C: Determining Probabilities Using Fractions

- If you have two or more independent events, the probability can be found by multiplying all single events.

→ _Simulation_ - an experiment that can be used to model a real situation. The _results are experimental results._

Examples:

1. You spin a spinner divided into three equal regions and roll a 8-sided die once.

a) Show the sample space.

Spinner Die	1	1	2
1	1 , 1	1 , 1	2 , 1
2	1 , 2	1 , 2	2 , 2
3	1 , 3	1 , 3	2 , 3
4	1 , 4	1 , 4	2 , 4
5	1 , 5	1 , 5	2 , 5
6	1 , 6	1 , 6	2 , 6
7	1 , 7	1 , 7	2 , 7
8	1 , 8	1 , 8	2 , 8

b) What is the probability of spinning a 1 and rolling a 2.

$$P(1,2) = \frac{2}{24}$$

$$= \frac{1}{12} = 0.08\overline{3} = 8.\overline{3}\%$$

c) Use a second method to find $P(1,2)$.

outcomes = spinner × die
$$= 3 \times 8$$
$$= 24$$

$$P(1,2) = P(1) \times P(2)$$
$$= \frac{2}{3} \times \frac{1}{8}$$

$$= \frac{2}{24}$$

$$\boxed{= \frac{1}{12}} =$$

2. A coin is flipped three times.

a) What is the prob. a tail is flipped on all three flips?

outcomes = $1^{st} \times 2^{nd} \times 3^{rd}$
$$= 2 \times 2 \times 2$$
$$= 6$$

$$P(T,T,T) = P(T) \times P(T) \times P(T)$$
$$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

$$\boxed{= \frac{1}{6}} = 0.1\overline{6} = 16.\overline{6}\%$$

b) What is the prob. two heads and a tail are flipped in that order?

$$P(H,H,T) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$
$$= \frac{1}{6}$$

c) What is the prob two heads and a tail are flipped in any order?

$P(H,H,T)$ or $P(H,T,H)$ or $P(T,H,H)$

$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ $= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$$= \frac{1}{6} \qquad\qquad = \frac{1}{6} \qquad\qquad = \frac{1}{6}$$

$$\text{sum} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$

$$= \frac{3}{6}$$

$$\boxed{= \frac{1}{2} = 0.5 = 50\%}$$

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