

Mathematics Toolkit: Grade 7 Objective 5.A.1.a

Standard 5.0 Knowledge of Probability

Topic A. Sample Space

Indicator 1. Identify a sample space

Objective a. Determine the number of outcomes

Assessment Limits:

Use no more than 3 independent events with a sample space of no more than 6 outcomes in each event.

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Clarification

Mathematics Grade 7 Objective 5.A.1.a Assessment Limit 1

Probability is the chance or likelihood of an event happening. Each of the possible results of an activity, either theoretical or experimental, is an outcome. A set of all possible outcomes of an experiment is called a sample space. An event is a specific set of outcomes from the sample space. Two or more events are said to be independent events when the result of one event does not affect the outcomes of the other events. Two or more events are said to be dependent events when the result of one event does affect the outcomes of the other events.

Classroom Example 1

What is the total number of outcomes for the two spinners shown below?



This question can be solved using one of several methods shown below.

Method 1

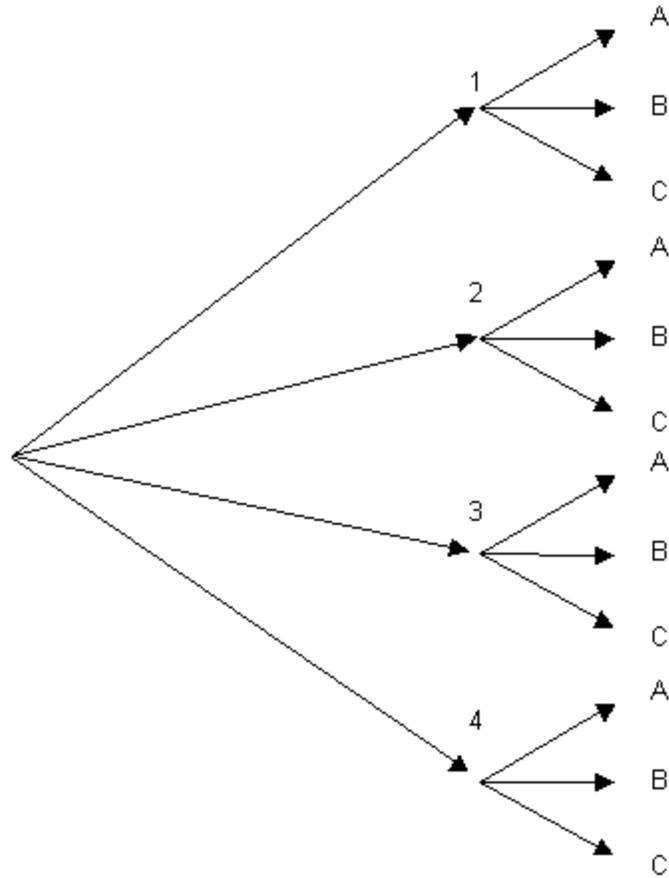
Make a list of all possible outcomes for each spinner

1, A	2, A	3, A	4, A
1, B	2, B	3, B	4, B
1, C	2, C	3, C	4, C

Answer: 12 possible outcomes

Method 2

Make a tree diagram showing each possibility



Trace each path on the tree diagram to show all of the possible outcomes.

- | | | |
|------|------|------|
| 1, A | 1, B | 1, C |
| 2, A | 2, B | 2, C |
| 3, A | 3, B | 3, C |
| 4, A | 4, B | 4, C |

Answer: 12 possible outcomes

Method 3

Apply the Fundamental Counting Principle

Fundamental Counting Principle:

If one event can occur in m ways and a second event can occur in n ways, then the first event followed by the second event can occur in $m \cdot n$ ways.

The first spinner has 4 (m) possible outcomes (1, 2, 3, or 4). The second spinner has 3 (n) possible outcomes (A, B, or C). To determine the total number of possible outcomes for both independent events, multiply the number of outcomes for each event.

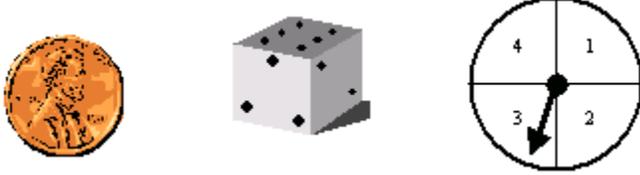
$$4 \cdot 3 = 12$$

Answer: 12 possible outcomes

Sample Item #1 - Selected Response (SR) Item

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Edward conducts a simulation using a coin, a number cube, and a spinner, as shown below.



What is the number of outcomes for his simulation?

- A. 3
- B. 8
- C. 12
- D. 48

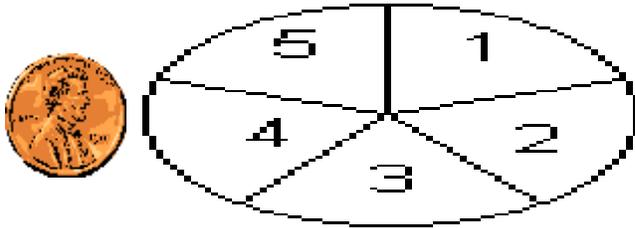
Correct Answer:

D

Sample Item #2 - Selected Response (SR) Item

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Paloma flips a coin and then spins the arrow on the spinner.



What is the total number of outcomes for this event?

- A. 7
- B. 10
- C. 15
- D. 25

Correct Answer:

B

Answer Annotation

- A. 7 (adds number of events)
- B. 10 (correct answer)
- C. 15 (multiplies three times five)
- D. 25 (squares number of outcomes on spinner)

Sample Item #3 - Selected Response (SR) Item

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Alan tosses a quarter and then rolls a six-sided number cube. What is the total number of outcomes for this event?

- A. 8
- B. 10
- C. 12
- D. 36

Correct Answer:

C

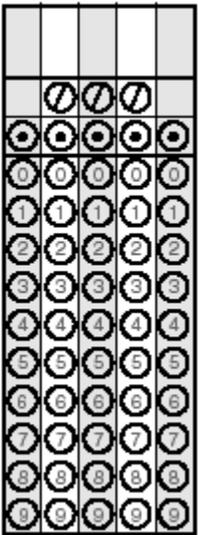
Answer Annotation

- A. 8 (adds outcomes)
- B. 10 (thinks 5 outcomes on cube)
- C. 12 (correct answer)
- D. 36 (squares six events for a die)

Sample Item #4 - Student Produced Response (SPR) Item

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What is the total number of outcomes for picking a card from a group of 6 cards labeled A, B, C, D, E, and F, tossing a coin and rolling a number cube?

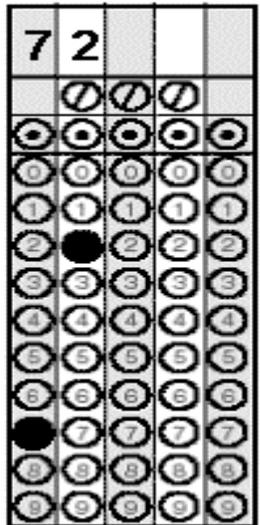
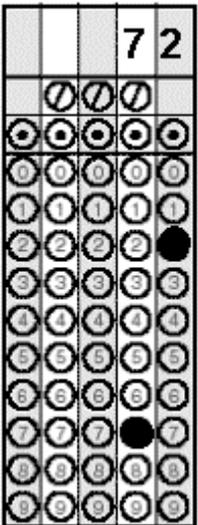


Correct Answer:

72

Answer Annotation

Answer: or



Sample Item #5 - Brief Constructed Response (BCR) Item

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The list below shows the different taco shells, fillings, and toppings sold at Rico's Taco Bar.

<u>Taco Shells</u>	<u>Fillings</u>	<u>Toppings</u>
Soft	Chicken	Cheese
Hard	Beef	Lettuce
	Bean	Salsa
		Onions
		Sour Cream

Step A

How many different types of tacos can Rico make using one taco shell, one filling, and one topping?

Step B

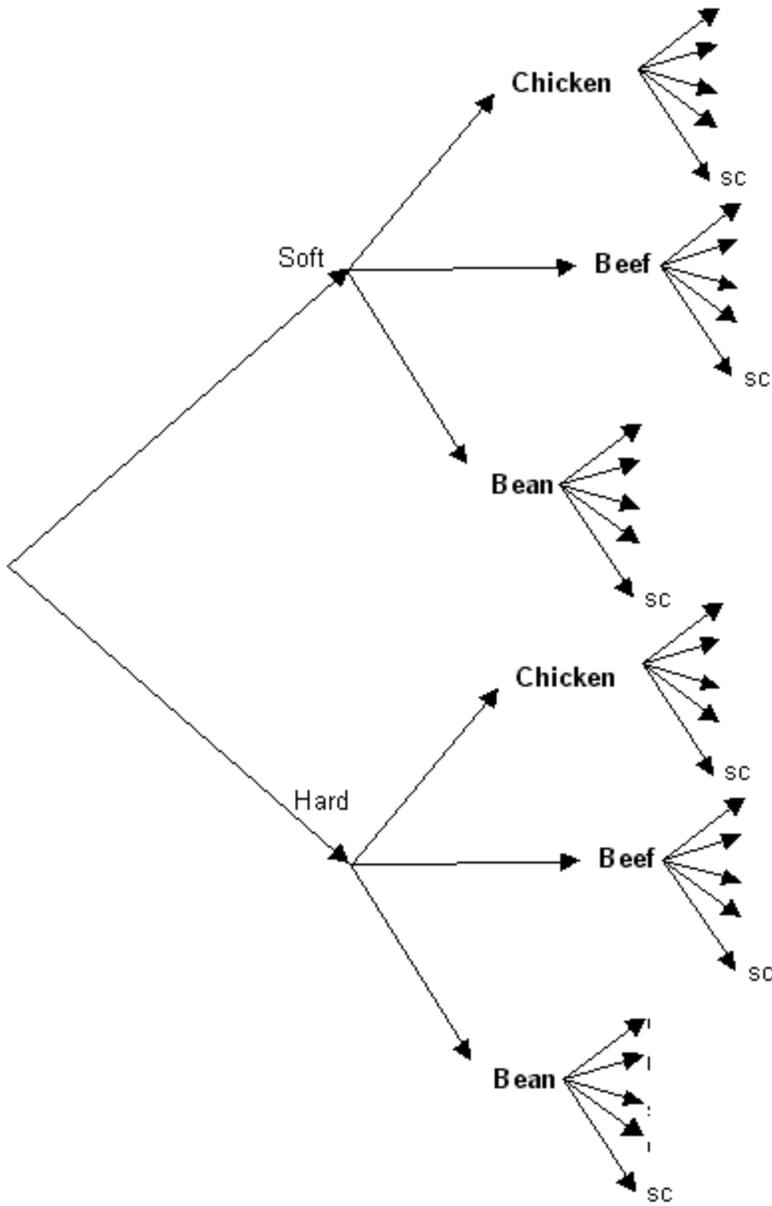
Use what you know about probability to justify why the number of different types of tacos you determined is correct. Use words, numbers, and/or symbols in your justification.

Answer Annotation

Step A Answer: 30

Step B Sample correct response: Since there are 2 different types of shells, 3 different types of filling, and 5 different types of toppings, then using the Fundamental Counting Principle, the total number of combinations is $2 \cdot 3 \cdot 5$, or 30, different ways.

Step B Sample correct response



If I count the end branches on my tree diagram, there are 30.

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.
- Explanation¹ of and/or justification² 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.³

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.
- Explanation¹ of and/or justification² 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.³

Score 0

The response is completely incorrect, irrelevant to the problem, or missing.⁴

Notes:

- ¹ Explanation refers to students' ability to communicate how they arrived at the solution for an item using the language of mathematics.
- ² 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.
- ³ Students need to complete rubric criteria for explanation, justification, connections and/or extensions as cued for in a given problem.
- ⁴ Merely an exact copy or paraphrase of the problem will receive a score of "0".

Rubric Document Date: August 2003