Defining 0!

If we replace r by n in the previous formula, we get the number of permutations of n elements taken n at a time. This we know is n!.

$$_{n}P_{n} = n! = \frac{n!}{(n-n)!} = \frac{n!}{0!}$$

For this to be equal to n! the value of 0! must be 1.

0! is defined to have a value of 1.

In a region, vehicle license plates consist of 2 different letters followed by 4 different digits. If the letters I, O, Y, and Z are not used, determine how many different license plates are possible by

- a) the fundamental counting principle
- b) permutations



In many cases involving simple permutations, the fundamental counting principle can be used in place of the permutation formulas.

Complete Assignment Questions #7 - #14

Assignment

- 1. Without using a calculator, determine the value of
 - 5! a)

2. Express as single factorials.

a)
$$6 \times 5 \times 4 \times 3 \times 2 \times 1$$
 b) $9 \times 8 \times 7 \times 6!$ c) $(n+2)(n+1)n(n-1)$...× $3 \times 2 \times 1$

- 3. Express as a quotient of factorials.
 - a) $9 \times 8 \times 7 \times 6$
- **b)** $20 \times 19 \times 18$ **c)** (n+2)(n+1)n

ements

- 4. Use a calculator to determine the exact value of the following:
 - a) 10!
- **b**) $\frac{8!}{4!}$
- $\mathbf{d}) \left(\frac{25!}{21!}\right) \left(\frac{7!}{11!}\right)$
- 5. Simplify the following expressions. Leave the answer in product form where appropriate.

- a) $\frac{n!}{n}$ b) $\frac{(n-3)!}{(n-2)!}$ c) $\frac{(n+1)!}{(n-1)!}$ d) $\frac{(3n)!}{(3n-2)!}$

6. Solve the equation.

a)
$$\frac{(n+1)!}{n!} = 6$$

b)
$$(n+1)! = 6(n-1)!$$

c)
$$\frac{(n+2)!}{n!} = 12$$

d)
$$\frac{(n+1)!}{(n-2)!} = 20(n-1)$$

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7.	Determine the number of arrangements that can be made using all of the letters in the word			
	a) DOG	b) DUCK	c) SANDWICH	d) CANMORE

- Consider the number of five-digit numbers that can be made from the digits 2, 3, 4, 7, and 9 if no digit can be repeated. Express your answer using

iate.

- a) factorial notation b) $_{n}P_{r}$ notation c) the fundamental counting principle
- 9. a) Use the formula for ${}_{n}P_{r}$ to show that ${}_{7}P_{0} = 1$.
 - b) Explain why n must be greater than or equal to r in the notation ${}_{n}P_{r}$.
- 10. In each case determine the number of arrangements of the given letters by
 - i) using the fundamental counting principle ii) writing in $_{n}P_{r}$ form and evaluating

 - a) two letters from the word GOLDEN b) three letters from the word CHAPTERS
 - c) four letters from the word WEALTH d) one letter from the word VALUE

How many numbers (up to a maximum of four digit numbers) can be made from the digits 2, 3, 4, and 5 if no digit can be repeated?

- Multiple 12. In a ten-team basketball league, each team plays every other team twice, once at home and once away. The number of games that are scheduled is

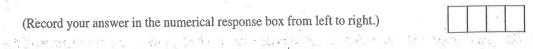
 - 90 C.
 - D. 180
 - The value of $_{n}P_{2}$ is

 - D. en alle and State of the State

Numerical 14. Response

In a competition on the back of a cereal packet, seven desirable qualities for a kitchen (eg. spaciousness, versatility, etc.) must be put in order of importance. The number of different entries that must be completed in order to ensure a winning order is _____.

(Record your answer in the numerical response box from left to right.)



Answer Key

- 1. a) 120

- 3. a) $\frac{9!}{5!}$ b) $\frac{20!}{17!}$ c) $\frac{(n+2)!}{(n-1)!}$ 4. a) 3 628 800 b) 1680 c) 3003 d) $\frac{115}{3}$
- **b)** 90 **c)** $\frac{1}{100}$ 2. a) 6! **b)** 9! **c)** (n+2)!

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- 5. a) (n-1)! b) $\frac{1}{n-2}$ c) n(n+1) d) 3n(3n-1)6. a) n=5 b) n=2 c) n=2 d) n=47. a) 6 b) 24 c) 40320 d) 50408. a) 5! b) $_5P_5$ c) $5 \times 4 \times 3 \times 2 \times 1 = 120$ 9. a) $_7P_0 = \frac{7!}{(7-0)!} = \frac{7!}{7!} = 1$ b) You cannot arrange more elements than the number of elements there are to begin with.
- **10.a**) $_{6}P_{2} = 30$ **b**) $_{8}P_{3} = 336$ **c**) $_{6}P_{4} = 360$ **d**) $_{5}P_{1} = 5$

- 11. 64
- 12.B 13.D 14. 5 0 4

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Class Ex. #1

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