Assignment

1. How many arrangements could be made of the word

a) **FATHER** if **F** is first?

F|_ _ _ _ _

$5! = 120$

b) **UNCLE** if **C** is first and **L** is last?

C|_ _ _|L

$3! = 6$

c) **DAUGHTER** if **UG** is last?

_ _ _ _ _ _|UG

$6! = 720$

d) **MOTHER** if the vowels are first and last?

O|_ _ _ _|E

E|_ _ _ _|O

$2! \cdot 4! = 48$

2. How many arrangements of the following words can be made if all the vowels must be kept together?

a) **FATHER**

AE_ _ _ _

$2! \cdot 5! = 240$

b) **DAUGHTER**

AUE|_ _ _ _ _

$3! \cdot 6! = 4320$

c) **EQUATION**

EUAIO|_ _ _

$5! \times 4! = 2880$

3. Determine the number of different arrangements of the six letters in the word **ANSWER**

a) without restrictions

$6! = 720$

b) that begin with an **S**

S|_ _ _ _ _ $5! = 120$

c) that begin with a vowel and end with a consonant

(2) _ _ _ _ (4) $2 \times 4! \times 4 = 192$

Vowel

d) that have the three letters **A**, **N**, and **S** adjacent and in the order **ANS**

ANS _ _ $4! = 24$

e) that have the three letters **A**, **N**, and **S** adjacent but not necessarily in that order

ANS _ _ _

$3! \cdot 4! = 144$

4. Ann, Brian, Colin, Diane, and Eric go to watch a movie and sit in 5 adjacent seats. In how many ways can this be done if

a) Brian sits next to Diane?

BD| _ _ _
2! × 4! = 48

b) Ann refuses to sit next to Eric?

#no restrictions − #(Ann next to Eric)
= 5! − 2! × 3!
= 120 − 48 = 72

5. In how many ways can four adults and five children be arranged in a single line

a) without restriction?

9! = 362 880

b) if children and adults are alternated?

$C_1 A_1 C_2 A_2 C_3 A_3 C_4 A_4 C_5$
5! × 4! = 2880

c) if the adults are all together and the children are all together?

$(A_1 A_2 A_3 A_4)(C_1 C_2 C_3 C_4 C_5)$
4! · 5! · 2!
= 5760

d) if the adults are all together?

$(A_1 A_2 A_3 A_4) C_1 C_2 C_3 C_4 C_5$
4! × 6! = 17 280

6. How many different arrangements can be made using all of the letters of each word?

a) **COCHRANE**

2C $= \frac{8!}{2!} = 20160$

b) **WINNIPEG**

2I 2N $= \frac{8!}{2!2!} = 10080$

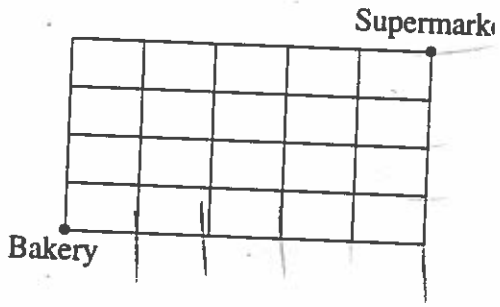
c) **OSOYOOS**

4O 2S $= \frac{7!}{4!2!} = 105$

7. The bakery is four blocks south and five blocks west of the supermarket. The bakery driver, bored with travelling the same route, decides to use a different route for each delivery.

Assuming that he always travels closer to the supermarket, how many deliveries are possible before he has to repeat a route?

$\frac{9!}{5!4!} = 126$



8. A race at the Olympics has 8 runners. In how many orders can their countries finish if

a) there are 2 Canadian, 1 Russian, 1 German, 1 South African, and 3 American runners?

$\frac{8!}{2!3!} = 3360$

b) there are 1 Canadian, 2 British, 2 Ethiopian, 1 Algerian, and 2 Kenyan runners?

$\frac{8!}{2!2!2!} = 5040$

9. Naval signals are made by arranging coloured flags in a vertical line and the flags are th read from top to bottom. How many signals using six flags can be made if you have

a) 3 red, 1 green, and 2 blue flags? $\frac{6!}{3!2!} = 60$

b) 2 red, 2 green, and 2 blue flags? $\frac{6!}{2!2!2!} = 90$

c) unlimited supplies of red, green, and blue flags?

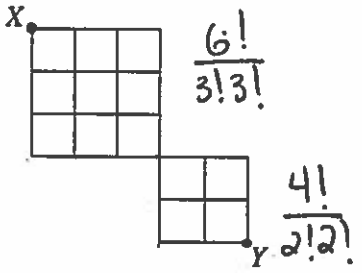
$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6 = 729$

Multiple Choice **10.** The number of different arrangements can be made using all the letters of the word **SASKATOON** is

A. 720 **B.** 45 360 $\binom{2S}{2A\ 2O} = \frac{9!}{2!2!2!} = 45.360$

C. 362 880 **D.** 725 760

11. The number of pathways from X to Y if paths must always move closer to Y is



A. $\frac{6!}{3!\,3!} + \frac{4!}{2!\,2!}$ **B.** $\frac{6!}{3!\,3!} \times \frac{4!}{2!\,2!}$

C. $\frac{8!}{4!\,4!} + \frac{6!}{3!\,3!}$ **D.** $\frac{8!}{4!\,4!} \times \frac{6!}{3!\,3!}$

Numerical Response **12.** The number of different ways that seven basketball players can be seated on a bench so that two specified players are always sitting side by side is _____ .

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

1	4	4	0

AB _ _ _ _ _

$2! \times 6! = 1440$

Answer Key

1. a) 120 b) 6 c) 720 d) 48 2. a) 240 b) 4320 c) 2880
3. a) 720 b) 120 c) 192 d) 24 e) 144
4. a) 48 b) 72 5. a) 362 880 b) 2880 c) 5760 d) 17 280
6. a) 20 160 b) 10 080 c) 105 7. 126 8. a) 3360 b) 5040
9. a) 60 b) 90 c) $3^6 = 729$ 10. B 11. B 12.

1	4	4	0