




## Exceptional, Free Online Resources for Teaching Probability

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## Introductions

Who am I?  
Who are YOU?

## Today's Topics

- Birthday Problem
- SKUNK
- Stick or Switch
- Prime Time
- Raffle

## <http://illuminations.nctm.org>

**Lessons**



**Activities**



**Brainteasers**



**Games**



**Monthly E-Newsletter**







## Illuminations

lessons include:  
learning objectives, materials, instructional plan, activity sheets, questions for students, assessment options, extensions, teacher reflections, and standards addressed.


Activities Include:  
Interactive apps and related lessons

## [calculationnation.nctm.org](http://calculationnation.nctm.org)


### calculation nation

- Interactive math games
- Two players compete from any two computers
  - Ranks based on wins/losses
  - Tracks where in the world competitors live
- Includes math content and related resources
- More games and features on the way...




### Get to Know Each Other

- We are going to organize ourselves in a line segment by our birth dates.
- What questions might we ask?



### Get to Know Each Other

- We are going to organize ourselves in a line segment by our birth dates.
- How many possible positions do we have on this line?
- Who thinks they are the first in line?
- Who thinks they are the last in line?
- Is anyone sharing a position?  
What does this mean?




### To get a 50% Chance we need...

- 364
- 2
- 182-183
- 100
- 50
- 32
- 23

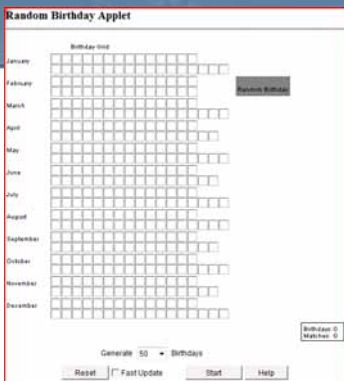

What might a person be thinking when they offer these answers?

Are there any you know that are wrong?

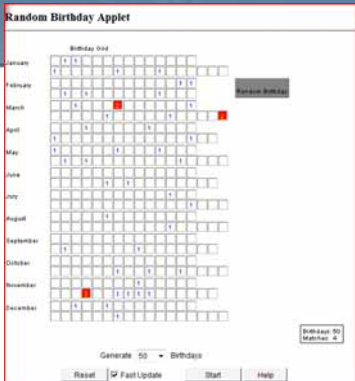

Explain your thinking to a neighbor.



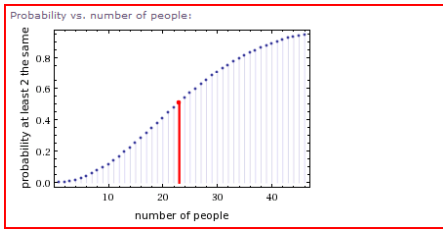
### Random Birthday Applet


### Random Birthday Applet

### How Many to Get to 50% Chance



[http://www.wolframalpha.com/input/?i=birthday+problem+calculator&a=FSelect\\_''BirthdayProblem-&l2=23&f=BirthdayProblemWithLeapYear.n\\_23](http://www.wolframalpha.com/input/?i=birthday+problem+calculator&a=FSelect_''BirthdayProblem-&l2=23&f=BirthdayProblemWithLeapYear.n_23)




Let's get Movin!  
The Game of SKUNK

S | K | U | N | K




Playing Skunk

- One pair of dice are rolled for all players
- Active players add the sum of dice to the their current sum for their column, **unless...a "one" comes up.**
- If a "one" is rolled, the round is over and active player's receive 0 points for the round.
- If "double ones", the round is over and active players go back to 0 points for all previous rounds.
- Rounds end when no active players.





Let's get Movin!  
The Game of SKUNK

S | K | U | N | K






SKUNK

- What questions might we ask?



SKUNK

- Which part of this game is **CHOICE**?
- Which part of this game is **CHANCE**?
- Create a set strategy to use for this game? Write it down. Explain to your neighbor.
- Let's see

SKUNK Pictures

What representation would help us think about the outcomes of a roll in skunk?

### SKUNK Pictures

What representation would help us think about the outcomes of a roll in skunk?

**1**

**2**

**3**

**4**

**5**

**6**

### SKUNK Pictures

What representation would help us think about the outcomes of a roll in skunk?

1-1 1-2 1-3 1-4 1-5 1-6

2-1 2-2 2-3 2-4 2-5 2-6

3-1 3-2 3-3 3-4 3-5 3-6

4-1 4-2 4-3 4-4 4-5 4-6

5-1 5-2 5-3 5-4 5-5 5-6

6-1 6-2 6-3 6-4 6-5 6-6

	1	2	3	4	5	6
1	XX	X	X	X	X	X
2	X	4	5	6	7	8
3	X	5	6	7	8	9
4	X	6	7	8	9	10
5	X	7	8	9	10	11
6	X	8	9	10	11	12

### SKUNK Questions

What is the probability of

- Rolling a “double one”?
- Rolling a “one”?
- Of not rolling a one?
- Rolling an odd sum?

- Of Rolling three times with no “ones”
- Of rolling 10 times with no “ones.”

### SKUNK Questions

- What score would be a “needs improvement” score for the game? Why?
- What score would be a “GREAT!” score for the game? Why?
- Share your ratings with another group. Why are they different? Change?

### SKUNK Questions



- What other questions could you ask to get your students thinking?

### What is the score for an average roll? Average column?

Table 1

		Second Die				
		2	3	4	5	6
First Die	2	4	5	6	7	8
	3	5	6	7	8	9
	4	6	7	8	9	10
	5	7	8	9	10	11
	6	8	9	10	11	12

### Let's Make a Deal


### Let's Make a Deal





### Stick or Switch



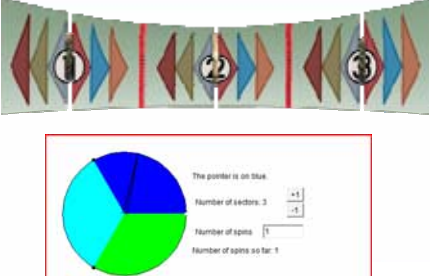

### Stick or Switch



What questions could we ask?



### First Contestant




The pointer is on blue.

Number of sectors: 3


Number of apples: 1

Number of apples so far: 1



### Do you stick our switch?


- Why would you do it?
- Convince your neighbor.
- Who thinks Stick?
- Who thinks Switch?



### Possible Strategies


- If you were the contestant, which of the following strategies would you choose, and why?

Strategy 1 (stick): Stick with the original door  
 Strategy 2 (flip): Flip a coin, stick if it shows heads, switch if it shows tails  
 Strategy 3 (switch): Switch to the other door



### How these strategies played out



Strategy	Won	Lost
<b>Stick</b>	<b>32,595</b>	<b>67,405</b>
<b>Flip</b>	<b>51,163</b>	<b>48,837</b>
<b>Switch</b>	<b>67,403</b>	<b>32,597</b>





### Prime Time!




### Options for choosing your turn





### What is the best way to roll a 2?


### Lowest Number Raffle

- The object of this game is to pick the lowest positive integer that no one else picked.
- Write a number on a piece of paper.
- Show your number to your neighbor.
- Ready.....




### Lowest Number Raffle

- What questions could we ask?





### Lowest Number Raffle

- What is a reasonable range of answers for this group?
- What influenced the number you picked?
- Ready.....




### Questions? Comments ?

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### References

- [http://calculationnation.nctm.org/Games/.](http://calculationnation.nctm.org/Games/)
- [http://illuminations.nctm.org.](http://illuminations.nctm.org)



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**Session #106 Las Vegas Regional**  
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**Birthday Problem**

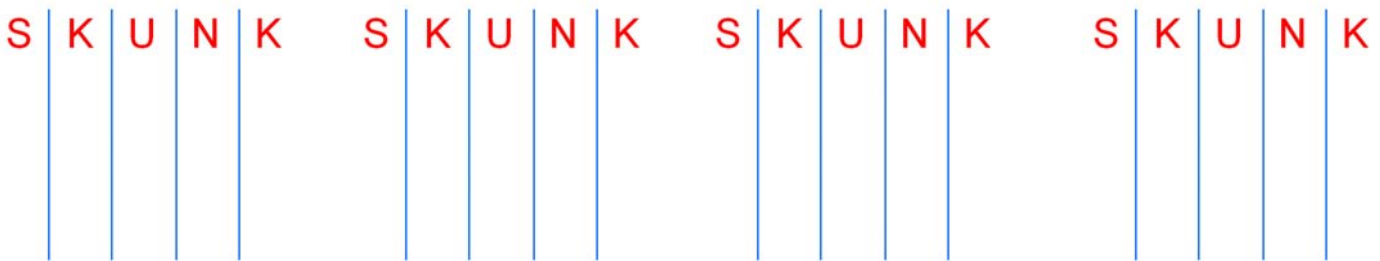
Lesson: <http://illuminations.nctm.org/LessonDetail.aspx?id=L299>

App: <http://www-stat.stanford.edu/~susan/surprise/Birthday.html>

Calculator: <http://www.wolframalpha.com/input/?i=birthday+problem+calculator>

**SKUNK**

- One pair of dice are rolled for all players
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Lesson: <http://illuminations.nctm.org/LessonDetail.aspx?id=L248>

Applet: <http://illuminations.nctm.org/Lessons/6-8/Choice/Skunk.htm>

**Stick or Switch**

Lesson: <http://illuminations.nctm.org/LessonDetail.aspx?id=L248>

Spinner Applet: <http://illuminations.nctm.org/Lessons/6-8/Choice/Skunk.htm>

Simulation: <http://shodor.org/interactivate-java/activities/SimpleMontyHall/>

**Prime Time**

Online Game: [CalculationNation.nctm.org](http://CalculationNation.nctm.org)

**Lowest Number Raffle**

Pick the lowest positive integer not picked by someone in the room.