

Choices or Orders

Decide whether order matters, then count the outcomes.

HIGH SCHOOL • MA.912.DP.4.10

MA.912.DP.4.10 "Given a mathematical or real-world situation, calculate the appropriate permutation or combination."

NAME _____

DATE _____

ORDER CHANGES THE COUNT

Use a permutation when a different order or different roles make a new outcome. Use a combination when you are only choosing a group. The formulas are $nPr = \frac{n!}{(n-r)!}$ and $nCr = \frac{n!}{r!(n-r)!}$.

WORKED EXAMPLE

Thirteen photos will compete for first and second place in a photo contest. How many possible results are there?

1. The award places are different, so use a permutation.
2. ${}_{13}P_2 = 13 \times 12$.
3. $13 \times 12 = 156$.

Answer: 156 possible results

PRACTICE 6 problems

- 1** Six candidates are running for president, vice president, and secretary of a club. How many ways can the three offices be filled?

ANSWER _____

- 2** A student chooses 3 novels from 7 novels for a book discussion group. How many groups can be chosen?

ANSWER _____

- 3** Five dancers are available for 3 different positions in a performance. How many ways can the positions be filled?

ANSWER _____

- 4** Ten students want to join a 3-person environmental committee. How many committees are possible?

ANSWER _____

- 5** A video editor chooses and arranges 3 opening clips from 9 clips. How many different opening sequences are possible?

ANSWER _____

- 6** Eleven players are eligible for a 3-person leadership panel. How many panels can be formed?

ANSWER _____

APPLY IT Show your work

- 1** A student podcast contest has 9 finalists. The judges award first, second, and third place. How many possible sets of winners are there?

WORK SPACE

ANSWER _____

- 2** At a campus gaming event, you can register for 3 of 10 independent workshops. The order in which you register does not matter. How many workshop schedules can you choose?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A game club has 10 members. It must choose a 3-person planning team, then choose a captain from that team. How many possible team-and-captain outcomes are there?

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Six candidates are running for president, vice president, and secretary of a club. How many ways can the three offices be filled?	$6P3 = 120$
2	A student chooses 3 novels from 7 novels for a book discussion group. How many groups can be chosen?	$7C3 = 35$
3	Five dancers are available for 3 different positions in a performance. How many ways can the positions be filled?	$5P3 = 60$
4	Ten students want to join a 3-person environmental committee. How many committees are possible?	$10C3 = 120$
5	A video editor chooses and arranges 3 opening clips from 9 clips. How many different opening sequences are possible?	$9P3 = 504$
6	Eleven players are eligible for a 3-person leadership panel. How many panels can be formed?	$11C3 = 165$

PART 2 • APPLY IT

- 504 possible sets of winners** The award places are different, so use $9P3$. Calculate $9 \times 8 \times 7 = 504$.
- 120 workshop schedules** The workshops form an unordered group, so use $10C3$. Calculate $10C3 = 120$.

CHALLENGE

360 possible outcomes

Accept equivalent permutation or combination notation and correct numerical answers. For the challenge, accept $10C3 \times 3 = 360$ or an equivalent method.