Instructions: Use the multiplication rule to count the number of things in each scenario.

1. Suppose that a wardrobe has three pairs of pants, five shirts, two belts, six pairs of socks, three blazers, and two pairs of shoes. How many different outfits are possible if you need to choose one of each?

$$3 \cdot 5 \cdot 2 \cdot 6 \cdot 3 \cdot 2 = 1080$$

2. Baskin Robbins advertised that they have 31 flavours. They also have two different types of cones, plus a sundae bowl. You can also get up to three scoops that can be any flavour or combination of their 31 flavours. How many different types of ice cream can you get?

assuming 3 scoops
$$31 \cdot 31 \cdot 31 \cdot 3 = 89373$$

assuming at least one scoop
$$31 \cdot 32 \cdot 32 \cdot 3 = 95,232$$

3. Phone numbers in the US have 10 digits. 9 of those digits can be any number. The first digit can't be 1 or 0. How many different phone numbers in the US are there?

$$8,000,000,000$$

4. Suppose you go into a restaurant to order dinner. Their special allows you to pick a special as follows: a drink, a main course, a side dish, and dessert. There are 7 drinks, 5 main courses, 8 side dishes, and 4 desserts. How many different meals are there until this special?

$$7 \cdot 5 \cdot 8 \cdot 4 = 1120$$

5. A pizza parlor has two kinds of sauce, 12 types of toppings, and 4 sizes. How many different kinds of one-topping pizza is there at this shop?

$$2 \cdot 12 \cdot 4 = 96$$

6. You are trying to remember a password you've forgotten. You remember that it had 11 characters. The first 7 characters were all lower case letters, and the last 4 digits were numbers. What are the possible combinations of passwords like this that you would need to try if you had to crack it by brute force?

$$26^7 \cdot 10^4 = 8.03 \times 10^{13}$$

7. Suppose you and five more friends are standing in line. In how many different orders can you and your friends stand in line?

$$6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$$

8. A deck of cards has 52 cards in it. You draw 5. In how many ways can the order of those 5 cards come out?

$$52 \cdot 51 \cdot 50 \cdot 49 \cdot 48 = 311,875,200$$

9. Suppose a lottery drawing has 39 balls in the machine. 7 balls are chosen. How many different ways can those 7 balls come out of the machine?

$$39 \cdot 38 \cdot 37 \cdot 36 \cdot 35 \cdot 34 \cdot 33 = 7.75 \times 10^{10}$$

10. Suppose you are playing with 6 dice. One is 4-sided, one is 6-sided, one is 8-sided, one is 10-sided, one is 12-sided, one is 20-sided. How many different outcomes are there if you roll all the dice at once?

$$4 \cdot 6 \cdot 8 \cdot 10 \cdot 12 \cdot 20 = 460,800$$

11. In some states, license plates are composed of a string of 3 numbers, followed by three letters (but not O since it looks too much like 0). How many different license plates are possible of this form?

$$10^3 \cdot 25^3 = 15,625,000$$

12. If you toss a coin 10 times, how many different outcomes are possible?

$$2^{10} = 1024$$

13. A car company offers 6 different amenities for their cars (or none), and 5 different paint colours (you have to choose one of those). You can also choose automatic or manual transmission. You can also choose coupe, sedan or hatchback, and gas, electric or hybrid. How many different combinations of features are possible?

$$7 \cdot 5 \cdot 2 \cdot 3 \cdot 3 = 630$$