

### Core Content

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| <b>Cluster Title:</b> Use the rules of probability to compute probabilities of compound events in a uniform probability model.   |
| <b>Standard S.CP.8 (+):</b> Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)$ , and interpret the answer in terms of the model.  |
| <b>Concepts and Skills to Master</b>   |
| <ul style="list-style-type: none"> <li>Define the probability of event (<i>A and B</i>) as the probability of the intersection of events <i>A</i> and <i>B</i>.</li> <li>Understand <math>P(B A)</math> to mean the probability of event <i>B</i> occurring when <i>A</i> has already occurred.</li> <li>Use the multiplication rule, <math>P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)</math>, to determine <math>P(A \text{ and } B)</math>.</li> <li>Determine the probability of dependent and independent events in real contexts.</li> </ul> |

### Supports for Teachers

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| <b>Critical Background Knowledge</b>  |                  |           |           |           |    |    |          |    |    |  |
| <ul style="list-style-type: none"> <li>Probabilities of compound events and tree diagrams. (7.SP.8)</li> <li>Sample space, sets, subsets, outcomes, events, union, intersection, “and”, “or”. (II.4.S.CP.1)</li> <li>Conditional probability. (II.4.S.CP.3)</li> <li>Two-way tables. (II.4.S.CP.4)</li> </ul>   |                  |           |           |           |    |    |          |    |    |  |
| <b>Academic Vocabulary</b>  |                  |           |           |           |    |    |          |    |    |  |
| uniform probability model, multiplication rule, $P(A)$ , $P(A   B)$ , $P(A \cap B)$   |                  |           |           |           |    |    |          |    |    |  |
| <b>Suggested Instructional Strategies</b>   | <b>Resources</b> |           |           |           |    |    |          |    |    |  |
| <ul style="list-style-type: none"> <li>Apply and interpret the multiplication rule to a variety of contextual events.</li> <li>Illustrate the multiplication rule with tree diagrams, Venn diagrams and two-way tables.</li> </ul>  |                  |           |           |           |    |    |          |    |    |  |
| <b>Sample Formative Assessment Tasks</b>  |                  |           |           |           |    |    |          |    |    |  |
| <p><b>Skill-Based Task:</b><br/>Given the following table, which includes data regarding boating preferences of boys and girls, find the probability that a randomly chosen student is a girl who prefers lake boating.</p> <table border="1" style="margin-left: 20px;"> <tr> <td></td> <td>Lake (L)</td> <td>River (R)</td> </tr> <tr> <td>Girls (G)</td> <td>21</td> <td>29</td> </tr> <tr> <td>Boys (B)</td> <td>32</td> <td>18</td> </tr> </table> |                  | Lake (L)  | River (R) | Girls (G) | 21 | 29 | Boys (B) | 32 | 18 | <p><b>Problem Task:</b><br/>The probability that a student passes the written portion of a driving test is 62%. The probability that a student passes the driving part of the test is 86%. Draw a diagram to clearly demonstrate the probability that a student passes both tests.</p> |
|   | Lake (L)         | River (R) |           |           |    |    |          |    |    |  |
| Girls (G)   | 21               | 29        |           |           |    |    |          |    |    |  |
| Boys (B)  | 32               | 18        |           |           |    |    |          |    |    |  |

## Core Content

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| <b>Cluster Title: Use the rules of probability to compute probabilities of compound events in a uniform probability model.</b>   |
| <b>Standard S.CP.9 (+):</b> Use permutations and combinations to compute probabilities of compound events and solve problems.  |
| <b>Concepts and Skills to Master</b>   |
| <ul style="list-style-type: none"> <li>Define <math>n!</math> as the product: <math>n \cdot (n-1) \cdot \dots \cdot 3 \cdot 2 \cdot 1</math>.</li> <li>Understand that a permutation is a rearrangement of the elements of an ordered list and calculate probabilities using the permutation formula <math>P(n,r) = n \cdot (n-1) \cdot \dots \cdot (n-(r-1)) = n!/(n-r)!</math>.</li> <li>Understand that a combination is the number of ways to choose <math>r</math> items from a set of <math>n</math> elements and calculate probabilities using the combination formula <math>C(n,r) = P(n,r)/r! = n!/[(n-r)! r!]</math>.</li> </ul> |

## Supports for Teachers

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| <b>Critical Background Knowledge</b>   |   |
| <ul style="list-style-type: none"> <li>Probabilities of compound events (7.SP.8).</li> <li>Conditional probability (II.4.S.CP.3).</li> <li>Multiplication rule of probability (II.4.S.CP.8 (+)).</li> </ul>            |   |
| <b>Academic Vocabulary</b>   |   |
| factorial, permutation, combination, $P(n,r)$ , ${}_nP_r$ , $C(n,r)$ , ${}_nC_r$ , $\binom{n}{r}$  |   |
| <b>Suggested Instructional Strategies</b>  | <b>Resources</b>  |
| <ul style="list-style-type: none"> <li>Embed combination and permutation explorations in contextual situations.</li> </ul>   | Permutations and Combinations:<br><a href="http://mathforum.org">http://mathforum.org</a>   |
| <b>Sample Formative Assessment Tasks</b>   |   |
| <p><b>Skill-Based Task:</b><br/>Given the set of ice cream flavors {chocolate, strawberry, vanilla}, list all possible two-scoop cones, and find the probability that a randomly selected cone includes chocolate.</p> | <p><b>Problem Task:</b><br/>Referring to the skill-based task, consider all possible sets of two-scoop cones. How would you define “two-scoop cone” in order to be a permutation? What part of your definition would you change to define the cones as a combination? How do the probabilities of getting chocolate change in each setting?</p> |