11.2 Probablility

Theoretical Probability:

If all outcomes in a sample space are equally likely, then the theoretical probability of event A, denoted by P(A), is defined by :

$$P(A) = \frac{\text{number of outcomes in event A}}{\text{number of outcomes in the sample space}}$$

$$\frac{\text{winning outcomes}}{\text{total possible outcomes}}$$

Example 1: Find the probability of choosing a BLUE marble from a bowl containing 4 GREEN, 7 BLUE and 6 WHITE marbles.

$P(\text{BLUE}) = \frac{\#\text{ Blue}}{\#\text{ marbles}} = \frac{7}{17}$

Example 2: A bag contains 12 yellow blocks, 13 blue blocks, 7 green blocks, and 10 red blocks. You pick one block from the bag at random. Find each theoretical probability.

$12+13+7+10=42$

a) P(yellow)

$\frac{12 \div 6}{42 \div 6} = \boxed{\frac{2}{7}}$

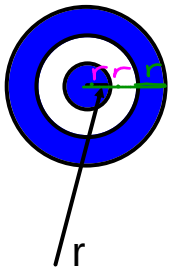
b) P(not blue)

$\frac{42-13}{42} = \boxed{\frac{29}{42}}$

c) P(red or not green)

$\frac{35 \div 7}{42 \div 7} \boxed{\frac{5}{6}}$

Example 3: Suppose that a dart lands at random on the dartboard shown below. Find each theoretical probability.



Width of each ring = r

$A = \pi r^2$

$A(\text{BLUE}) = A_{\text{whole}} - \text{medium circle} + \text{smallest blue circle}$

$= \pi(3r)^2 - \pi(2r)^2 + \pi r^2$

$= \pi 9r^2 - \pi 4r^2 + \pi r^2 = 6\pi r^2$

a) P(dart landing in blue region) $= \dfrac{\text{Area of BLUE}}{\text{area of target}} = \dfrac{6\pi r^2}{\pi(3r)^2}$

$= \dfrac{6\pi r^2}{9\pi r^2} = \boxed{\dfrac{2}{3}}$

b) P(dart landing in center circle) $\dfrac{A(\text{little})}{A \text{ whole thing}} = \dfrac{1\pi r^2}{9\pi r^2}$

$= \boxed{\dfrac{1}{9}}$

Example 4

Mark goes to the fridge once during the time interval from 3:30-4:00. Find the probability that he will go to the fridge during each time interval.

a) from 3:30-3:40

$\dfrac{10 \text{ min}}{30 \text{ min}} = \boxed{\dfrac{1}{3}}$

b) from 3:45-3:50

$\dfrac{5 \text{ min}}{30 \text{ min}} = \boxed{\dfrac{1}{6}}$

c) from 3:58-4:00

$\dfrac{2 \text{ min}}{30 \text{ min}} = \boxed{\dfrac{1}{15}}$