

**OPRE 6398 Prescriptive Analytics  
Homework 3**

**Due 02/22/19  
(11:59 p.m.)**

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Note: 1. Your homework submission must be typewritten.

1. Show only the solutions and do not copy the problems in the submission.

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1. Read Readings 5.

2. Hi-Tech, Inc., is a computer training company serving metropolitan Toronto, Canada. The firm contracts a group of part-time instructors to teach a variety of courses concurrently at its downtown location. While demand is so high that any class offered will be filled immediately, Hi-Tech is looking at only two courses at this time: Introduction to Computers (ITC) and Creation of Web Pages (CWP).

Each ITC class requires 7.5 hours of preparation/instruction time and contributes a profit of \$720, whereas each CWP class calls for only 3 hours and contributes \$300. Available time for these two courses is limited to 56 hours a day. There is a restriction on the maximum number of trainees that can be efficiently handled. More specifically, at most 100 students can be accommodated on a daily basis without putting a strain on the facility and support staff. Additionally, each course has a class size limit - 6 for ITC and 12 for CWP. Hi-Tech would like to maximize the daily total profit from both courses so that it could offer certain other courses on a “goodwill” basis.

Formulate an AILP for management to decide how many classes should be scheduled for each subject daily.

3. The Gorgon Chemical Company in Lancaster, Pa., manufactures and sells an extremely effective termite spray either (1) in a 55-gallon drum for \$50 or (2) in bulk form at \$1.25 per gallon. It has just received a new shipment of the two chemicals required for the spray and has available several workers to mix the product. The characteristics of the mixing process are summarized below:

	Chemical requirement (1) (gallons/drum)	Chemical requirement (2) (gallons/gallon)	Chemical availability (gallons)
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Chemical A	16.67	0.44	1,000
Chemical B	13.33	0.25	750
-			

	Labor requirement (1) (hours/drum)	Labor requirement (2) (hours/gallon)	Labor availability (hours)
-			
Work force	0.53	0.04	80
-			

Represent the problem situation by an MILP that can be employed to develop the production plan with the maximum total revenue.

4. Coach Doug Hoffman of DTU is putting together a swimming team for the 400-meter medley relay race, in which each member must swim 100 meters of freestyle (FR), breaststroke (BR), butterfly (BU), or backstroke (BA). Four swimmers are under consideration: Gary Hall (GH), Mark Spitz (MS), Jim Mount (JM), and Chuck Johnson (CJ). The average times (in seconds) for each of them to swim 100 meters of different strokes are summarized in the table below:

	FR	BR	BU	BA
GH	54	54	51	53
MS	51	57	52	52
JM	50	53	54	56
CJ	56	54	55	53

- (1) Set up a ZOLP for the assignment problem that can be used to determine who should swim which stroke in order to have the best chance to win.
  - (2) Solve the ZOLP in (1) by running Solver. Be sure to copy and paste the Answer report at the appropriate place in your homework submission. What are the optimal solution and the optimal objective function value? What do they mean here?
5. Super Sunday, the once-a-year TV extravaganza focused on the activities of the NFL Super Bowl, has almost become a tradition. NBC has received the TV contract for this year's family festivities, and the producers have identified 12 potential camera locations within the stadium. They have also identified 25 stadium areas that may require camera coverage during the pregame, game, and postgame activities. The following table indicates camera locations and stadium areas each camera can cover:

Camera location	Stadium areas covered
1	1, 3, 4, 6, 7
2	8, 4, 7, 12
3	2, 5, 9, 11, 13
4	1, 2, 18, 19, 21
5	3, 6, 10, 12, 14
6	8, 14, 15, 16, 17
7	18, 21, 24, 25
8	2, 10, 16, 23
9	6, 11
10	20, 22, 24, 25
11	2, 4, 6, 8
12	1, 6, 12, 17

NBC executives are mainly concerned about the costs for the production. Consequently, they have set a goal of minimizing the number of cameras used. In seeking this objective, they want at least one camera to be available to cover each stadium area. Camera location 9 is the "blimp," and it has been decided that the blimp must be used because of viewer expectation and fascination with the shots from this location. Stadium areas 1 and 2 are locker room locations. The viewer interest in football personalities has led the executives to request that at least two cameras be available to cover each of these areas.

- (1) Formulate a ZOLP for the set covering problem that can be used to determine the minimum number of cameras that needed for coverage and where they should be set up.

- (2) Run Solver to solve the ZOLP in (1) above. Be sure to copy and paste the Answer report at the appropriate place in your homework submission. What are the optimal solution and the optimal objective function value? What do they mean here?