

# Christmas Problems

## Pleasanton Math Circle: Elementary School

DANIEL NIE

December 8, 2022

### §1 Giving Gifts

**Problem 1.1.** Bob is going to the mall to buy Christmas presents. He has 100 dollars to spend. Chocolates cost 5 dollars and ornaments cost 7. What is the difference between the maximum number of chocolates he can buy and the maximum number of ornaments that he can buy?

**Problem 1.2.** Bob is going to the mall to buy Christmas presents. He has 100 dollars to spend. Chocolates cost 5 dollars and ornaments cost 7. What is the maximum number of total gifts he can buy?

**Problem 1.3.** Ryan wants to give each of his 7 teachers a Christmas gift (so he can get a good finals grade). He has 7 different types of candies. How many ways can he distribute the gifts if each teacher gets a different type of candy?

**Problem 1.4.** Ryan wants to give each of his 7 teachers a Christmas gift (so he can get a good finals grade). He has 2 different types of candies. How many ways can he distribute the gifts? It does not matter how many gifts of each type are given out.

### §2 Christmas Trees

**Problem 2.1.** Ryan Fu is going to the store for a Christmas tree. He spends 15 minutes driving there at 20 miles per hour and 10 minutes driving back at 30 miles per hour. What was his average speed?

**Problem 2.2.** Ryan Fu is going to the store for a Christmas tree. Unfortunately, he encounters traffic on the way there. He travels 15 miles in traffic and 5 miles out of traffic. Given that his speed in traffic is a third of his speed out of traffic and he traveled for a total of 1 hour, how much time did he spend in traffic?

**Problem 2.3.** Bob has planted a Christmas Tree in his backyard. It grows 5 inches at 1:00 PM each day, but at 1:00 AM each night it shrinks 1 inch. In how many days will the tree reach 24 inches?

**Problem 2.4.** Bob has planted a Christmas Tree in his backyard. It grows 5 inches at 1:00 PM each day, but at 1:00 AM each night it shrinks 1 inch. In how many days will the tree reach 25 inches?

### §3 Christmas Party

**Problem 3.1.** Ryan is going to a Christmas party. He has 3 suits, 4 pairs of pants, and 1 pair of socks. How many ways can he dress?

**Problem 3.2.** Ryan is going to a Christmas party. He has one white suit, one blue suit, and one black suit. He has one pair of blue pants, one pair of green pants, one pair of black pants, and one pair of white pants. He has one pair of striped socks, one pair of all-black socks, one pair of polka-dot socks. How many ways can he dress if he doesn't want to wear all black?

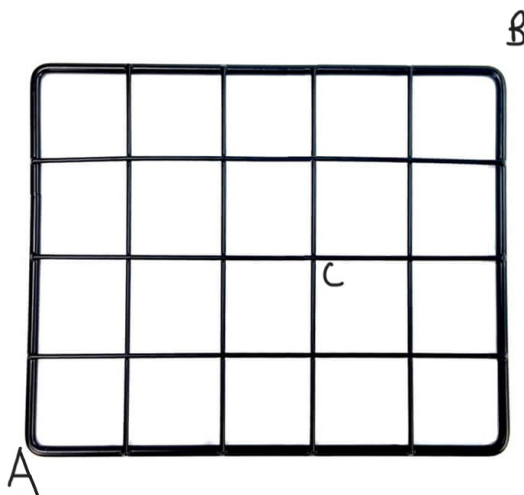
**Problem 3.3.** Ryan Fu is performing 4 saxophone concertos at a winter concert. He decides to play one concerto each day for 5 days to practice. How many ways can he practice his concertos?

**Problem 3.4.** Ryan Fu is performing 3 saxophone concertos at a winter concert. He decides to play one concerto each day for 5 days to practice. However, he does not want to play the same solo two days in a row. How many ways can he practice his concertos?

**Problem 3.5.** Ryan Fu is performing 5 saxophone concertos at a winter concert. One of the pieces is the Glazunov. Ryan does not want to play the Glazunov first or last. How many ways can he order his pieces for performance at the concert?

### §4 Santa Claus

**Problem 4.1.** Santa is visiting the town of PLeasanton. Pleasanton can be represented by a grid, as shown below. How many walls can Santa travel from point A to point B? Santa must travel along the grid-lines.



**Problem 4.2.** Santa is visiting the town of Pleasanton. Pleasanton can be represented by a grid, as shown below. How many walls can Santa travel from point A to point B if Santa goes through point C? Santa must travel along the grid-lines.

**Problem 4.3.** Santa has eaten a lot of milk and cookies while delivering his presents. The first house gave him one cookie, the second two, the third three, and so on. How many cookies did Santa get?