11.1 Permutations and Combinations.....page

GOAL: Solve problems involving permutations and combinations.

Feb 7-12:03 PM

Warm Up

Think of reducing strategies.

1. $\frac{4\cdot3\cdot2\cdot1}{3\cdot2}$ = 4

2. $\frac{7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{4\cdot3\cdot2\cdot1}$ = 210

3. $\frac{8\cdot7\cdot6\cdot5\cdot4\cdot3\cdot2\cdot1}{(4\cdot3\cdot2\cdot1)(3\cdot2\cdot1)}$ = 280

4. $5!$ $5\cdot4\cdot3\cdot2\cdot1$ = 120

Feb 7-12:06 PM

Factorial: The factorial of a number is the product of the natural numbers less than or equal to the number.

$$n! = n\cdot(n-1)\cdot(n-2)\cdot(n-3)\cdot\ldots\cdot1$$

0! = 1

SHOW YOUR WORK!

5. $\frac{7!}{4!}$ $\frac{7\cdot6\cdot5\cdot4!}{4!}$ = 210

6. $\frac{11!}{(8-2)!}$ $\frac{11!}{6!} = \frac{11\cdot10\cdot9\cdot8\cdot7\cancel{\cdot6!}}{\cancel{6!}}$ = 55,440

7. $\frac{8!}{5!3!}$

Feb 7-12:16 PM

A **permutation** is a selection of a group of objects in which order is important.

A family of 3 plans to sit in the same row at a movie theater. How many ways can the family be seated in 3 seats?

List all possible groupings.

A, B, C B, A, C C, A, B
A, C, B B, C, A C, B, A

There are six different ways the family can sit.

Feb 7-12:15 PM

arrangements of 7 $= \frac{7!}{4!} = \frac{7\cdot6\cdot5\cdot\mathbf{4\cdot3\cdot2\cdot1}}{\mathbf{4\cdot3\cdot2\cdot1}} = 210$
arrangements of 4

Permutations

NUMBERS	ALGEBRA
The number of permutations of 7 items taken 3 at a time is $_7P_3 = \frac{7!}{(7-3)!} = \frac{7!}{4!}$.	The number of permutations of n items taken r at a time is $_nP_r = \frac{n!}{(n-r)!}$.

Feb 7-12:26 PM

8. $_9P_3 = \frac{9!}{(9-3)!}$ $\frac{9!}{6!} = \frac{9\cdot8\cdot7\cdot\cancel{6!}}{\cancel{6!}}$ = 504

9. $_5P_5$ = $\frac{5!}{5-5!} = \frac{5!}{0!}$ $5\cdot4\cdot3\cdot2\cdot1$ = 120

10. $_7P_2$ =

Feb 7-12:28 PM

Think about

U
P
S
check

How many ways can a student government select a president, vice president, secretary, and treasurer from a group of 6 people?

$6 P_4$

YOUR TURN !

Awards are given out at a costume party. How many ways can "most creative," "silliest," and "best" costume be awarded to 8 contestants if no one gets more than one award?

$8 P_3$

Feb 7-12:29 PM

A **combination** is a grouping of items in which order does not matter. There are generally fewer ways to select items when order does not matter. For example, there are 6 ways to order 3 items, but they are all the same combination:

6 permutations → {ABC, ACB, BAC, BCA, CAB, CBA}

1 combination → {ABC}

Feb 7-2:03 PM

Combinations

NUMBERS	ALGEBRA
The number of combinations of 7 items taken 3 at a time is $_7C_3 = \frac{7!}{3!(7-3)!}$.	The number of combinations of n items taken r at a time is $_nC_r = \frac{n!}{r!(n-r)!}$.

$_9C_4 = \frac{9!}{(9-4)!\cdot 4!}$ $\frac{9!}{5!\cdot 4!}$ $\frac{9\cdot 8\cdot 7\cdot 6}{4\cdot 3\cdot 2\cdot 1}$ 126

$_6C_2 = \frac{6!}{4!\cdot 2!}$ $\frac{6\cdot 5\cdot 4!}{4!\cdot 2\cdot 1}$ 15

Feb 7-2:07 PM

Think about

U
P
S
check

The swim team has 8 swimmers. Two swimmers will be selected to swim in the first heat. How many ways can the swimmers be selected?

$8C_2$

A teacher wants to choose 3 students from a class of 30 to receive extra credit. How many ways could the teacher select the students to earn extra credit?

$30C_3$

Feb 18-3:27 PM

Assignment:

11.1 Day 1 Wkst

Feb 7-3:02 PM

Feb 10-12:54 PM