

# Mathematics Toolkit: Grade 5 Objective 5.A.1.a

Standard 5.0 Knowledge of Probability

Topic A. Sample Space

Indicator 1. Identify possible outcomes

Objective a. Determine possible outcomes of independent events

Assessment Limits:

Use two independent events with no more than 4 outcomes each and an organized list or tree diagram

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### Scoring Rubric

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- Rubric - Brief Constructed Response

## Clarification

### Mathematics Grade 5 Objective 5.A.1.a Assessment Limit 1

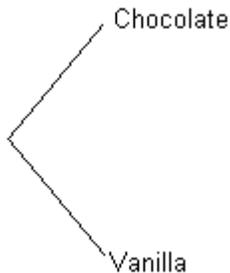
Two different methods can be used to find the total number of outcomes for independent events. One is a tree diagram and the other is an organized list. A tree diagram is constructed with branches that represent the outcomes of each independent event. The first set of branches lead to the outcomes of the first event and the next set of branches lead to the outcomes of the next independent event. To list the outcomes, read across each set of branches. An organized list is a systematic arrangement of outcomes. To complete the list, begin with the first outcome of the first independent event and arrange each of the outcomes of the next independent event with that first outcome. Then, select the second outcome of the first independent event and arrange the outcomes of the next independent event with that second outcome. Complete the process until all the outcomes are from the two events are arranged.

### Classroom Example 1

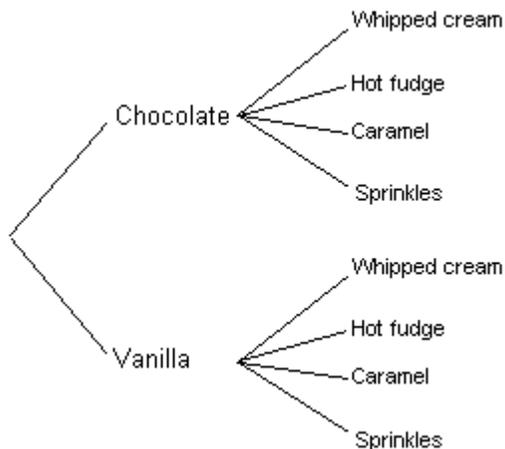
Find the different kinds of ice cream dishes you can make with 2 types of ice cream (first independent event) and 4 toppings (second independent event).

Use a tree diagram to find the different combinations.

- Begin with the first set of branches that represent the 2 types of ice cream.



- Continue by adding the next set of branches.



- Read across each set of branches to list the outcomes.

Ice cream	Topping	Outcome
	Whipped cream	Chocolate with whipped cream
Chocolate	Hot fudge	Chocolate with hot fudge
	Caramel	Chocolate with caramel
	Sprinkles	Chocolate with sprinkles
	Whipped cream	Vanilla with whipped cream
Vanilla	Hot fudge	Vanilla with hot fudge
	Caramel	Vanilla with caramel
	Sprinkles	Vanilla with sprinkles
		There are 8 different dishes (outcomes).

### Classroom Example 2

Suppose you have 3 shirts and 3 pairs of pants. What are the different outfits you could make with the shirts (first independent event) and pants (second independent event)? Use an organized list to find the different outfits.

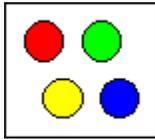
<b>Shirts:</b> blue, green, red		
<b>Pants:</b> khaki, white, jeans		
<u>Organized List</u>		
blue shirt/khaki pants	green shirt/khaki pants	red shirt/khaki pants
blue shirt/white pants	green shirt/white pants	red shirt/white pants
blue shirt/jeans	green shirt/jeans	red shirt/jeans
There are 9 different outfits (outcomes).		

## Higher Order Thinking Skills

Mathematics Grade 5 Objective 5.A.1.a Assessment Limit 1

### Question

Brendan pulled a chip out of a box and tossed a coin as shown below.



### Level 1: Knowledge/Comprehension

- How many possible outcomes with heads and chips together are there?
- How many possible outcomes with tails and chips together are there?
- How many possible outcomes are there?

### Level 2: Application/Analysis

- Create a tree diagram or organized list to show all possible outcomes.
- Create an organized list to show all possible outcomes.  
Explain the steps you took to complete the list.  
How did you know when you were done?  
How did you know you had listed all possible outcomes?

### Level 3: Synthesis/Evaluation

- How many possible outcomes are there? Explain why your answer is correct.
- If another color chip was added to the box, how would the number of outcomes change? Create a tree diagram or an organized list to show the change.



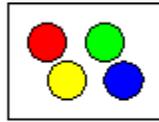
Sample Item #2 - Selected Response (SR) Item

Mathematics Grade 5 Objective 5.A.1.a

Brendan pulled a chip out of a box and tossed a coin as shown below. He created a tree diagram to record all possible outcomes.



*heads or tails*



*red, yellow green or blue*

Which tree diagram correctly shows all possible outcomes for pulling a chip and tossing a coin?

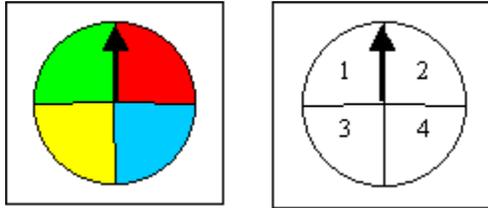
- A.
  - Heads
    - Red
    - Green
  - Heads
    - Blue
    - Yellow
- B.
  - Heads
    - Red
    - Blue
    - Yellow
    - Green
  - Tails
    - Red
    - Blue
    - Yellow
    - Green
- C.
  - Heads
    - Red
    - Blue
  - Tails
    - Green
    - Yellow
- D.
  - Tails
    - Red
    - Green
  - Tails
    - Blue
    - Yellow

Correct Answer:  
B

### Sample Item #3 - Brief Constructed Response (BCR) Item

Mathematics Grade 5 Objective 5.A.1.a

Brendan is playing a game with these two spinners. The spinners are each divided into 4 equal sections. He spins the arrows on both spinners and records the color and number he got each time. For example, on his first spin, Brendan got blue, 2.



Step A

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How many possible outcomes are there?

Step B

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Explain how you found your answer. Use what you know about probability in your explanation. Use words, numbers, and/or symbols in your explanation.

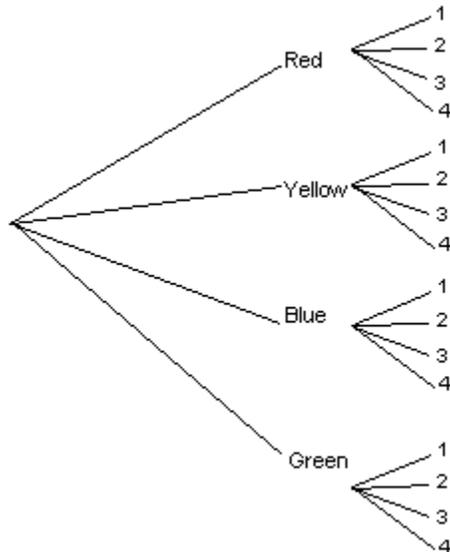
Correct Answer:

Step A

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Answer Annotation

Sample correct response: I used a tree diagram.



## Rubric - Brief Constructed Response (BCR)

### Score 2

The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate.<sup>3</sup>

### Score 1

The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation<sup>1</sup> of and/or justification<sup>2</sup> for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.<sup>3</sup>

### Score 0

The response is completely incorrect, irrelevant to the problem, or missing.<sup>4</sup>

### Notes:

- <sup>1</sup> Explanation refers to students' ability to communicate how they arrived at the solution for an item using the language of mathematics.
- <sup>2</sup> Justification refers to students' ability to support the reasoning used to solve a problem, or to demonstrate why the solution is correct using mathematical concepts and principles.
- <sup>3</sup> Students need to complete rubric criteria for explanation, justification, connections and/or extensions as cued for in a given problem.
- <sup>4</sup> Merely an exact copy or paraphrase of the problem will receive a score of "0".

Rubric Document Date: August 2003