Welcome!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 5 - 7 Topic: Hidden Figures	0 1 2	
Tuesday Date: 5 - 8 Topic: Experimental vs. Theoretical Probability	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Class Plan:

1. Warm-up
2. Chapter 14 TREE DIAGRAMS

C SAMPLE SPACE

3. Investigation:

Will you get a prize in your cereal box?

Joke Break!

4. Practice

Warm-up: Determine the P(yellow) for each bag of jelly beans.

Bag A

$\frac{1}{5} = 20\%$

Bag B

$\frac{3}{5} = 60\%$

How could we show all the possibilities?

C SAMPLE SPACE

Diagrams that show all the possibilities(*Sample space)*:

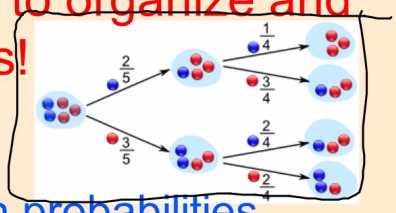
The **sample space** of an experiment is the set of its possible outcomes.

We can represent sample spaces in a number of ways, including:

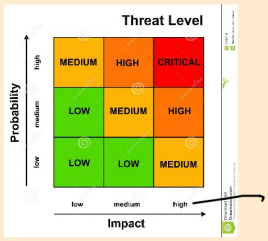
- lists
- grids
- tree diagrams
- Venn Diagrams

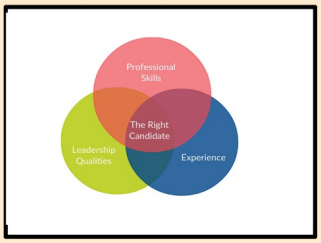
Caitlin	Dave
Aero	Aero
Aero	Bounty
Aero	Crunchie
Aero	Dime
Bounty	Aero
Bounty	Bounty
Bounty	Crunchie
Bounty	Dime
Crunchie	Aero
Crunchie	Bounty
Crunchie	Crunchie
Crunchie	Dime
Dime	Aero
Dime	Bounty
Dime	Crunchie
Dime	Dime

Trees - Method to organize and count outcomes!



(Very useful when probabilities of branches are different)





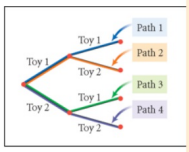
Investigation: Cereal Box Toys

1) Parts 1 - 3

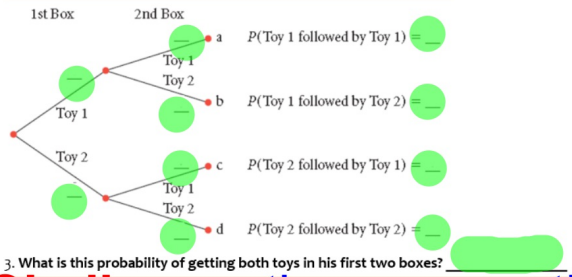
Example 1: *A national advertisement says that every Honey Nut Cheerios cereal box contains a toy and that the toys are* ***distributed equally****. Tywon wants to collect both toys.*

1. **P(Toy 1) = _____ P(Toy 2) = _____.**

2. Which paths show getting both toys? _____.



Add probabilities to the tree diagram below.



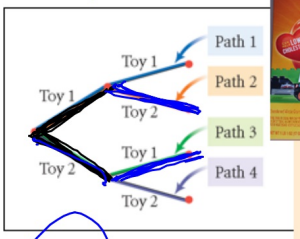
3. **What is this probability of getting both toys in his first two boxes?** _____

If I buy 2 boxes... what are the chances I'll get both free toys?!

Challenge: there was a **third** toy... What's the probability he will get ***all three toys in the first three boxes***?

Investigation: Cereal Box Toys

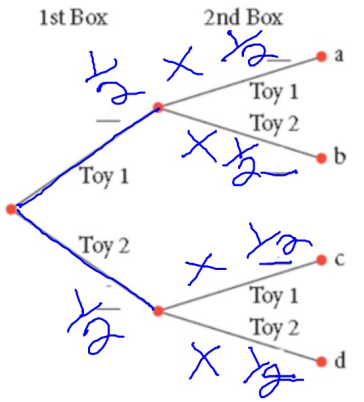
Example 1: *A national advertisement says that every Honey Nut Cheerios cereal box contains a toy and that the toys are* ***distributed equally. Tywon wants to collect both toys.***



1. **P(Toy 1)** = ½ **P(Toy 2)** = ½.

2. Which paths show getting both toys? 2 + 3

Add probabilities to the tree diagram below.



$P(\text{Toy 1 followed by Toy 1}) = \frac{1}{4}$

$P(\text{Toy 1 followed by Toy 2}) = \frac{1}{4}$

$P(\text{Toy 2 followed by Toy 1}) = \frac{1}{4}$

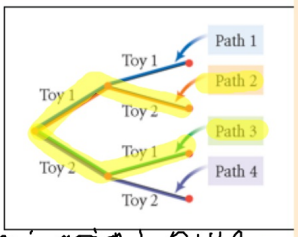
$P(\text{Toy 2 followed by Toy 2}) = \frac{1}{4}$

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

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

3. **What is this probability of getting both toys in his first two boxes?** _____

Example 1: *A national advertisement says that every Honey Nut Cheerios cereal box contains a toy and that the toys are* ***distributed equally.*** ***Tywon wants to collect both toys.***

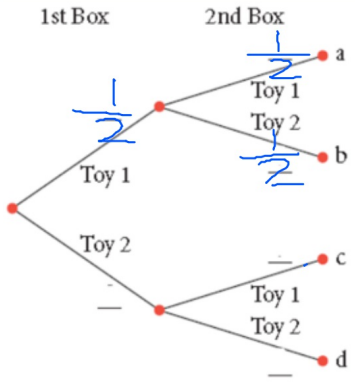


1. **P(Toy 1)** = $\frac{1}{2}$ **P(Toy 2)** = $\frac{1}{2}$.

2. Which paths show getting both toys? PATHS 2 & 3

Add probabilities to the tree diagram below.

Multiplication Rule



$P(\text{Toy 1 followed by Toy 1}) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

$P(\text{Toy 1 followed by Toy 2}) = \frac{1}{4}$

$P(\text{Toy 2 followed by Toy 1}) = \frac{1}{4}$

$P(\text{Toy 2 followed by Toy 2}) = \frac{1}{4}$

3. **What is this probability of getting both toys in his first two boxes?** $P_2 + P_3 = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

Investigation: Cereal Box Toys

Challenge: 3 toys!

3 3 3
B1 B2 B3

…won would like for his collection.

…e there? _____

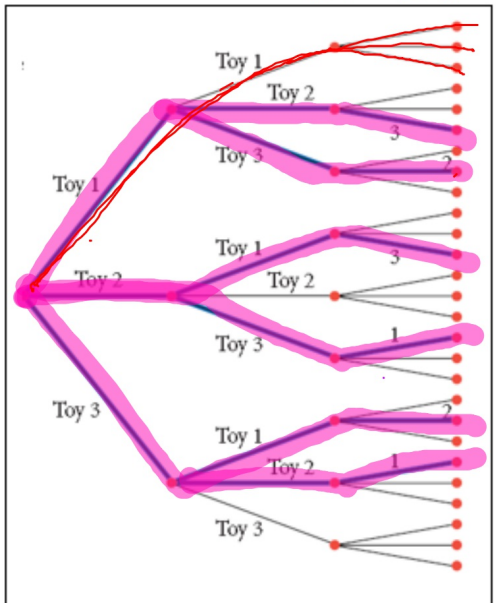
…o get toy 1? _____

…o get toy 2? _____

…o get toy 3? _____

… P(T 3) =_____

…ing all three toys in



123
132

6
27 poss

Suppose there are now 3 toys Tywon would like for his collection.

1st 2nd 3rd
$3 \cdot 3 \cdot 3 = 27$

a. How many outcomes (paths) are there? 27

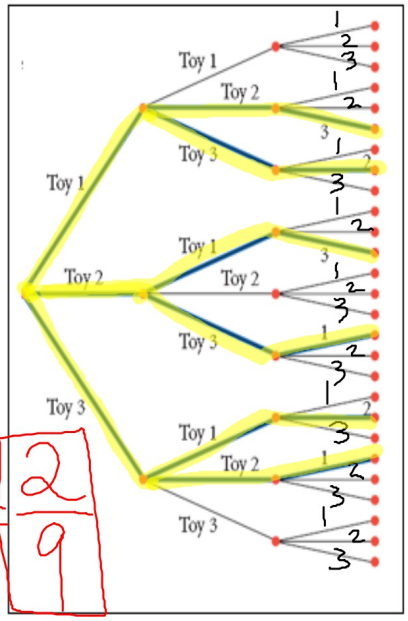
b. How many paths allow Tywon to get toy 1? 19

9 + 5 + 5

c. How many paths allow Tywon to get toy 2? 19

d. How many paths allow Tywon to get toy 3? 19

e. **P(T 1) =** $\frac{19}{27}$ **P(T 2) =** $\frac{19}{27}$ **P(T 3) =** $\frac{19}{27}$

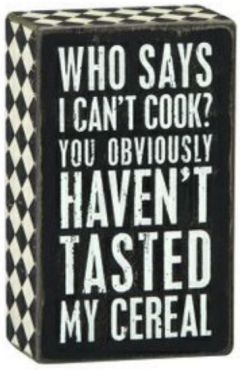


4. **What is this probability of getting all three toys in his first three boxes?**

P(ALL 3 TOYS IN 1ST 3 BOXES) $= \frac{6}{27} = \boxed{\frac{2}{9}}$

Jokes for the day

"I taped his homework to the back of the cereal box."



G USING TREE DIAGRAMS

Example 11 Self Tutor

Bag A contains 4 red jelly beans and 1 yellow jelly bean. Bag B contains 2 red and 3 yellow jelly beans. A bag is randomly selected by tossing a coin, and one jelly bean is removed from it. Determine the probability that it is yellow.

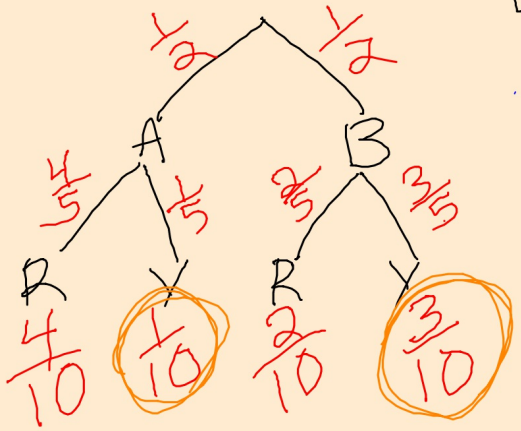
P(Yellow) =

$\frac{1}{10} + \frac{3}{10} = \frac{4}{10}$

$= \frac{2}{5} = 40\%$

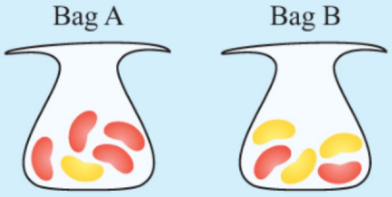
ChooseBag
ChooseBean

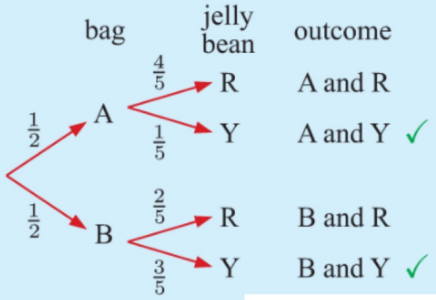
A	B
$P(Y) = \frac{1}{5}$	$P(Y) = \frac{3}{5}$
$P(R) = \frac{4}{5}$	$P(R) = \frac{2}{5}$



Bag A

Bag B





$$\begin{aligned} \text{P(yellow)} &= \text{P(A and Y)} + \text{P(B and Y)} \\ &= \tfrac{1}{2} \times \tfrac{1}{5} + \tfrac{1}{2} \times \tfrac{3}{5} \qquad \{\text{branches marked } \checkmark \\ &= \tfrac{4}{10} \\ &= \tfrac{2}{5} \end{aligned}$$

To get a yellow we need either Bag A and yellow, **or**, Bag B and yellow. We **add** the probabilities for these outcomes.

G Additional Example USING TREE DIAGRAMS

Example 10 Self Tutor

Stephano is having computer problems. His desktop computer will only boot up 90% of the time, and his laptop will only boot up 70% of the time. Stephano attempts to boot both machines.

a Draw a tree diagram to illustrate this situation.

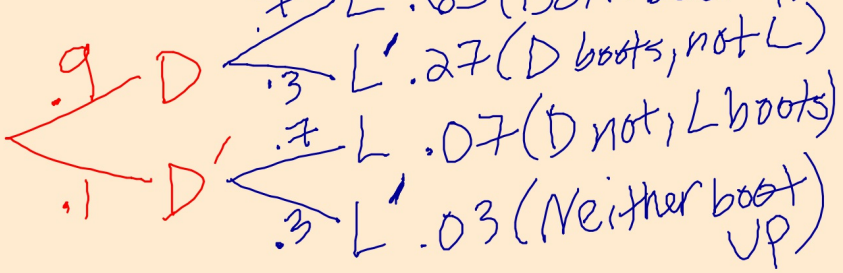
b Use the tree diagram to determine the chance that:

i both will boot up 63% ii only the desktop computer boots up. 27%

Desk: D
Laptop: L

D: Boots up
L: Boots up

D′: Doesn't boot
L′: Doesn't boot



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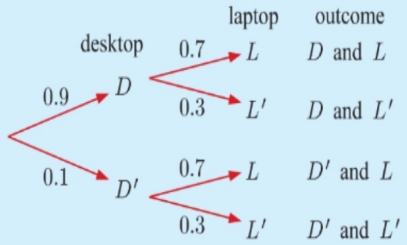
i both will boot up ii only the desktop computer boots up.

a D = desktop computer boots up
L = laptop boots up



b i P(both boot up)
$= \text{P}(D \text{ and } L)$
$= \text{P}(D) \times \text{P}(L)$
$= 0.9 \times 0.7$
$= 0.63$

ii P(desktop boots up but laptop does not)
$= \text{P}(D \text{ and } L')$
$= \text{P}(D) \times \text{P}(L')$
$= 0.9 \times 0.3$
$= 0.27$

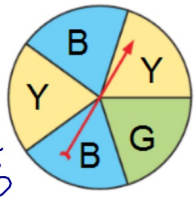
EXERCISE 14G

$P(B) = \frac{2}{5}$

$P(G) = \frac{1}{5}$

$P(Y) = \frac{2}{5}$

1 Suppose this spinner is spun twice.



a Draw a tree diagram to illustrate the sample space.

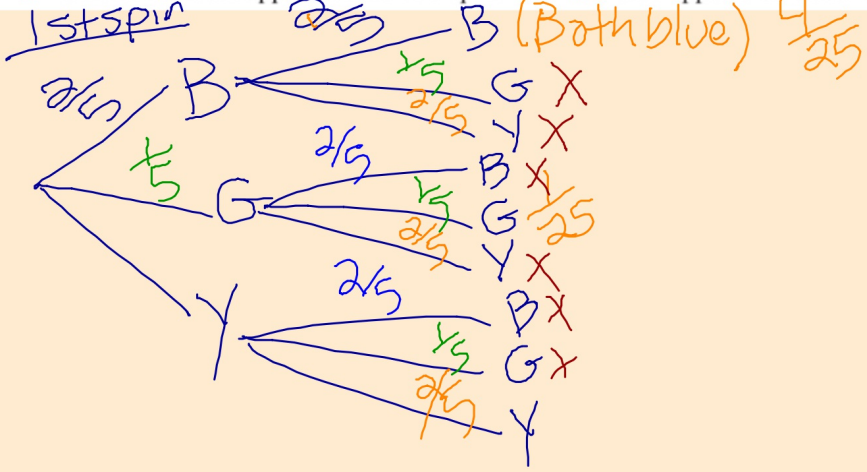
b Determine the probability that:

i blue appears on both spins $\frac{4}{25}$

ii green appears on both spins $\frac{1}{25}$

iii different colours appear on the two spins

iv blue appears on *either* spin.



EXERCISE 14G

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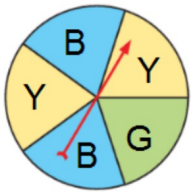

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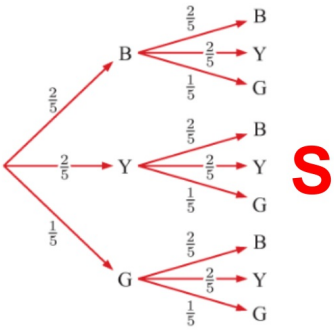
EXERCISE 14G

1 a



b **i** $\frac{4}{25}$

ii $\frac{1}{25}$

iii $\frac{16}{25}$

iv $\frac{16}{25}$

Solution

Solution

EXERCISE 14G

1 Suppose this spinner is spun twice.

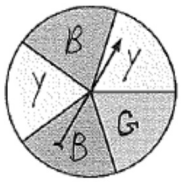
a Draw a tree diagram to illustrate the sample space.

b Determine the probability that:

i blue appears on both spins

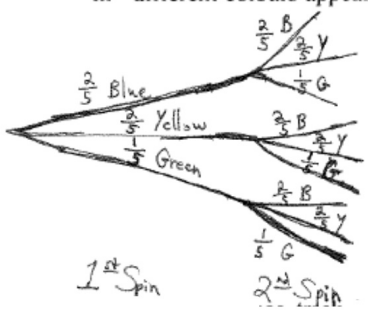
ii green appears on both spins

iii different colours appear on the two spins **iv** blue appears on *either* spin.



Key:
B - blue
G - green
Y - yellow

1.)



B.) i. $\frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25}$

ii. $\frac{1}{5} \cdot \frac{1}{5} = \frac{1}{25}$

iii. $\frac{2}{5}\cdot\frac{2}{5}+\frac{2}{5}\cdot\frac{1}{5}+\frac{2}{5}\cdot\frac{2}{5}+\frac{2}{5}\cdot\frac{1}{5}+\frac{1}{5}\cdot\frac{2}{5}+\frac{1}{5}\cdot\frac{2}{5} = \frac{16}{25}$

$P(BY) + P(BG) + P(YB) + P(YG) + P(GB) + P(GY) = P(\text{different colors})$

iv.

$\frac{2}{5}\cdot\frac{2}{5}+\frac{2}{5}\cdot\frac{2}{5}+\frac{2}{5}\cdot\frac{1}{5}+\frac{2}{5}\cdot\frac{2}{5}+\frac{1}{5}\cdot\frac{2}{5} = \frac{16}{25}$

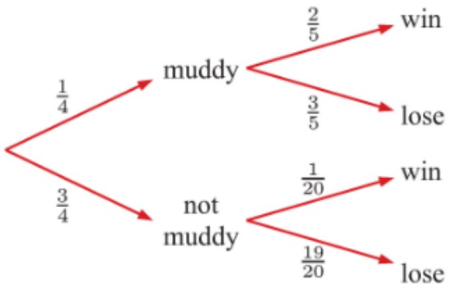
$P(BB) + P(BY) + P(BG) + P(YB) + P(GB) = P(B)$

2 The probability of the race track being muddy next week is estimated to be $\frac{1}{4}$. If it is muddy, the horse Rising Tide will start favourite with probability $\frac{2}{5}$ of winning. If it is dry, Rising Tide has a $\frac{1}{20}$ chance of winning.

a Display the sample space of possible results on a tree diagram.

b Determine the probability that Rising Tide will win next week.

2 a



b $\frac{11}{80}$

Solution

Solution

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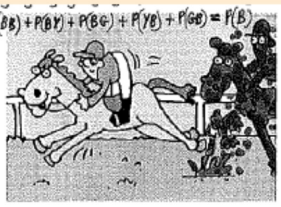

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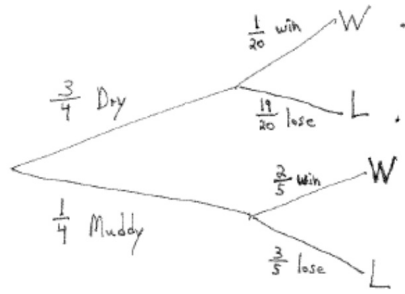
A.)



B.) Probability

$\frac{3}{4} \cdot \frac{1}{20} = \frac{3}{80}$

and

$\frac{1}{4} \cdot \frac{2}{5} = \frac{2}{20} = \frac{8}{80}$

$P(\text{dry, win}) + P(\text{muddy, win}) = P(\text{win})$

$\frac{3}{80} + \frac{8}{80} = \frac{11}{80}$