

Worksheet 7E

The number of groups of r items selected from n items	Repetition allowed	No repetition
Order matters	n^r	$\frac{n!}{(n-r)!}$
Order doesn't matter	$\frac{(n+r-1)!}{r!(n-1)!}$	$\frac{n!}{(n-r)!r!}$

A **permutation** is an ordered group with no repetition.

A **combination** is an unordered group with no repetition.

The **factorial** of a number n is $n! = 1 \times 2 \times 3 \times \dots \times n$, with the convention that $0! = 1$.

Calculation tips:

$$\frac{n!}{(n-r)!} = n \times (n-1) \times \dots \times (n-r+1)$$

$$\frac{n!}{(n-r)!r!} = \frac{n \times (n-1) \times \dots \times (n-r+1)}{1 \times 2 \times \dots \times r}$$

1) Calculate

$$8! \qquad \frac{9!}{4!} \qquad \frac{26!}{19!7!}$$

2) How many different five-character passwords can be formed from the lowercase letters of the English alphabet?

3) How many different ten-digit phone numbers can be formed such that the first three digits must be "808"?

4) How many 6-person lineups can be formed from a 10-player volleyball roster? (In volleyball, every player plays every position.)

5) A city council of 10 members must elect an executive committee consisting of a mayor, deputy mayor, secretary, and treasurer. How many executive committees are possible?

6) You toss a coin 10 times.

a) How many possible outcomes are there?

b) How many outcomes in which you get *exactly* 4 heads?

c) What is the probability of getting *exactly* 4 heads?

d) What is the probability of getting *at least* 4 heads?

7) How many different telephone numbers of the form *aaa-bbb-cccc* if the area code *aaa* can only begin with the numbers 2 through 7 and the exchange *bbb* cannot begin with 0?

8) The U.S. Postal Service uses both five-digit and nine-digit ZIP codes.

(a) How many five-digit ZIP codes are available to the U.S. Postal Service?

(b) How many nine-digit ZIP codes are available to the U.S. Postal Service? Could everyone in the United States have his or her own personal nine-digit ZIP code? The US population is about 342 million (2026).