

In a financial firm's trading division, there are 16 analysts, 7 specializing in equities and 9 specializing in fixed income. The firm selects a head trader and a 3-person risk management committee (where the head trader cannot also serve on the committee). What is the probability that the head trader specializes in the same asset class as the majority of the risk management committee?

Case 1: The head trader specializes in equities.

There are 7 choices for the head trader (since 7 analysts specialize in equities). We then need to count the number of ways to choose a risk management committee with more equities specialists than fixed income specialists.

- There are $\binom{6}{3}$ ways to choose 3 equities specialists for the committee (since the head trader cannot be on the committee).
- There are $9 \times \binom{6}{2}$ ways to choose 2 equities specialists and 1 fixed income specialist for the committee.

Thus, the total number of favorable outcomes for this case is:

$$7 \left(\binom{6}{3} + 9 \binom{6}{2} \right) = 7 (20 + 135) = 7 \times 155 = 1085.$$

Case 2: The head trader specializes in fixed income.

There are 9 choices for the head trader (since 9 analysts specialize in fixed income). We then need to count the number of ways to choose a risk management committee with more fixed income specialists than equities specialists.

- There are $\binom{8}{3}$ ways to choose 3 fixed income specialists for the committee (since the head trader cannot be on the committee).
- There are $7 \times \binom{8}{2}$ ways to choose 2 fixed income specialists and 1 equities specialist for the committee.

Thus, the total number of favorable outcomes for this case is:

$$9 \left(\binom{8}{3} + 7 \binom{8}{2} \right) = 9 (56 + 196) = 9 \times 252 = 2268.$$

Total Number of Favorable Outcomes

Finally, the total number of favorable outcomes is:

$$1085 + 2268 = 3353.$$

The total number of ways to select the head trader and the committee is:

$$16 \times \binom{15}{3} = 16 \times 455 = 7280.$$

The probability that the head trader specializes in the same asset class as the majority of the committee is:

$$\frac{3353}{7280} \approx 46.06\%$$