7.1 Exercise Set

1. Suppose Sam can travel from Calgary to Vancouver by car, train or bus, and from Vancouver to Victoria by boat or plane.

a) How many different modes of transportation can Sam use to travel from Calgary to Victoria?

b) Make a list of different possible transportation modes for Sam.

2. There are 4 roads between cities A and B, and 3 roads between cities B and C.

a) How many ways can a person travel from A to C by way of B?

b) How many ways can a person make a round trip from A to C and back to A by way of B?

c) How many ways can a person make a round trip from A to C and back to A by way of B, without using any road twice?

3. A math quiz consists of 5 multiple-choice questions with 4 choices each. How many possible answer keys are there?

4. A coin is tossed. If it comes out heads, a die is then tossed once; if a tail appears, the coin is tossed one more time. How many outcomes are possible? List these possibilities.

5. If a student has a choice of 6 different computers, 4 different monitors and 5 different printers, how many ways can a person select a computer system?

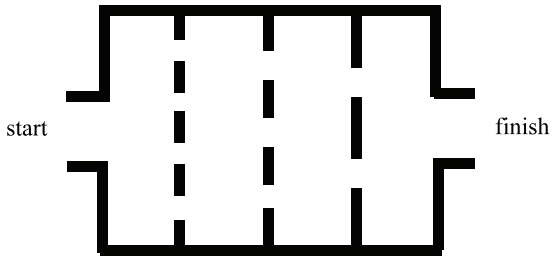
6. In a 7 horse race, Bill thinks horses 1, 4, 6 will be the top 3 horses in the race, but not necessarily in that order. If Bill is correct, how many different outcomes are possible?

7. A breakfast consists of the following menu:

Juice:	apple, orange, grapefruit
Toast:	white, whole wheat
Eggs:	scrambled, over easy, poached
Beverage:	coffee, tea, milk

Choose one item from each category. How many different breakfast combinations are possible?

8. The maze below is constructed so a novice must pass through a series of one-way doors. How many different paths are possible?



9. A license plate consists of 3 letters followed by 3 digits. Determine the total number of possible license plates if the following conditions apply:

a) there are no restrictions on letters or digits

b) no letter or number can be repeated

c) a letter or digit can be used twice

d) a letter can be used twice and a number only once.

10. How many different 3-letter "words" are possible such that the letters of each word are all different, and are in alphabetical order? (For example, the "word" ADF is in alphabetical order.)

Questions 11 to 15 should be done with a tree diagram.

11. List all possible outcomes for the gender of the children in a family that has 3 children.

12. Bruce plays a game in which he has an equal chance of winning or losing. He starts with $1.00 and plays by betting $1.00 each time. If he wins, he gains $1; if he loses, he loses $1. He plays until he has $0 or up to 4 bets. How many ways can the betting occur?

13. Ray and Ann play in a tennis tournament. The first person to win two games out of three wins the tournament. How many outcomes are possible?

14. Trisha goes to a restaurant to order either a sandwich or a hamburger. She can use mustard, ketchup or relish. Trisha never has ketchup on her sandwich, and never mixes ketchup and relish. How many different combinations are possible?

15. A town has only 3 T.V. stations A, B, C with starting time for different shows listed. If you decide to watch T.V. continuously from 7:00 p.m. to 10:00 p.m., how many different combinations of complete shows are possible? You can't switch stations half-way through a show, or switch to shows already started.

Time

A	7:00	→	8:00	→	9:00	→	10:00
B	7:00	7:30	8:00	→	9:00	→	10:00
C	7:00	7:30	→	8:30	→	9:30	10:00

16. Without using a calculator, evaluate:

a) $\frac{200!}{198!}$ **b)** $\frac{100! - 98!}{98!}$ **c)** $\frac{100! \cdot 98!}{99! \cdot 97!}$

17. **a)** Write $20 \cdot 19 \cdot 18 \cdot 17$ in factorial notation.

b) How many ways can 6 different books be arranged on a shelf?

c) How many different numbers can be made using all the digits 1, 2, 3, 4, 5, 6 and 7 ?

d) How many ways can 7 books be arranged on a shelf if there is room for only 4 books?

18. Simplify each of the following to an expression containing no factorial notation.

a) $\dfrac{(n-1)!(n+1)!}{(n!)^2}$

b) $\dfrac{(2n-1)!(n+1)!}{(2n+1)!(n-1)!}$

c) $\dfrac{(n-1)!-(n-2)!}{(n-1)!}$

d) $\dfrac{(n-1)!}{n!}+\dfrac{(n-2)!}{n!}$

e) $\dfrac{n!-(n-1)!}{(n+1)!-2(n-1)!}$

f) $\dfrac{n!-6(n-2)!}{(n-3)(n-2)!}$

19. Solve:

a) $\dfrac{3!(n-1)!}{(n-3)!}=72$

b) $\dfrac{(2n-1)!}{2!(2n-3)!}=10$