8.DSP.5 For events with a large number of outcomes, understand the use of the multiplication counting principle. Develop the multiplication counting principle, and apply it to situations with a large number of outcomes.

Reporting Category: Geometry, Measurement, Data Analysis, Statistics, and Probability	**Subdomain**: Solving Problems

8.DSP.5 Instructional Framework

Assessed On:

☐ Checkpoint 1   ☐ Checkpoint 2   ☐ Checkpoint 3   ☑ Summative

Content Limits:
- Restrict small-scale situations to no more than 3 elements to be combined.
- Include four or more elements to be combined for large-scale situations.

Clarifications:
- Real-world context should be used for most items, but is not required for all items.
- The keypad in the ILEARN testing system does not allow students to enter a comma between each period in a multi-digit number. (Example: 13,323 would be entered as 13323.)

Calculator Availability: Allowed

Expected Academic Vocabulary: multiplication counting principle, outcomes, possibilities, combinations, tree diagrams,

Examples of Context and Varying Difficulty Levels	
Context: Easy	The number of outcomes at each stage of the event is 4 or less.
Context: Medium	The number of outcomes of the compound event is up to 100.
Context: Difficult	The number of outcomes of the compound event may exceed 100.

| **Proficiency Level Descriptors and Example Items**	
Looking Back: 7.DSP.5 ILEARN Item Specification	**Looking Ahead**: AII.MQ.1

Below Proficiency: Demonstrate how the multiplication counting principle can be used to find the same number of outcomes as a listing method.

The numbers 3, 6, 8, and 9 can be used to create two-digit codes, like 3-6, using each digit only one time. The total number of combinations that can be made are represented by the tree diagrams.	This is a DOK 2 item because students must identify how the multiplication counting principle can be applied
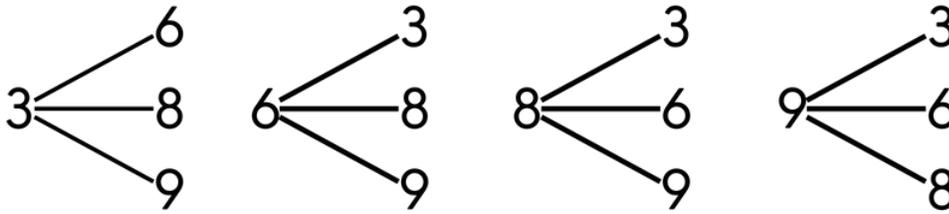
Choose the expression that represents the total number of outcomes.

    a. 3 • 6 • 8 • 9
    b. 4 • 4 • 4 • 4
    c. 4 • 3
    d. 4 • 3 • 2 • 1

Answer: c

to the given situation and listing method to determine the same number of outcomes.

This is an easy item because there are two stages to the compound event with 4 choices each.

Approaching Proficiency: Identify or write expressions to represent the application of the multiplication counting principle to small-scale situations; OR solve small-scale problems by applying the multiplication counting principle.

A student buys new clothes before the beginning of the school year. The student buys:
- 4 shirts
- 3 pants
- 2 pairs of shoes

How many different combinations of 1 shirt, 1 pair of pants, and 1 pair of shoes can be made?

Answer: 24

This is a DOK 1 item because students must apply the multiplication counting principle to the given situation to determine the number of outcomes.

This is an easy item because each aspect of the compound event has 4 or fewer outcomes.

A bakery sells cupcakes with different kinds of icing and toppings. A customer can choose from:
- 8 different flavors of cupcakes,
- 5 different kinds of icing, and
- 2 different toppings.

Which expression represents all the possible combinations of cupcake flavors, icing, and toppings?

    a. 8 • 5 • 2
    b. 8 + 5 + 2

This is a DOK 1 item because students must identify the expression that demonstrates the use of the multiplication counting principle.

This is a medium-difficulty item because the total number of outcomes is

c. 8 • 5 + 2

d. (8 • 5) + (8 • 2)

Answer: a

| | less than 100. |

At Proficiency: Solve large-scale problems by applying the multiplication counting principle.

| A license plate consists of 3 letters followed by 4 digits (0-9).

If all letters and numbers are allowed to be used more than one time, how many different license plates can be made?
*There are 26 letters in the alphabet.

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Answer: 175,760,000 | This is a DOK 2 item because students must apply the multiplication counting principle to a large-scale problem to determine the number of outcomes.

This is a difficult item because the total number of outcomes exceeds 100. |
| An airline allows passengers to customize their flight experience by selecting from this list of options.
● 50 seating choices
● 4 meal options
● 3 in-flight entertainment options
● 5 baggage option

If a passenger must choose one option from each category, how many different flight experiences can be created?

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Answer: 3000 | This is a DOK 2 item because students must apply the multiplication counting principle to a large-scale problem to determine the number of outcomes.

This is a difficult item because the total number of outcomes exceeds 100. |

Above Proficiency: Solve problems that include constraints on order or repetition by applying the multiplication counting principle.

| A school carnival sold raffle tickets to raise money.

● 30 tickets, each bought by a different person, were put in a hat.
● 3 random tickets will be drawn from the hat and not put back in.

How many different combinations of the 30 people who bought raffle tickets could be drawn? | This is a DOK 3 item because students must apply the multiplication counting principle to identify the number of outcomes for a situation that includes at least one restriction.

This is a difficult item |

because the total number of outcomes exceeds 100.

Answer: 24,360