

## The Perfect Bracket?

It's March and time for the NCAA Tournaments and Bracketology. This year there will be 68 men's and 68 women's team's competing. These are "sudden death" tournaments. The winners of each game will move on to the next round and the losing team is out. Finally one team for each championship is left standing and is crowned champion.

Millions of fans will fill out bracket predictions and closely monitor the tournament while competing in pools with friends and co-workers. There are various prizes given for predicting a perfect bracket but nothing like the **one billion dollars** that was offered to anyone who picked the entire tournament correctly in 2014. What are the chances of picking every game in the tournament correctly? Let's try to figure it out.

The tournament begins with 68 teams. 8 of the teams play before the field of 64 teams is set. These 8 teams play to qualify for the field of 64. Often tournament "pick'em" brackets do not include these first four play-in games.

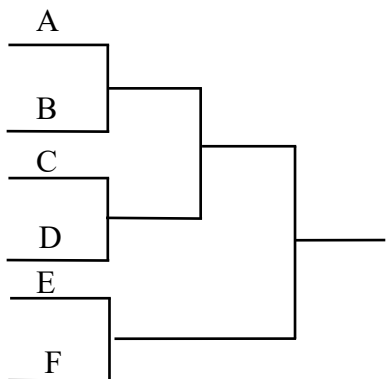
One way to figure out your chances of picking a 64 or 68 team "sudden death" tournament correctly, is to try to first figure out or chances of picking a smaller, more manageable group of teams correctly. Let's first consider the chances of predicting the outcomes of 1, 2, 3, or 4 games.

There will always two possible outcomes in each game. So, it makes sense to try to figure out how many games will need to be played for each number of teams.

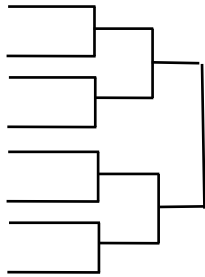
1. If 2 teams play a sudden death tournament, how many different outcomes are possible? if it helps, make a diagram to show this or fill in a table.
  
2. How many different outcomes are possible when you have 4 teams playing? First A vs. B and then C vs. D? Make a diagram to show this and fill in the table.

Number of games played	Possible outcomes (not just who wins)
1	
2	
3	
4	
n	

3. How many different outcomes are possible when 6 different teams? Say A vs. B, C vs. D and E vs. F? Make a diagram to show this and fill in the table. How can you make sure that you have all possibilities?

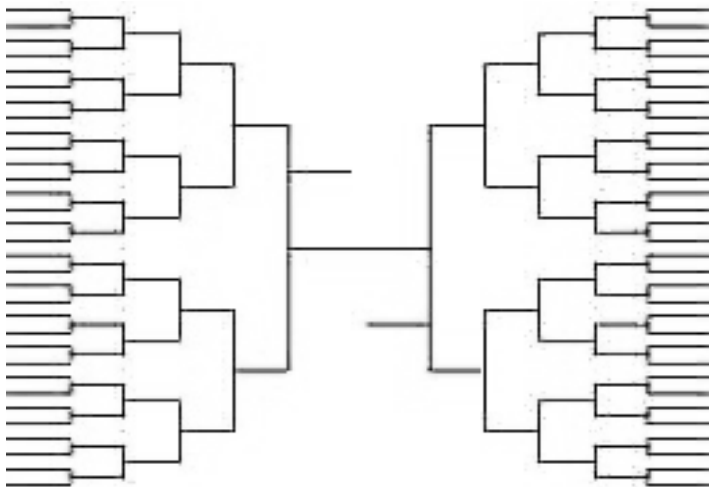


4. How many games would have to be played if there were 8 teams playing in a sudden death tournament?



Round:	Teams playing in that round:	Number of games played in round:
1		
2		
3		
4		
5		
6		

5. How many outcomes are possible with picking 8 teams playing? A vs. B, C vs. D and E vs. F? Make a diagram to show this and fill in the table. How can you make sure that you have all possibilities?
6. Find a relationship between games played and total possible outcomes. Explain the relationship in your own words.
7. Once you have found a relationship between games played and total possible outcomes you can find the total number of possible outcomes for a 64-team sudden death tournament, if you know the total number of games played in the tournament. Use the graphic and the table below to help you determine this. What patterns do you see? How does total games played in the tournament relate to the number of teams playing in the tournament? Does this relationship hold true for tournaments with 16 and 32 teams as well?



8. Now that you found a relationship between the number of games played and the number of possible outcomes, use that relationship to find the number of possible outcomes in a 64 team tournament (the Billion Dollar Bracket required you to pick from the field of 64, not the original 68). Reflect on your chances of picking that perfect bracket and winning one billion dollars.

9. Check out the video clip from DePaul Professor, Jeff Bergan that can be found on the post for this lesson. How does his reasoning compare or contrast to yours or to that of your group?
  
10. A few years ago, the number of teams invited to the tournament increased from 64 to 68. Eight teams play in the days prior to the tournament to qualify for the top 64 teams. In many bracket contests you only pick for a 64-team field. If you include these initial four games the tournament actually has 67 games. How many possible outcomes are there in a 67 game tournament?
  
11. Suppose you and your friends have decided to fill out every possible bracket, so that one of your bracket choices will have to be the winner. How many reams of paper will you need in order to print off and fill out all the brackets? (A ream of paper has 500 sheets and is about 5 centimeters thick). Imagine all those reams of paper. Would they fit in your bedroom, your classroom or your house?
  
12. According to a math professor at DePaul University, if you know college basketball well, your odds of picking a perfect bracket (63 games) can improve to 1 out of 128 billion. How might have the professor come to these odds? Explain your reasoning.

Sources: <http://chicago.cbslocal.com/2012/03/12/odds-of-picking-a-perfect-bracket-9-2-quintillion-to-1/>, <http://espn.go.com/>  
[https://en.wikipedia.org/wiki/2021\\_NCAA\\_Division\\_I\\_Men%27s\\_Basketball\\_Tournament](https://en.wikipedia.org/wiki/2021_NCAA_Division_I_Men%27s_Basketball_Tournament)

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