Answer on Question #56356 – Math – Combinatorics | Number Theory

Question

A crew of 8 oar boat has to be chosen out of 11 men five of whom can row on stroke side only, four on the bow side only and remaining two on either side. How many different selections can be made?

Solution

We will use the following formula for choosing m men from n men:

$$C_n^m = \frac{n!}{m! \cdot (n-m)!}$$

There are four rowers on the stroke side (rower's right hand side) and four on the bow side (rower's left hand side).
Consider all variants.

Choose 4 men from five for stroke side and 4 men from 4 for bow side:

$$C_5^4 \cdot C_4^4 = 5;$$

Choose 4 men from five for stroke side and 3 men from 4 for bow side and 1 man from 2 for bow side:

$$C_5^4 \cdot C_4^3 \cdot C_2^1 = 5 \cdot 4 \cdot 2 = 40;$$

Choose 4 men from five for stroke side and 2 men from 4 for bow side and 2 men from 2 for bow side:

$$C_5^4 \cdot C_4^2 \cdot C_2^2 = 5 \cdot 6 \cdot 1 = 30;$$

Choose 3 men from five for stroke side and 4 men from 4 for bow side and 1 man from 2 for stroke side:

$$C_5^3 \cdot C_4^4 \cdot C_2^1 = 10 \cdot 1 \cdot 2 = 20;$$

Choose 2 men from five for stroke side and 4 men from 4 for bow side and 2 men from 2 for stroke side:

$$C_5^2 \cdot C_4^4 \cdot C_2^2 = 10 \cdot 1 \cdot 1 = 10;$$

Choose 3 men from five for stroke side and 3 men from 4 for bow side and 2 men from 2 (one man for bow side and one man for stroke side):

$$C_5^3 \cdot C_4^3 \cdot C_2^2 = 10 \cdot 4 \cdot 1 = 40;$$

The sum of these variants is 5+40+30+20+10+40 = 145.

Answer: 145.