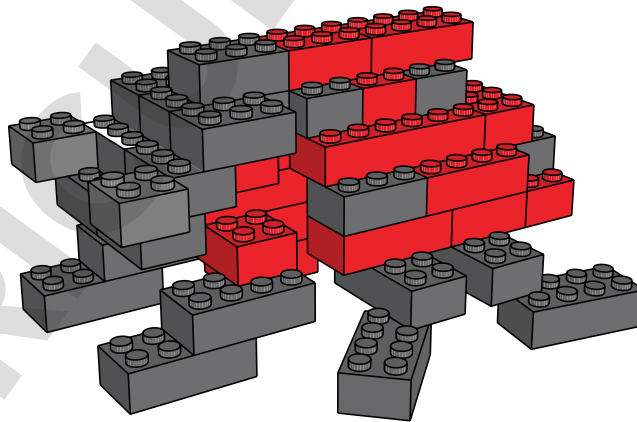


2x4
bricks

1



2x3
brick



Congrats!
YOU BUILT THE BEETLE!

Project 6: The Beetle

Try This Extension

Scientists estimate that there could be anywhere from 3-8 million beetle species on Earth! Do some research about different types of beetles and adapt your beetle build to look like your favorite species of beetle.

Think About It

Did you know that around 40% of all insects are a type of beetle? That's right! Almost half of the bugs found all around the world belong to the beetle family. Some scientists estimate that there could be anywhere from three to eight million beetle species on Earth.

Beetles are very adaptable. They can be found in almost every climate or region of the world, everywhere except for the coldest parts of the arctic! To survive as a small insect, beetles have developed many different lines of defense. Some beetles use camouflage, some are toxic and others fight back with pincers and horns!

Ladybugs are actually a type of beetle, and a very important one at that. A ladybug's main source of food is an even smaller insect called an aphid. Aphids are tiny bugs who eat vegetables and plants — one pack of hungry aphids could destroy your garden! That's what makes ladybugs their own type of superhero. A family of ladybugs could save your favorite flowers.

Beetles come in all shapes, colors and sizes, but what most beetles have in common is their hard outer shell. Just like a lobster, beetles have an exoskeleton that helps protect them from the elements and even predators.



KEY TERMS:

Aphid: a tiny insect that lives in large colonies which feed on vegetation. Aphids are known for causing extensive crop damage.

Camouflage: an adaptation that helps animals blend into their environment.

Estimate: an approximate calculation of a value which has not been counted.

Toxic: poisonous.

Wrap Up

1. Are there lots of beetles in the world? Or not very many?
2. Why are ladybugs a type of superhero?
3. Where are beetles not found?

6 PROJECT

Cause & Effect

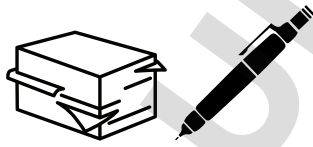


Think of a cause and effect event and make it into a short movie.

MATERIALS



Tablet



Paper & Pencil



Minimum number of people needed to do this activity.

KEY TERMS:

Storyboarding: A sequence of drawings that shows the basic setting and action of scenes in a movie.

Director: The principal creative artist on a movie set who tells the actors how to act in a scene.

Rehearse: Practice for a later public/recorded performance.

Actor: A person who plays the role of a character.

Inanimate: Anything that is not alive such as rocks and books.

Genre: The style of a story such as thriller, comedy, or action.

Script: The written story a film uses as a guide.

PROJECT 6: Cause & Effect

Create a short film that tells a story of cause and effect.



PREPARATION:

1

What is cause and effect? What would make an interesting movie? Spend about fifteen minutes thinking of any events that come to mind. Some examples might be a baseball hitting a window causing the window to shatter, bending a stick too far causing it to snap, or startling a cat causing it to run. Be creative! Remember to think of events that can be recorded close by.

2

Generate as many story ideas as possible: Remember, no criticism of ideas. All group members should contribute at least three story ideas. Record all ideas; write down what the cause is and what the effect is for each idea.



SCREENWRITING (Cont) :

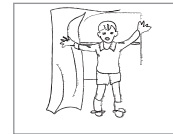
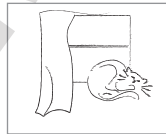
Beginning: A cat is peacefully lying next to the window, sleeping.

Middle: A young boy jumps out from behind the curtains, shouting and throwing his hands in the air.

End: The cat becomes frightened, hisses, and runs away.

6

Sketch a drawing of the beginning, middle, and end of your movie. This process is called **STORYBOARDING**.



SCREENWRITING:

3

Choose which idea you like most and would enjoy making into a short movie. Which idea did you choose?

4

What event (or effect) would not happen if the cause did not happen? Write three to five sentences about the possible outcomes.

5

Think how to visually show the event in a movie. Give your movie a beginning, middle, and end. Here is an example:



REHEARSAL:

7

Assign everyone a role for your movie. Some will be actors, and one person will operate the camcorder while telling the actors what to do. This person functions as both the camera operator and the **DIRECTOR**.

8

Act out the entire movie several times before you begin recording. **REHEARSE** until you feel confident

PROJECT 6: Cause & Effect



ACTION:

9

Begin recording! Re-enact your process from beginning to end in one shot. If a mistake is made, start again from just before the part that needs to be refilmed. Stop recording between each take so that each attempt is saved in a separate file.



POST-PRODUCTION:

10

Use video editing software to trim the best clips together and delete the extra takes. If you have time, add titles, credits, transitions, audio or other effects.



SHOWTIME:

11

Play your movie for your class.

Think About

As movies became more complex, there was a greater need for written layouts to keep the production. The format for movie scripts borrows heavily from American theater, using stage directions, formatting techniques, and setting locations to note where the scene takes place.

Scripts are used to tell actors and crew what to do in every scene, where to stand, what their dialogue is, how to say it, and what needs to be going on around them.

Scripts also document which actors are playing which roles. Depending on what kind of control the writer or director wants over the movie, scripts can range from vague to exact and specific. Scripts for movies are also called screenplays.

```
13.
CORRECTED.
LEONORA
I don't know.
EXT. OUTSIDE HERBERT'S KITCHEN - DAY
Erik is smoking around outside the house. He tries to
listen to what Dave and Leonora's conversations, but hears
nothing.
He takes out a small microphone from his pocket and places
it in the partially open window. He puts an earphone in one
ear and listens.
LEONORA (O.S.)
Will no more nonsense?
DAVE (O.S.)
No.
INT. HERBERT'S KITCHEN - DAY
DAVE
I thought they would come first.
You know, like they say they do.
When you lose your memory, for as
far as you can remember anything at
all. It's really terrible.
LEONORA
Well, if your uncle shows up soon
at least we can ask him.
DAVE
Dad, if he shows up, I'm
getting married.
It's silent for a moment.
DAVE (CONT'D)
So, why did you become a
reporter?
```

A good movie has good storytelling. Popular books and comics are often adapted into movies.

Acting is another important element in storytelling and filmmaking. Many actors work in the theater as well as in film.

Dialogue is the conversation between actors. A director is the lead artistic force in telling the story on film. He or she works with the actors, set designers, camera operators, and writers to create a movie. Movie making is a team effort!

Additional Resources:

Early Cinema - www.earlycinemas.com

Film History - www.filmsite.org

Screen Writing - www.screenwriting.org

Academy Awards - www.oscars.org

Encyclopedia of Film - www.filmreference.com

PROJECT 6: Cause & Effect

Try This

CHAIN OF EVENTS

Think of a chain of events that is started by one event happening. For example, a rock falling into a lake causes ripples to splash. The ripples then push a stick floating in the water up onto the shore. A little boy sees the stick and grabs it while walking along the road. As he is picking up the stick, he sees a butterfly and follows it into the bushes. A chain of events creates a more interesting story.

Wrap Up

Multiple Choice:

1. To rehearse means to ...
 - a. Create a list of solutions where there are no bad ideas
 - b. Practice for a later performance
 - c. Edit a film
 - d. Tell the actors what to do in a scene
2. Storyboarding shows the basic _____ and _____ of scenes in a movie.
 - a. Story and price
 - b. Programming and color
 - c. Director and Actor
 - d. Setting and action
3. A script is...
 - a. The list of actors
 - b. A contract the director signs
 - c. Another word for storyboard
 - d. The written story a film uses as a guide

Check for Understanding:

1. Did the story show the events drawn in the storyboard?
2. How many attempts did it take to get your story recorded?
3. Why is it important to show both the cause of an event and the effect?
4. Is it more fun to be an actor or the director?

9 PROJECT

Obstacle Course



Test *indi*'s limits by creating an obstacle course then changing it a little at a time until *indi* fails.

MATERIALS:



Color Tiles



Custom *indi* Stickers



indi Robotic Car



KEVA Planks

KEY TERMS:

Failure point: an engineering term for the point at which a solution no longer works.

Iterative design process: the process of designing a product by testing and evaluating it repeatedly at different stages with the goal of improving the design over time.

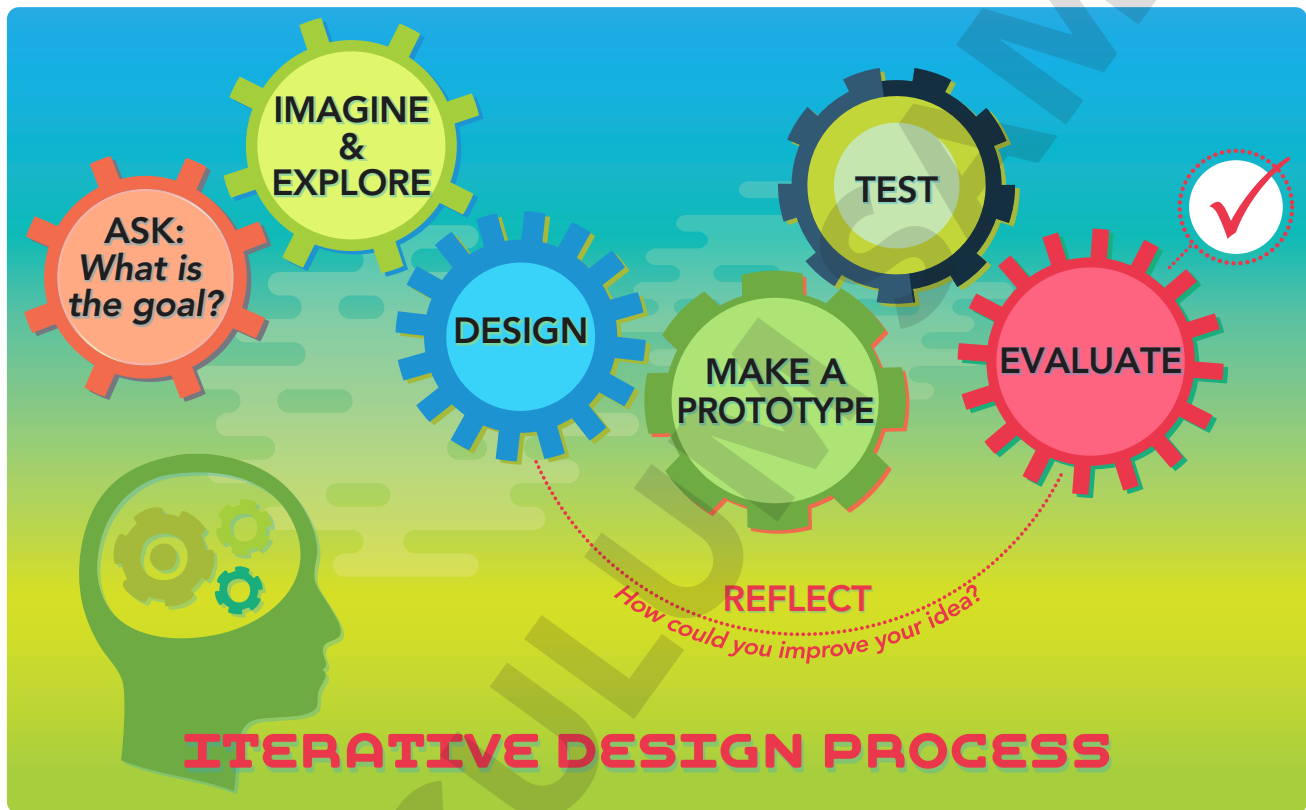
Limiting factor: a variable in a system that when changed makes the system stop working correctly.

Obstacle course: a series of objects and challenges that one has to overcome (climb over, go around, go under, etc.) in order to finish.

Project 9: Obstacle Course

Think About It

How do engineers figure out what new robots can and cannot do? Just like they do while designing the robots, they use the *iterative design process* to create challenges that test the robots' abilities. These challenges are meant to find the *failure points* of their designs. By testing robots over and over and slightly increasing the difficulty of the challenges each time, engineers can pinpoint the *limiting factors* in a robot's abilities.



Create an *obstacle course* for your indi out of KEVA planks.

Include at least one ramp and one thing to break through. Celebrate by using the purple tile last.



Project 9: Obstacle Course

Challenge

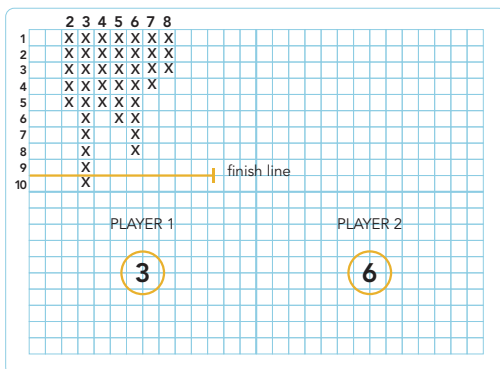
Try to make *indi* stop in the same place it started by adding different color tiles to your course.

Take It Further

Add other elements to your *obstacle course* track (books, tables, chairs, etc.). Keep *iterating* on your design to test the *limits* of how steep a ramp or thick a wall you can make before *indi* fails.

8 PROJECT

Dicey Digits



Learn about probability and how it can be expressed as a fraction or ratio.

Think About It

In math, numbers can describe the probability, or chance, that something is going to happen. That chance can range from zero (never going to happen, or impossible) to one (will happen every time, or is the only possibility). If you ever want to know how likely it is that some specific thing will happen, then you need to understand probability!

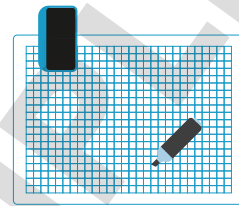
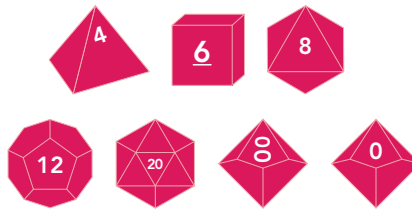
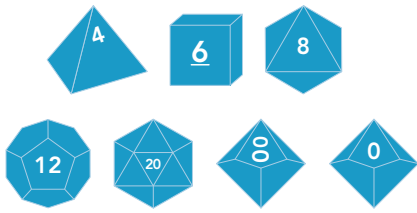
Probability is often described as the odds of something happening. Odds either show a ratio of how often something is likely to happen versus how often it isn't, or it is a ratio of how many of one thing there are versus how many of another thing there are. Ratios can be shown in different ways. For example, let's say you wanted to compare the number of boy students to the number of girl students at a table. If there are two boys and three girls at the table you could write the ratio in several ways:

- using a colon (:) to separate the two values **2:3**
- using a division bar (/) to separate one value from the other, where both parts of the fraction equal the total number of things. In this case, students. **$\frac{2}{3}$** (2 out of 5 of the students are boys, and 3 out of 5 students are girls)
 - When reading the two ratios above, both would be said as a ratio of "two to three."
- as a decimal, after dividing one value by the total $2 \div 5 =$ **0.4**
- as a percentage, converting from decimal form $0.4 =$ **40%**

All over the world, this type of math is used outside of the classroom. In sports, probability math is used to determine the best winning strategy. When looking at a basketball team's starting line, a coach might look at each player's shooting percentage, or the probability of them making the shot when they shoot the basketball. Or, let's say a placekicker on an NFL team has made 9 out of the last 10 field goals from a distance of 40 yards. $\frac{9}{10} = 0.9 = 90\%$, which means that at a distance of 40 yards, that kicker has a 90% probability of scoring!

Project 8: Dicey Digits

MATERIALS:



2 sets of 7 Polyhedral Dice

- 1 Whiteboard
- 1 Dry-Erase Marker
- 1 Eraser (1 per person)

This activity can be done alone, but math is always more fun with a friend!

Begin by collecting two of the same-sided dice from the dice bags. This game can be played with any pairs of dice, d4 - d12. For the d20's, you would need a massive whiteboard!

Example: d4



Start by creating a table on the whiteboard that includes all the possible numbers you can get when you add together the numbers on the two dice. For a pair of d4, include columns for 2,3,4,5,6,7, and 8. The number 1 is not included because the smallest number you can get when adding two dice is 2 (1 + 1).

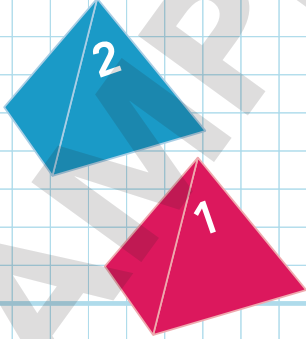
To the right of the table, draw 5 boxes, one for each level. If you win a level, check the box. If not, leave it blank. You'll learn what these levels do later.

2	3	4	5	6	7	8	Levels
							<input type="checkbox"/> 1
							<input type="checkbox"/> 2
							<input type="checkbox"/> 3
							<input type="checkbox"/> 4
							<input type="checkbox"/> 5

Project 8: Dicey Digits

Next, select a "lucky number" by choosing one of the numbers on their table that you think will be rolled most often out of one hundred rolls. Write this number on the whiteboard.

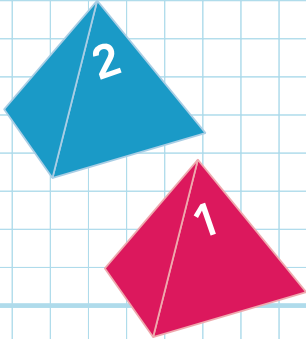
2	3	4	5	6	7	8	Levels
	3						<input type="checkbox"/> 1
							<input type="checkbox"/> 2
							<input type="checkbox"/> 3
							<input type="checkbox"/> 4
							<input type="checkbox"/> 5



Now it's time to play!

This game has 5 levels. For each level, roll both dice at the same time a total of twenty times. If playing with a partner, split it up so each person rolls 10 times. Take turns rolling the pair of dice, and after every roll, add the numbers together and place an "X" in the table beneath that corresponding number.

2	3	4	5	6	7	8	Levels
X	X	X	X	X	X	X	<input checked="" type="checkbox"/> 1
X	X	X	X	X		X	<input type="checkbox"/> 2
X	X		X				<input type="checkbox"/> 3
X	X						<input type="checkbox"/> 4
	X						<input type="checkbox"/> 5
	X						



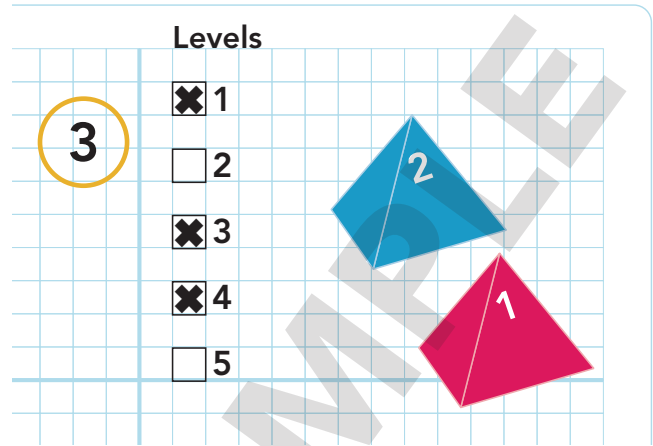
After you've rolled twenty times, count the number of "X"s beneath your lucky number. Whoever has the most wins the first round, and if you tie, you both win that round! Check the box for Level 1 if you won.

DON'T ERASE THE "X"s!

Project 8: Dicey Digits

Continue following the steps above, rolling twenty times per round (ten rolls each with a partner), recording the sums and determining a winner after each level. Note: the winner is determined by ALL the "X"s under your lucky number at the end of each level, not just the ones from the latest twenty rolls.

After 100 rolls, count up who won three or more levels, and that person wins the game!



KEY TERMS:

Probability: means how often something is likely to occur.

Frequency: the number of times something happens within a particular period.

Frequency Distribution Table: a graphic used to record how often a number of different things happen, useful for seeing patterns in large numbers of data.

Odds: are used to describe the chance of something happening. The odds are the numbers that compare how many ways the event can occur to how many ways the event cannot occur. Odds are usually expressed as a ratio.

Ratio: a relationship between two groups or amounts that expresses how much bigger one is than the other.

Try This

- Repeat the game several times, choosing different lucky numbers. Do you notice any patterns the more you play?
- Play with different pairs of dice, or make it more exciting by increasing the total number of rolls to two hundred, or three hundred!

Take It Further

Play a variation of the game by picking your lucky numbers, then seeing how many times you have to roll to hit your number 10 times. Take turns rolling as before, recording each number as you go. Race a friend to the finish line. The first one to record 10 lucky numbers wins!

Feeling ambitious? Pick one of the games you played and find the odds for rolling each number on your table then show the ratio in all four forms!