

# KINDERGARTEN-CONTENT STANDARD #7 EXTENDED LESSON A

Permission Granted

## Recognizing Possible and Impossible Outcomes

### Introduction

**Objective** → Children will recognize possible and impossible outcomes in a given situation.

**Context** → Children have used number cubes and recognize numerals 1 through 6. They will use the notion of possible and impossible outcomes in mathematical and everyday situations.

### NCTM Standards Focus

Often children are asked to determine possible/impossible events just from illustrations. This has its drawbacks because of children's vivid imaginations. In this standards-based lesson, children are given several concrete situations. They use a number cube, a two-color counter, and decide what is possible and what is impossible. They use two methods – conducting an experiment and finding all the possible outcomes—to determine whether something is impossible or possible.

**Reasoning and Proof** Children make and investigate mathematical conjectures. They reason whether or not given situations are possible. They show that situations are impossible if they cannot occur.

**Representation** Children represent possible outcomes of a two-color counter, a bag with cubes, and a number cube using different recording methods and conclude that certain events are impossible with the help of these representations.

**Communication** Children communicate their understanding of when situations are possible and why a situation is impossible. They share their conclusions with the rest of the class.

### Teaching Plan

**Materials** → Student pages A.24-25; paper for recording information from the experiments (one sheet for each group for each experiment); a number cube labeled with numbers 1-6; one two-color counter; one set of three different colored cubes and an opaque bag.

This lesson can either be done as a whole class or in small groups. It will probably be better to do at least the first activity together to help children understand what they are doing. Also, three experiments are suggested here. Depending on the time you have you may wish to focus on one or two experiments and save another for later.

[Source: [Connect to NCTM Standards 2000 Kindergarten](#), p.134-139, Creative Publications, Inc.]

Ask the children if they can tell you what it means if something is possible. Have them give examples of things they believe might be possible. Then ask them what it means if something is impossible. Again, have them give examples of something that is impossible. Make sure children give their reasons as to why they think something is either possible or impossible. Have them try to convince other children that whatever they are saying is impossible or possible. If disagreements arise about whether something is possible or impossible, focus on what the class could do to find out which it is. This will help set the stage for what will happen later in the lesson. Also, it will work on developing their ability to reason.

Now bring out your bag with three cubes (for example red, blue, and white). Make sure children have paper to record the color of the cubes as they are drawn out of the bag. Show the children the cubes that are in the bag. Tell them you are going to pick out a cube and then put it back. When you pick out the cube, they should record the color. *What cubes is it possible for me to pick out? Do you think that a green cube could come out of the bag?* You may want to ask for a thumbs up or thumbs down vote for whether different outcomes are possible. This way you can see what each child thinks.

Discuss different ways that they can record the results. Some may wish to put the color on their paper and tally, and some may want to make a tally mark of the color of the cube. Ask them to get what they need ready. Tell them to make a spot for green and to get their green crayon out just in case they need to use it.

Now conduct the experiment. Draw one cube and have children record the results. Repeat this ten times. Discuss the results in terms of what they said earlier was possible and impossible. Review again why they thought some were possible or impossible. Take out all the cubes and line them up so children can easily see all the possible outcomes. Discuss with children how knowing all the possible outcomes can be used as a method to see if something is possible or impossible.

Show children a two-color counter (for example yellow and red) and give them a new piece of paper for the experiment. Tell them that you will flip the counter and they will record what happens. Ask them what they think the possible outcomes are and why they

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**Children are using two different techniques to check on the possibility and impossibility of certain outcomes. One method is to check for all possible outcomes. In the example with the cubes and the bags, checking the colors of all the cubes is finding all the outcomes. The other method is running an experiment. The experiment method is not totally valid for showing that a green cube will not come up. However, since a green cube did not come up, children can see that the experiment did not show green was possible. The experiment helped support their belief that green was impossible. Having children see that the event is not in the data set will tell them whether or not it is possible or impossible.**

[Source: [Connect to NCTM Standards 2000 Kindergarten](#), p.134-139, Creative Publications, Inc.]

**A.21**

think that. Ask them if they think that blue could come up after you flipped the counter. Discuss why they believe this.

Discuss with children how they would like to record this experiment. Make sure they have a way to record blue if it should come up. Repeat the experiment ten times. Ask the children if they think that if you flipped the counter more times it would come up blue at least once, and why. Discuss the outcome of the experiment again, focusing on what was possible and what was impossible. Check with children to see if the results agreed with what they thought.

For the final experiment, bring out the number cube and show it to the children. Give them another piece of recording paper. Have a similar discussion with children about what is possible and impossible, and why. Use the number zero as a suggestion for the impossible number. Also have them set up their recording systems. You may need to do this experiment a few more times than the others since there are more possible outcomes. Discuss the results when the experiment is done.

| <b>What Might Happen ... What to Do</b>   |   |
|---|---|
| The cube might present a problem to some children in determining the data set since they may get confused as to what numbers they have seen and not | seen. One method that may help them is to put a small piece of masking tape on the number once they have it written down. |

To end the lesson, ask children to discuss ways they can tell whether something is possible or not. It may help to give them some concrete examples similar to the examples used in class. Help them focus on using the technique of finding all the possible outcomes.

### **Student Pages**

Student page A.24 asks children to represent something that is possible.

Student page A.25 asks children to represent something that is impossible.

### **Assessment**

During this lesson, you had several opportunities to assess children's understanding of the terms *possible* and *impossible*. You were able to see individual children's responses for

### **Answers**

*Page A.24*  
Answers will vary.

*Page A.25*  
Answers will vary.

[Source: [Connect to NCTM Standards 2000 Kindergarten](#), p.134-139, Creative Publications, Inc.]

each experiment. Also at the end of the lesson you were able to look at their response for individual examples.

### **NCTM Standards Summary**

Children used reasoning in concrete situations to determine whether outcomes were possible or impossible. They represented possible outcomes by recording information in experiments investigating the situation. They communicated their understanding of when situations are possible and shared their understanding about why a situation is impossible.

[Source: [Connect to NCTM Standards 2000 Kindergarten](#), p.134-139, Creative Publications, Inc.]

**A.23**

Name \_\_\_\_\_

## Recognizing Possible and Impossible Outcomes

**Draw a picture of something that would be possible.**



[Source: [Connect to NCTM Standards 2000 Kindergarten](#), p.134-139, Creative Publications, Inc.]

Name \_\_\_\_\_

## Recognizing Possible and Impossible Outcomes

**Draw a picture of something that would be impossible.**



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