

## Number of cases

1

Among the 50 participants, 27 preferred coffee, 15 preferred tea, and 12 preferred neither coffee nor tea.

How many people like both coffee and tea?

2

(1) How many ways are there to pay 200 yen using 100 yen, 50 yen, and 10 yen coins?

However, there shall be a sufficient number of each coins, and there may be coins that are not used.

(2) There are 3 modes of transportation to get from prefecture A to prefecture B: bus, train, and airplane.

How many ways are there to go from prefecture A to prefecture B and back?

However, the same means of transportation may be used for the return trip.

3

How many positive divisors of 60 are there in total? Also, find the sum of the divisors.

4

- (1) How many 3-digit integers can be obtained from the 7 integers 1, 2, 3, 4, 5, 6, and 7 by taking 3 different integers and arranging them in a row? How many of these integers are odd?
- (2) How many 4-digit integers in total can be formed when four different integers are taken from the 6 integers 0, 1, 2, 3, 4, and 5 and arranged in a row?
- (3) When 6 people, 3 boys and 3 girls, line up in a row, how many ways are there for the 3 girls to be next to each other? Also, how many ways are there in which the boys are at both ends of the line?

5

- (1) How many ways are there to arrange 7 different beads in the shape of a circle?
- (2) How many ways are there to make a loop by threading 7 different beads?
- (3) How many ways are there to paint each face of the cube using all 6 different colors?

However, the painting methods that match by rotating the cube are considered the same.

6

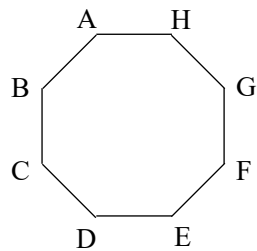
(1) How many 3-digit integers can be formed using the 4 different numbers 0, 1, 2, and 3?

However, the same number may be used repeatedly.

(2) When dividing 6 people into 2 rooms A and B, how many different ways are there to divide them so that every room has at least 1 person?

7

- (1) How many ways are there to choose 6 from 9?
- (2) How many triangles can be formed in total  
by selecting the 3 vertices of a regular octagon ABCDEFGH?  
How many triangles can be made that do not share a side  
with a regular octagon?



8

How many ways are there to divide the 8 people as follows?

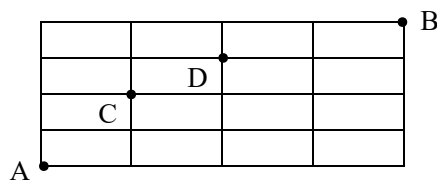
- (1) Divide the group into four pairs of two each, A, B, C, and D.
- (2) Divide the group into four pairs of two people each.
- (3) Divide the group into three groups of three, three, and two.



9

In the diagram on the right, how many different paths can be taken to get from point A to point B in the shortest way in the following cases?

- (1) All Directions
- (2) Directions through point C
- (3) Directions that do not pass through both points C and D



10

- (1) How many pairs of integers  $(x, y, z)$  are there in total satisfying  $x+y+z=8$ ,  $x \geq 0$ ,  $y \geq 0$ ,  $z \geq 0$ ?
- (2) How many pairs of natural numbers  $(l, m, n)$  satisfy  $l+m+n=8$  in total?

**Study 1**

When 6 people, A, B, C, D, E, and F, line up in a row, how many ways are there to line up so that A, B, and C are not next to each other?

**Study 2**

When the eight letters M, O, U, N, T, A, I, N are arranged in a horizontal row, how many ways can O, U, A, I be arranged in this order?