Activity 4 Combinations

Aim: Review counting techniques and use ${}^{n}C_{r}$ notation.

1. The group of friends from Activity 1; Alfred, Blanche, Caleb, Debbie and Ernie, have three tickets for the Ferris wheel.

   a) List the 10 different groups of 3 that can use the tickets.

   b) When the group of three is chosen how many ways can they line up for a photograph?

   c) How many possible photographs of three of the friends are possible?

   d) Explain how the figure of 10 possible groupings in a) can be calculated from your answers to b) and c).

   e) Write 10 as an expression using factorial notation based upon your answer to d).

2. Frances and Greg join the group

   a) List all possible groupings of three friends.

b) When the group of three is chosen how many ways can they line up for a photograph?

c) How many possible photographs of three of the friends are possible?

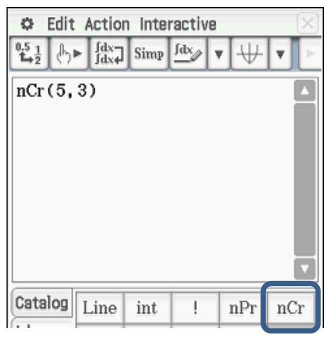
d) Write the number of possible groupings as an expression using factorial notation.

e) How many possible groupings are there for those who do <u>not</u> get a ride?

3. Use ClassPad to calculate the following:

Combinations: from n objects choose r

- From the Keyboard, Advance tab
- Select nCr
- Enter the number choosing from, then the number chosen.



a) C^5_3

b) $\dfrac{P^5_3}{3!}$

c) C^5_2

d) $\dfrac{5!}{2!\times 3!}$

e) C^7_3

f) $\dfrac{P^7_3}{3!}$

g) C^7_4

h) $\dfrac{7!}{4!\times 3!}$

4. Generalise your results from Q's 1 – 3.

5. Describe how combinations are connected to Pascal's triangle.
Hint: evaluate C_0^5 , C_1^5 , C_2^5 , C_3^5 , C_4^5 and C_5^5. Then look at Pascal's triangle for a connection.

6. Which of the following statements are true?

a) The number of ways of leaving out five people from a group of seven is the same as the number of ways of selecting two.

b) $\binom{n}{r} = \binom{n}{n-r}$

c) $\binom{10}{6} + \binom{10}{7} = \binom{11}{7}$

d) $\binom{n}{r} + \binom{n}{r+1} = \binom{n+1}{r+1}$

e) For those statements that are false provide a counter example. For those that are true provide a proof or justification.

Learning notes

Q's 1 – 3 are aimed at developing the connection between combinations and permutations by using specific examples.

Definitions:

$$n! = n(n-1)(n-2)\ldots 1$$

$$^{n}C_{r} \text{ or } \binom{n}{r} = \frac{n!}{(n-r)!\,r!} \text{ read as } n \text{ choose } r$$

Where n choose r is the number of different ways of choosing r from a possible n.