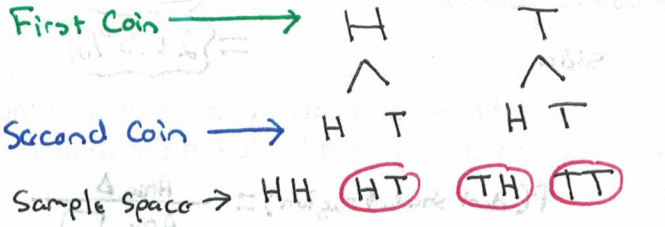
Math 2

Unit 7.3 – Applications with Probability (Simple Probability)

- **(simple) probability** → represents the fraction of $\frac{\text{DESIRED outcome}}{\text{TOTAL outcome}}$ *This is a fraction*
  - The probability of an event occurring is always between 0 and 1 inclusive
    - If the probability of an event is closer to 0 then the less likely the event will occur
    - If the probability of an event is closer to 1 then the more likely the event will occur
  - Probability can be represented using a tree diagram or using combinations ($_nC_r$)
  - Probability is stated as a number in three forms: fraction, decimal, and percent (seen most often)

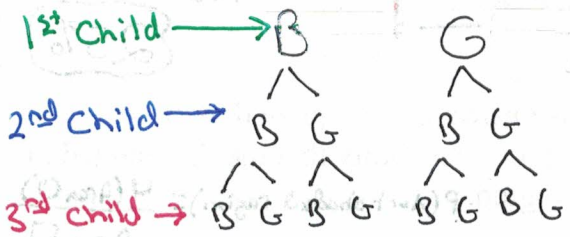
Example 1: Determine the probability using a tree diagram in its three forms.

a.) When two coins are tossed, what is the probability that there will be at least a tail?



$P(\text{at least a Tail}) = \frac{3}{4} = .75 = 75\%$

b.) A woman wants three children, what is the probability that she will have 2 boys?



Sample Space: BBB, BBG, BGB, BGG, GBB, GBG, GGB, GGG

$P(2\text{ boys}) = \frac{3}{8} = \frac{1}{2} = .5 = 50\%$

Example 2: Determine the probability using combinations as a percent. Round % to tenths.

(desire / total → $_nC_r$ ← taking)

a.) Ebony has 4 male kittens and 7 female kittens. She picks up 2 kittens to give to a friend. Find the probability for the following: (4 subtotal, 7 subtotal, 2 picked up, 11 Total)

i.) P (2 male) $\frac{\text{desire}}{\text{total}}$

$\frac{{}_4C_2}{{}_{11}C_2} = \frac{6}{55}$

10.9%

ii.) P (2 female)

$\frac{{}_7C_2}{{}_{11}C_2} = \frac{21}{55}$

38.2%

iii.) P (1 of each)

$\frac{{}_4C_1 \cdot {}_7C_1}{{}_{11}C_2} = \frac{28}{55}$ (Two combos on top!)

50.9%

iv.) P (1 male, 2 female)

ONLY PICKING UP 2! NOT 3!

0%

b.) Bob is moving and all of his CDs are mixed up in a box. Twelve CDs are rock, eight are jazz, and five are classical. If he reaches into the box and selects them at random, find the probability for… (25 total)

i.) P (3 jazz) r=3

$\frac{{}_8C_3}{{}_{25}C_3} = \frac{56}{2300}$

2.4%

ii.) P (2 classical, 1 rock) r=3

$\frac{{}_5C_2 \cdot {}_{12}C_1}{{}_{25}C_3} = \frac{120}{2300}$

5.2%

iii.) P (2 jazz, 3 reggae)

DOES NOT OWN REGGAE!

0%

iv.) P (1 classical, 1 jazz, 2 rock) r=4

$\frac{{}_5C_1 \cdot {}_8C_1 \cdot {}_{12}C_2}{{}_{25}C_4} = \frac{2640}{12650}$

20.9%

Math 2

– **geometric probability** → represents the fraction of $\frac{\text{AREA of DESIRED Outcome}}{\text{AREA of TOTAL outcome}}$

Common Area Formulas You SHOULD KNOW:

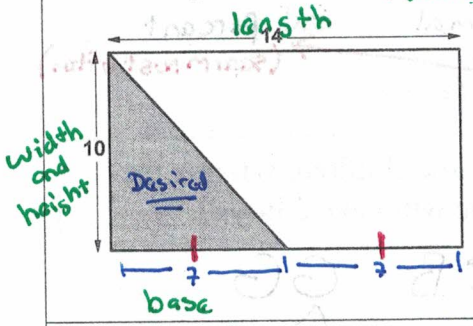
Area of Square → Area = (side)^2 $A = s^2$ *Area of Rectangle* → Area = (length)(width) $A = lw$

Area of Triangle → Area = $\frac{1}{2}$(base)(height) $A = \frac{1}{2}bh$ *Area of Circle* → Area = π(radius)^2 $A = \pi r^2$

Example 3: Find the geometric probability for each given situation/diagram. Express as a percent.

a.) A coin is thrown from a ladder. Find the probability of the coin landing in the shaded region.

P(coin in shaded) = Area △ / Area □



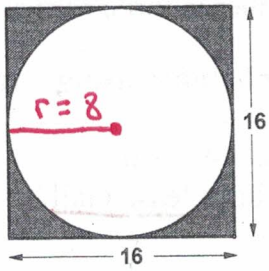
$= \frac{\frac{1}{2}(7)(10)}{(10)(14)}$

$= \frac{35}{140}$

25%

b.) A rock is thrown from a second story building. Find the probability of the rock landing in the shaded region.

P(rock in shaded region) = (Area □ − Area ○) / Area □



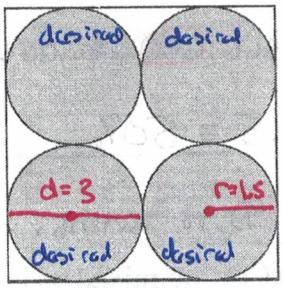
$= \frac{(16)^2 - (\pi \cdot 8^2)}{(16)^2}$ use the symbol until the end.

$= \frac{(256 - 64\pi)}{256}$ ← use the π key

21.5%

c.) A dart is thrown at the square dart board below. Find the probability that the dart landed in the shaded region.

P(dart shaded region) = 4(Area ○) / Area □



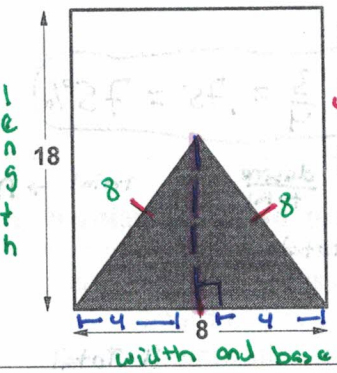
$= \frac{4(\pi \cdot 1.5^2)}{(6)^2}$

$= \frac{4(2.25\pi)}{36}$

78.5%

d.) A dart is thrown at the dart board below. Find the probability that the dart landed in the shaded region.

P(dart shaded region) = Area △ / Area □



① $h^2 + (4)^2 = (8)^2$

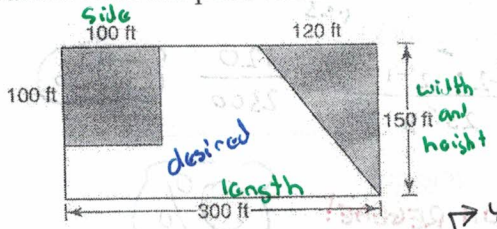
$h^2 = 48 \rightarrow h = 6.9282$ ($4\sqrt{3}$)

② $= \frac{\frac{1}{2}(8)(6.9282)}{(18)(8)}$

$= \frac{27.7128}{144}$

19.2%

e.) River Park in Durham, NC hosts an annual festival. The shaded area represents where the vendors have to set up to display and sell merchandise. What percent of the park is designated for the community to walk around the park when the festival is occurring?



$\frac{\text{Area □} - (\text{Area □} + \text{Area △})}{\text{Area □}}$

$= \frac{[300 \cdot 150] - [100^2 + \frac{1}{2}(120)(150)]}{(300 \cdot 150)}$ → $\frac{45000 - 19000}{45000}$

$= \frac{26000}{45000}$

57.8%

f.) An archery target has 5 scoring zones formed by concentric circles. The radius of the yellow zone is 12.2 cm and the width of each ring is also 12.2 cm. If an arrow hits the target at a random point, what is the probability that it hits any area of the red zone?