ON Target!

Math Games with Impact

Students will:

- Practice grade-level appropriate math skills.
- Develop mathematical reasoning.
- Move flexibly between concrete and abstract representations of mathematical ideas in order to solve problems, model mathematical ideas, and communicate solution strategies.

Use the following games to help students practice the following [and many other] grade-level appropriate math skills.

Note: Some skills are repeated in multiple age groups and grades, and so can be worked on with multiple age-groups.

2nd Graders:

- Guess the number
- Coordinate graphs
- Word problems
- Multiplication tables up to 5
- Multiplication tables up to 10
- More, less, and equally likely
- Certain, probable, unlikely, and impossible
- Median, mode, and range
- Divisors and quotients up to 5
- Divisors and quotients up to 10

3rd Graders:

- Working on multiplication and division facts up to 12
- Coordinate graphs
- Guess the number
- Word Problems
- Calculate probability
- Make predictions
- Addition, subtraction, multiplication, and division terms

4th Graders:

- Practicing multiplication and division facts to 12
- Multiply 1 digit numbers by larger numbers**.**
- Numeric patterns: word problems
- Graph points on a coordinate plane
- Guess two numbers based on sum, difference, product, and quotient
- Mean, median, mode, and range
- Number sequences involving decimals
- Multiplying two digit numbers by two digit numbers.

- Divide larger numbers with one digit divisors.
- Calculate probability
- Make predictions
- Divide by two digit numbers.
- Word Problems

5th Graders:

- Practicing multiplication and division facts to 12
- Add, subtract, multiply, and divide whole numbers
- Multi-step Word Problems
- Place values in decimal numbers
- Calculate probability
- Make predictions
- Even and odd arithmetic patterns
- Put integers in order
- Make Predictions
- Fractions
- Reduce fractions to simplest form (Ex. Write 4/10 in simplest form)

6th Grade:

- Add, subtract, multiply, and divide whole numbers, fractions, integers, mixed numbers, money amounts, and decimals
- Word problems with multiple steps or extra or missing information
- Reduce fractions to simplest form (Ex. Write 4/10 in simplest form)
- Coordinate graphs review
- Calculate mean, median, mode, and range
- Probability of opposite, mutually exclusive, and overlapping events
- Compound events - find the number of outcomes by counting
- Probability of one event
- Make predictions
- Fractions

7th Grade:

- Add, subtract, multiply, divide, and simplify whole numbers, rational numbers, fractions, integers, mixed numbers, money amounts, and decimals
- Word problems with multiple steps or extra or missing information
- Decimal numbers
- Make predictions
- Probability of simple events
- Probability of opposite, mutually exclusive, and overlapping events
- Calculate mean, median, mode, and range

8th Grade and higher:

- Add, subtract, multiply, divide, and simplify whole numbers, rational numbers, fractions, integers, mixed numbers, money amounts, and decimals
- Word problems with multiple steps or extra or missing information
- Calculate mean, median, mode, and range
- Make predictions
- Probability of simple events
- Probability of opposite, mutually exclusive, and overlapping events
- Decimal numbers

ZAP!

Materials:

- 2 dice
- playing cards with the King, Ace, and Jokers removed; Jack = 11 points and Queen = 12

How to play:

1. Divide students into groups
2. Each player is dealt seven cards. The remainder of the deck is placed face down in the center of the playing area.
3. The first player rolls the two dice and adds together the numbers represented on them. If the player has that number among the cards in hand, he places down the card or cards.
4. For example:
   If the dice total is 11, then the player might place down a Jack (=11) or he might place down a combination of cards that adds up to 11 (a 6 and a 5, for example, or a 3, 4 and 4).
5. If the player does not have that number, he says ZAP! Whenever a player calls out ZAP!, that signals all the other players to place down their card(s) that add up to the total on the dice. Any player can put down their card(s), but only the first player to finish placing down their card(s) is allowed to keep them down. Other players must return their card(s) to their hands.
6. The roller always draws one more card after his turn is over. Players who participate in the ZAP! round do not pick up another card.
7. For subsequent rounds, alternate the player who will roll the dice. Play continues until one player has no cards left in hand. That player is the winner.

VARIATION

Grades 3 and up: The roll of the dice is made into a 2-digit number. (For example, if a player rolls a 4 and a 6, those dice can be used to create the number 46.) Players must place down 4 and 6. If that player does not have the 4 and 6 combination in their hand, they say ZAP!

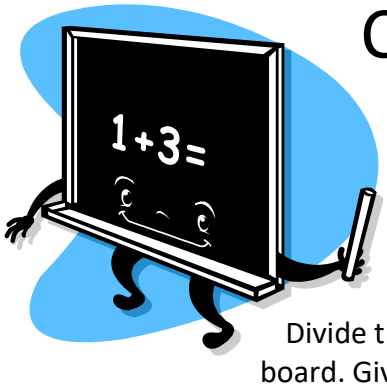
1 vs. All

1 vs (class size). Based on the TV show 1 vs 100.

This is really good for all subjects, if you can get a bit creative.

Here is a quick list of how to do things:

1. The aim of the game is for one contestant to answer questions against (class size) others and eventually try to eliminate them all.
2. The 1 is selected (however you want to choose)
3. The player is asked a three-way multiple choice question.
4. The "(class size)" are given six seconds to answer by selecting the letter A,B, or C, that are written on 2 separate sheets of paper.
5. The "1" can then give their answer in their own time. If the 1 is correct, they stay in the game. If they are wrong, they leave with nothing.
6. If any of the class members get a question wrong they are eliminated, and for each elimination the 1 receives ($1000 in the real game, you can give them points). However, to get their hands on the money/points they must eliminate all their opponents.
7. In order for the player to get the (reward) he/she must answer all the questions correctly and get rid of all the opponents.
8. The class, has a goal to stay in the game. IF they successfully knock out the 1, then they split the (reward.)

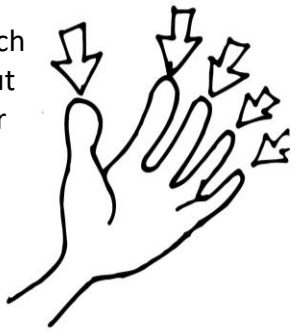


Chalkdown!

Use Chalkdown to practice math facts. (It's called chalkdown because back when I was in school and learned to play it, we had chalk, and the chalk had to be down on the tray before you could ge the problem correct, and markerdown just doesn't sound as good!)

Divide the class into two teams and a person from each team goes up to the board. Give them a math problem to solve. The first one to get the right answer and put their marker on the tray with the cap on gets a point for their team.

Digits!



Start out with everyone sitting on the carpet, have several groups, or have students remain in their desks while 2 students stand and face each other. Count to 3 and have each student put out their hands holding out different amounts of fingers. Whoever says how many fingers the other person is holding out first wins. (You can tell right away who knows addition facts and who does not.) The loser goes to their seat, the winner stays on the carpet for round two. Keep going until there is only one person left.
Variation: Have students multiply the digits instead of adding.

Makes Cents: THE VALUE OF A DOLLAR

Small change adds up fast in this quick game involving money and dice but no gambling.
Materials:

- Dice
- Coins [at least four quarters, three dimes, two nickels, and five pennies per person]

Divide students into groups and place a pile of coins in the middle of a table: at least four quarters, three dimes, two nickels, and five pennies per person. Players take turns rolling a pair of dice and taking coins from the pile that add up to the number rolled: a player who rolls an 11 takes a dime and a penny. As players amass money, they must trade in smaller coins for bigger ones. (If the player with 11 cents rolls a nine next, he takes a nickel and four pennies and trades the nickel and five pennies for a dime.) The first player to collect one dollar wins. To teach the painful concept of fines, add a rule that says a player must lose a nickel for a missed trading-up opportunity.

Mingle Math

A fun and active way to practice of numbers or fractions!

1. Teach the kids the "Mingle Chant" (be warned, it will stick in your head all day!)
Mingle, mingle, mingle! Mingle, mingle, mingle!
2. As the kids sing the mingle chant, they mingle amongst themselves.
3. When the chant finishes you shout out a number.
4. The kids quickly get into groups of this number and sit down.

That's it! Very simple but very fun! If you count up the number of kids in the class first, and then write this on the board for everyone to see, you can also say things like "half" or "two thirds"

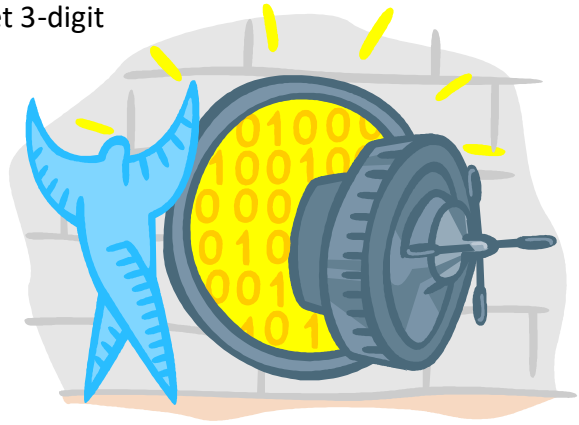
and get the kids to work out how many people should be in each group! Or you could try shouting out a sum where the answer is how many people they have to make a group with.

MONEY MATH:

A GUESSING GAME THAT PAYS OFF

Exercise your student's math muscle with a guessing game that can be played virtually anywhere. Hold a handful of change behind your back and reveal both the number of coins and the total sum: "I've got six coins that equal fifty-four cents." Players must guess the exact coins in your hand (two quarters and four pennies). Tailor the level of difficulty to a player's age; an older kid can handle a puzzler like, "I've got seven coins that equal forty-five cents." Offer the guessers a pile of coins for testing out solutions or let math whizzes solve the puzzle in their heads.

Code Breakers: Ones, Tens, Hundreds



By the process of elimination, students figure out the secret 3-digit number.

Objective: Students will use their knowledge of place value to ask questions that will help them figure out a secret 3-digit number. The first student to figure out the secret 3-digit number wins!

This game will help reinforce students understanding of the Ones, Tens, and Hundreds positions in three-digit numbers.

Before playing, refresh students knowledge of the positions of the Ones, Tens, and Hundreds columns. You might draw a representation of the columns and their positions on the board or use the included sheets:

Hundreds	Tens	Ones

Then provide a series of numbers and ask random questions such as

- What number is in the Tens column in the number 526? *(2)*
- In which column is the 4 in the number 324? *(It is in the Ones column.)*
- In the number 479, in which column in the 4? *(It is in the Hundreds column.)*
- Which number is in the Ones column in the number 611? *(1)*

Next, write a 3-digit number on a card or a small slip of paper. Keep the number secret from your students. Then invite them to ask yes or no questions about the digits and their positions

in the number that will help them figure out what the number is. For example, if you write the secret number **467**, students might ask questions such as

- Is the number an even number? *(no)*
- Is the number in the Tens column between 2 and 6? *(yes)*
- Is the number in the Hundreds column less than 6? *(yes)*
- Is the number in the Tens column an odd number? *(no)*
- Is the number in the Ones column greater than 5? *(yes)*
- Is the number in the Hundreds column greater than 4? *(no)*

Go around the room and give each student an opportunity to ask a yes or no question that will help them pinpoint the digits that appear in the Ones, Tens, and Hundreds columns of the secret number. After each student asks her/his question, s/he is entitled to guess the secret number based on the information at hand.

Students might keep track of the possibilities by creating a chart that looks something like this one:

Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Students might draw an X through each number as their questions remove it from possibility. So far we know that

- The number in the Hundreds column is not greater than 4, but it is less than 6; that means it cant be 5. It must be 1, 2, 3, or 4..
- The number in the Tens column is an even number between 2 and 6; that means the number in the Tens column must be either 2, 4, or 6.
- The number in the Ones column is an odd number (based on the answer to the first question above) that is greater than 5; that means the number in the Ones column must be either 7 or 9.

With the knowledge above, the questioning continues

- Is the number in the Hundreds column an even number? *(yes, so we can eliminate 1 and 3 from the possibilities; it must be 2 or 4)*
- Is the number in the Hundreds column less than 3? *(no, so we know it must be 4)*
- Is the number in the Tens column less than 3? *(no, so we know it must be 4 or 6)*
- Is the number in the Tens column between 5 and 7? *(yes, so we know it must be 6)*
- Is the number in the Ones column more than 8? *(no, so we know it must 7)*

By the process of elimination, we now know the secret three-digit number must be 467.

When the rules of the game and the questioning techniques are clear to your students, you might give a student the opportunity to write down the secret number and respond to classmates questions about the digits that appear in the numbers Ones, Tens, and Hundreds columns.

Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9
Hundreds	Tens	Ones
0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9	0 1 2 3 4 5 6 7 8 9

Your Place, or Mine?

2 Player Game

Materials

- playing cards Ace (=1) through 9
- 2 dice
- BINGO chips, or another small marker

Each player takes six cards from the deck and uses them to make a 6-digit number face up. Each player rolls a die to determine where to place the decimal point in their number; if a 1 is rolled the decimal point is inserted before the last number in the string, if a 2 is rolled the decimal point is inserted before the next to the last number Players use BINGO chips, or another form of marker, to represent the decimal point between cards.

The players verbalize their numbers to one another.

Next, a die is rolled to determine who scores a point.

- An odd roll (1, 3, or 5) means that the lowest, or smallest, number scores the point.
- An even roll (2, 4, or 6) means that the player with the larger number scores the point.

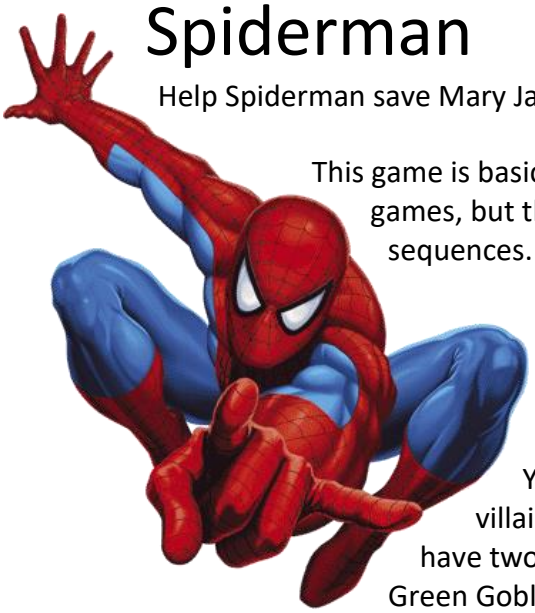
SAMPLE:

- Player 1 arranges his six cards to form the number 641329.
- Player 2 arranges her six cards to form the number 526914.
- Player 1 rolls a 2 on the die; he places his decimal chip/marker to form the number 6413.29
- Player 2 rolls a 4 on the die; she places her decimal chip/marker to form the number 52.6914
- The die is rolled and a 5 (and odd number) comes up. That means the player with the lowest/smaller number wins the round. Player 2 scores one point because she has the smaller number.

Players draw six more cards and play again. Play continues until a set number of points is reached.

Spiderman

Help Spiderman save Mary Jane!



This game is basically a scoring game which you can mix and match with other games, but the way it is presented here is great for simple sums, problems or sequences.

Preparation

First of all you need print outs of various Spiderman characters.

You'll need one Mary Jane Watson, and then one Spiderman and villain for each group. One group can be up to around 8 kids. If you have two groups the best pairing is one game as Spiderman 1 vs. the Green Goblin, and the other group as Spiderman 2 vs. Doctor Octopus!

On the board you need to draw a tall building with several floors (around 7 or 8) and wide enough so that your characters fit. Each teams' Spiderman and villain starts at the ground floor. On top of the building you put the picture of Mary Jane. The idea is the Spidermans will race to the top to save the girl! (Or you can have Mary Jane Race to save Spiderman, it's up to you.)

Then you need to split the kids into groups, up to 8 people in each group works well, so for 30 kids you need around 4 groups, but it can work with classes as small as 6 (2 groups of 3) . All the groups have to have the same number of people.

How to Play:

1. Each group forms a circle.
2. Each group decides which person in the group will go first.
3. The teacher says "Go!"
4. Simultaneously the first kid in each group starts the sum or sequence. e.g. "5".
5. The next kid (clockwise) adds a bit onto the sum e.g. "5 + 3 = 8", then the next kid continues "8 + 2 = 10" etc.
6. Keep going round the group until they get back to the first person!.
7. Everyone stands up and shouts "Yeah!"
8. The quickest team is the winner.
9. The winner's team's Spiderman moves one floor up the building. And all the other teams' villains move one floor up the building.
10. The person next to the person who started last time starts this time.
11. Repeat from 3
12. Keep going until one Spiderman has saved Mary Jane!! [or Mary Jane saves Spiderman]

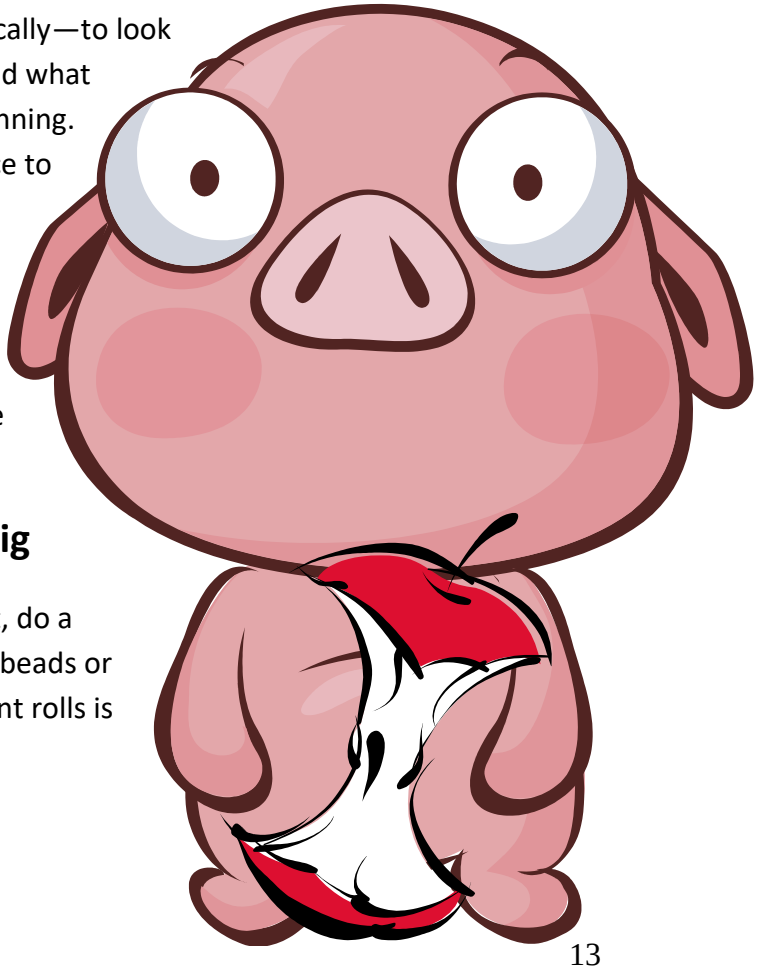
This game works great, even with older kids, just the simple fact of having the game based on Spiderman gets the kids hooked!

The kids can either go round the circle doing sums, addition, division, multiplication, or sequences. The teacher can also give them the starting number.

PIG!

Students can test their own greedy nature by playing PIG!

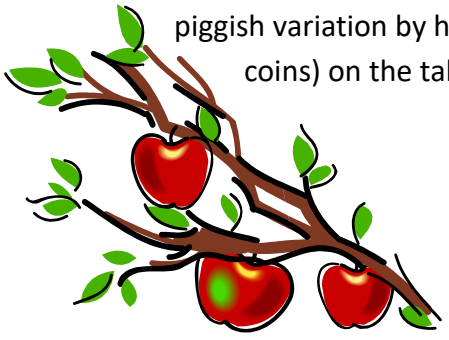
Playing PIG! Is a really fun way for students to practice doing addition in their heads and to see if they can stop themselves from getting greedy. Mental math skills are something a lot of students need help with and a chance to practice, in a fun and memorable way. The most obvious math while playing the game might be the simple addition, but playing Pig! is also a great way to teach students how to think strategically—to look ahead and figure out how what just happened, and what might happen next, will affect their chances of winning. And this effort to predict provides a perfect chance to explore probability, a way to measure how likely something is to happen. Probability doesn't tell us what will happen, it just tells us how likely something is to happen.



In this dice rolling game players win by getting the score closest to 100, without going over 100.

Variation for Younger Students: **Greedy Pig**

For younger students who can't add up to 100 yet, do a piggish variation by having a pile of objects (ex. beads or coins) on the table. The number the student rolls is



the number of “apples” their greedy pig gets to gobble. The pig that gobbles the most before the pile of food runs out wins!

For Older Students:

Materials for each group of students:

- A pair of Dice
- Paper and Pencils
- A copy of the chart
- Markers, crayons, or colored pencils with at least 4 different colors, 11 different colors is even better.

The object: to be the first to score 100 points without going over. If students have a hard time reaching 100 and get frustrated, change the winning score to 50. *(Adjust the goal according to the age of your students and their skills.)*

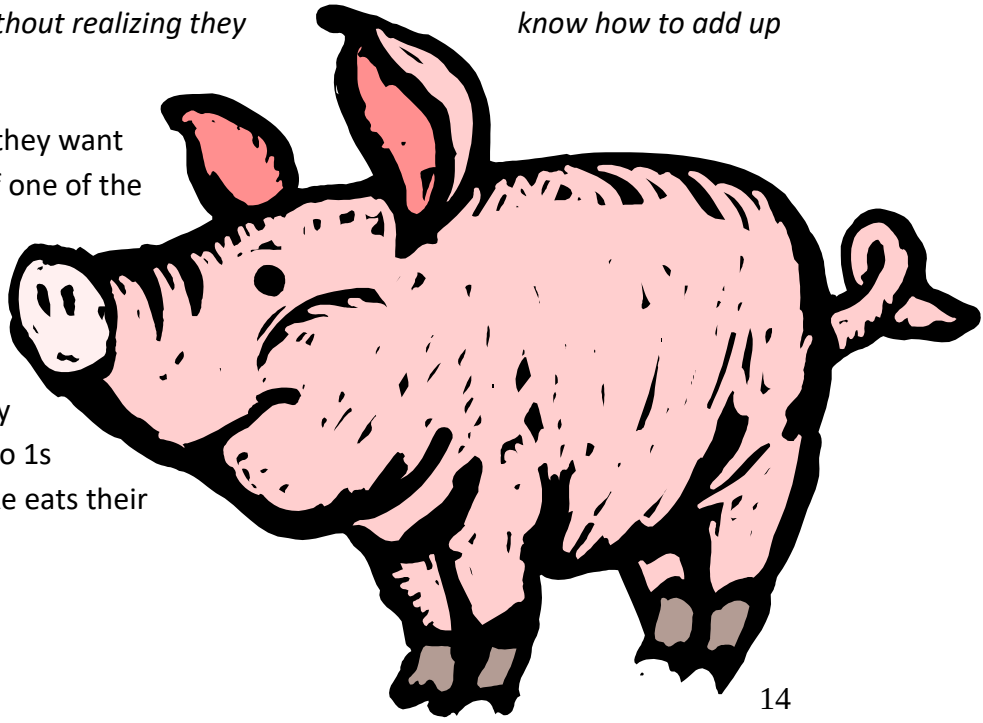
How to play:

1. To start, each player rolls a dice. The player with the higher number starts playing first.

2. They will roll both dice and add the two numbers together. That’s their score.

3. Now, they roll again. And add that total to their first score. They add the numbers in their head and keep track of their score out loud. Part of the challenge is doing all of the math in their head. *If that is too difficult for students at first allow them to write down their scores and total them, but the goal of the game is for students to be able to do the math in their head. Sometimes it helps if you will relate the numbers to money, $1.00 = 100. Kids often know how to add up change without realizing they know how to add up numbers too.*

4. They can roll as many times as they want on a turn, unless they roll a 1. If one of the dice comes up as a 1, they get zero points for that turn, and the dice go to the other player. Even worse, if a 1 comes up on **both** dice, not only does the turn end, but the if two 1s are rolled (snake eyes) the snake eats their



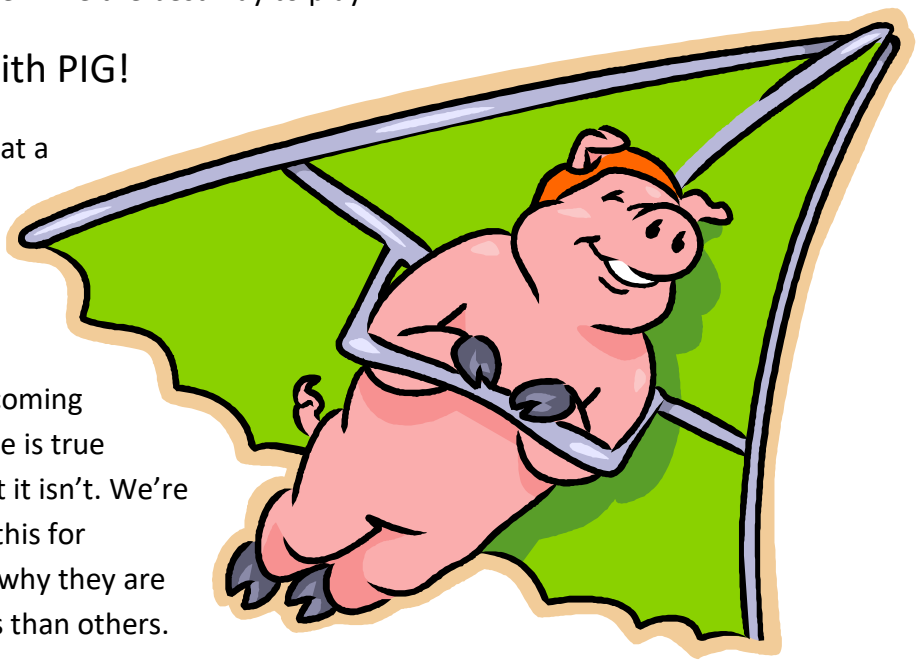
score back down to zero and the player's entire game total returns to zero, and it's the other player's turn.

5. Each person can decide to stop rolling and pass the dice to the other player at any time. Don't forget—if their score goes **over** 100, they lose! Remind students that if they get close to 100, they might want to let the other player have a turn. After the other player takes a turn, they can decide if they want to roll again.

6. The winner is the player whose final score is nearer to 100 (or exactly at 100) without going over by even one point!

After students have had the chance to play the game several times, have a discussion about the strategies they used. You may want to list their ideas and have them test different strategies against each other to try and determine the best way to play.

Exploring Probabilities with PIG!



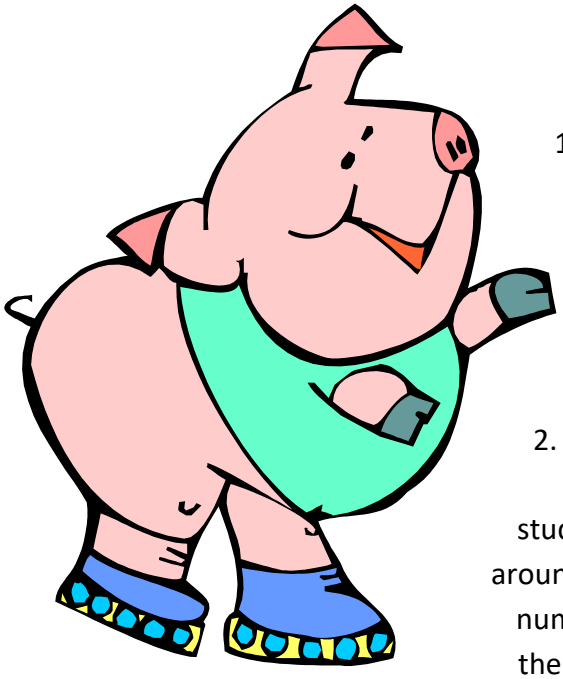
Understanding the probability that a certain number will come up can help you figure out strategies for winning PIG!

When rolling a single die every number has an equal chance of coming up. You might think that the same is true when you play with two dice, but it isn't. We're going to have students discover this for themselves and discover as well why they are more likely to roll some numbers than others.

Have students fill out the chart showing all the ways that the numbers on the two dice can be added. Each sum on the chart will show one possible outcome, one of the things that could happen when they roll the dice. How many different possible outcomes are there when they roll two dice?

When you roll two dice, do some numbers come up more often than others? Which numbers come up the most?

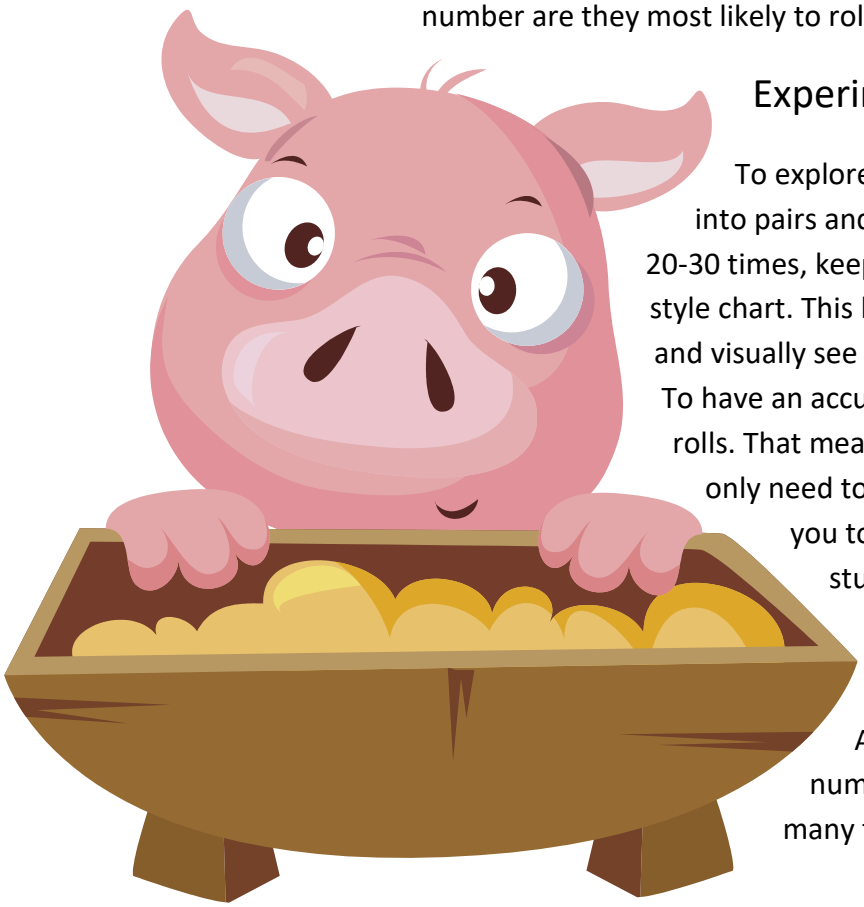
Have your students find the answers to these questions using their chart and colored pencils, crayons, or markers.



1. Have students use one color to circle all the different ways the numbers on two dice can add up to 7. Ex. You could roll a 1 on Die A and a 6 on Die B, that would equal 7. Or you could roll a 3 on Die A and a 4 on Die B, that also equals 7. How many ways are there to get 7?

2. Now, let's go to another number, and another color. Let's try 2. How many ways are there to roll a 2? Have students circle them. They will end up with six circles around numbers that add up to 7 and only one circle around numbers that add up to 2. That means every time they roll the dice, they have six times as many chances to roll a 7 as they do to roll a 2!

3. Now have students continue, using different colors to circle all the ways they can roll a 3, 4, 5, 6, 8, 9, 10, 11, and 12. If they don't have 11 different colors, they can use different shapes as well as different colors. Ex. They can put triangles around the numbers that add up to 12 and circles around those that add up to 10. The point is for them to be able to easily see the different ways they can reach each number. Which number are they most likely to roll?



Experimenting with Probability Pig

To explore probability further divide your students into pairs and have them roll their dice a minimum of 20-30 times, keeping track of their results on a bar graph style chart. This helps your students see what is happening and visually see what numbers are most likely to come up. To have an accurate chart you need to record 200 to 250 rolls. That means if you have 10 pairs of students they only need to roll their dice 20 to 25 times in order for you to have good results, if you have fewer students, they'll need to roll a lot more, or roll individually, keeping track of their own results.

After everyone has rolled the requisite number of times, ask each student pair how many times they got the number 2. Add all the

results and graph the number on the bar graph. Then keep going, repeating this for every number all the way up to 12.

Ask your students what the graph is showing them. It may reveal several things, such as the numbers 2 and 12 don't come up very often and the numbers 6, 7, and 8 get rolled a lot.

If your students compare their charts they filled out earlier and their graphs they may see that the experimental results (their rolls) might not exactly match the predicted results from the probability theory (their charts.) Experimental results show tendencies. Remember, probability isn't a perfect predictor, it just tells us what is likely to happen, not exactly will happen.

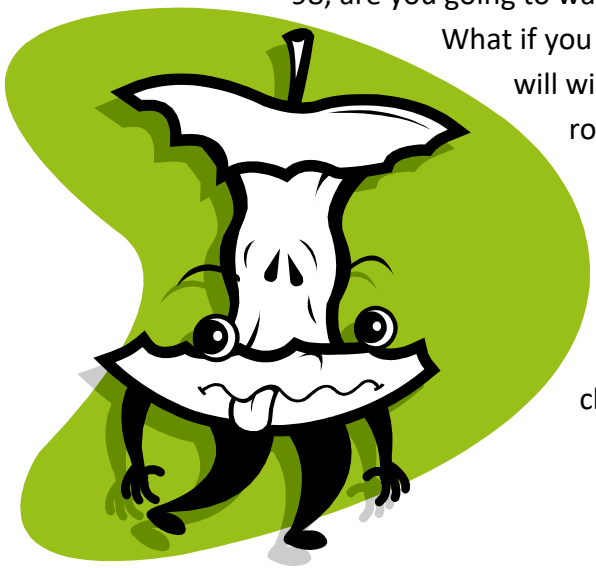
Looking at their dice chart can help students see that they are more likely to roll some numbers and less likely to roll others. The different colors, or different shapes creates a visual pattern on their charts, and this makes understanding their dice charts even easier.

Have students count up all of the different possible outcomes with two dice. They will find that when a player rolls two dice there are 36 different combinations possible. Remind students that rolling a 1 on Die A and a 4 on Die B is different than rolling a 4 on Die A and a 1 on Die B, even though you come up with the same answer of 5. This is why the dice on their charts are colored blue and orange. Rolling a 1 on the orange die and a 4 on the blue die is clearly different than rolling a 4 on the orange and a 1 on the blue. Different events have happened, reaching the same result.

While we have 36 possible outcomes, there is still only one way to roll a two and six ways to roll a 7. They are six times more likely to roll a 7 than they are a two.

But, what does it have to do with playing PIG!?

Knowing which numbers are most likely to come up is an advantage when students are playing PIG! Remember, our target score is 100, and we don't want to go over. So if you have a score of 98, are you going to want to roll again? What are your chances of rolling a 2? What if you have 90 points? Should you roll? 10 points and you will win, 11 or 12 and you will lose. To figure out whether to roll again your students can look at their dice chart and count how many ways there are to roll an 11 or 12. There are only three ways to roll and 11 or 12, meaning that their chance of rolling over 10 is only 3/36. So there are 33 ways of rolling a lower number. The might want to roll again, since their chances are very good that they won't roll over 100,



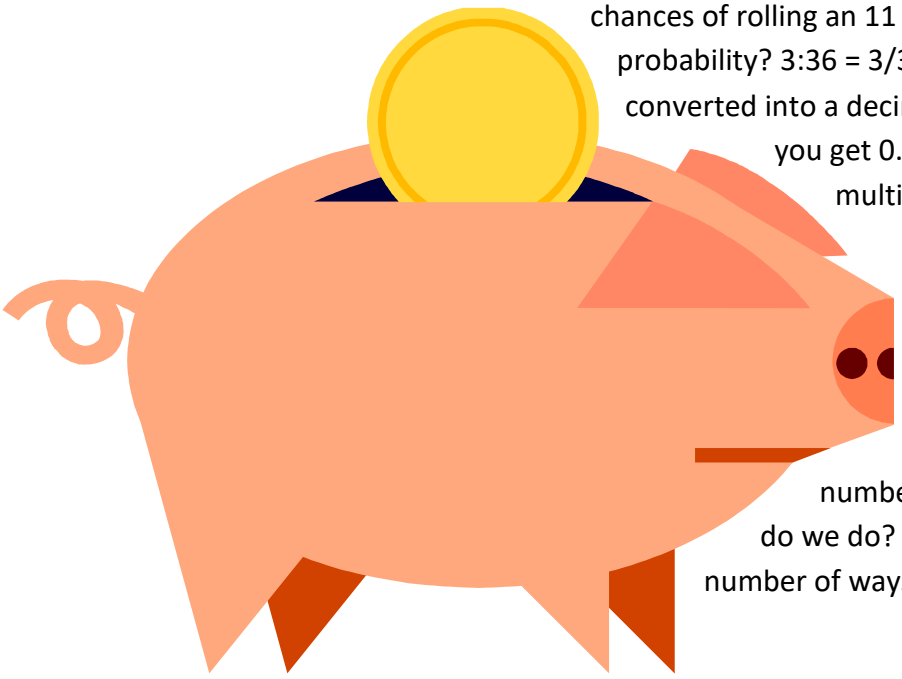
but keep in mind, probability doesn't tell us what will happen, it only tells us what is likely to happen. What if you have 94 points?

Once your student has grasped this concept you can teach him/her how to calculate basic probability. When you flip a coin you have an equal probability of getting heads or tails. So if you say "heads" how likely is it that you are going to win? One way to describe your probability of winning is to say that you have one chance out of two to win. There are two possible events, it will land on heads or it will land on tails. In one of those events you win, in one of them you lose. So your probability of winning is 1 out of 2, or written as a fraction, ½. The number of ways your result (winning) can happen, 1, over the number of possible results (heads or tails), 2.

$$\text{Probability} = \frac{\text{The number of ways a result can happen}}{\text{The number of possible results}}$$

If your probability was 0, means that that result will never happen, there is no likelihood. If your probability was 1, that would mean that that event would happen no matter what, there is no likelihood of it not happening. So, probability is a number between 0 and 1 that measures how likely it is that something will happen. So in our penny flipping example, a probability of ½ means that that result (you will win) will happen half of the time.

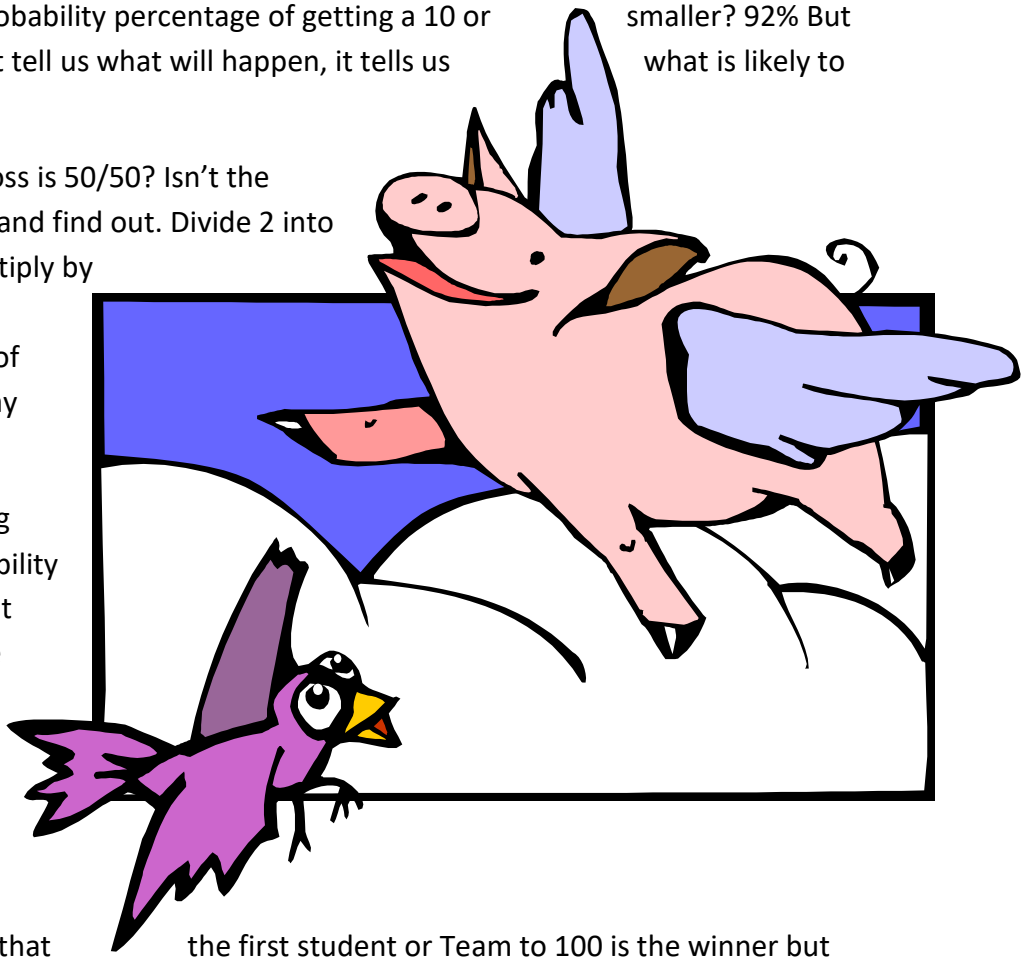
With dice there are a lot more possible outcomes. With one die we have 6 possible outcomes, with two dice we have 36 possible outcomes. It's important to remember that when we are calculating the probability (creating a ratio by comparing the number of ways a result can happen to the number of possible results) that a certain number will come up when we roll them. So when we were debating rolling again when we had a score of 90, we found our chances of rolling an 11 or 12 were 3. What's our probability? 3:36 = 3/36 = 1/12. A fraction can be converted into a decimal number. Divide 12 into one and you get 0.08. Then to convert it into a percent multiply .08 by 100. You get 8%.



Now, let's try it the other way. Let's find out our probability of rolling a 10 or smaller. Have students count how many outcomes are possible that result in 10 or a smaller number. There should be 33. So now what do we do? Create a fraction by putting the number of ways our result (getting 10 or smaller)

can happen over the number of possible results (all of the numbers.) The ratio is 33:36. Which means our fraction is 33/36. So there is our probability. But what does that mean? That means that if we roll the dice 36 times, we are going to roll to roll the number 10 or a smaller number than ten 33 times out of those 36 rolls. We can make the fraction smaller (11/12) and it tells us the same thing, if we roll those dice 12 times, we are likely to get a number 10 or smaller 11 times out of those 12 rolls. That's a pretty good probability! But can we show it as a decimal and as a percent? Yes! Divide 11 by 12. What decimal do we get? (0.92) Now, multiply your answer by 100. What is the probability percentage of getting a 10 or smaller? 92% But remember, probability doesn't tell us what will happen, it tells us what is likely to happen.

So why do people say a coin toss is 50/50? Isn't the probability ½? Let's convert it and find out. Divide 2 into 1. You get what? (.5) Now multiply by 100 to get a percent. (50%) So heads will turn up 50 percent of the time. That's why people say that you have a 50/50 chance.



Have students continue finding probability. What is the probability of rolling 6 or less? What about the probability of rolling snake eyes? Can your students calculate the probability of pigs flying?

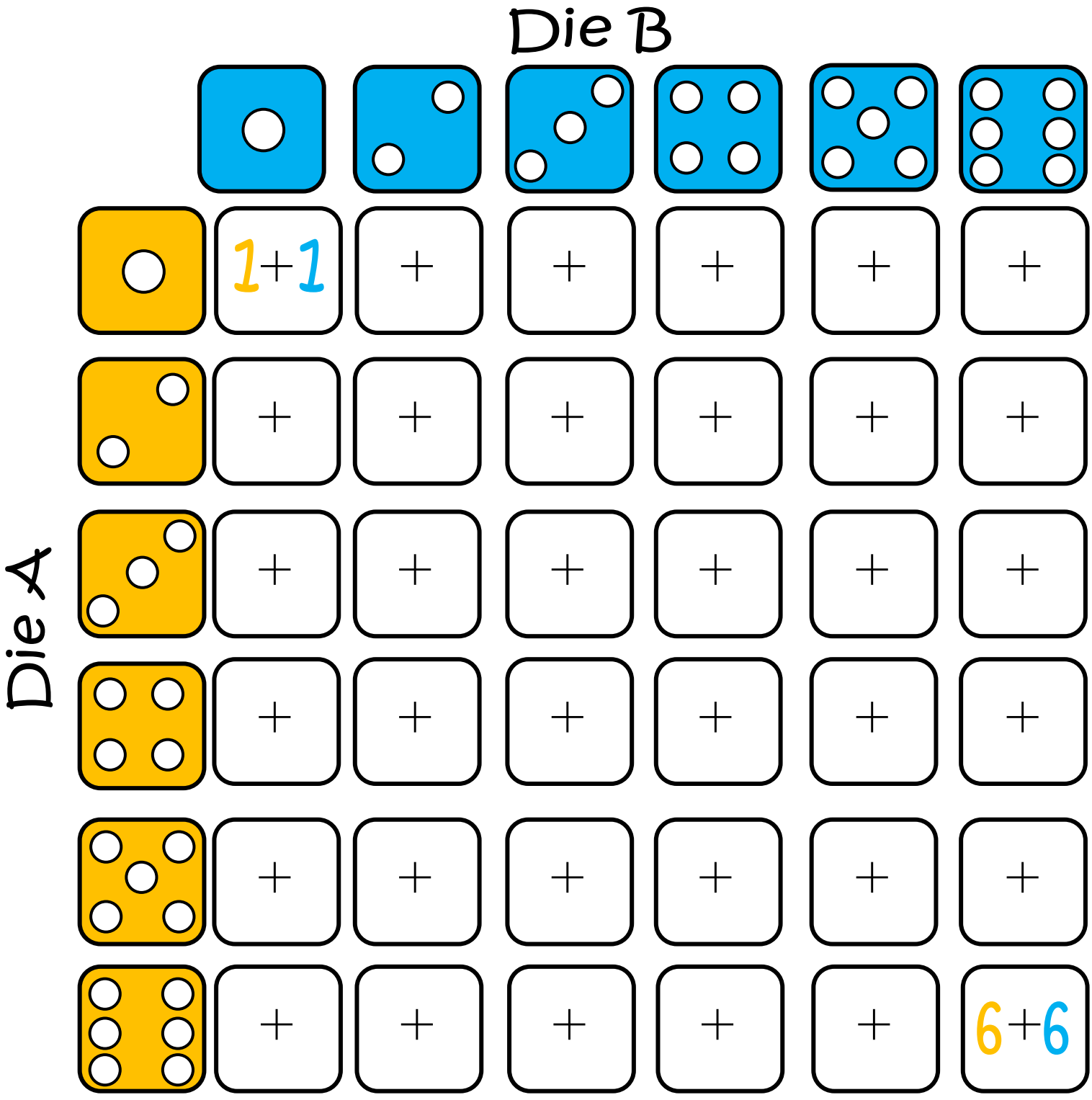
Variations:

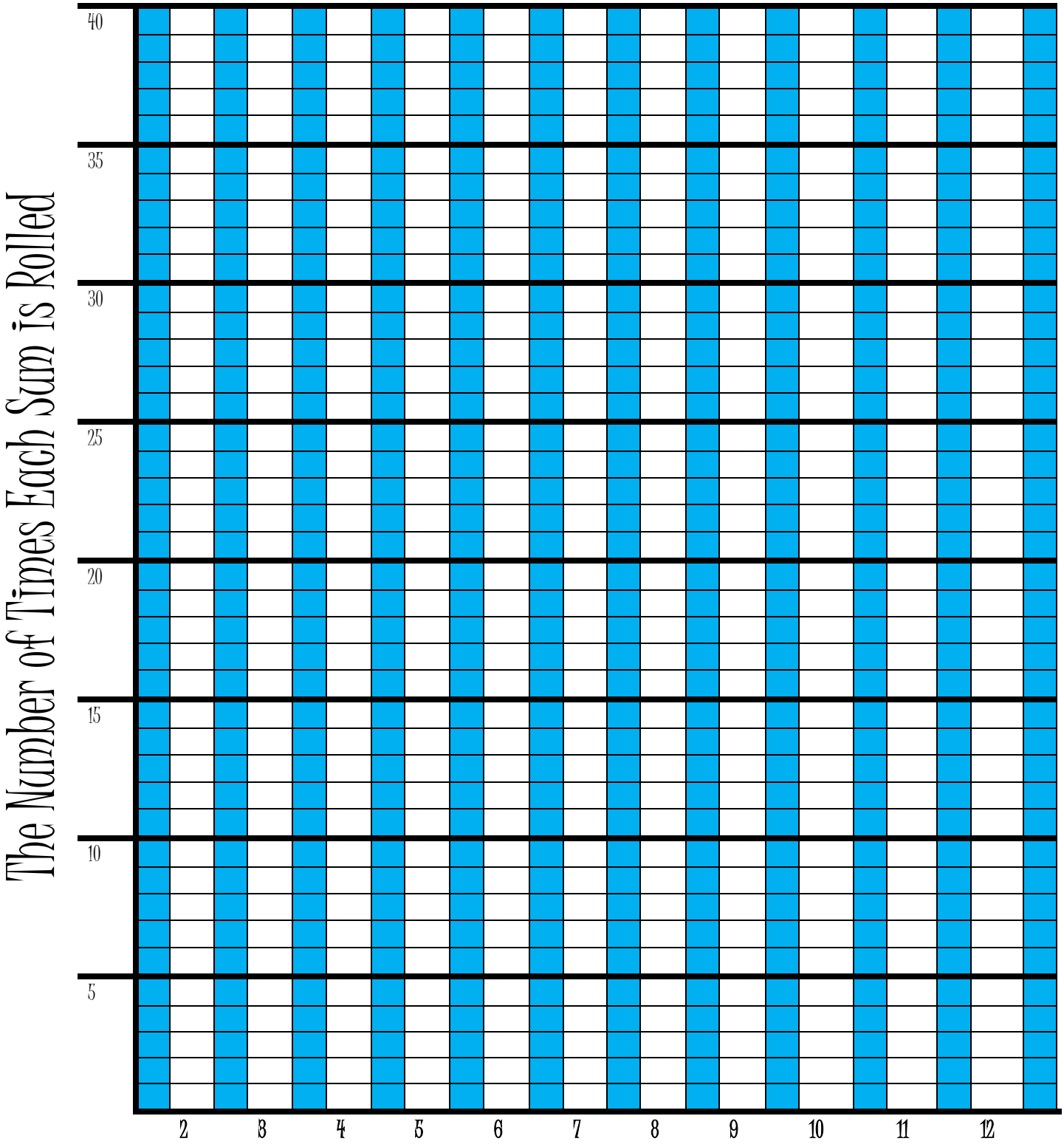
The Teacher may wish to play that the first student or Team to 100 is the winner but since it is possible for one student to be SO lucky as to get to 100 without passing the dice, the Teacher may want to add new twists to keep things interesting - first to 100 is the 1st winner and begins SUBTRACTING from 100 back to zero.

As students progress, move on to 12-sided dice. Because the scores add up so much more rapidly and the likelihood of rolling a 1 diminishes greatly, the student might only get 3 rolls per turn, however the same PIG! rules apply.

HOG

In 3rd grade they have been introduced to and SHOULD know their multiplication tables. Then the Teacher may switch to HOG. The rules are the same except that you multiply the numbers on the dice and add it to your score. You may wish to keep students scores on individual note cards.


Die B
Die A
1+1
6+6



Each time a sum is rolled, put an **X** in the column above that number.