Chapter Test

ACHIEVEMENT CHART				
Category	Knowledge/ Understanding	Thinking/Inquiry/ Problem Solving	Communication	Application
Questions	All	11	5, 10, 11	3, 4, 6, 7, 8, 9, 10, 11

1. A coin is tossed three times.

  a) Draw a tree diagram to illustrate the possible outcomes.

  b) Determine the probability that heads will appear each time.

2. A jumbled desk drawer contains three pencils, four pens, and two markers. If you randomly pull out a writing instrument,

  a) what is the probability that it is not a pencil?

  b) what are the odds in favour of pulling out a pen?

3. A die is rolled ten times. What is the probability that a prime number will be rolled every time?

4. If Juanita bumps into Troy in the hallway between periods 2 and 3, there is a 25% chance that she will be late for class. If she does not bump into Troy, she will make it to class on time. If there is a 20% chance that Juanita will bump into Troy, how likely is it that she will be late on any given day?

5. Of 150 workers surveyed in an industrial community, 65 worked in the paper mill and 30 worked in the water-treatment plant.

  a) What is the probability that a worker surveyed at random works

    i) in either the paper mill or the water-treatment plant?

    ii) somewhere other than the paper mill or the water-treatment plant?

  b) What assumptions must you make in part a)?

6. The gene for blood type A is dominant over the one for type O blood. To have type O blood, a child must inherit type O genes from both parents. If the parents of a child both have one blood type A gene and one blood type O gene, what are the odds in favour of the child having type O blood?

7. Of the members of a track-and-field club, 42% entered track events at the most recent provincial meet, 32% entered field events, and 20% entered both track and field events.

  a) Illustrate the club's entries with a Venn diagram.

  b) What is the probability that a randomly selected member of the club

    i) entered either a track event or a field event at the provincial meet?

    ii) did not compete at the meet?

8. Five siblings, Paula, Mike, Stephanie, Kurt, and Emily, are randomly seated along one side of a long table. What is the probability that the children are seated

  a) with the three girls in the middle?

  b) in order of age?

9. Naomi, a fan of alternative music, has 12 CDs.

Band	Number of CDs
Nine Inch Nails	3
Soundgarden	4
Monster Magnet	2
Pretty & Twisted	1
Queensrÿche	2

If Naomi randomly loads her player with five CDs, what is the probability that it will hold

a) no Soundgarden CDs?

b) exactly one Monster Magnet CD?

c) three Nine Inch Nails CDs or three Soundgarden CDs?

d) one CD from each band?

10. Ursula, an electrical engineer in a quality-control department, checks silicon-controlled rectifiers (SCRs) for manufacturing defects. She has noticed that when a defective SCR turned up on the assembly line, there was a 0.07 probability that the next unit would also be defective. If, however, an SCR passed inspection, then there was just a 0.004 likelihood that the next unit would fail inspection.

a) Assuming that Ursula has just found a defective SCR, find

   i) the initial probability vector

   ii) the transition matrix

   iii) the probability that the next two SCRs will both fail inspection

b) Is this Markov chain regular? Explain why or why not.

c) What does your answer to part b) imply about the long-term probability of an SCR failing inspection? Quantify your answer.

Knowledge/Understanding	Thinking/Inquiry/Problem Solving	Communication	Application

11. Candice owns a chocolate shop. One of her most popular products is a box of 40 assorted chocolates, 5 of which contain nuts.

   a) If a person selects two chocolates at random from the box, what is the probability that

      i) both of the chocolates contain nuts?

      ii) at least one of the chocolates contains nuts?

      iii) only one of the chocolates contains nuts?

      iv) neither of the chocolates contain nuts?

   b) Describe how you could simulate choosing the two chocolates. Outline a method using

      i) a manual technique

      ii) appropriate technology

   c) Suppose you ran 100 trials with either of your simulations. Would you expect empirical probabilities based on the results of these trials to match the probabilities you computed in part a)? Why or why not?

   d) Due to the popularity of the chocolates with nuts, Candice is planning to double the number of them in each box. She claims that having 10 of the 40 chocolates contain nuts will double the probability that one or both of two randomly selected chocolates will contain nuts. Do you agree with her claim? Support your answer with probability calculations.