12-1 Fundamental Counting Principle
& Multiplying Probabilities

1. Outcome - the result of a single trial.

2. Sample Space - the set of all possible outcomes

3. Independent Events - when one event does NOT affect the choices for the other events

4. Dependent Events - The outcome of one event DOES affect the outcome of another event.

5. Fundamental Counting Principle - If event M can occur in *m* ways and is followed by event N that can occur in *n* ways, then event M followed by event N can occur in $m \bullet n$ ways

6. Tree Diagram- A way to show the possible outcomes

ex) Dane is renting a tuxedo for prom. Once he has chosen his jacket, he must choose from three types of pants and six colors of vests. How many ways can he select his attire for prom?

ex) Draw a tree diagram of this situation.

ex) A sandwich menu offers customers a choice of white, wheat or rye bread with one spread chosen from butter, mustard, or mayonnaise. How many different combinations of bread and spread are possible?

ex) Sara wants to take ten different classes next year. Assuming each class is offered each period, how many different schedules could she have?

7. Probability - the ratio that measures the chance of an event occurring.

8. Success - A desired outcome

9. Failure - any other outcome

10. $P(S) = \frac{s}{s+f}$ $\frac{1}{6}$, $\frac{3}{6} = \frac{1}{2}$

13 TOTAL MARBLES

ex) A bag contains 3 red, 4 blue and 6 green marbles. One marble is chosen. Find each.

P(red) = $\frac{3}{13} = 23.1\%$

P(blue) = $\frac{4}{13} = 30.8\%$

P(not blue) = $\frac{9}{13} = 69.2\%$

8. Probability of Two Independent Events -

P(A and B) = $P(A) \bullet P(B)$ $\frac{1}{10} \cdot \frac{9}{10} = \frac{9}{100}$

Boy, girl

9. Probability of Two Dependent Events -

P(A and B) = $P(A) \bullet$ P(B following A)

ex) Jared has 9 dimes and 7 pennies in his pocket. He randomly selects one coin, looks at it, and replaces it. He then randomly selects another coin. What is the probability that both coins he selects are dimes?

16

$\left(\frac{9}{16}\right) \cdot \left(\frac{9}{16}\right) = \frac{81}{256}$ 31.7%

ex) P(both are pennies) $\frac{7}{16} \cdot \frac{7}{16} = \frac{49}{256}$ 19.2%

3 white 2 black 5 red

White

$\frac{3}{10}$ = .3

RED

$\frac{5}{10}$ 50%

even

$\frac{3}{6} = \frac{1}{2}$ 50%

ODD

$3/6 = 1/2$ 50%

<3

$\frac{2}{6}$ 33%

>3

$\frac{3}{6} = \frac{1}{2}$ 50%

1) A Teen male being killed in car accident vs B female

2) A Dying from FLU vs B fall

3) A injured by bucket or pail vs B Toilet

4) A struck by lightning vs B killed by a shark

ex) When three dice are rolled, what is the probability that the first two show a 5 and the third shows an even number?

$\left(\frac{1}{6}\right)\left(\frac{1}{6}\right)\left(\frac{3}{6}\right) = \frac{3}{216}$ 1.4%

ex) P(they are all 6)= $\left(\frac{1}{6}\right)\left(\frac{1}{6}\right)\left(\frac{1}{6}\right) = \frac{1}{216}$ .5%

ex)P(all are even)=

ex) The host of a game show is drawing chips from a bag to determine the prizes for which contestants will play. Of the 10 chips in the bag, 6 show *television*, 3 show *vacation*, and 1 shows *car*. If the host draws the chips at random and does NOT replace them. Find each.

P(vacation then car)= $\left(\frac{3}{10}\right)\left(\frac{1}{9}\right)=\frac{3}{90}=\frac{1}{30}=3.3\%$

P(two televisions)= $\left(\frac{6}{10}\right)\left(\frac{5}{9}\right)$ $\frac{30}{90}=\frac{3}{9}=\frac{1}{3}$ 33%

P(car then television)= $\left(\frac{1}{10}\right)\left(\frac{6}{9}\right)=\frac{6}{90}=\frac{1}{15}=6.7\%$

ex) Three cards are drawn from a standard deck of cards $\boxed{\text{WITHOUT}}$ replacement. Find each. 52 TOTAL 13 in EACH SUIT

P(heart, heart, spade in that order)=
$\left(\frac{13}{52}\right)\left(\frac{12}{51}\right)\left(\frac{13}{50}\right)=\frac{2028}{132600}$ 1.5%

P(diamond, club, diamond in that order) =
$\left(\frac{13}{52}\right)\left(\frac{13}{51}\right)\left(\frac{12}{50}\right)$ = 1.5%

P(three cards of the same suit) = $\left(\frac{13}{52}\right)\left(\frac{12}{51}\right)\left(\frac{11}{50}\right)$
$\frac{1716}{132600}$ = 1.3%

ex)Three cards are drawn from a standard deck of cards $\boxed{\text{WITH}}$ replacement. Find each.

P(club, heart, diamond in that order)=
$\left(\frac{13}{52}\right)\left(\frac{13}{52}\right)\left(\frac{13}{52}\right)$ $\frac{2197}{140608}$ 1.6%

P(three of the same number) =
$\frac{4}{52}$ $\frac{4}{52}$ $\frac{4}{52}$ $\frac{64}{140608}$ = .045%

2 letters 3 digits

$\underline{26}\cdot\underline{26}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}$
676,000

$\underline{26}\cdot\underline{26}\cdot\underline{26}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}$
175,760,000

$\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}\cdot\underline{10}$
1,000,000,000

80% 95%

$.8 \cdot .95 = .76$ or 76%

$P(A) = .5$ $P(B) = .25$ $P(C) = .75$ $P(D) .1$

$P(C \& D) = .75 \cdot .1 = .075$ or 7.5%

$P(A \& D) = .5 \cdot .1 = .05$ or 5%

$\frac{1}{8} \cdot \frac{1}{8} \cdot \frac{1}{8} = \frac{1}{512} = .19\%$

$\frac{4}{8} \cdot \frac{4}{8} \cdot \frac{4}{8} = \frac{64}{512}$ 12.5%