

2-12-22

Math 2018 June A11 Stars & Bars, Vector addition, counting (should order matter?)



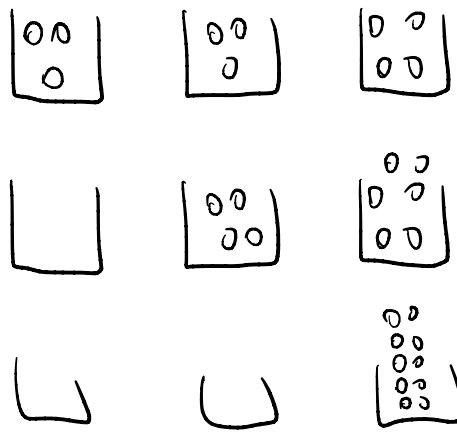
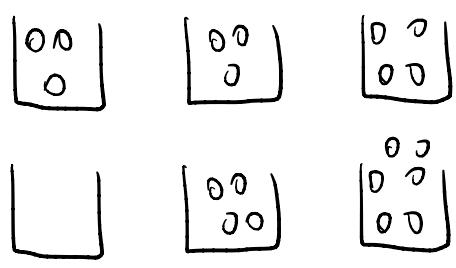
ncr :  $\binom{n}{r} = \frac{n!}{r!(n-r)!}$

$\binom{4}{2}$  : how many ways to choose 2 balls

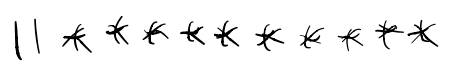
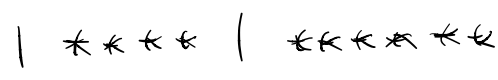
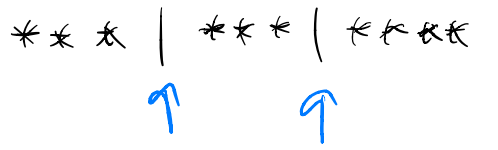
$n=10$   
 $r=3$

You have 10 indistinguishable balls and need to put them in 3 distinguishable urns. How many ways are there to do this?

0 0 0 0 0  
0 0 0 0 0



Stars and bars



12 symbols

choose 2 to be bars

$\binom{12}{2} = \binom{n+r-1}{r-1}$

$$4) \langle x, y \rangle$$

$$\begin{array}{r} (x, y) \\ + (m, n) \\ \hline (x+m, y+n) \end{array}$$

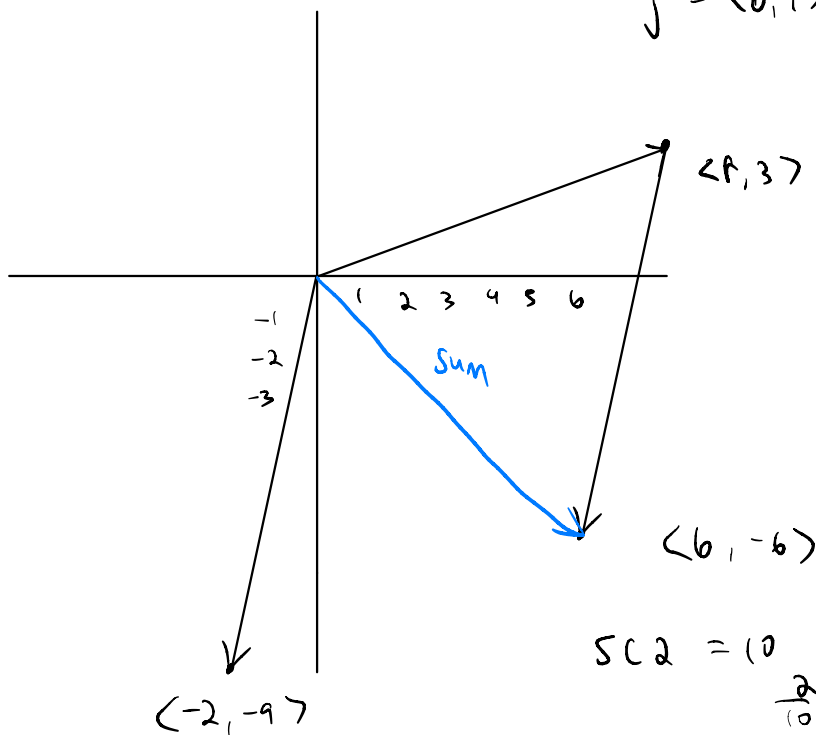
60)

$$\langle 8, 3 \rangle + \langle -2, -9 \rangle = \boxed{\langle 6, -6 \rangle}$$

$$\langle 8, 3 \rangle = 8i + 3j$$

$$i = \langle 1, 0 \rangle$$

$$j = \langle 0, 1 \rangle$$



$$SC2 = 10$$

$$\frac{2}{10} = \frac{1}{5}$$

order  
doesn't  
matter

$$\begin{array}{l} 58) \quad (3, 4) \neq (4, 3) \\ \quad \quad (3, 4) = (4, 3) \end{array}$$

order matters  
order doesn't matter.

5! = 5PS

SP2 How many ways to pick 2 balls out of 5 without replacement?

$$20 = 5 \cdot 4 \text{ possibilities}$$

$$\frac{2}{20} = \frac{1}{10} \quad \frac{4}{20} = \frac{1}{5}$$

$$(2, 6) \quad (5, 2) \quad (3, 4) \quad (4, 3)$$

$$(5,5) = (5,5) \quad 1 \text{ outcome}$$

$$(4,3) \neq (3,4) \quad 2 \text{ separate outcomes}$$

$\{5,5\}$  happens half as often as  $\{3,4\}$

$$49) \quad x = 3.5 \quad y = 3.9 \quad x + y \stackrel{?}{=} 8$$

D

$$\cancel{y = 3.\bar{9} = 4}$$

$$y = 3.9998 \quad \checkmark$$