

# Combinations and Permutations

## Long-Term Memory Review

### Review 1

1. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS important.
2. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS NOT important.
3. How do you read  ${}_5P_3$ ? \_\_\_\_\_.
4. How do you read  ${}_5C_3$  or  $\binom{5}{3}$ ? \_\_\_\_\_.
5. Assume a school has three people interested in serving on a two-member panel that includes a chairperson and a vice-chairperson. Clearly, one person will be left off the panel. To decide who resides on the panel, the student body of the school is asked to vote.
  - a. If the names of the three people interested in serving are *Ron*, *Latisha*, and *Vince*, then list the different ways the election for the panel could occur?

<b>First Way</b>	<b>Third Way</b>	<b>Fifth Way</b>
<u>Latisha</u> Chairperson	<u>Ron</u> Vice-Chair	<u>          </u> Chairperson
<u>Ron</u> Vice-Chair	<u>          </u> Vice-Chair	<u>          </u> Vice-Chair
<b>Second Way</b>	<b>Fourth Way</b>	<b>Sixth Way</b>
<u>Ron</u> Chairperson	<u>Vince</u> Chairperson	<u>          </u> Chairperson
<u>Latisha</u> Vice-Chair	<u>Ron</u> Vice-Chair	<u>          </u> Vice-Chair

- b. In the above problem, is order important? (Why or why not?) \_\_\_\_\_  
\_\_\_\_\_

6. Assume a school has three people interested in serving on a two-member panel. Clearly, one person will be left off the panel. To decide who resides on the panel, the student body of the school is asked to vote.
  - a. If the names of the three people interested in serving are *Ron*, *Latisha*, and *Vince* then list the different ways the election for the panel could occur?

<b>First Way</b>	<b>Second Way</b>	<b>Third Way</b>
<u>Latisha</u> Member	<u>          </u> Member	<u>          </u> Member
<u>Ron</u> Member	<u>          </u> Member	<u>          </u> Member

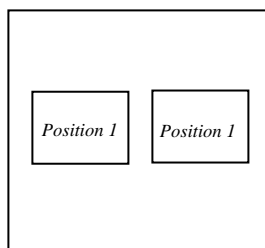
- b. In the above problem, is order important? (Why or why not?) \_\_\_\_\_  
\_\_\_\_\_

# Combinations and Permutations

## Long-Term Memory Review

### Review 2

1. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS important.
2. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS NOT important.
3. How do you read  ${}_4P_3$ ? \_\_\_\_\_.
4. How do you read  ${}_4C_3$  or  $\binom{4}{3}$ ? \_\_\_\_\_.
5. **Counting Principle:** Miranda has a gift-wrapping business. She has 15 types of paper, 10 types of ribbon, and 12 different bows. How many different arrangements can be made for wrapping a gift?  
(Hint: # of paper types times # of ribbon types times # of bow types = # of different arrangements)
6. Assume you have three different colored blocks (**R** – Red, **G** – Green, **B** – Blue) and you want to organize two of them on a table (one adjacent to the next). Using the table below, show the sample space for all the different arrangements. (HINT: There are too many boxes in the sample space below)



<b>Position 1</b>	<b>R</b>										
<b>Position 2</b>	<b>G</b>										
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>

7. How many different arrangements did you produce? \_\_\_\_\_
8. Go back to the sample space and cross out the columns that have the same letters as a previous column (e.g. column **RG** and **GR** are the same). How many columns did you cross out? \_\_\_\_\_
9. How many columns were not crossed out? \_\_\_\_\_
10. If two coins are tossed and a die is rolled, which expression below best describes the total number of outcomes possible?  
 A.  $2 + 6$                       B.  $2 + 2 + 6$                       C.  $2(2)(6)$                       D.  $2(2 + 6)$

# Combinations and Permutations

## Long-Term Memory Review

### Review 3

- A \_\_\_\_\_ is an arrangement of a set of objects in which order IS important.
- A \_\_\_\_\_ is an arrangement of a set of objects in which order IS NOT important.
- How do you read  ${}_5P_3$ ? \_\_\_\_\_.
- How do you read  ${}_5C_3$  or  $\binom{5}{3}$ ? \_\_\_\_\_.
- How many arrangement will  ${}_5P_3$  produce?  
 A. 2 arrangements      B. 10 arrangements      C. 15 arrangements      D. 60 arrangements
- Counting **Principle**: How many different kinds of sandwiches can be made choosing from 3 kinds of bread, 5 fillings, and 3 dressings? # of breads times # of fillings times # of dressings = # of different sandwiches  
 A. 9 sandwiches      B. 11 sandwiches      C. 15 sandwiches      D. 45 sandwiches
- Suppose a license plate consists of three letters followed by three digits. How many different license plates can be created? (*Letters and numbers CAN be repeated*). You only need to set-up the problem.

_____	26	_____	■	_____	10
How many letters are there to choose from?	How many letters are there to choose from?	How many letters are there to choose from?	How many #'s are there to choose from?	How many #'s are there to choose from?	How many #'s are there to choose from?

- Suppose a license plate consists of three letters followed by three digits. How many different license plates can be created? (*Letters and numbers CAN NOT be repeated*). You only need to set-up the problem.

_____	_____	24	■	10	_____	_____
How many letters are there to choose from?	How many letters are there to choose from?	How many letters are there to choose from?	How many #'s are there to choose from?	How many #'s are there to choose from?	How many #'s are there to choose from?	How many #'s are there to choose from?

- Assume you have four video games (*M – Metal Gear, G – Gran Turismo, F – Final Fantasy, and A – Ace Combat*) and you want to organized them on a shelf (one adjacent to the next). Using the table below, show the sample space for all the different arrangements. (*HINT: There are too many boxes*)

M	M													
G	G													
F	A													
A	F													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

# Combinations and Permutations

## Long-Term Memory Review

### Review 4

- A \_\_\_\_\_ is an arrangement of a set of objects in which order IS important.
- A \_\_\_\_\_ is an arrangement of a set of objects in which order IS NOT important.
- How do you read  ${}_5P_3$ ? \_\_\_\_\_.
- How do you read  ${}_5C_3$  or  $\binom{5}{3}$ ? \_\_\_\_\_.
- How many arrangements will  ${}_5C_3$  produce?
  - 2 arrangements
  - 10 arrangements
  - 15 arrangements
  - 60 arrangements

- Assume a school has three people interested in serving on a two-member panel that includes a chairman and a vice-chairman. Clearly, one person will be left off the panel. To decide who resides on the panel the student body of the school is asked to vote.
  - If the names of the three people interested in serving are *Ron*, *Latisha*, and *Vince* then list the different ways the election for the panel could occur?

<b>First Way</b>	<b>Second Way</b>	<b>Third Way</b>
$\frac{\textit{Latisha}}{\text{Chairperson}}$	$\frac{\textit{Ron}}{\text{Vice-Chair}}$	$\frac{\text{_____}}{\text{Chairperson}}$
$\frac{\textit{Ron}}{\text{Vice-Chair}}$	$\frac{\text{_____}}{\text{Vice-Chair}}$	$\frac{\text{_____}}{\text{Vice-Chair}}$
<b>Fourth Way</b>	<b>Fifth Way</b>	<b>Sixth Way</b>
$\frac{\textit{Ron}}{\text{Chairperson}}$	$\frac{\textit{Vince}}{\text{Chairperson}}$	$\frac{\text{_____}}{\text{Chairperson}}$
$\frac{\textit{Latisha}}{\text{Vice-Chair}}$	$\frac{\textit{Ron}}{\text{Vice-Chair}}$	$\frac{\text{_____}}{\text{Vice-Chair}}$

- In the above problem, is order important? (Why or why not?) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- Five people – A, W, X, Y, and Z – go to a movie and sit in adjacent seats. If A sits in the aisle seat, then how many possible arrangements are there for the other four people?
  - 24 arrangements
  - 20 arrangements
  - 10 arrangements
  - 9 arrangements
- A jar contains 15 M&M's each with a different letter marked on the candy. How many different handfuls of five M&M's can you pull from the jar? \_\_\_\_\_

# Combinations and Permutations

## Long-Term Memory Review

### Quiz

1. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS important.
2. A \_\_\_\_\_ is an arrangement of a set of objects in which order IS NOT important.
3. How do you read  ${}_6P_3$ ? \_\_\_\_\_.
4. How do you read  ${}_6C_3$  or  $\binom{6}{3}$ ? \_\_\_\_\_.
5. How many arrangement will  ${}_6P_3$  produce?
  - a) 12 arrangements      b) 18 arrangements      c) 24 arrangements      d) 120 arrangements
6. Write a possible word problem that asks you to solve for  ${}_6P_3$ ?
7. Assume a school has three people interested in serving on a two-member panel. Clearly, one person will be left off the panel. To decide who resides on the panel, the student body of the school is asked to vote.
  - a. If the names of the three people interested in serving are *Ron*, *Latisha*, and *Vince* then list the different ways the election for the panel could occur?

<b>First Way</b>	<b>Second Way</b>	<b>Third Way</b>
$\frac{\textit{Latisha}}{\text{Member}}$	$\frac{\textit{Ron}}{\text{Member}}$	
$\frac{\text{Member}}{\text{Member}}$	$\frac{\text{Member}}{\text{Member}}$	

- b. In the above problem, is order important? (Why or why not?) \_\_\_\_\_  
 \_\_\_\_\_
8. **Counting Principle:** How many different kinds of sandwiches can be made choosing from 3 kinds of bread, 5 fillings, and 3 dressings? # of breads x # of fillings x # of dressings = # of different sandwiches
  - A. 9 sandwiches      B. 11 sandwiches      C. 15 sandwiches      D. 45 sandwiches

9.

<i>M</i>	<i>M</i>																																				
<i>G</i>	<i>G</i>																																				
<i>F</i>	<i>A</i>																																				
<i>A</i>	<i>F</i>																																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30								

10. Five people – A, W, X, Y, and Z – go to a movie and sit in adjacent seats. If A sits in the aisle seat, then how many possible arrangements are there for the other four people?
  - A. 24 ways      B. 20 ways      C. 10 ways      D. 9 ways
11. A jar contains 15 M&M’s each with a different letter marked on the candy. How many different handfuls of five M&M’s can you pull from the jar?

# Combinations and Permutations

Long-Term Memory Review

## ANSWERS

### Review 1 - Answers

1. permutation
2. combination
3. The number of permutations of 5 items taken 3 at a time
4. The number of combinations of 5 items taken 3 at a time
5. a.

<b>First Way</b>	<b>Third Way</b>	<b>Fifth Way</b>
<u>Latisha</u> Chairperson	<u>Ron</u> Vice-Chair	<u>Ron</u> Chairperson
<u>Ron</u> Vice-Chair	<u>Vince</u> Vice-Chair	<u>Vince</u> Chairperson
<u>Latisha</u> Vice-Chair	<u>Vince</u> Chairperson	<u>Latisha</u> Vice-Chair
<b>Second Way</b>	<b>Fourth Way</b>	<b>Sixth Way</b>
<u>Ron</u> Chairperson	<u>Vince</u> Chairperson	<u>Latisha</u> Chairperson
<u>Latisha</u> Vice-Chair	<u>Ron</u> Vice-Chair	<u>Vince</u> Vice-Chair
<u>Vince</u> Vice-Chair	<u>Latisha</u> Vice-Chair	<u>Ron</u> Vice-Chair

b. Yes, order is important because one person is the chairperson and another is the vice-chair.

6. a.	<b>First Way</b>	<b>Second Way</b>	<b>Third Way</b>
	<u>Latisha</u> Member	<u>Ron</u> Member	<u>Ron</u> Member
	<u>Ron</u> Member	<u>Vince</u> Member	<u>Vince</u> Member
	<u>Vince</u> Member	<u>Latisha</u> Member	<u>Latisha</u> Member

b. No, order is not important because there is no distinction between members; there is no order to being a member.

### Review 2 - Answers

1. permutation
2. combination
3. The number of permutations of 4 items taken 3 at a time
4. The number of combinations of 4 items taken 3 at a time
5.  $(15)(10)(12) = 1800$  different arrangements
- 6.

<b>Position 1</b>	<b>R</b>	<b>R</b>	<b>G</b>	<b>G</b>	<b>B</b>	<b>B</b>					
<b>Position 2</b>	<b>G</b>	<b>B</b>	<b>R</b>	<b>B</b>	<b>R</b>	<b>G</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>

7. 6 arrangements were made.

# Combinations and Permutations

## Long-Term Memory Review

8.

Position 1	R	R	<del>G</del>	G	<del>B</del>	<del>B</del>					
Position 2	G	B	<del>R</del>	B	<del>R</del>	<del>G</del>					
	1	2	3	4	5	6	7	8	9	10	11

3 columns (arrangements) were crossed out

9. 3 columns (arrangements) were not crossed out

10. C. 2(2)(6)

### Review 3 - Answers

- permutation
- combination
- The number of permutations of 5 items taken 3 at a time
- The number of combinations of 5 items taken 3 at a time
- D. 60 arrangements
- D. 45 sandwiches

7.  $\frac{26}{\text{How many letters are there to choose from?}}$      $\frac{26}{\text{How many letters are there to choose from?}}$      $\frac{26}{\text{How many letters are there to choose from?}}$      $\frac{10}{\text{How many #'s are there to choose from?}}$      $\frac{10}{\text{How many #'s are there to choose from?}}$      $\frac{10}{\text{How many #'s are there to choose from?}}$

8.  $\frac{26}{\text{How many letters are there to choose from?}}$      $\frac{25}{\text{How many letters are there to choose from?}}$      $\frac{24}{\text{How many letters are there to choose from?}}$      $\frac{10}{\text{How many #'s are there to choose from?}}$      $\frac{9}{\text{How many #'s are there to choose from?}}$      $\frac{8}{\text{How many #'s are there to choose from?}}$

9.

M	M	M	M	M	M	G	G	G	G	G	G	F	F	F	F	F	F	A	A	A	A	A	A
G	G	F	F	A	A	M	M	F	F	A	A	M	M	G	G	A	A	M	M	G	G	F	F
F	A	G	A	F	G	F	A	M	A	M	F	G	A	M	A	M	G	G	F	M	F	M	G
A	F	A	G	G	F	A	F	A	M	F	M	A	G	A	M	G	M	F	G	F	M	G	M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

### Review 4 - Answers

- permutation
- combination
- The number of permutations of 5 items taken 3 at a time
- The number of combinations of 5 items taken 3 at a time

# Combinations and Permutations

## Long-Term Memory Review

5. b. 10 arrangements

6. a.

**First Way**

Latisha  
Chairperson      Ron  
Vice-Chair

**Second Way**

Ron  
Chairperson      Vince  
Vice-Chair

**Third Way**

Vince  
Chairperson      Latisha  
Vice-Chair

**Fourth Way**

Ron  
Chairperson      Latisha  
Vice-Chair

**Fifth Way**

Vince  
Chairperson      Ron  
Vice-Chair

**Sixth Way**

Latisha  
Chairperson      Vince  
Vice-Chair

b. Yes, order is important because one person is the chairperson and another is the vice-chair; there is a difference between the two offices.

7. A. 24 arrangements

8. 3003

## Quiz - Answers

1. permutation

2. combination

3. The number of permutations of 6 items taken 3 at a time

4. The number of combinations of 6 items taken 3 at a time

5. D. 120 arrangements

6. Six students run for school office with only three positions – President, Vice-President, and Secretary. How many ways can students be elected?

7. a.

**First Way**

Latisha  
Member      Ron  
Member

**Second Way**

Ron  
Member      Vince  
Member

**Third Way**

Vince  
Member      Latisha  
Member

b. No, order is not important because there is no distinction between members.

8. D. 45 sandwiches

9.

M	M	M	M	M	M	G	G	G	G	G	G	F	F	F	F	F	F	A	A	A	A	A	A
G	G	F	F	A	A	M	M	F	F	A	A	M	M	G	G	A	A	M	M	G	G	F	F
F	A	G	A	F	G	F	A	M	A	M	F	G	A	M	A	M	G	G	F	M	F	M	G
A	F	A	G	G	F	A	F	A	M	F	M	A	G	A	M	G	M	F	G	F	M	G	M
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

10. A. 24 ways

11. 3003