MA162: Finite mathematics

Paul Koester

University of Kentucky

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Schedule:

- Web Assign assignment (Chapter 6.3) due on Tuesday, November 5 by 6:00 pm.
- Web Assign assignment (Chapter 6.4) due on Friday, November 8 by 6:00 pm.
- Exam 3 on Monday, November 25, 5:00 pm to 7:00 pm.

Today we look at Chapter 6.3

6.3: Multiplication Principle

- Suppose there are m ways of performing task T_1 and n ways of performing task T_2. Then there are $m \cdot n$ ways of performing the task T_1 followed by the task T_2.

- In order for the multiplication principle to apply, it is essential that the choices for task T_2 do not depend on the particular choice of task T_1 . . . more on this in a minute.

6.3: An example of the multiplication principle

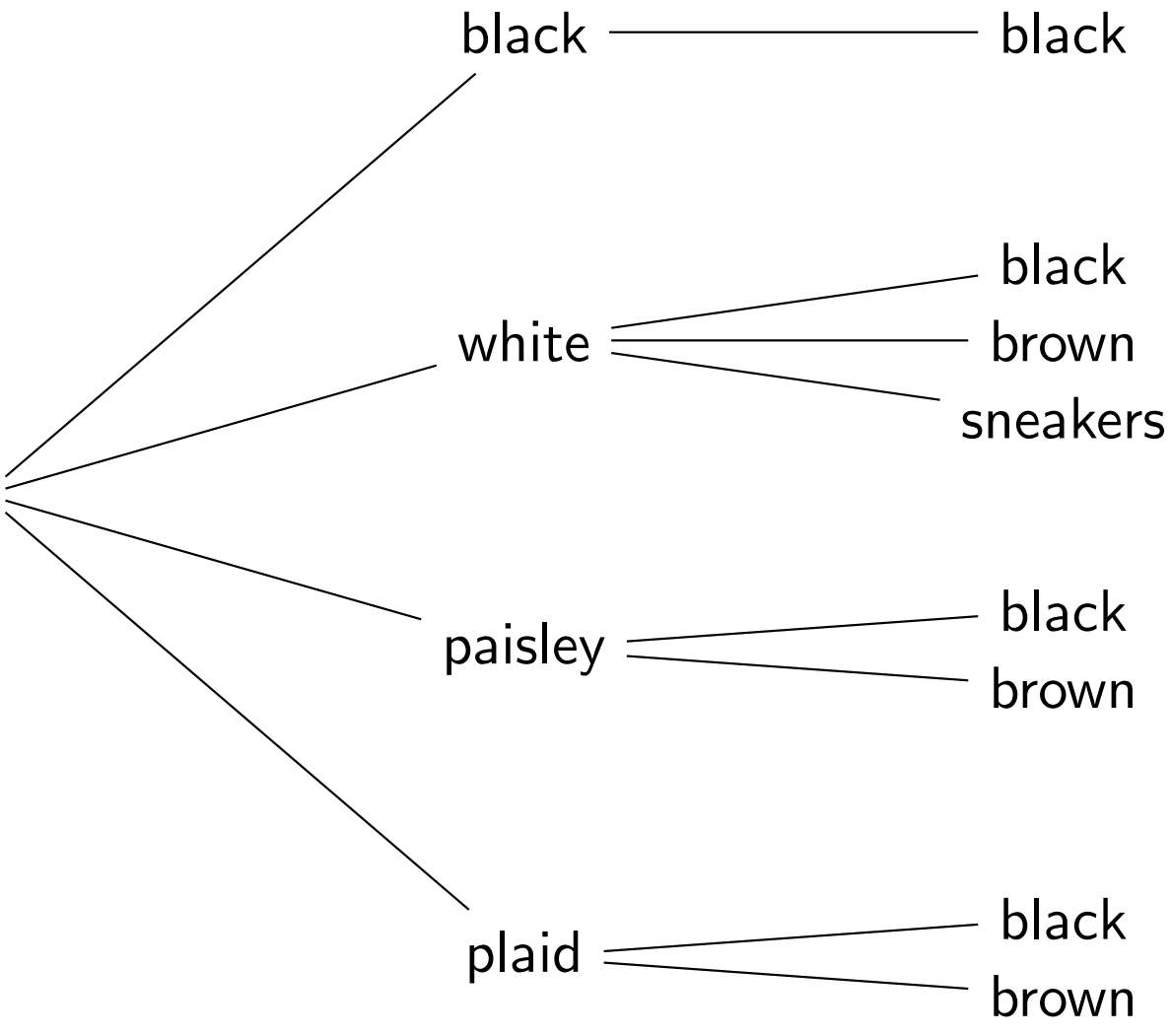
- You have four kinds of socks: plaid, paisley, white, black.
- You have three pairs of shoes: sneakers, brown, black.
- How many sock-shoe combinations are possible?

6.3: When the multiplication principle DOES NOT APPLY

- You have four kinds of socks: plaid, paisley, white, black.
- You have three pairs of shoes: sneakers, brown, black.
- Your fashion sense dictates some restrictions:
  - Only white socks go with sneakers
  - Brown shoes should not be worn with black socks.
- Now how many sock-shoe combinations are possible?

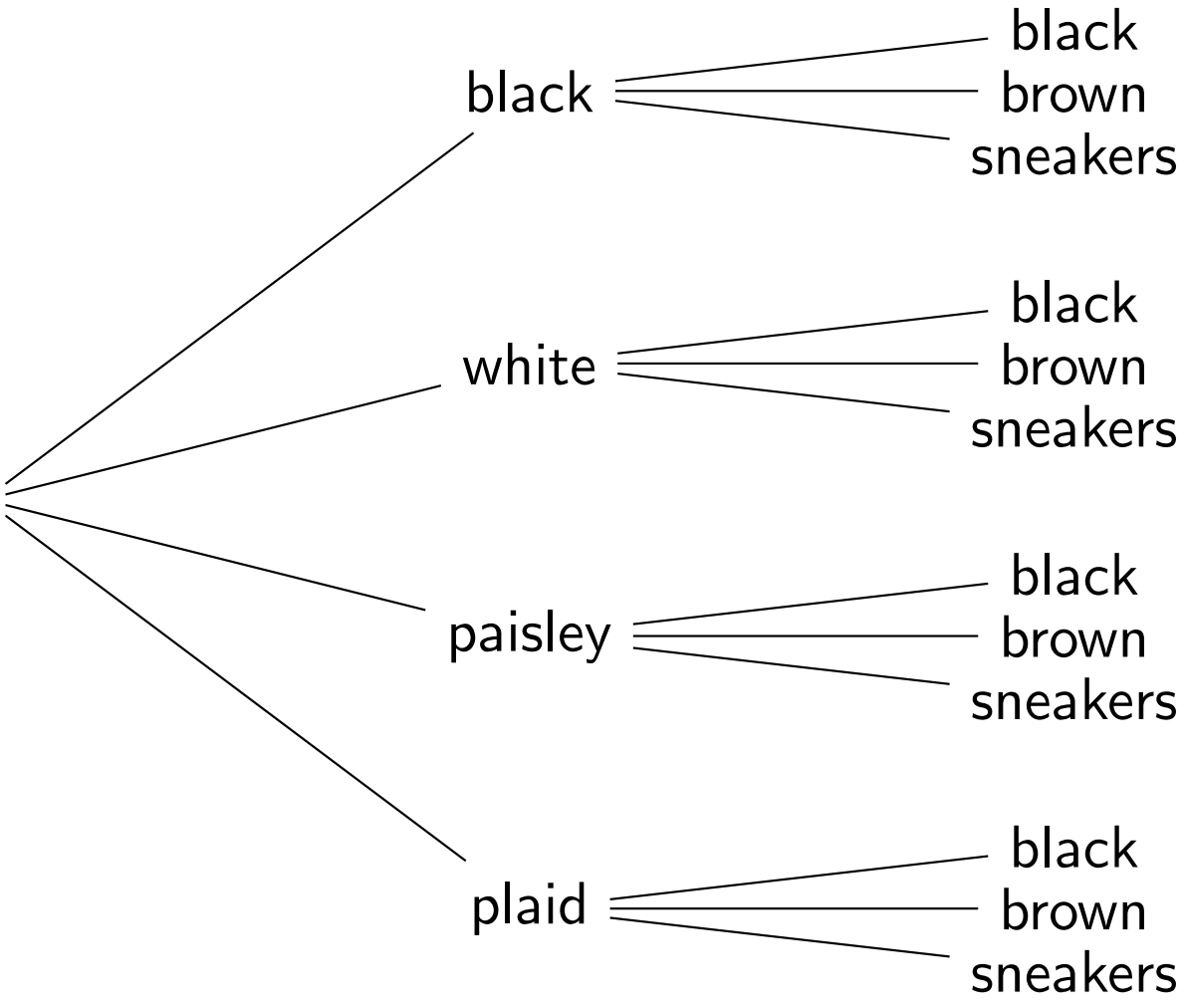
6.3: Counting with trees

- If choices of shoes and socks are DEPENDENT, best way to count is with a tree:



6.3: Counting with trees

- If choices of shoes and socks are INDEPENDENT, we can still count with a tree:



- But in this case, much easier to just use multiplication principle!

6.3: A generalization of the multiplication principle

- You can order either a cheeseburger, a bacon cheeseburger, or double deluxe super bacon burger.
- You can choose one of these sides: fries, curly fries, onion rings, chilli
- You can choose one of these drinks: Coke, Diet Coke, Dr. Pepper, Sprite, Orange.
- How many different value meal combinations can you choose from?

6.3: Multiplication Principle

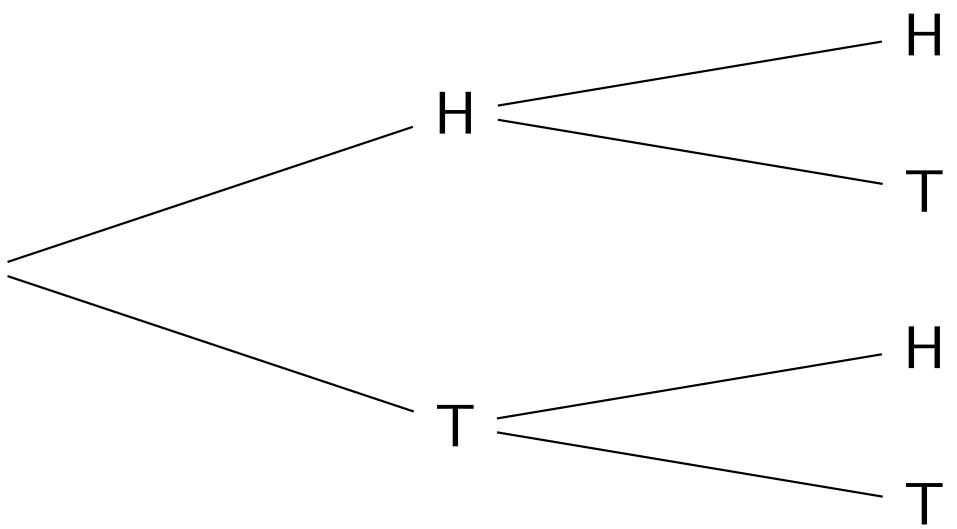
- Suppose there are N_1 ways of performing task T_1, N_2 ways of performing task T_2, ..., and finally N_k ways of performing task T_k. Then there are $N_1 \cdot N_2 \cdots N_k$ ways of performing the task T_1, followed by the task T_2, ..., followed by task T_k.

- In order for the multiplication principle to apply, it is essential that the available choices for a given task do not depend on the particular choice of any other task.

- IF the choices are DEPENDENT, then the multiplication principle does not apply. You're best bet is to draw a tree in those cases.

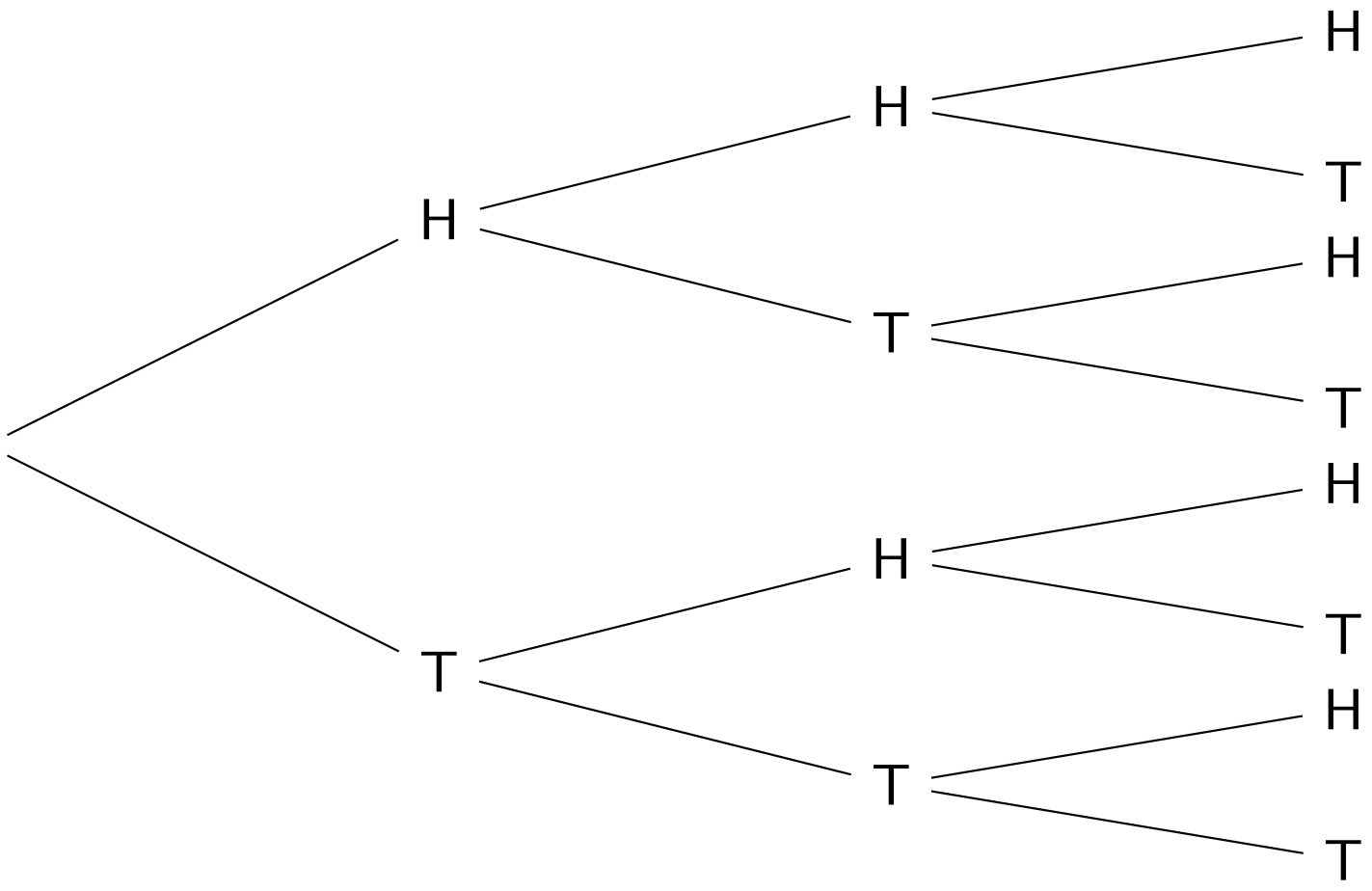
6.3: Counting Coins

- You flip a two-sided coin two times.
- How many possible outcomes, assuming the order matters, i.e., HT is not the same as TH.



6.3: Counting Coins

- What if you flip three times?



6.3: License to count

- A standard Kentucky license plate has three digits followed by three letters. Assuming all choices of digits and letters were allowed, how many license plates are possible?

- 4 million people, about 4 million vehicles, 2 million of which probably have standard plates. Are there enought license plates to guarantee each driver a unique plate?

6.3: Rearranging letters

How many two letter "code words" can be formed by selecting and arranging two letters from HORSEY?

6.3: Rearranging letters

How many three letter "code words" can be formed by selecting and arragnging three letters from HORSEY?

6.3: Rearranging letters

How many six letter "code words" can be formed by arranging the letters from HORSEY?