1. **Problem**
   A lottery machine will select a set of 4 different numbered marbles. The selection process begins with 10 different numbered marbles to choose from. How many different sets are possible?

2. **Problem**
   A company needs to select a president, a manager, a CFO, a vice president, and a secretary. Each position will be held by a different person. The company is considering the same pool of 19 applicants for each position. How many configurations are possible?

3. **Problem**
   A bike designer is choosing different colors for the rims, fork, and frame. There are 17 colors available. How many color configurations are possible?

4. **Problem**
   A team has 12 players. The coach needs to pick 2 starters. How many ways could the coach do this?

5. **Problem**
   A team has 13 players. The coach will give out 3 different prizes. How many ways could the coach do this?

6. **Problem**
   A designer is choosing a color pallette. There are 8 colors available, but the designer will only choose 2 colors for her pallette. How many pallettes are possible?

7. **Problem**
   A pizza place has 17 toppings available. Brenda will order a pizza with 5 toppings. How many different pizzas is Brenda choosing between?

8. **Problem**
   A team has 8 players. The coach needs to pick 3 starters. How many ways could the coach do this?

9. **Problem**
   A team has 13 players. The coach will give out 4 different prizes. How many ways could the coach do this?

10. **Problem**
    A team has 21 players. The coach needs to pick 2 starters. How many ways could the coach do this?

11. **Problem**
    A landscape architect has 5 spots to plant 5 different trees. The landscape architect has 25 different trees available. How many configurations are possible?

12. **Problem**
    A company needs to select a CFO, a vice president, and a secretary. Each position will be held by a different person. The company is considering the same pool of 19 applicants for each position. How many configurations are possible?

1. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 4 from a set of size 10.

$$_nC_r = \frac{n!}{(n-r)!\cdot r!}$$

$$n = 10$$

$$r = 4$$

$$_{10}C_4 = \frac{10!}{(10-4)!\cdot 4!}$$

$$= \frac{10!}{6!\cdot 4!}$$

$$= \frac{10\cdot 9\cdot 8\cdot 7}{4\cdot 3\cdot 2\cdot 1}$$

$$= \boxed{210}$$

2. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 5 from a set of size 19.

$$_nP_r = \frac{n!}{(n-r)!}$$

$$n = 19$$

$$r = 5$$

$$_{19}P_5 = \frac{19!}{(19-5)!}$$

$$= \frac{19!}{14!}$$

$$= 19\cdot 18\cdot 17\cdot 16\cdot 15$$

$$= \boxed{1395360}$$

3. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 3 from a set of size 17.

$$
\begin{aligned}
{}_nP_r &= \frac{n!}{(n-r)!} \\
n &= 17 \\
r &= 3 \\
{}_{17}P_3 &= \frac{17!}{(17-3)!} \\
&= \frac{17!}{14!} \\
&= 17 \cdot 16 \cdot 15 \\
&= \boxed{4080}
\end{aligned}
$$

4. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 2 from a set of size 12.

$$
\begin{aligned}
{}_nC_r &= \frac{n!}{(n-r)! \cdot r!} \\
n &= 12 \\
r &= 2 \\
{}_{12}C_2 &= \frac{12!}{(12-2)! \cdot 2!} \\
&= \frac{12!}{10! \cdot 2!} \\
&= \frac{12 \cdot 11}{2 \cdot 1} \\
&= \boxed{66}
\end{aligned}
$$

5. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 3 from a set of size 13.

$$
\begin{aligned}
{}_nP_r &= \frac{n!}{(n-r)!} \\
n &= 13 \\
r &= 3 \\
{}_{13}P_3 &= \frac{13!}{(13-3)!} \\
&= \frac{13!}{10!} \\
&= 13 \cdot 12 \cdot 11 \\
&= \boxed{1716}
\end{aligned}
$$

6. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 2 from a set of size 8.

$$
\begin{aligned}
{}_nC_r &= \frac{n!}{(n-r)! \cdot r!} \\
n &= 8 \\
r &= 2 \\
{}_8C_2 &= \frac{8!}{(8-2)! \cdot 2!} \\
&= \frac{8!}{6! \cdot 2!} \\
&= \frac{8 \cdot 7}{2 \cdot 1} \\
&= \boxed{28}
\end{aligned}
$$

7. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 5 from a set of size 17.

$$
\begin{aligned}
{}_nC_r &= \frac{n!}{(n-r)! \cdot r!} \\
n &= 17 \\
r &= 5 \\
{}_{17}C_5 &= \frac{17!}{(17-5)! \cdot 5!} \\
&= \frac{17!}{12! \cdot 5!} \\
&= \frac{17 \cdot 16 \cdot 15 \cdot 14 \cdot 13}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} \\
&= \boxed{6188}
\end{aligned}
$$

8. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 3 from a set of size 8.

$$
\begin{aligned}
{}_nC_r &= \frac{n!}{(n-r)! \cdot r!} \\
n &= 8 \\
r &= 3 \\
{}_{8}C_3 &= \frac{8!}{(8-3)! \cdot 3!} \\
&= \frac{8!}{5! \cdot 3!} \\
&= \frac{8 \cdot 7 \cdot 6}{3 \cdot 2 \cdot 1} \\
&= \boxed{56}
\end{aligned}
$$

9. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 4 from a set of size 13.

$$\begin{aligned}
{}_nP_r &= \frac{n!}{(n-r)!} \\
n &= 13 \\
r &= 4 \\
{}_{13}P_4 &= \frac{13!}{(13-4)!} \\
&= \frac{13!}{9!} \\
&= 13 \cdot 12 \cdot 11 \cdot 10 \\
&= \boxed{17160}
\end{aligned}$$

10. This scenario describes a combinations problem (order does not matter). We are considering the subsets of size 2 from a set of size 21.

$$\begin{aligned}
{}_nC_r &= \frac{n!}{(n-r)! \cdot r!} \\
n &= 21 \\
r &= 2 \\
{}_{21}C_2 &= \frac{21!}{(21-2)! \cdot 2!} \\
&= \frac{21!}{19! \cdot 2!} \\
&= \frac{21 \cdot 20}{2 \cdot 1} \\
&= \boxed{210}
\end{aligned}$$

11. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 5 from a set of size 25.

$$_nP_r = \frac{n!}{(n-r)!}$$

$$n = 25$$

$$r = 5$$

$$_{25}P_5 = \frac{25!}{(25-5)!}$$

$$= \frac{25!}{20!}$$

$$= 25 \cdot 24 \cdot 23 \cdot 22 \cdot 21$$

$$= \boxed{6375600}$$

12. This scenario describes a permutations problem (order matters). We are considering the nonrepeating sequences of size 3 from a set of size 19.

$$_nP_r = \frac{n!}{(n-r)!}$$

$$n = 19$$

$$r = 3$$

$$_{19}P_3 = \frac{19!}{(19-3)!}$$

$$= \frac{19!}{16!}$$

$$= 19 \cdot 18 \cdot 17$$

$$= \boxed{5814}$$