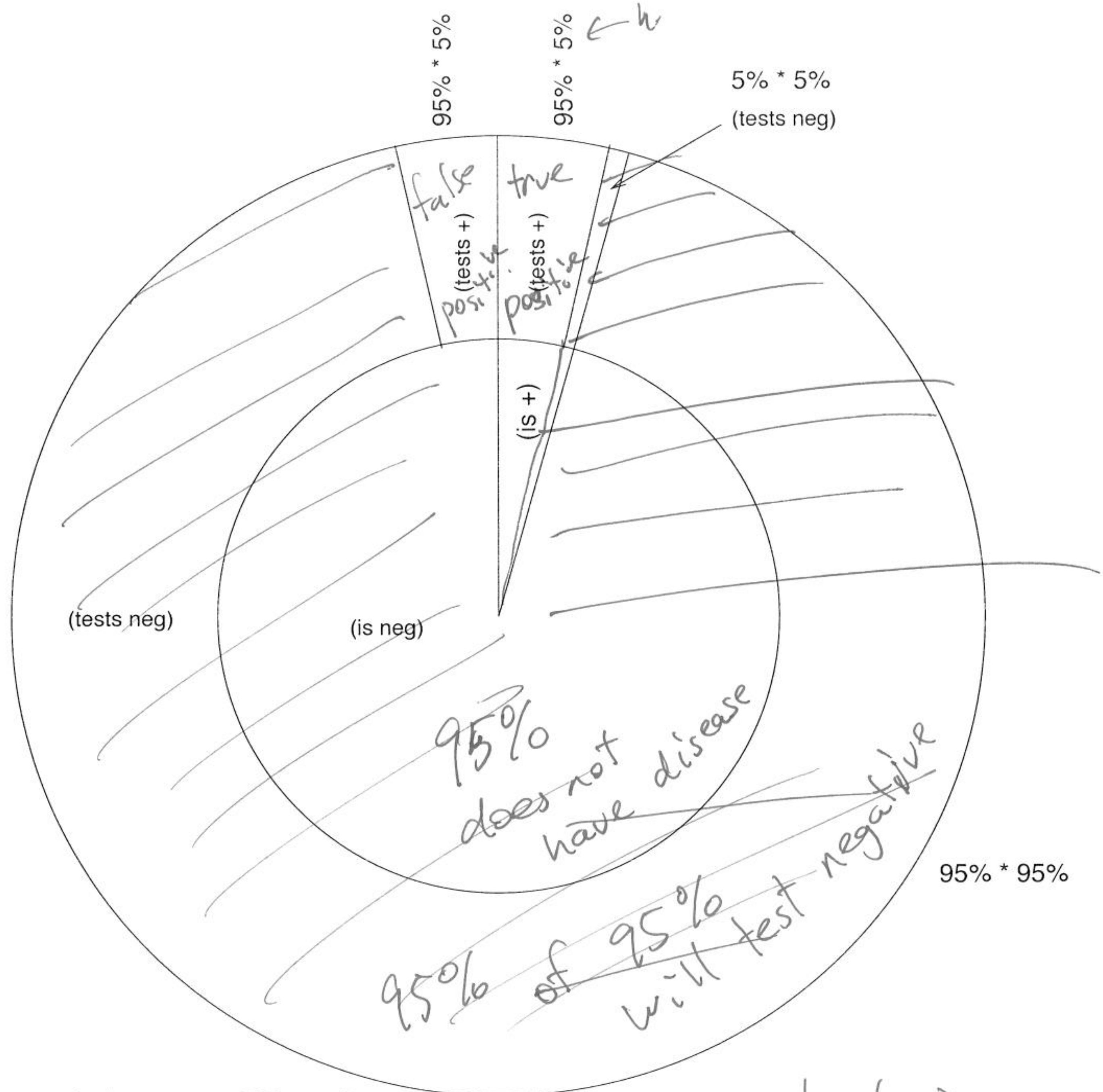


Given that I test positive what is the probability that I have disease

$$A = \begin{bmatrix} 19 & 16 \\ 11 & 25 \end{bmatrix}$$

mod 29

$$\det A = 19\cdot 25 - 11\cdot 16 = 299 \equiv 9 \pmod{29}$$

$$9 \cdot 13 \equiv 1 \pmod{29}$$

$$A^{-1} = \begin{bmatrix} 25 & -16 \\ -11 & 19 \end{bmatrix} \cdot 9^{-1}$$

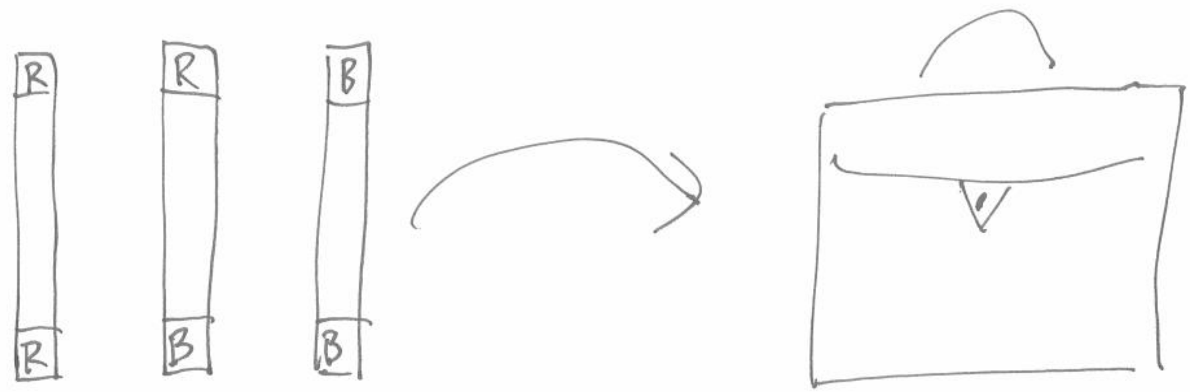
$$= \cancel{\begin{bmatrix} \cdot & - \\ & \end{bmatrix} \cdot 13}$$

$$= \begin{bmatrix} 25 & 13 \\ 18 & 19 \end{bmatrix} \cdot 13 = \begin{bmatrix} 6 & 24 \\ 2 & 15 \end{bmatrix}$$

$$\underset{A^{-1}}{\begin{bmatrix} 6 & -5 \\ 2 & 15 \end{bmatrix}} \underset{A}{\begin{bmatrix} 19 & 16 \\ 11 & -4 \end{bmatrix}} = \begin{bmatrix} 19\cdot 6 - 55 & \overset{9+20}{6\cdot 16 + 20} \\ 2\cdot 19 + 11\cdot 15 & 2\cdot 16 - 60 \end{bmatrix}$$

$$-28 \equiv 1$$

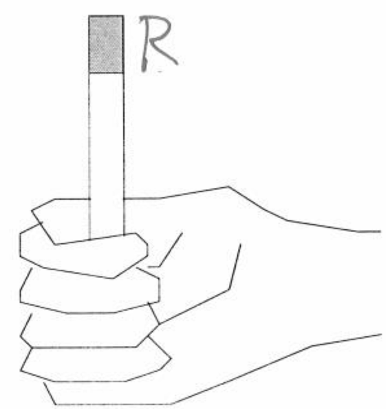
$$\begin{bmatrix} \begin{matrix} 27 - 55 \\ 27 - 2\cdot 27 - 1 \end{matrix} & 0 \\ 9 + 20 & 1 \end{bmatrix}$$



Take three sticks which have their ends colored and place them in a bag. The first stick has two red ends, the second has two black ends and the third stick has a red and a black end.

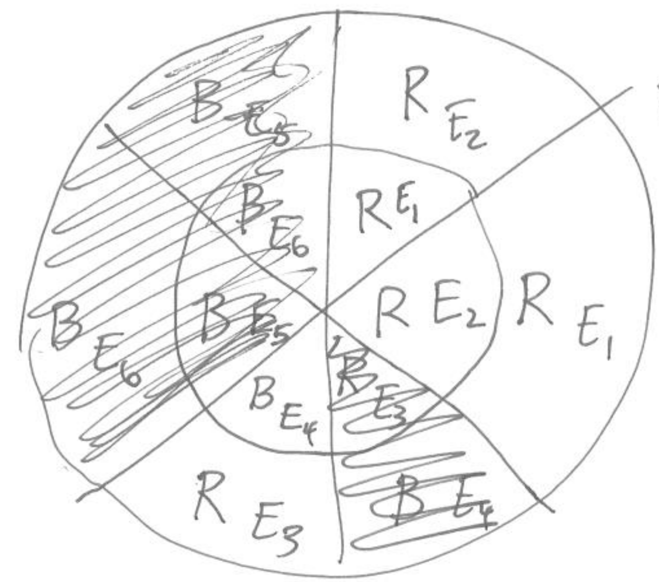
Now, reach into this bag (no peeking) and grasp one of the sticks by an end so that the other end is showing and pull the stick out. Say that a red end is showing.

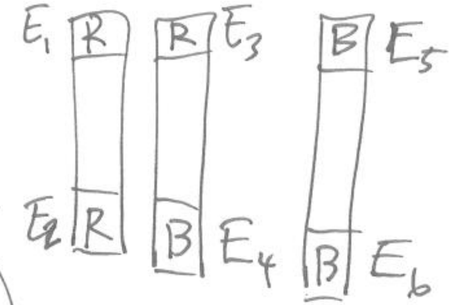
What color is most likely clasped in your fist?



Is the answer?

A) red
B) black
C) red/black are equally likely
D) don't know/~~care~~
E) don't care

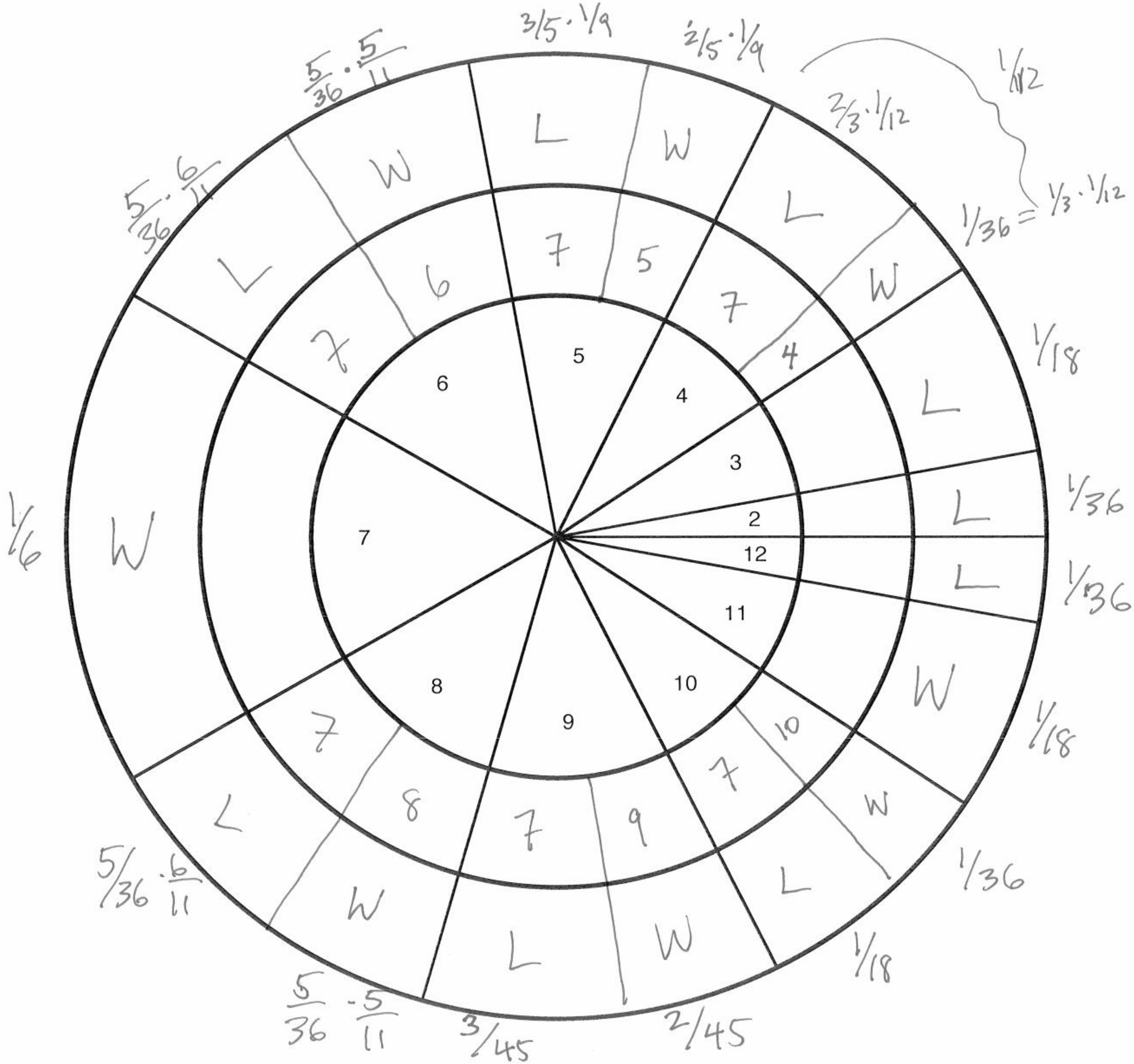




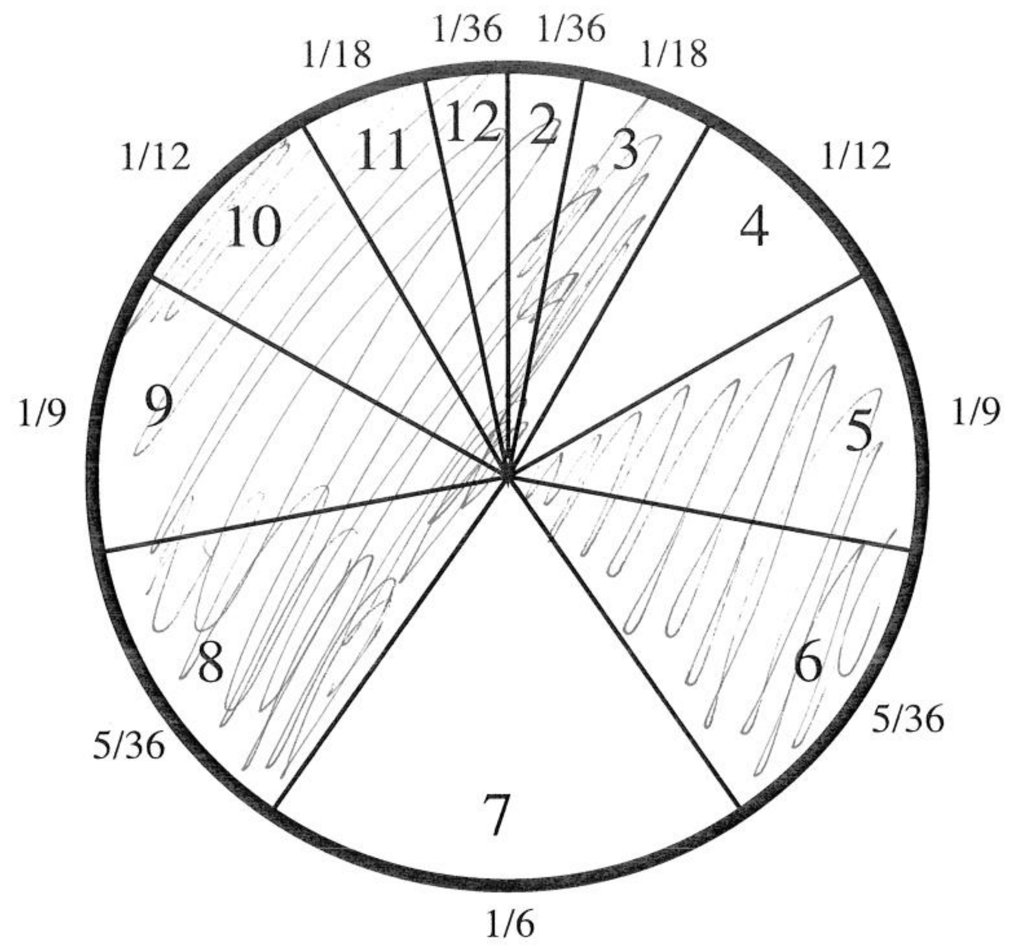
inner = hidden
outer = showing

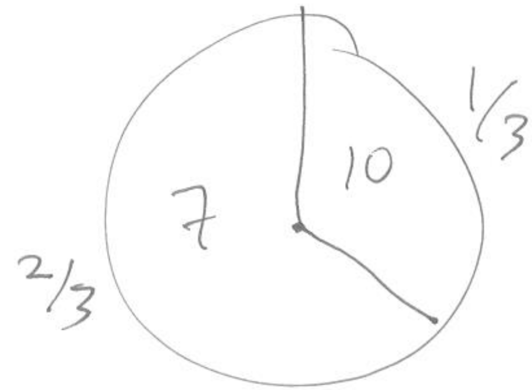
$$P(\text{hidden end is Red} \mid \text{show end is R}) = \frac{2}{3}$$

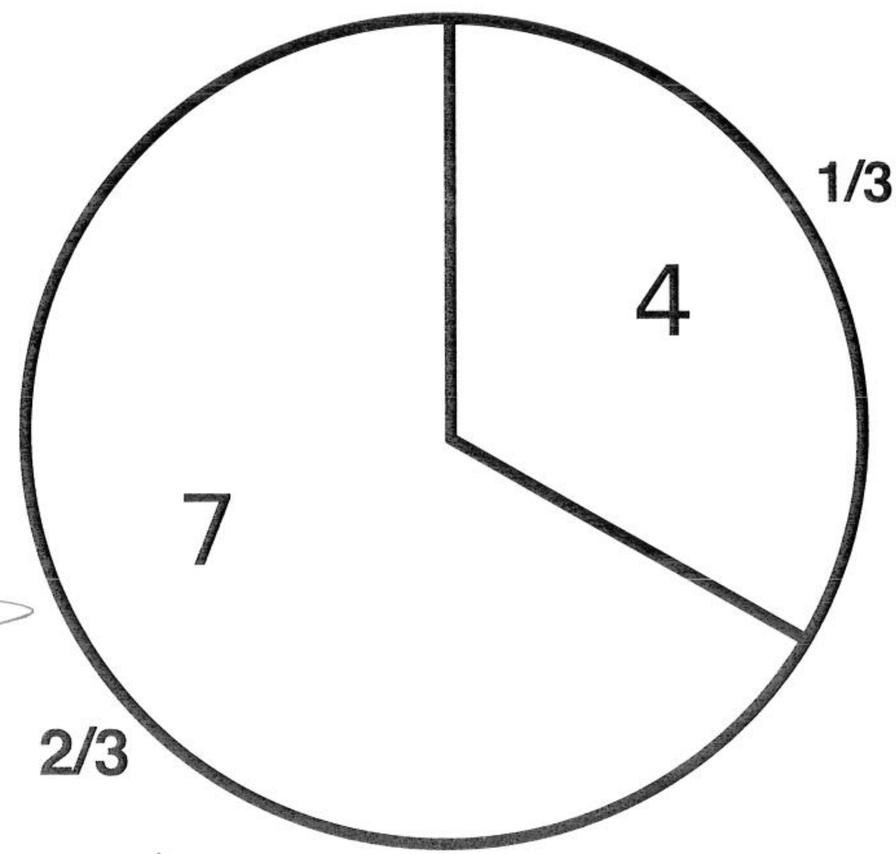
$$\frac{P(\text{hidden} = \text{R \& show. is R})}{P(\text{show is R})} = \frac{2 \cdot 1/6}{1/2} = \frac{2}{3}$$



7
6
5
4
3
2
12
11
10
9
8
W
L
7
6
5
4
10
9
8
1/6
5/36 · 6/11
5/36 · 5/11
3/5 · 1/9
2/5 · 1/9
2/3 · 1/12
1/12
1/36 = 1/3 · 1/12
1/18
1/36
1/36
1/18
1/36
1/18
2/45
3/45
5/36 · 5/11
5/36 · 6/11

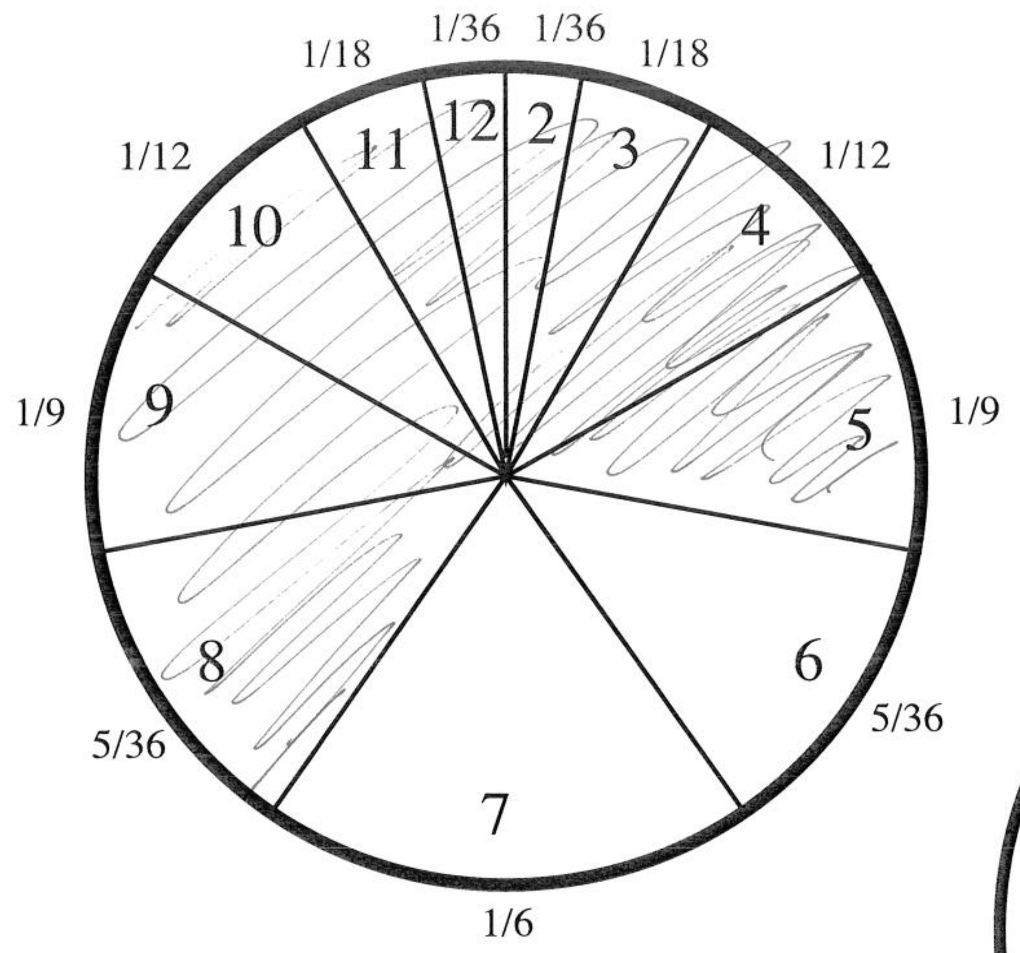


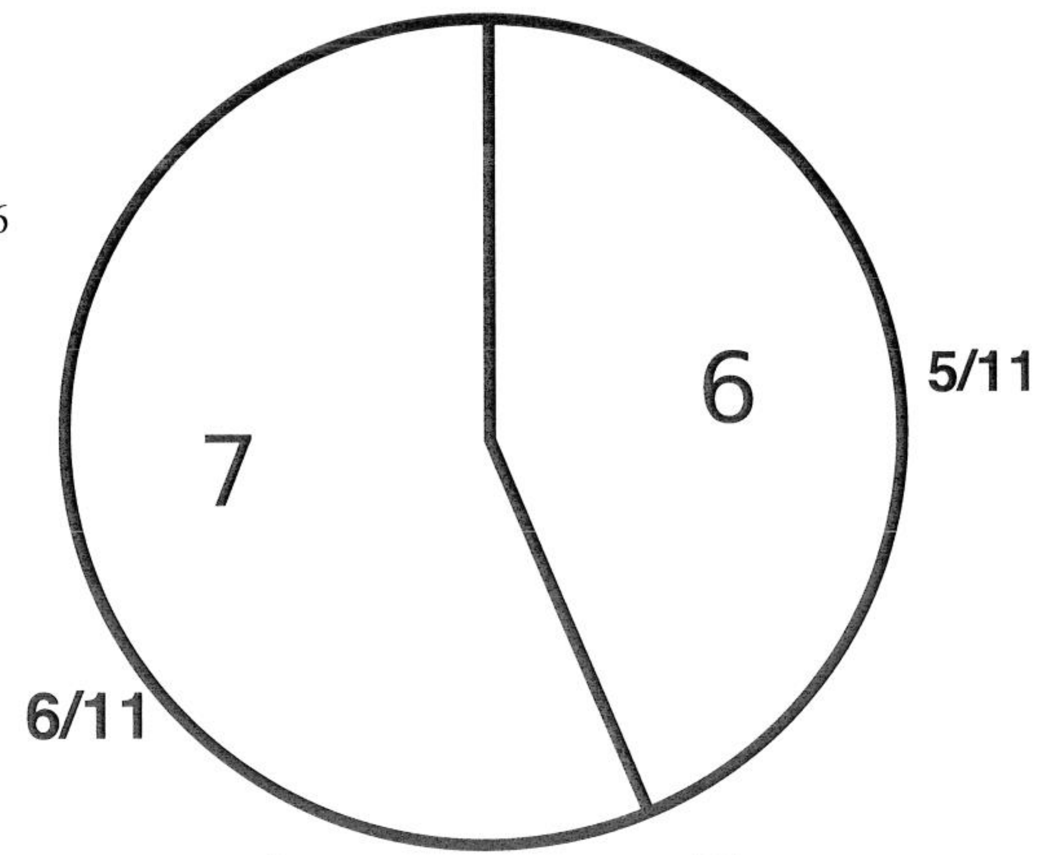




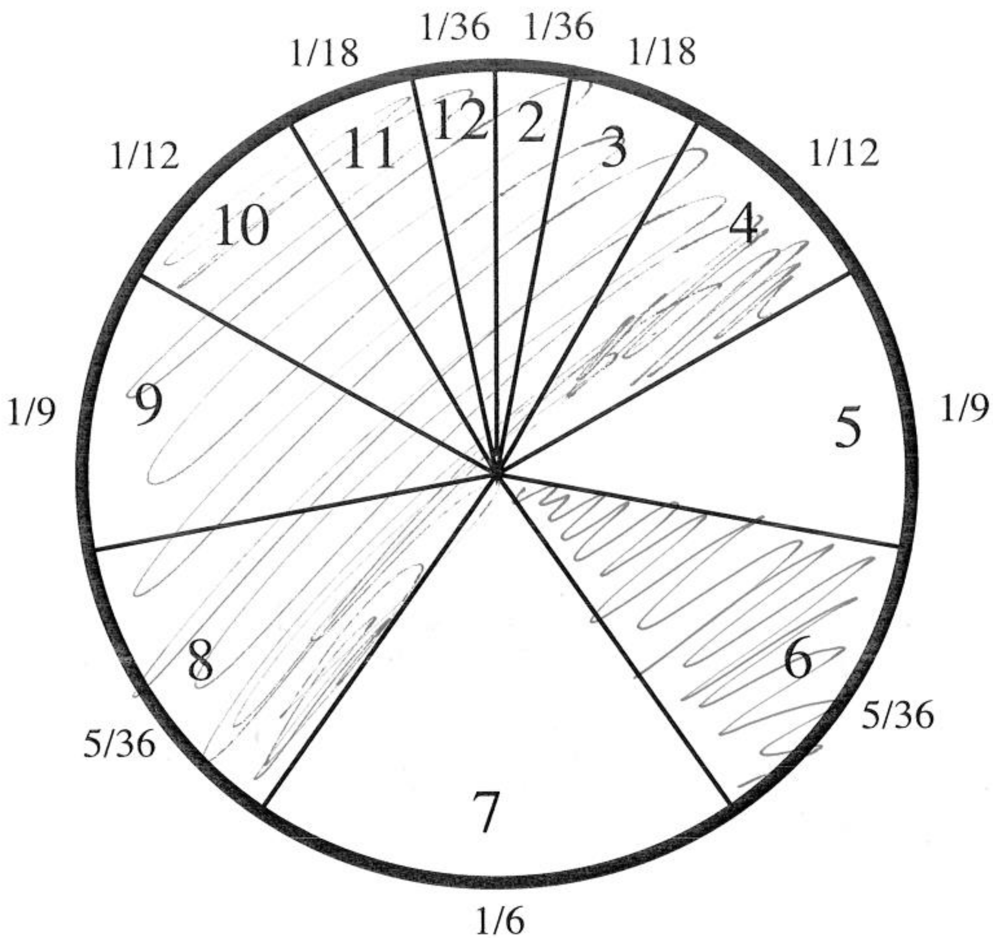
P(roll 7 | roll 7 OR 4)

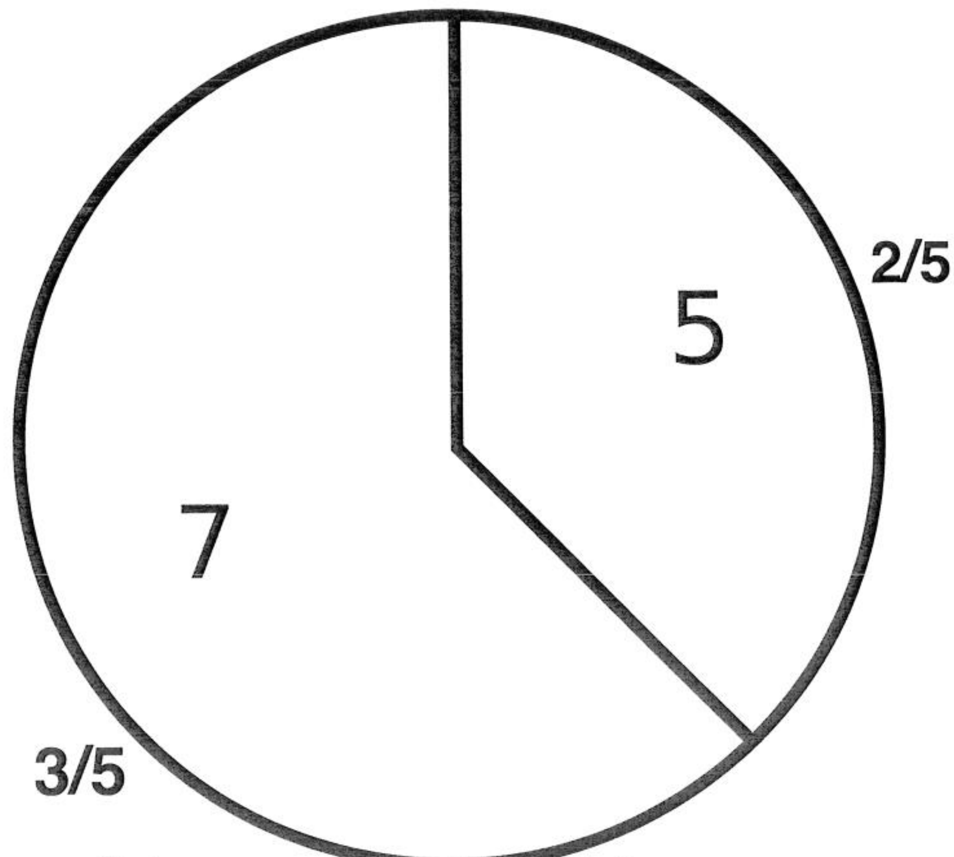
$$\frac{P(\text{roll } 7 \;\&\; (\text{roll } 7 \text{ OR } 4))}{P(\text{roll } 7 \text{ OR } 4)} = \frac{1/6}{1/6 + 1/12} = \frac{2/12}{3/12} = \frac{2}{3}$$





$$P(\text{roll } 6 \mid \text{roll } 6 \text{ OR } 7) = \frac{P(\text{Roll } 6 \ \& \ (\text{roll } 6 \text{ OR } 7))}{P(\text{roll } 6 \text{ OR } 7)} = \frac{5/36}{1/6 + 5/36} = \frac{\frac{5}{36}}{11/36} = \frac{5}{11}$$

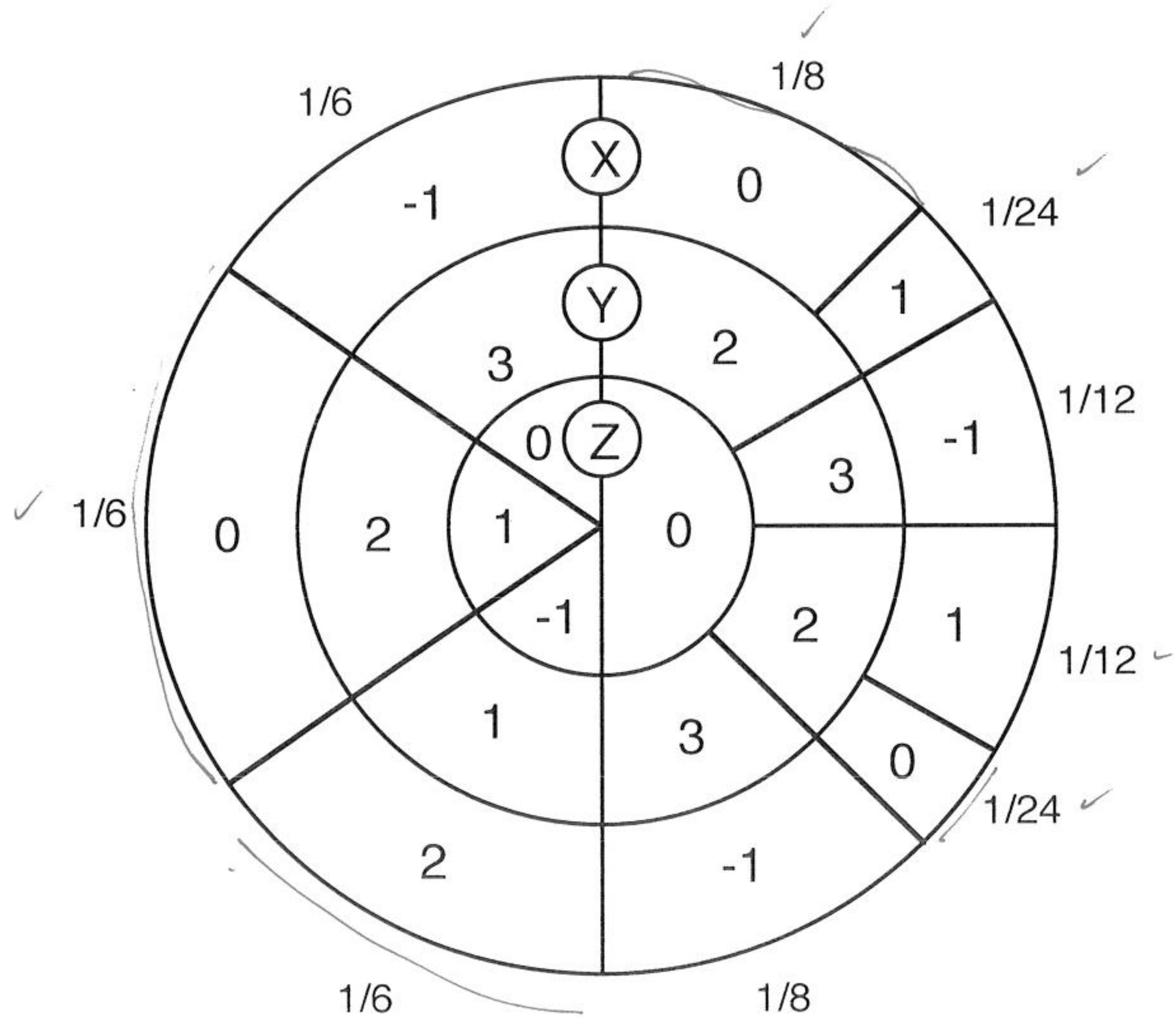




$$P(\text{roll } 5 \mid \text{roll } 5 \text{ OR } 7)$$

$$= \frac{P(\text{roll } 5 \ \& \ (\text{roll } 5 \text{ OR } 7))}{P(\text{roll } 5 \text{ OR } 7)} = \frac{1/9}{1/9 + 1/6} = \frac{2/18}{5/18} = 2/5$$

1. The wheel below represents the random variables X, Y and Z.



Calculate:

a) P(X=0) $= \frac{1}{3}$

b) P(X=1) $= \frac{1}{8}$

c) P(Z=-1 or X=0) $= \frac{1}{2}$

d) P(Y=2) $= \frac{11}{24} = \frac{1}{3}+\frac{1}{8}$

e) P(Y=2 or X=0) $= \frac{11}{24}$

f) P(Y=2 and X=0) $= \frac{1}{3}$

g) P(X=0 | Y=2) $= \frac{\frac{1}{3}}{\frac{11}{24}}$

h) P(X=0 | Z=-1)

i) P(X=2 | Z=-1)