

## 11.1 HOMEWORK: Fundamental Counting Principal and Factorial

1) Simplify the following. (Do not use a calculator)

a)  $\frac{7!}{6!}$

$$= \frac{7 \cdot 6!}{6!}$$

$$= 7$$

b)  $\frac{31!}{30!}$

$$\frac{31(30!)}{30!}$$

$$= \cancel{30!} 31$$

c)  $\frac{9!}{6!}$

$$= \frac{9 \cdot 8 \cdot 7 \cdot 6!}{6!}$$

$$= 504$$

d)  $\frac{10!}{6!4!}$

$$\frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6!}{6! 4!}$$

$$\frac{10 \cdot 9 \cdot 8 \cdot 7}{4 \cdot 3 \cdot 2 \cdot 1} = 210$$

e)  $\frac{(k+3)!}{(k+2)!}$

$$= \frac{(k+3)(k+2)!}{(k+2)!}$$

$$= k+3$$

f)  $\frac{7!(r+2)!r}{6!(r-1)!}$

$$\frac{7 \cdot \cancel{6!} (r+2)(r+1)(r)(\cancel{r-1})! r}{\cancel{6!} (\cancel{r-1})!}$$

$$7(r+2)(r+1)r^2$$

- 2) Solve the following for  $n$ .

$$n! = 20(n-2)!$$

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

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

$$n^2 - n - 20 = 0$$

$$(n-5)(n+4) = 0$$

$$n = 5 \quad n = -4$$

- 3) A nickel and a dime are tossed on a table. In how many ways can they land?

heads  
tails

↙

heads  
tail

$$\underline{2} \cdot \underline{2} = 4 \text{ ways}$$

- 4) If there are 12 runners entered in a race, in how many ways can first, second and third place be awarded?

$$\underline{12} \cdot \underline{11} \cdot \underline{10} = 1320 \text{ ways.}$$

- 5) Pizza Barn offers three choices of salad, 20 kinds of pizza, and four different desserts. How many different three-course meals can one order?

$$3(20)(4) = 240 \text{ meals.}$$

- 6) A first year student must take a modern language, a natural science, a social science, and English. If there are four different modern languages, five natural sciences, three social sciences, but each student must take the same English course, how many different ways can they select their course of study?

$$4(5)(3)(1) = 60 \text{ ways.}$$

- 7) Suppose that the executive of Manitoba Association of Mathematics Teachers consists of three women and two men. In how many ways can a president and a secretary be chosen if:

- a) The president is to be female and the secretary male?

$$\underline{3} \cdot \underline{2} = 6$$

- b) The president if to be male and the secretary female?

$$\underline{2} \cdot \underline{3} = 6$$

- c) The president and secretary are to be of the opposite sex?

Case 1 female president & male secretary. 6

Case 2 or male president and female secretary

$$\begin{array}{r} 6 \\ + 6 \\ \hline 12 \end{array}$$

**Answers:**

1a) 7      b) 31      c) 504      d) 210      e)  $k + 3$       f)  $7(r + 2)(r + 1)r^2$

3)  $n = 4, 5$       4) 4 ways      5) 1320 ways      6) 240 meals      7) 60 ways

8) a) 6 ways      b) 6 ways      c) 12 ways

