



## Scheduling Speakers

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Watt  
Evans  
Fudd

Watt  
Fudd  
Evans

Evans  
Fudd  
Watt

Evans  
Watt  
Fudd

Fudd  
Evans  
Watt

Fudd  
Watt  
Evans

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Watt  
Evans  
Fudd

Watt  
Fudd  
Evans

Evans  
Fudd  
Watt

Evans  
Watt  
Fudd

Fudd  
Evans  
Watt

Fudd  
Watt  
Evans

Answer = 3

A meeting is to be addressed by people named Smith, Jones, Watt, Evans, and Fudd. In how many ways can the order of the speakers be arranged if Fudd insists on speaking before Watt?

How many possibilities with Fudd speaking first?

Fudd

????

????

????

????

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How many possibilities with Fudd speaking first?

Fudd  
????  
????  
????  
????

$4! = 24$   
ways with  
Fudd first

How many possibilities with Fudd speaking second?

????  
Fudd  
????  
????  
????

$3 \times 3 \times 2 \times 1$   
 $= 18$  ways to  
arrange them  
with Fudd  
second.

The diagram consists of a yellow vertical bar on the left containing five rows of text: four rows of four question marks and one row with the name 'Fudd'. To the right of this bar is a blue-bordered box containing a mathematical calculation:  $3 \times 3 \times 2 \times 1 = 18$  ways to arrange them with Fudd second. Four green arrows originate from the right side of the yellow bar, pointing to the four rows of question marks. The top arrow points to the top row of question marks, the second arrow points to the second row, the third arrow points to the third row, and the bottom arrow points to the fourth row.

How many possibilities with Fudd speaking second?

????  
Fudd  
????  
????  
????

$3 \times 3 \times 2 \times 1 = 18$  ways to arrange them with Fudd second.

The diagram shows a vertical list of five items: four question marks followed by 'Fudd', and four more question marks. To the right is a blue-bordered box containing the calculation  $3 \times 3 \times 2 \times 1 = 18$  ways to arrange them with Fudd second. Four green arrows point from the four question marks in the list to the four numbers in the calculation.

How many possibilities with Fudd speaking third?

????  
????  
Fudd  
????  
????

The diagram shows a vertical list of seven items: two question marks, 'Fudd', and four more question marks.

How many possibilities with Fudd speaking second?

????  
Fudd  
????  
????  
????

$3 \times 3 \times 2 \times 1 = 18$  ways to arrange them with Fudd second.

How many possibilities with Fudd speaking third?

????  
????  
Fudd  
????  
????

$3 \times 2 \times 2 \times 1 = 12$  ways to arrange them with Fudd third.

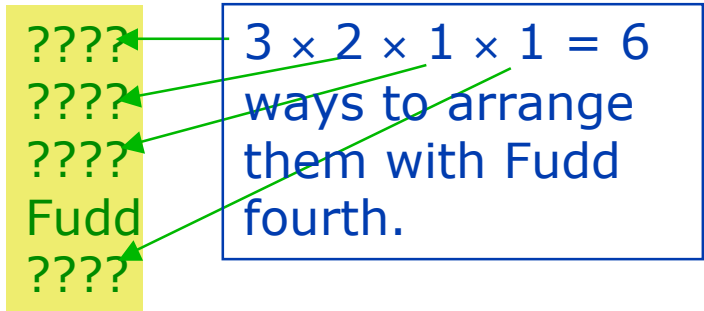
How many possibilities with Fudd speaking fourth?

????  
????  
????  
Fudd  
????

$3 \times 2 \times 1 \times 1 = 6$   
ways to arrange them with Fudd fourth.

The diagram shows a vertical list of five items: four question marks and the name 'Fudd'. Green arrows point from each of these five items to a blue-bordered box on the right. The box contains the calculation  $3 \times 2 \times 1 \times 1 = 6$  and the text 'ways to arrange them with Fudd fourth.' The arrows indicate that the calculation applies to the four unknown items, as 'Fudd' is fixed in the fourth position.

How many possibilities with Fudd speaking fourth?



Putting Fudd last is not possible if Fudd is to speak before Watt.

# ways with Fudd speaking first	24
# ways with Fudd speaking second	18
# ways with Fudd speaking third	12
# ways with Fudd speaking fourth	<u>6</u>
Total number of ways	60

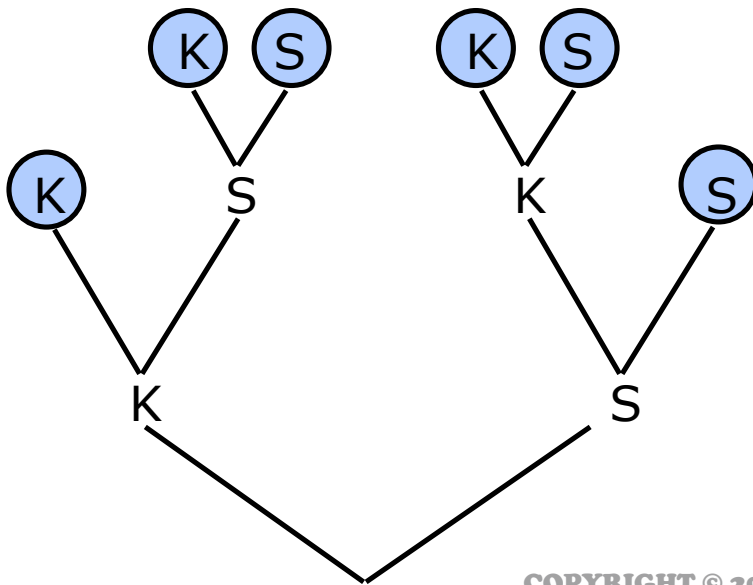
## Clever observation

There are 5 speakers, and with if there were no restrictions they could arranged in  $5! = 120$  ways. Of these 120 ways, there would be just as many arrangements that put Fudd before Watt as there would be putting Watt before Fudd. In other words, half the arrangements would put Fudd before Watt and half would put Watt before Fudd.

$$120 \times 1/2 = 60$$

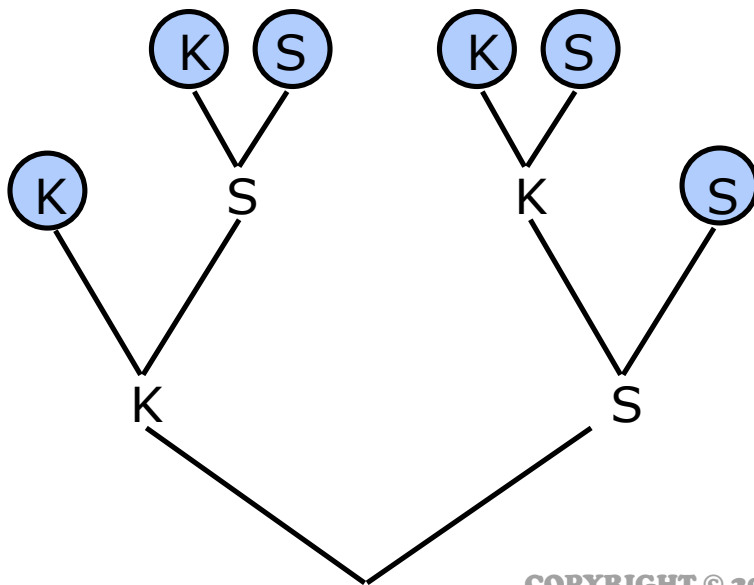
## Tracking a Tennis Match

Kim and Susan are going to play a tennis match. The winner of the match will be the first person to win two sets. Draw a tree diagram to represent all the possible outcomes for the tennis match.



## Outcomes for a Tennis Match

Kim and Susan are going to play a tennis match. The winner of the match will be the first person to win two sets. Draw a tree diagram to represent all the possible outcomes for the tennis match.



$4 + 2 = 6$   
different  
cases

## Men's Tennis

Players Bob and Tom. To win the match someone must win 3 sets.

How many different possibilities are there for the match? (How many different outcomes would we have if we drew a tree diagram?)

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Players Bob and Tom. To win the match someone must win 3 sets.

How many different possibilities are there for the match? (How many different outcomes would we have if we drew a tree diagram?)

We'll count the number of possibilities where Bob wins. (There would be an equal number of cases where Tom wins.)

Cases where Bob wins in 3 sets

1

Cases where Bob wins in 3 sets 1

Cases where Bob wins in 4 sets ?

Cases where Bob wins in 3 sets 1

Cases where Bob wins in 4 sets ?

1. ?
2. ?
3. ?
4. Bob

Cases where Bob wins in 3 sets 1

Cases where Bob wins in 4 sets 3

1. ?
2. ?
3. ?
4. Bob

For Bob to win in 4 sets, he would have to win 2 of the first 3 sets.

$$C(3,2) = 3$$

Cases where Bob wins in 3 sets	1
Cases where Bob wins in 4 sets	3
Cases where Bob wins in 5 sets	?

1. ?
2. ?
3. ?
4. ?
5. Bob

Cases where Bob wins in 3 sets	1
Cases where Bob wins in 4 sets	3
Cases where Bob wins in 5 sets	6

1. ?

2. ?

3. ?

4. ?

5. Bob

For Bob to win in 5 sets, he must win 2 of the first 4 sets.

$$C(4,2) = 6$$

Cases where Bob wins in 3 sets	1
Cases where Bob wins in 4 sets	3
Cases where Bob wins in 5 sets	6
Total # of cases where Bob wins match	<u>10</u>
Total # of cases	20

You could check the validity of this calculation by actually drawing a tree diagram for the match.

The world series in baseball requires that a team win 4 games. If you drew a tree diagram for a world series played between the Braves and Yankees, how many outcomes would your tree show? Can you do this without drawing a tree using the ideas just used in the tennis match?