3-5 Cumulative Review

1. List five elements in each of the following sets.
   a) $A = \{\text{provinces east of Alberta}\}$
   b) $B = \{b \mid b = 10x, x \in I\}$

2. a) Represent these sets in a Venn diagram.
   - $U = \{\text{the days of the week}\}$
   - $A = \{\text{the days you go to school}\}$
   - $B = \{\text{the days of the weekend}\}$
   - $C = \{\text{the days of the week that begin with the letter T}\}$
   b) List a pair of disjoint subsets in part a), if any.
   c) Is each statement true or false? Explain.
   i) $A \subset B$ iii) $A' = B$
   ii) $C \subset A$ iv) $n(A) + n(B) + n(C) = n(U)$

3. Erynn surveyed 35 students about their favourite fruit. She recorded her results.

Favourite Fruit	Number of Students
oranges	14
apples	26
neither oranges nor apples	8

   a) Draw and label a Venn diagram to represent the data.
   b) Determine how many students like oranges or apples.
   c) Determine how many students like only oranges or only apples.

4. Describe two sets A and B to which each of the following formulas would apply.
   a) $n(A \cup B) = n(A) + n(B)$
   b) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

5. Le Centre de développement musical, La Girandole, and L'UniThéâtre offer a summer camp every year in Edmonton. At the Camp Multi-Arts, students can receive instruction in at least one of the following: singing, dancing, and acting. Of the 56 campers:
   • 35 were instructed in singing, 38 in dancing, and 33 in acting.
   • 21 were instructed in singing and dancing.
   • 18 were instructed in singing and acting.
   • 23 were instructed in acting and dancing.
   How many campers received instruction in all three art forms?

6. Consider this conditional statement: "If a number is negative, then it is less than zero."
   a) Determine if the statement is true.
   b) Write the converse. Is it true? Explain.
   c) Write the inverse. Is it true? Explain.
   d) Write the contrapositive. Is it true? Explain.
   e) Can this statement be written as a biconditional? Explain.

7. You roll a standard die and flip a coin.
  a) Draw a tree diagram to show all possible outcomes.
  b) Verify that you have listed all possible outcomes using the Fundamental Counting Principle.

8. Since 1991, Yukon licence plates have consisted of three letters followed by two numbers.
  a) How many different Yukon licence plates are possible?
  b) Of these different plates, how many use the same letter or the same number more than once?

9 . Evaluate.

  a) $12!$ **c)** $\dfrac{10!}{6!3!}$ **e)** $_9C_5$

  b) $_8P_8$ **d)** $_9P_5$ **f)** $\dbinom{12}{8}$

10. The camera club has 15 members. In how many ways can:
  a) All the members be arranged in a row for a yearbook photo?
  b) The club choose a president, vice-president, and treasurer?
  c) Jill and two other members be chosen to take pictures of the next football game?

11. A softball team has a record of 13 wins and 5 losses. How many different ways could this record have occurred?

12. Determine the number of possible routes to get from point A to point B, if you travel only south or east.

  a) A •

  b) A •

  • B
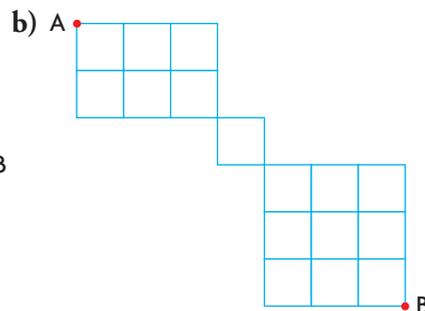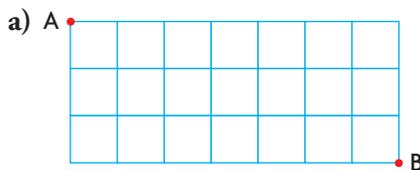
13. Solve for n:
  $_nC_4 = {_nP_3}$

14. There are 7 parents and 9 students who volunteer to be on a school fundraising committee. How many different six-person committees are possible if the committee must consist of:
  a) 3 parents and 3 students?
  b) At least 1 student?
  c) More parents than students?

15. How many different three-card hands with one ace and one ten can be dealt from a standard deck of 52 playing cards?

16. Amber and Jackson take turns rolling two standard dice. If both numbers are even on her roll, Amber wins a point. If both numbers are odd on his roll, Jackson wins a point. If one number is even and the other is odd, neither wins a point on their roll, but they do roll again. The first player to 10 points wins. Is this a fair game? Explain.

17. The odds against a post-secondary graduate being employed one year after graduation are estimated to be 1 : 25.
  a) Estimate the odds in favour of a post-secondary graduate being employed one year after graduation.
  b) Estimate the probability that a post-secondary graduate will be employed one year after graduation.

18. Six students are running for student council president. Suppose that each student is equally likely to win the election. What is the probability that Sonya will finish in the top three on election day?

19. In the game of bridge, four players are dealt 13 cards from a well-shuffled standard deck of 52 playing cards. Determine the probability that a player:
  a) Is dealt all the hearts.   **b)** Is dealt all the kings.

20. Describe a pair of events that can be classified by each of the following descriptions:
  a) Mutually exclusive   **b)** Dependent   **c)** Independent

21. Enzo rolls two standard dice. Determine the probability of each event.
  a) The sum is 3 or 12.
  b) The sum is odd, or the sum is greater than 7.
  c) The sum is even, given that the first die is 1.
  d) The first die is less than 3, and the second die is greater than 5.

22. Jan and Stan are evenly matched table tennis players. However, each time Jan loses a game, her probability of winning the next game decreases by $\frac{1}{4}$. When she wins, her probability of winning the next game increases by $\frac{1}{8}$. If they play two games, determine the probability that:
  a) Jan wins at least one game.
  b) Stan wins both games.

23. A euchre deck consists of the 9, 10, jack, queen, king, and ace of all four suits. This results in a euchre deck of 24 cards. Audrey draws two cards from a well-shuffled euchre deck. Determine the probability that both cards are queens:
  a) If the first card drawn is replaced.
  b) If the first card drawn is not replaced.