Key

Probability
Fundamental Counting Principle

Example 1
You go to your favorite ice cream shop and want to order an ice cream cone. There are 5 different kinds of ice cream to choose from (chocolate, vanilla, cookies and cream, rocky road, and mint chocolate chip) and 2 different kinds of cones (waffle and sugar). How many different kinds of single scoop ice cream cones could you order?

Chocolate — W S
Vanilla — W S
Cookies — W S
R.Road — W S
M.Chip — W S

Number of cones: 10

Example 2
a) Maya is choosing her outfit for school. She hasn't done her laundry in a while, so she only has 3 pairs of pants (black, grey, and white) and 4 different colored shirts (purple, red, green, and pink) to choose from. How many possible outfits can she make?

Black — P R G P
Grey — P R G P
White — P R G P

Number of outfits: 12

Fundamental Counting Principle
If: Event A can happen *a* ways Event B can happen *b* ways **Then:** The number of ways to do Event A **and** Event B is A • B

b) Now Maya is trying to decide which shoes to wear and she is choosing from her flip flops or her pair of converse shoes. How many possible outfits could she pick from her 3 pairs of pants, 4 shirts, and 2 pairs of shoes?

3 pants • 4 shirts • 2 shoes

Number of outfits: 24

VOCABULARY

Random Experiment: no way to determine the outcome prior to the experiment.

Outcome: the result of a single trial.

Event: set of one or more outcomes.

Sample Space: set of all possible outcomes (i.e. all possible outfits)

Independent Events: the result of one event does not affect the result of another event.

Dependent Events: the result of one event does affect the result of another event.

Example 3

If Ellie has 3 skirts and 8 pants, how many ways can she pick a skirt **or** pants? (Notice this time I am asking one **or** the other.)

$3+8$

Number of outfits: 11

If: Event A can happen *a* ways Event B can happen *b* ways **Then:** The number of ways to do A **or** B is A+B

Your Turn…

1. A restaurant has 8 different types of salads and 9 different types of pastas.

a) In how many different ways can you order a salad and a dish of pasta?

$8 \cdot 9 = 72$

b) In how many different ways can you order a salad or a dish of pasta?

$8+9 = 17$

2. A co-ed ultimate frisbee team has 7 girls and 8 boys.

a) In how many ways can the coach pick a girl and a boy captain?

$7 \cdot 8 = 56$

b) In how many ways can the coach pick a girl or a boy captain?

$7+8=15$

3. If you have two dice, how many possible outcomes are there?

$6 \cdot 6 = \boxed{36}$

Example 4

2 5 COLORS

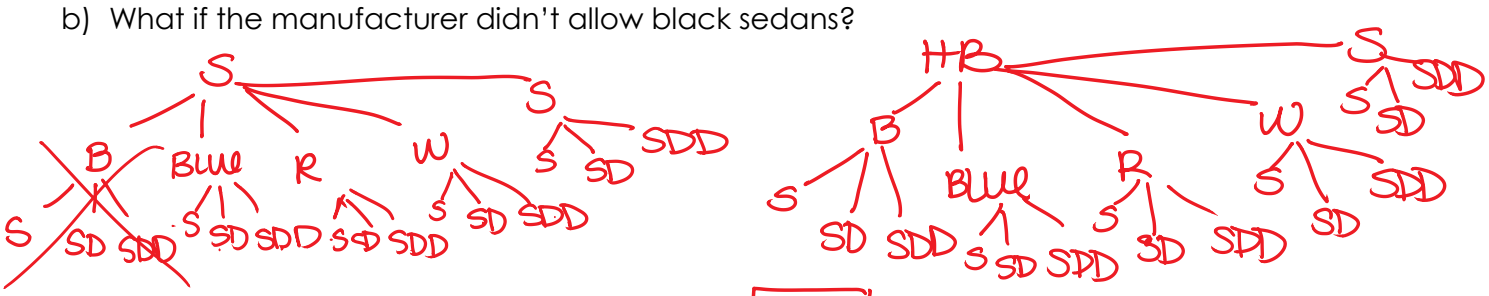
You are out to buy a sweet new ride. You can get a sedan or hatchback, each could be black, blue, red, white, or silver and each could have one of three trim levels (S:super, SD:super deluxe, SDD:super-duper deluxe).

3 trim

a) How many different cars could you have?

$2 \cdot 5 \cdot 3 = 30$

b) What if the manufacturer didn't allow black sedans?



$12 + 15 = \boxed{27}$

Example 5

You have 6 choices of ice cream and 3 cones. How many ice cream cones can you make if you have 1 scoop and 1 cone? What about if you have 2 scoops and a cone? What if you have 2 scoops and a cone, but the scoops have to be different flavors?

1 scoop and 1 cone → $6 \cdot 3 = \boxed{18}$

2 scoops and 1 cone → $6 \cdot 6 \cdot 3 = \boxed{108}$

} independent

2 scoops and 1 cone → $6 \cdot 5 \cdot 3 = \boxed{90}$

dependent variable

Example 6

a) How many license plates are there that must have a letter followed by 6 digits?

(26) (0-9) → 10

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

b) How many license plates are there that must have a letter followed by 6 different digits?

$\underline{26} \cdot \underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} = 3{,}931{,}200$

c) How many license plates are there that must have a letter followed by 6 different digits and may not start with the letters B or M?

$\underline{24} \cdot \underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} = 3{,}628{,}800$

Practice:

1) How many 3 letter "words" are possible? A "word" is any arrangement of letters?

independent $\underline{26} \cdot \underline{26} \cdot \underline{26} = 17{,}576$

2) How many 3 letter "words" are possible if no repeating of letters is allowed?

dependent $\underline{26} \cdot \underline{25} \cdot \underline{24} = 15{,}600$

Challenge:

How many 5 letter words can you form out of the word HINSDALE? (8 letters)

$\underline{8} \quad \underline{7} \quad \underline{6} \quad \underline{5} \quad \underline{4} = 6{,}720$