PRACTICE TEST, pages 759–760

1. Multiple Choice A bed and breakfast has 6 rooms and 4 guests. No guests share a room. How many ways can the guests be assigned to rooms?

A. 4! **B.** $_6P_4$ **C.** $_6P_2$ **D.** $_6C_4$

2. Multiple Choice What is the 3rd term in the expansion of $(2x - 2)^7$?

A. $896x$ **B.** $-2688x^2$ **C.** $2688x^5$ **D.** $-896x^6$

3. A battery has a negative and a positive end. In how many different ways can 4 AAA batteries be arranged end to end? Explain.

Each battery can be positioned in 2 ways: positive end up or negative end up.
Use the fundamental counting principle.
The number of possible arrangements is: $2 \cdot 2 \cdot 2 \cdot 2 = 16$
So, there are 16 ways to arrange the batteries end to end.

4. a) Would you use a permutation or combination to solve this problem? Explain.
In a particular week, there are 2 volleyball games, 3 floor hockey games, and 4 basketball games scheduled in Jerome's school. He has a ticket that allows him to attend 3 of the games. How many ways can Jerome attend exactly 2 floor hockey games and one other game?

I would use a combination because the order in which Jerome attends the games does not matter.

b) Solve the problem.

Jerome can attend 2 of 3 floor hockey games in 3 ways: AB, AC, BC
For the other game, there are 2 volleyball games and 4 basketball games to choose from, for a total of 6 games.
Use the fundamental counting principle: $3 \cdot 6 = 18$
There are 18 ways that Jerome can attend exactly 2 floor hockey games and one other game.

5. How many different ways are there to arrange all the letters in the word NANNURALUK, an Inuit word for polar bear?

There are 10 letters: 2 are As, 2 are Us, and 3 are Ns
Number of permutations:
$$\frac{10!}{2!2!3!} = 151\,200$$
So, there are 151 200 different ways to arrange all the letters.

6. A golfer has 13 clubs in her bag. She practises with 4 clubs from the bag. How many choices of 4 clubs can the golfer make?

The order in which she chooses the clubs does not matter.
Use a combination.
$_{13}C_4 = 715$
The golfer can make 715 choices of 4 clubs.

7. Solve each equation.

a) $_nP_2 = 110$

$_nP_2 = \frac{n!}{(n-2)!}$

$110 = \frac{n!}{(n-2)!}$

$110 = n(n-1)$

$0 = n^2 - n - 110$

$0 = (n-11)(n+10)$

$n = 11$ or $n = -10$

Since n cannot be negative,
$n = 11$

b) $_nC_3 = 364$

$_nC_3 = \frac{n!}{(n-3)!3!}$

$364 = \frac{n!}{(n-3)!6}$

$6 \cdot 364 = n(n-1)(n-2)$

$2184 = n(n-1)(n-2)$

$\sqrt[3]{2184} \doteq 12.97$

Try 3 consecutive numbers
with 13 as the middle number:
$12 \cdot 13 \cdot 14 = 2184$
So, $n = 14$

8. These are the terms in row 5 of Pascal's triangle.

1 4 6 4 1

a) What are the terms in row 6?

Add pairs of adjacent terms in row 5 to generate the terms in row 6.
The first and last terms are 1.

1 4 6 4 1
1 5 10 10 5 1

So, the terms in row 6 are: 1, 5, 10, 10, 5, 1

b) Use the terms in row 6 to expand the binomial $(x - 1)^5$.

Use the terms in row 6 as coefficients of $(x - 1)^5$.
Start with x^5 and end with $(-1)^5$.

$$(x-1)^5 = 1(x^5) + 5(x^4)(-1) + 10(x^3)(-1)^2 + 10(x^2)(-1)^3 + 5(x)(-1)^4 + 1(-1)^5$$
$$= x^5 - 5x^4 + 10x^3 - 10x^2 + 5x - 1$$