

keep scrolling to get  
a sneak peek!

Help your Algebra 2 or  
PreCalculus students  
practice using **permutations  
and combinations**. Students  
will be eager to get the self-  
checking benefits from this  
circuit activity!

# PERMUTATIONS & COMBINATIONS

Differentiated Circuit Worksheet

Date: \_\_\_\_\_

**Answer Key**

## PERMUTATIONS & COMBINATIONS CIRCUIT

A circuit is a route that starts and ends at the same place. Start in the first box, solve the problem. Search through the remaining boxes for the answer you got for that question. Continue until you have completed the questions and you return to the original question. Record your path below.

9 → 3 → 10 → 5 → 7 → 2 → 8 → 4 → 6

Answer: 10	# 6	Previous Answer: 60
1. Evaluate: ${}_6P_3$		2. Evaluate: ${}_7P_2$
$\frac{6!}{(6-3)!}$		$\frac{7!}{(7-2)!}$
$\frac{6!}{3!}$		$\frac{7!}{5!}$
<del><math>6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120</math></del>		<del><math>7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1</math></del>
Answer: _____	# 9	Previous Answer: 36
3. Evaluate: ${}_6C_1$		4. Evaluate: ${}_5P_2$
Previous Answer: 40,320	# _____	Previous Answer: 12
1. Evaluate: $4!$		2. Evaluate: ${}_6P_2$
Previous Answer: 20	# _____	Previous Answer: 5,040
3. Evaluate: ${}_6C_1$		4. How many ways can 3 toppings be chosen from the 5 toppings?



2 versions + Answer key included

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Why do you need this?

# Permutations & Combinations Circuit



It's self-checking! Your students will know if they are correct or not.



2 differentiated versions for all students practice this essential math skill.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## PERMUTATIONS & COMBINATIONS CIRCUIT

Directions: A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_

Previous Answer: 10	# _____	Previous
1. Evaluate: ${}_6P_3$		2. Evaluate
Previous Answer: 15	# _____	Previous
3. Evaluate: ${}_7C_3$		4. Evaluate
Previous Answer: 24	# _____	Previous
5. Evaluate: ${}_6C_2$		6. How many ways can 4 students be chosen from 5 to run a relay race?

  

Previous Answer: 21	# _____	Previous Answer: 30
7. How many ways can president and vice president be chosen from 4 students running? <i>Circle one:</i> Permutation or Combination		8. Evaluate: $7!$
Previous Answer: 24	# _____	Previous Answer: 6
9. Evaluate: ${}_5P_3$		10. How many ways can 4 students be chosen from 5 students? <i>Circle one:</i> Permutation or Combination

Helpful Hints: Use these hints to help you solve the problems.

Does order matter?  
• Yes = Permutation  
• No = Combination

Permutation:  
Combination:  
Factorial:  
 $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

# Permutations & Combinations *includes:*

Challenge: Let  $u = \langle 3, -2 \rangle$  and  $v = \langle -1, 4 \rangle$ . Find  $3(u + v) - 2(u - v)$ .

How are you feeling about this topic? Circle one:

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Helpful Hints: Use these hints to help you solve the problems.

Vector Addition:  $\langle a, b \rangle + \langle c, d \rangle = \langle a + c, b + d \rangle$

Vector Subtraction:  $\langle a, b \rangle - \langle c, d \rangle = \langle a - c, b - d \rangle$

Be careful of subtracting negatives!!  
 $a - (-b) = a + b$

How are you feeling about this topic? Circle one:

- ✓ 10 self-checking problems
- ✓ a detailed answer key
- ✓ a standard version with an extension question
- ✓ a basic version with helpful hints section
- ✓ student self assessment

# Permutations & Combinations

standards covered:

**CCSS:** HSS-CP.B.9

**TEKs:** G.13.A

**VA SOLs:** S.AII.12

**PERMUTATIONS & COMBINATIONS CIRCUIT**

Previous Answer: 28 7. How many ways can a president, vice president, and secretary be chosen from 5 students. # <u>5</u> ${}_5P_3 = \frac{5!}{(5-3)!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 60$	Previous Answer: 42 8. How many ways can 2 students be chosen from 9 students? # <u>2</u> ${}_9C_2 = \frac{9!}{2!(9-2)!} = \frac{9 \cdot 8 \cdot \cancel{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{2 \cdot 1 \cdot \cancel{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}} = 36$
Previous Answer: 120 9. How many ways can 2 captains be selected from 6 players? # <u>1</u> ${}_6C_2 = \frac{6!}{2!(6-2)!} = \frac{6 \cdot 5 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}}{2 \cdot 1 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}} = 15$	Previous Answer: 35 10. How many 3-letter arrangements can be made from A, B, C, and D? # <u>3</u> ${}_4P_3 = \frac{4!}{(4-3)!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{1} = 24$

Challenge: How many ways can a president, vice president, and 2 committee members be selected from 6 students?

Choose a president and then a vice president:  ${}_6P_2 = 30$

Choose 2 committee members from 4 remaining students:  ${}_4C_2 = 6$

Total:  $30 \cdot 6 = 180$  ways

# how this circuit resource works

Then search for their answer on the worksheet. Once the answer is found, students complete the problem below it.

Students can track their path at the top.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### PERMUTATIONS & COMBINATIONS CIRCUIT

Directions: A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → 1

Previous Answer: 40,320 # _____	Previous Answer: 12 # _____
1. Evaluate: $4!$	2. Evaluate: ${}_6P_2$
Previous Answer: 20 # _____	Previous Answer: 5,040 # _____
3. Evaluate: ${}_6C_1$	4. How many ways can 3 toppings be chosen from the 5 toppings? You can get double & triple toppings.  <i>Circle one:</i> Permutation or Combination

Students start with the first question.

The last question they answer should lead back to problem #1 to “close” the circuit.

# how to use this resource

This is a great activity to use when reviewing how distinguish between and compute factorials, combinations and permutations to find probabilities.

It can be used right after teaching the concept or as homework.

This is also a **substitute-friendly** assignment!

Name: **Answer Key** Date: \_\_\_\_\_

## PERMUTATIONS & COMBINATIONS CIRCUIT

**Directions:** A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → **9** → **3** → **10** → **5** → **7** → **2** → **8** → **4** → **6** → 1

Previous Answer: 40,320 # <b>6</b>	Previous Answer: 12 # <b>7</b>
1. Evaluate: $4!$ $4 \cdot 3 \cdot 2 \cdot 1 = 24$	2. Evaluate: ${}_6P_2$

## PERMUTATIONS & COMBINATIONS CIRCUIT

Previous Answer: 28 # <b>5</b>	Previous Answer: 42 # <b>2</b>
7. How many ways can a president, vice president, and secretary be chosen from 5 students. ${}_5P_3 = \frac{5!}{(5-3)!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 60$	8. How many ways can 2 students be chosen from 9 students? ${}_9C_2 = \frac{9!}{2!(9-2)!} = \frac{9 \cdot 8 \cdot \cancel{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{2 \cdot 1 \cdot \cancel{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}} = 36$
Previous Answer: 120 # <b>1</b>	Previous Answer: 35 # <b>3</b>
9. How many ways can 2 captains be selected from 6 players? ${}_6C_2 = \frac{6!}{2!(6-2)!} = \frac{6 \cdot 5 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}}{2 \cdot 1 \cdot \cancel{4 \cdot 3 \cdot 2 \cdot 1}} = 15$	10. How many 3-letter arrangements can be made from A, B, C, and D? ${}_4P_3 = \frac{4!}{(4-3)!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{1} = 24$

Challenge: How many ways can a president, vice president, and 2 committee members be selected



hey there!

My name is Malia and I'm passionate about making learning and practicing math fun. I love creating engaging math resources for my students and I hope your students enjoy this activity too!

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