

- 1) (https://math.libretexts.org/Courses/Angelo_State_University/Finite_Mathematics)

Niki holds two part-time jobs, Job I and Job II. She never wants to work more than a total of 12 hours a week. She has determined that for every hour she works at Job I, she needs 2 hours of preparation time, and for every hour she works at Job II, she needs one hour of preparation time, and she cannot spend more than 16 hours for preparation.

If Nikki makes \$40 an hour at Job I, and \$30 an hour at Job II, how many hours should she work per week at each job to maximize her income?

- 2) (https://math.libretexts.org/Courses/Angelo_State_University/Finite_Mathematics)

A factory manufactures two types of gadgets, regular and premium. Each gadget requires the use of two operations, assembly and finishing, and there are at most 12 hours available for each operation. A regular gadget requires 1 hour of assembly and 2 hours of finishing, while a premium gadget needs 2 hours of assembly and 1 hour of finishing. Due to other restrictions, the company can make at most 7 gadgets a day. If a profit of \$20 is realized for each regular gadget and \$30 for a premium gadget, how many of each should be manufactured to maximize profit?

- 3) (https://math.libretexts.org/Courses/Angelo_State_University/Finite_Mathematics)

The Silly Nut Company makes two mixtures of nuts: Mixture A and Mixture B. A pound of Mixture A contains 12 oz of peanuts, 3 oz of almonds and 1 oz of cashews and sells for \$4. A pound of Mixture B contains 12 oz of peanuts, 2 oz of almonds and 2 oz of cashews and sells for \$5. The company has 1080 lb. of peanuts, 240 lb. of almonds, 160 lb. of cashews. How many pounds of each of mixtures A and B should the company make to maximize profit?

- 4) (https://math.libretexts.org/Courses/Angelo_State_University/Finite_Mathematics)

At a university, Professor Symons wishes to employ two people, John and Mary, to grade papers for his classes. John is a graduate student and can grade 20 papers per hour; John earns \$15 per hour for grading papers. Mary is a post-doctoral associate and can grade 30 papers per hour; Mary earns \$25 per hour for grading papers. Each must be employed at least one hour a week to justify their employment.

If Prof. Symons has at least 110 papers to be graded each week, how many hours per week should he employ each person to minimize the cost?

- 5) (Page 75)

Nitric acid is prepared commercially by a series of three chemical reactions. In the first reaction, nitrogen (N_2) is combined with hydrogen (H_2) to form ammonia (NH_3). Next, the ammonia is combined with oxygen (O_2) to form nitrogen dioxide (NO_2) and water. Finally, the NO reacts with some of the water to form nitric acid (HNO_3) and nitric oxide (NO). The amounts of each of the components of these reactions are measured in moles (a standard unit of measurement for chemical reactions). How many moles of nitrogen, hydrogen, and oxygen are necessary to produce eight moles of nitric acid?

- 6) (Page 118)

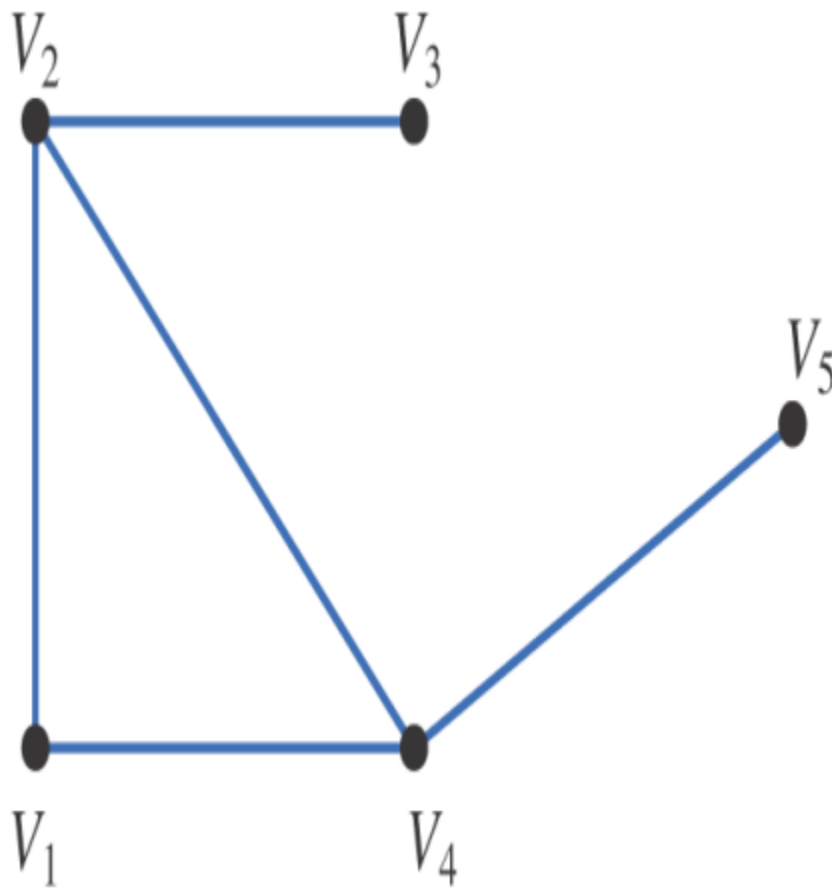
In a certain town, 30 percent of the married women get divorced each year and 20 percent of the single women

get married each year. There are 8000 married women and 2000 single women. Assuming that the total population of women remains constant, how many married women and how many single women will there be after one year? After two years?

7) (Page 139)

1. Determine the adjacency matrix A of the graph.
2. Compute A^2 . What do the entries in the first row of A^2 tell you about walks of length 2 that start from V_1 ?
3. Compute A^3 . How many walks of length 3 are there from V_2 to V_4 ? How many walks of length less than or equal to 3 are there from V_2 to V_4 ?

Consider the graph:

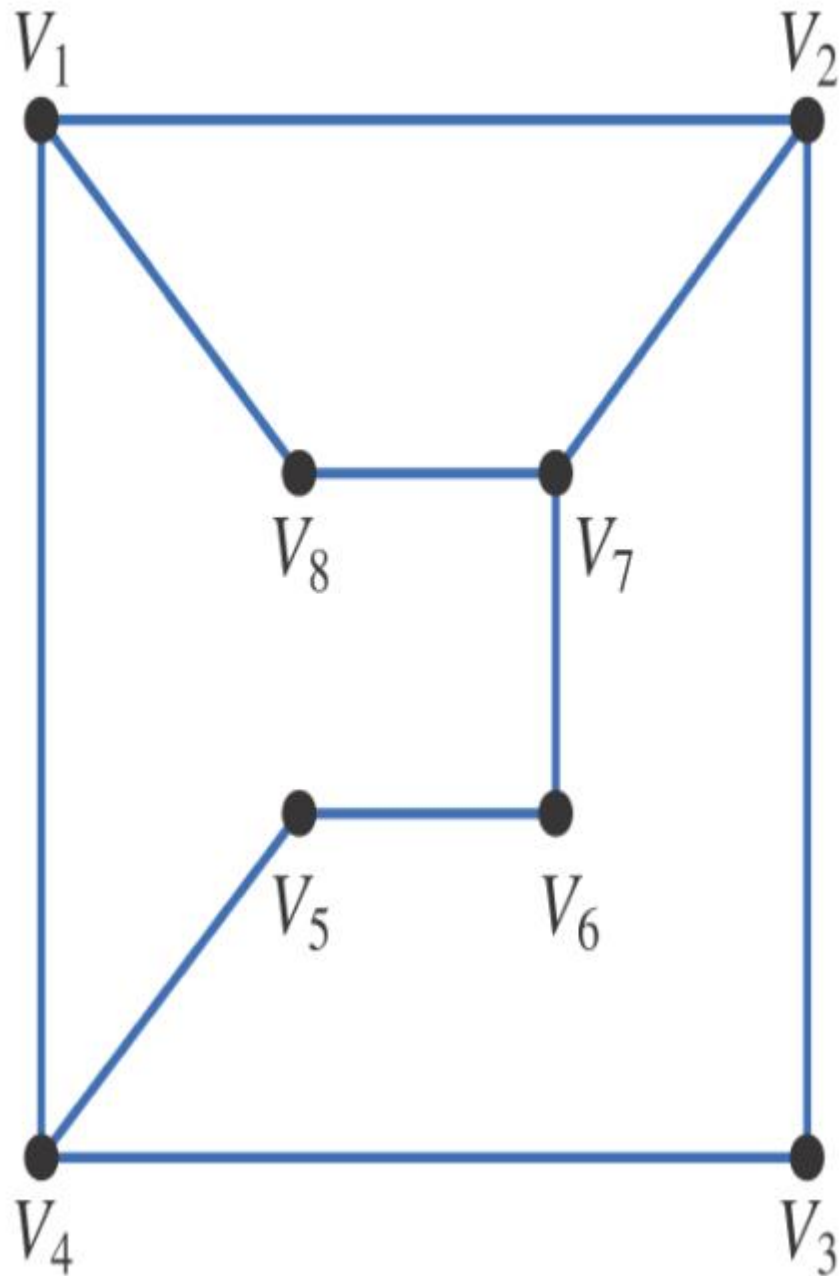


8) (Page 182)

1. Determine the adjacency matrix A for the graph and enter it in MATLAB.
2. Compute A^2 and determine the number of walks of length 2 from (i) V_1 to V_7 , (ii) V_4 to V_8 , (iii) V_5 to V_6 , and (iv) V_8 to V_3 .
3. Compute A^4 , A^6 , and A^8 and answer the questions in part (b) for walks of lengths 4, 6, and 8. Make a conjecture as to when there will be no walks of even length from vertex V_i to vertex V_j .
4. Compute A^3 , A^5 , and A^7 and answer the questions from part (b) for walks of lengths 3, 5, and

7. Does your conjecture from part (c) hold for walks of odd length? Explain. Make a conjecture as to whether there are any walks of length k from V_i to V_j based on whether $i + j + k$ is odd or even.

5. If we add the edges $\{V_3, V_6\}$, $\{V_5, V_8\}$ to the graph, the adjacency matrix B for the new graph can be generated by setting $B = A$ and then setting



9) (Page 326)

Suppose that the total population of a large metropolitan area remains relatively fixed; however, each year 6 percent of the people living in the city move to the

suburbs and 2 percent of the people living in the suburbs move to the city. If, initially, 30 percent of the population lives in the city and 70 percent lives in the suburbs, what will these percentages be in 10 years? 30 years? 50 years? What are the long-term implications?