

Probability Day 10 - Notes
Factorials

Name: Key
Date: _____ Period: _____

Factorial:

- For any integer n greater than 1, n factorial (written as $n!$) is the product of all the consecutive integers from n decreasing to 1.
- $0!$ is defined to equal 1

Examples:

1. $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$

2. $3!5! = 3 \cdot 2 \cdot 1 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

3. $\frac{5!}{6!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot \cancel{3 \cdot 2 \cdot 1}}{\cancel{6} \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \frac{3 \cdot 2 \cdot 1}{6} = 1$

****Do not use the factorial button on your calculator. Do the factorials by hand and cancel terms when appropriate. ****

Practice:

1. $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

4. $\frac{5!}{4!} = \frac{5 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{\cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}} = 5$

7. $\frac{19!5!}{20!} = \frac{19! \cdot 5!}{20 \cdot 19!} = \frac{120}{20} = 6$

2. $13! = 6,227,020,800$

5. $\frac{4!5!}{0!} = \frac{1 \cdot 2 \cdot 3 \cdot 4 \cdot 120}{1} = 2880$

8. $\frac{11!0!5!}{10!3!} = \frac{11 \cdot \cancel{10!} \cdot 5 \cdot 4 \cdot 3!}{\cancel{10!} \cdot 3!} = 220$

Look at cancelling

3. $3!8! = 1 \cdot 2 \cdot 3 \cdot 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 = 241,920$

6. $\frac{17!}{21!} = \frac{17!}{21 \cdot 20 \cdot 19 \cdot 18 \cdot 17!} = \frac{1}{143640} \approx 6.96 \times 10^{-6}$

9. $\frac{8!12!}{2!9!13!} = \frac{8! \cdot 12!}{2 \cdot 9! \cdot 13!} = \frac{1}{9 \cdot 13 \cdot 2} = \frac{1}{234} \approx 0.0043$

match closest
8 → 9 12 → 13