

Compound Counting and Probability

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

1. In a group of 56, 31 chose art, 26 chose music, and 6 chose both. Find the number in exactly one group, in the union, and in neither group.

Reference: Use  $|A \text{ union } B| = |A| + |B| - |A \text{ intersection } B|$ . Subtract the union from the total for neither.

2. A survey of 42 people recorded sets A, B, and C. Totals are  $|A|=14$ ,  $|B|=17$ ,  $|C|=17$ ,  $|A \text{ intersection } B|=4$ ,  $|A \text{ intersection } C|=4$ ,  $|B \text{ intersection } C|=4$ , and  $|A \text{ intersection } B \text{ intersection } C|=1$ . Find the union and neither.

Reference: For three sets, add singles, subtract pair intersections, then add the triple intersection once.

Compound Counting and Probability

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

3. 4 selections are made independently and uniformly from 15 labels, with replacement. Find the probability that at least two selections match.

Reference: Compute 1 minus the probability that all selections are distinct.

4. A code uses one of 8 colors followed by one of 10 digits, with every code equally likely. A prize code uses one of 4 marked colors and one of 8 marked digits. Find the favorable count, total count, and probability.

Reference: Use the multiplication rule separately for favorable outcomes and for all outcomes.

Compound Counting and Probability

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

5. 6 selections are made independently and uniformly from 19 labels, with replacement. Find the probability that at least two selections match.

Reference: Compute 1 minus the probability that all selections are distinct.

6. A survey of 41 people recorded sets A, B, and C. Totals are  $|A|=14$ ,  $|B|=16$ ,  $|C|=15$ ,  $|A \cap B|=5$ ,  $|A \cap C|=5$ ,  $|B \cap C|=5$ , and  $|A \cap B \cap C|=2$ . Find the union and neither.

Reference: For three sets, add singles, subtract pair intersections, then add the triple intersection once.

Compound Counting and Probability

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

7. A code uses one of 6 colors followed by one of 10 digits, with every code equally likely. A prize code uses one of 2 marked colors and one of 3 marked digits. Find the favorable count, total count, and probability.

Reference: Use the multiplication rule separately for favorable outcomes and for all outcomes.

8. In a group of 54, 28 chose art, 28 chose music, and 6 chose both. Find the number in exactly one group, in the union, and in neither group.

Reference: Use  $|A \cup B| = |A| + |B| - |A \cap B|$ . Subtract the union from the total for neither.

Compound Counting and Probability  
Worked Answer Key

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

1. In a group of 56, 31 chose art, 26 chose music, and 6 chose both. Find the number in exactly one group, in the union, and in neither group.

Reference: Use  $|A \cup B| = |A| + |B| - |A \cap B|$ . Subtract the union from the total for neither.

Answer: exactly one 45; union 51; neither 5

- 1. Art only =  $31 - 6 = 25$ ; music only =  $26 - 6 = 20$ .
- 2. Exactly one =  $25 + 20 = 45$ . Union =  $31 + 26 - 6 = 51$ .
- 3. Neither =  $56 - 51 = 5$ .

2. A survey of 42 people recorded sets A, B, and C. Totals are  $|A|=14$ ,  $|B|=17$ ,  $|C|=17$ ,  $|A \cap B|=4$ ,  $|A \cap C|=4$ ,  $|B \cap C|=4$ , and  $|A \cap B \cap C|=1$ . Find the union and neither.

Reference: For three sets, add singles, subtract pair intersections, then add the triple intersection once.

Answer: union 37; neither 5

- 1. Union =  $14 + 17 + 17 - 4 - 4 - 4 + 1 = 37$ .
- 2. Neither =  $42 - 37 = 5$ .

# Math Sheet

Name \_\_\_\_\_ Score \_\_\_\_\_ Teacher \_\_\_\_\_ Date \_\_\_\_\_

## Compound Counting and Probability

### Worked Answer Key

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

- 3. 4 selections are made independently and uniformly from 15 labels, with replacement. Find the probability that at least two selections match.**

Reference: Compute 1 minus the probability that all selections are distinct.

**Answer: 0.353**

1.  $P(\text{all distinct}) = (15 \times 14 \times 13 \times 12) / 15^4$ .
2.  $P(\text{a collision}) = 1 - P(\text{all distinct}) = 0.353$ .

- 4. A code uses one of 8 colors followed by one of 10 digits, with every code equally likely. A prize code uses one of 4 marked colors and one of 8 marked digits. Find the favorable count, total count, and probability.**

Reference: Use the multiplication rule separately for favorable outcomes and for all outcomes.

**Answer:  $32/80 = 0.400$**

1. Favorable count =  $4(8) = 32$ .
2. Total count =  $8(10) = 80$ .
3. Probability =  $32/80 = 0.400$ .

# Math Sheet

Name \_\_\_\_\_ Score \_\_\_\_\_ Teacher \_\_\_\_\_ Date \_\_\_\_\_

## Compound Counting and Probability

### Worked Answer Key

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

5. 6 selections are made independently and uniformly from 19 labels, with replacement. Find the probability that at least two selections match.

Reference: Compute 1 minus the probability that all selections are distinct.

**Answer: 0.585**

1.  $P(\text{all distinct}) = (19 \times 18 \times 17 \times 16 \times 15 \times 14) / 19^6$ .
2.  $P(\text{a collision}) = 1 - P(\text{all distinct}) = 0.585$ .

6. A survey of 41 people recorded sets A, B, and C. Totals are  $|A|=14$ ,  $|B|=16$ ,  $|C|=15$ ,  $|A \text{ intersection } B|=5$ ,  $|A \text{ intersection } C|=5$ ,  $|B \text{ intersection } C|=5$ , and  $|A \text{ intersection } B \text{ intersection } C|=2$ . Find the union and neither.

Reference: For three sets, add singles, subtract pair intersections, then add the triple intersection once.

**Answer: union 32; neither 9**

1.  $\text{Union} = 14 + 16 + 15 - 5 - 5 - 5 + 2 = 32$ .
2.  $\text{Neither} = 41 - 32 = 9$ .

## Compound Counting and Probability

### Worked Answer Key

Show favorable and total counts before forming a probability. For collisions, use the no-collision complement.

7. A code uses one of 6 colors followed by one of 10 digits, with every code equally likely. A prize code uses one of 2 marked colors and one of 3 marked digits. Find the favorable count, total count, and probability.

Reference: Use the multiplication rule separately for favorable outcomes and for all outcomes.

**Answer:  $6/60 = 0.100$**

1. Favorable count= $2(3)=6$ .
2. Total count= $6(10)=60$ .
3. Probability= $6/60=0.100$ .

8. In a group of 54, 28 chose art, 28 chose music, and 6 chose both. Find the number in exactly one group, in the union, and in neither group.

Reference: Use  $|A \text{ union } B| = |A| + |B| - |A \text{ intersection } B|$ . Subtract the union from the total for neither.

**Answer: exactly one 44; union 50; neither 4**

1. Art only= $28-6=22$ ; music only= $28-6=22$ .
2. Exactly one= $22+22=44$ . Union= $28+28-6=50$ .
3. Neither= $54-50=4$ .