HW 3

12 Box with 7 red and 13 blue balls.

Take 2 balls out of the box and discard them without looking. Then draw a 3rd ball and you notice its red. What's the prob. the two discarded balls are blue?

Let BB, BR, RR be the events that the first two balls where blue/blue, blue/red, or red/red.

Let R be the event the 3rd ball is red.

We want $P(BB|R)$

$$P(BB|R) = \frac{P(BB\cap R)}{P(R)} = \frac{P(R|BB)\cdot P(BB)}{P(R)}$$

$$P(BB\cap R) = P(R|BB)\cdot P(BB)$$

$$\boxed{P(R|BB)} = \frac{P(R\cap BB)}{P(BB)} = \boxed{\frac{P(BB\cap R)}{P(BB)}}$$

7 ~~8~~ ~~7~~ R

11 ~~12~~ ~~13~~ B

$$P(BB) = \frac{\binom{13}{2}}{\binom{20}{2}} = \frac{\frac{13\cdot 12}{2}}{\frac{20\cdot 19}{2}} = \boxed{\frac{78}{190}}$$

$$\binom{13}{2} = \frac{13!}{2!\,11!} = \frac{13\cdot 12\cdot \cancel{11!}}{2!\,\cancel{11!}} = \frac{13\cdot 12}{2}$$

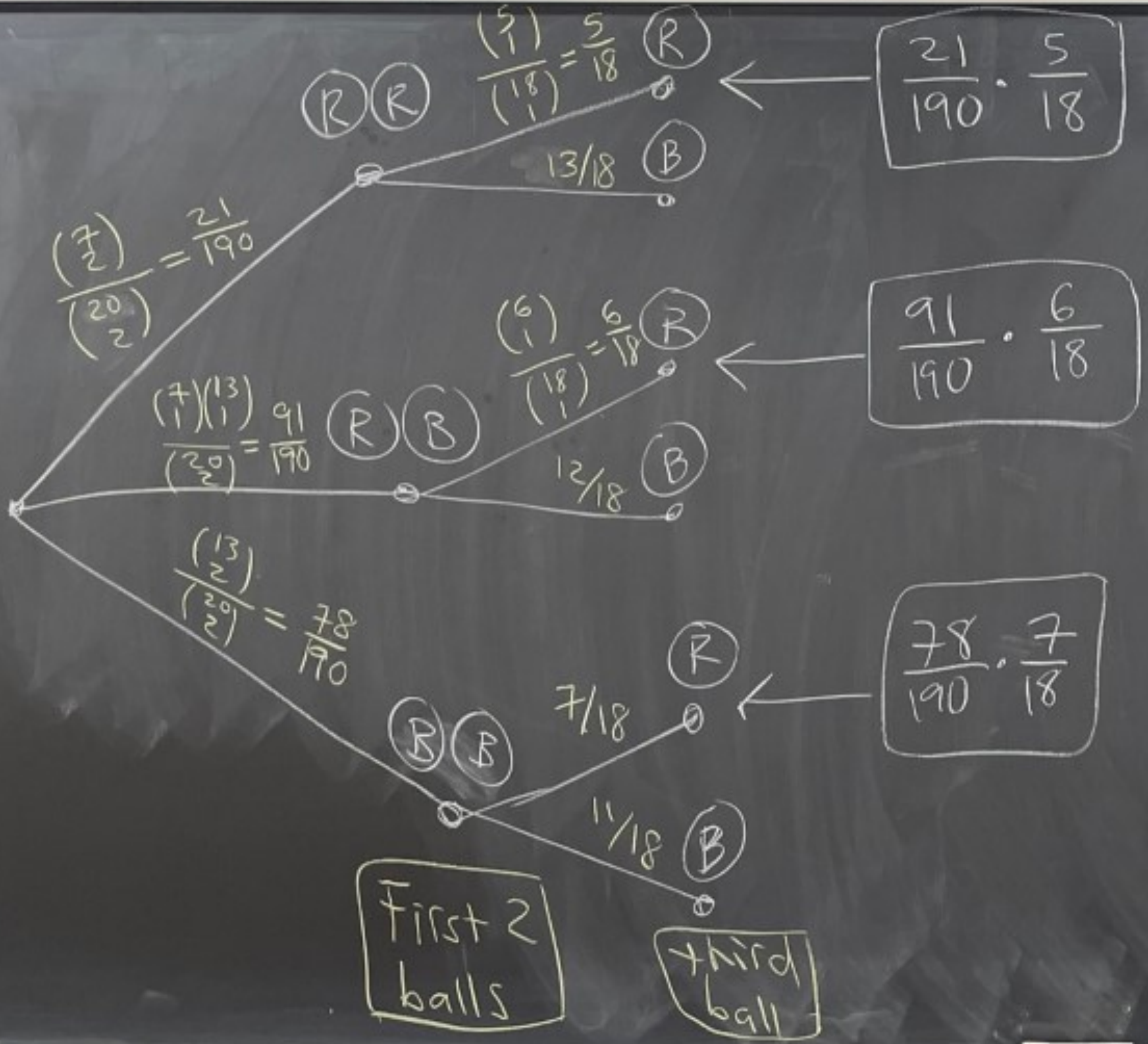
$$\boxed{\binom{n}{2} = \frac{n(n-1)}{2}}$$ ☆

$$P(R\,|\,BB) = \frac{\binom{7}{1}}{\binom{18}{1}} = \boxed{\frac{7}{18}}$$

after 2 blues taken out have

7 R

11 B



$$\frac{P(R|BB)\cdot P(BB)}{P(R)} = P(BB|R)$$

$$P(R) = \frac{21}{190}\cdot\frac{5}{18} + \frac{91}{190}\cdot\frac{6}{18} + \frac{78}{190}\cdot\frac{7}{18}$$

$$= \frac{7}{20}$$

Answer

$$P(BB|R) = \frac{P(R|BB)\,P(BB)}{P(R)} = \frac{(7/18)(78/190)}{7/20}$$

$$= \boxed{26/57} \approx \boxed{0.456}$$