Solutions to Probability Practice 1−9−17

1) A Since USA only allows for a person to be president twice and he has served two terms already P(Obama is president again)=0

2) P(had statistics class yesterday) = 1 (if you were in attendance)

3) 0 < P(snow day) < 1 snow days typically are not preannounced

SS = 5 red, 3 black, 2 green n = 10

4) P(R or B) $=\frac{5}{10}+\frac{3}{10}-\frac{0}{10}=\frac{8}{10}=\frac{4}{5}$ conut or add

5) P(R, B with replace) $=\frac{5}{10}\cdot\frac{3}{10}=\frac{15}{100}=\frac{3}{20}$ multiply same sample space

6) P(G, G without replace) $=\frac{2}{10}\cdot\frac{1}{9}=\frac{2}{90}=\frac{1}{45}$ multiply different sample space

7) P(R or G) $=\frac{5}{10}+\frac{2}{10}-\frac{0}{10}=\frac{7}{10}=\frac{7}{10}$ count or add

8) P(R, R, G w/o replace) $=\frac{5}{10}\cdot\frac{4}{9}\cdot\frac{2}{8}=\frac{40}{720}=\frac{1}{18}$ multiply different sample space

SS = 5 red, 3 black, 2 green n = 10

9) P(B, B, R w replace) $=\frac{3}{10}\cdot\frac{3}{10}\cdot\frac{5}{10}=\frac{45}{1000}=\frac{9}{200}$ multiply same sample space

10) P(B') = 1−P(B) = P(not B) $=1-\frac{3}{10}=\frac{7}{10}$ Use of complement

11) 8) P(B, R, G w/o replace) $=\frac{3}{10}\cdot\frac{5}{9}\cdot\frac{2}{8}=\frac{30}{720}=\frac{1}{24}$ multiply different sample space

12) P(G, B, R w replace) $=\frac{2}{10}\cdot\frac{3}{10}\cdot\frac{5}{10}=\frac{30}{1000}=\frac{3}{100}$ multiply same sample space

Odds in favor = $\dfrac{P(happened)}{P(\ did \text{ not } happen\ )} = \dfrac{P(A)}{P(A')} = \dfrac{P(A)}{P(\text{NOT } A)}$

Expressed as a fraction is typically avoided because some confuse probability with odds, they are related but they are not the same thing

$\dfrac{a}{b}$ (fraction notation)

$a \ to \ b$ (verbal notation)

$a{:}b$ (colon notation)

Odds in against =reciprocal of Odds in favor $= \dfrac{P(did \text{ not } happen\ )}{P(happened\ )} = \dfrac{P(A')}{P(A)} = \dfrac{P(\text{NOT } A)}{P(A)}$

M I S S I S S I P P I

Sample Space = {4 "I" , 4 "S" , 2 "P", 1 "M"} n = 11

13) odds in favor of drawing an "I" $=\dfrac{P(I)}{P(\text{NOT } I)}=\dfrac{\frac{4}{11}}{\frac{7}{11}}=\dfrac{4}{7}$

fraction notation for odds $\dfrac{4}{7}$ Verbal notation for odds 4 to 7 Colon notation 4:7

14) odds against of drawing a "P" $=\dfrac{P(\text{NOT } P)}{P(P)}=\dfrac{\frac{9}{11}}{\frac{2}{11}}=\dfrac{9}{2}$

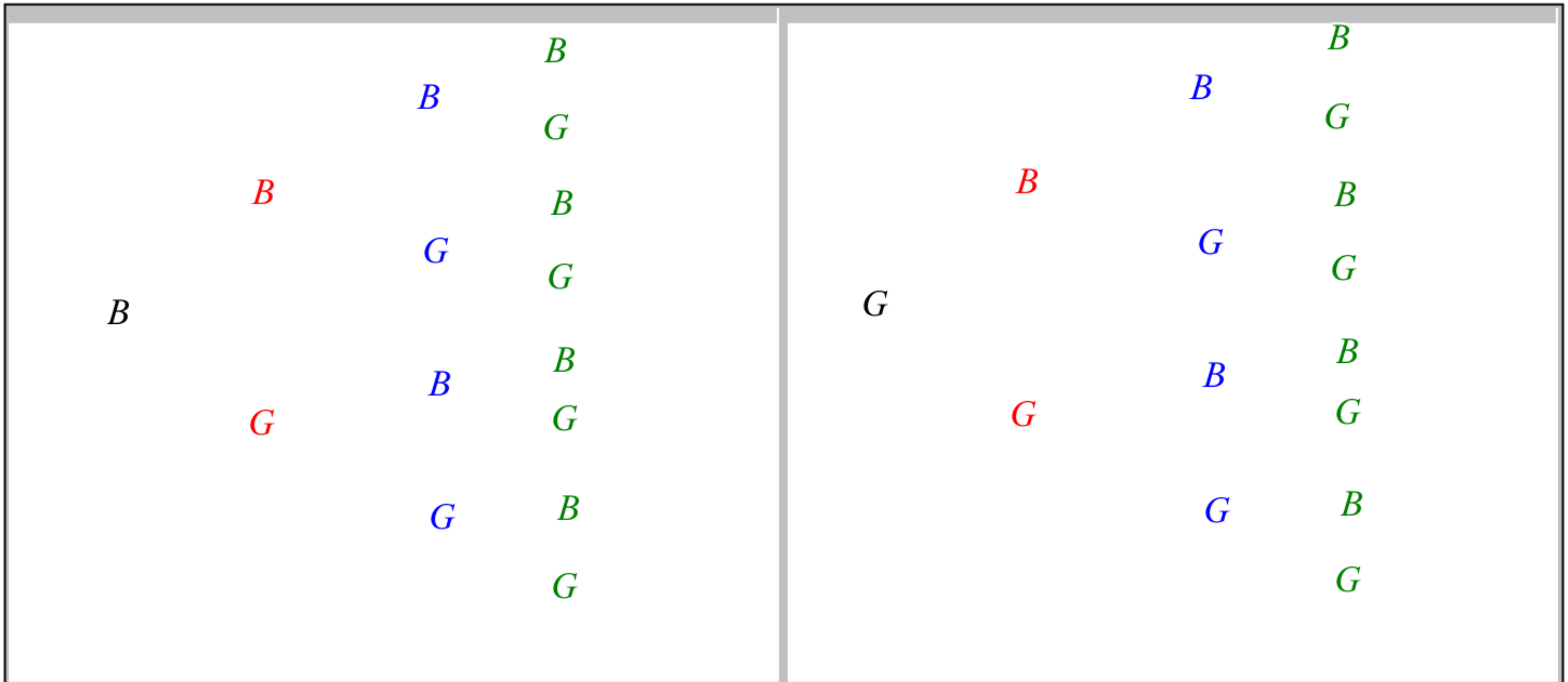
fraction notation for odds $\dfrac{9}{2}$ Verbal notation for odds 9 to 2 Colon notation 9:2

M I S S I S S I P P I

Sample Space = {4 "I" , 4 "S" , 2 "P", 1 "M"} n = 11

15) Drawing an I and Drawing a S are equally likely events

16) Drawing the M is least likely event



since we are performing the same task with the same number of outcomes, 2, with 4 separate trials we can say that Sample Size = $outcomes^{trials} = 2^4$ = 16 outcomes

Sample Space BBBB, BBBG, BBGB, BBGG, BGBB, BGBG, BGGB, BGGG

GGGG, GGGB, GGBG, GGBB, GBGG, GBGB, GBBG, GBBB

After you have done this tree diagram a couple of times, you start to notice patterns like the idea that it is easy to find "half" of the sample space and then just switch the B and G

BBBB	*GGGG*
BBBG *BBGB* *BGBB* *GBBB*	*GGGB* *GGBG* *GBGG* *BGGG*
BBGG *BGGB* *BGBG*	*GGBB* *GBBG* *GBGB*

I prefer this method of listing the sample space because it subdivides the different scenarios

The top row shows families with only one type of child (all boys or all girls)

The second row shows families with only one of one type of child and three of the other type (3 B and 1 G or 3G and 1 B)

The third row shows families that have two of each (2B and 2G)

18) P(at most two boys) = P(0B) +P(1B) +P(2B)

= 1−P(more than 2 B) = 1−P(3B or 4B)

BBBB	*GGGG*
BBBG	*GGGB*
BBGB	*GGBG*
BGBB	*GBGG*
GBBB	*BGGG*
BBGG	*GGBB*
BGGB	*GBBG*
BGBG	*GBGB*

P(at most two boys) = P(0B) +P(1B) +P(2B)

$$= \frac{1}{16} + \frac{4}{16} + \frac{6}{16}$$

$$= \frac{1+4+6}{16}$$

$$= \frac{11}{16.} \approx 0.6875$$

P(at most two boys) =1−P(3B or 4B)

$$= 1 - \left(\frac{4}{16} + \frac{1}{16}\right)$$

$$= 1 - \frac{5}{16} = \frac{11}{16.} \approx 0.6875$$

19) P(more than one girl) = P(4G) +P(3G) +P(2G)

= 1−P(less than 2 G) = 1−P(1G or 0G)

BBBB	GGGG
BBBG	GGGB
BBGB	GGBG
BGBB	GBGG
GBBB	BGGG
BBGG	GGBB
BGGB	GBBG
BGBG	GBGB

P(more than one girl) = P(4G) +P(3G) +P(2G)

$$= \frac{1}{16} + \frac{4}{16} + \frac{6}{16}$$

$$= \frac{1+4+6}{16}$$

$$= \frac{11}{16.} \approx 0.6875$$

P(more than one girl) =1−P(1G or 0G)

$$= 1 - \left(\frac{4}{16} + \frac{1}{16}\right)$$

$$= 1 - \frac{5}{16} = \frac{11}{16.} \approx 0.6875$$

20) P(exactly two boys) = P(2B)

$BBBB$	$GGGG$
$BBBG$ $BBGB$ $BGBB$ $GBBB$	$GGGB$ $GGBG$ $GBGG$ $BGGG$
$BBGG$ $BGGB$ $BGBG$	$GGBB$ $GBBG$ $GBGB$

P(exactly two boys) = P(2B)

$$=\frac{6}{16.} \approx 0.375$$