

Answer all questions by marking the scantron. Write your name and the last four digits of your social security number both on the scantron and on the exam. You may circle your answers on the exam as well. Good Luck!

In the following Table expected *profits* for three products and four possible states of the world are given.

Product	States of the World			
	I	II	III	IV
1	13	18	16	21
2	18	10	13	12
3	15	17	19	15

- Which product will you select according to the optimistic rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
- Which product will you select according to the pessimistic (conservative) rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
- Which product will you select according to the minimax regret rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
- Suppose that you can estimate the probabilities to be 0.2, 0.3, 0.4, 0.1 for the four states of the world, respectively. Which product will you select according to the expected value rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
- What is the expected profit?
 a. 16.9 b. 17.2 c. 12.7 d. 13.0 e. none of the above
- What is the Expected Value of Perfect Information?
 a. 0.6 b. 1.0 c. 1.2 d. 1.5 e. none of the above

In the following Table expected *costs* for three products and four possible states of the world are given.

Product	States of the World			
	I	II	III	IV
1	13	18	16	21
2	18	10	13	12
3	15	17	19	15

- Which product will you select according to the optimistic rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
- Which product will you select according to the pessimistic (conservative) rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.

9. Which product will you select according to the minimax regret rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
10. Suppose that you can estimate the probabilities to be 0.2, 0.3, 0.4, 0.1 for the four states of the world, respectively. Which product will you select according to the expected value rule?
 a. 1 b. 2 c. 3 d. two of the products are tied e. all three products are tied.
11. What is the expected profit?
 a. 16.9 b. 17.2 c. 12.7 d. 13.0 e. none of the above
12. What is the Expected Value of Perfect Information?
 a. 0.9 b. 1.0 c. 1.2 d. 1.5 e. none of the above

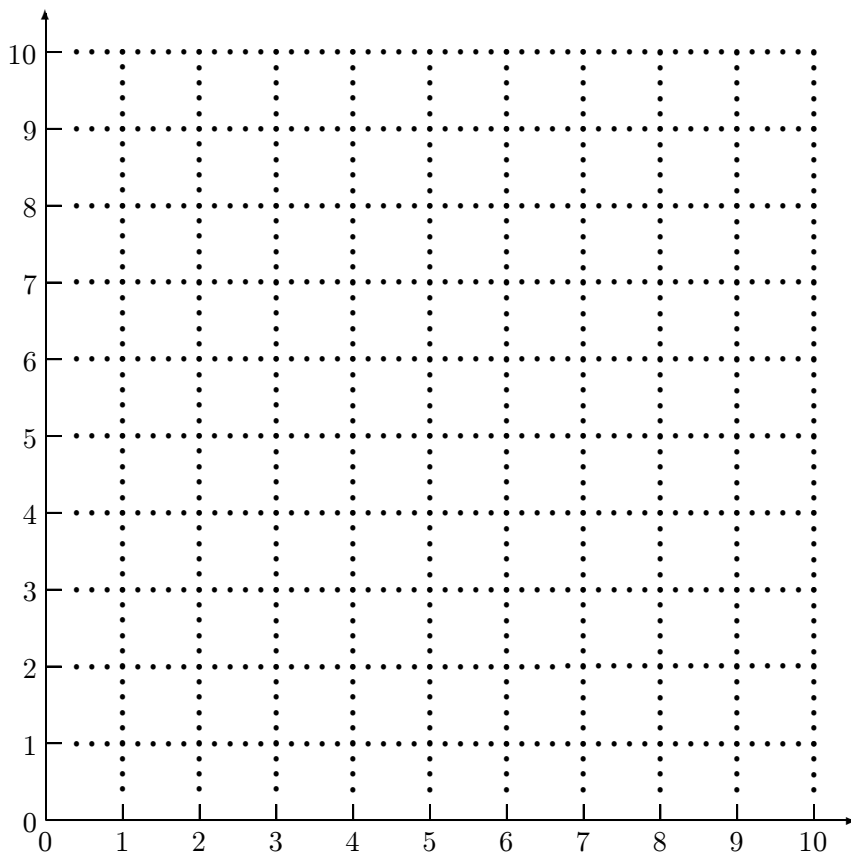
Consider the following data with a seasonality of 2. Find the seasonality indices and answer the following questions.

t	X_t
W00	70
S00	30
W01	90
S01	30
W02	70
S02	66

13. What is the index for winters?
 a. 0.640 b. 0.577 c. 1.360 d. 1.423 e. none of the above
14. What is the index for summers?
 a. 0.640 b. 0.577 c. 1.360 d. 1.423 e. none of the above
15. What is the adjusted value for Period S02?
 a. 49 b. 52 c. 103 d. 114 e. none of the above
16. What is the adjusted value for Period W00?
 a. 49 b. 52 c. 103 d. 114 e. none of the above

Solve the following linear programming problem graphically (on the next page) and answer the following questions

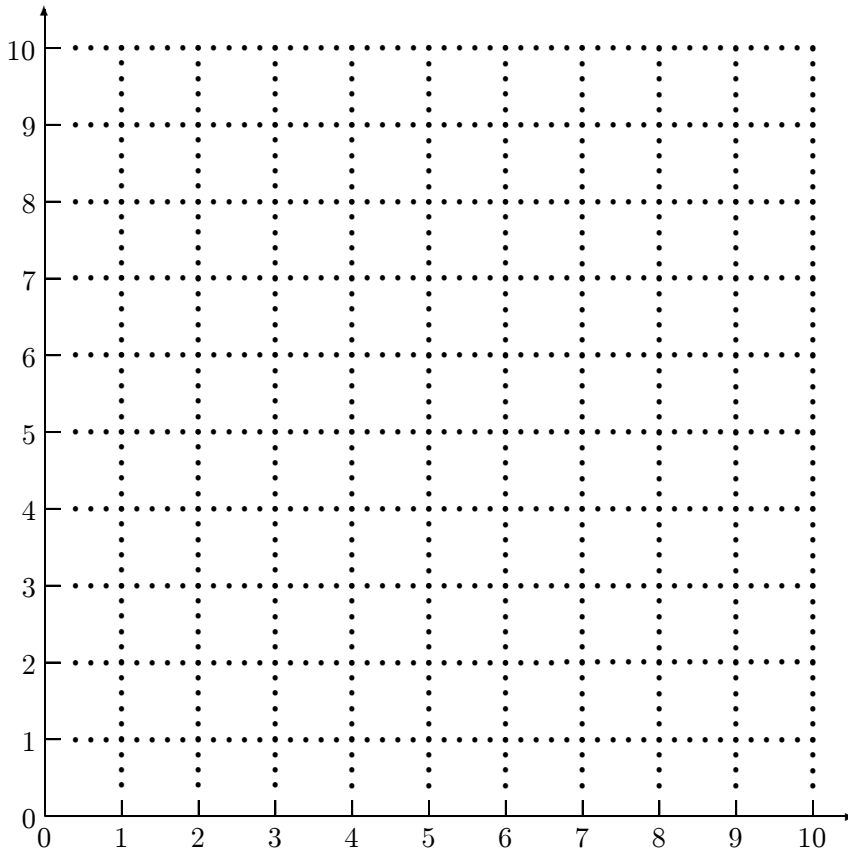
$$\begin{aligned}
 & \text{Max } \{2x_1 + 4x_2\} \\
 & \text{s.t.} \\
 & \quad 2x_1 + 5x_2 \leq 20 \\
 & \quad 7x_1 + 3x_2 \leq 21 \\
 & \quad 2x_1 + 2x_2 \geq 5 \\
 & \quad x_1, x_2 \geq 0
 \end{aligned}$$



x_1	x_2	z

17. How many vertices does the feasible region have?
a. 3 b. 4 c. 5 d. 6 e. none of the above
18. What is the maximal value of the objective function?
a. 15 b. 14.8 c. 16.00 d. 16.62 e. none of the above
19. What is the value of x_1 at maximum?
a. 0 b. 1.55 c. 3 d. 2.4 e. none of the above
20. What is the value of x_2 at maximum?
a. 1.4 b. 3.38 c. 0 d. 4 e. none of the above
21. What is the minimal value of the objective function?
a. 5 b. 6 c. 6.5 d. 8 e. none of the above
22. What is the value of x_1 at minimum?
a. 0 b. 1.55 c. 1.75 d. 2.5 e. none of the above
23. What is the value of x_2 at minimum?
a. 0 b. 0.75 c. 1.4 d. 2.5 e. none of the above

Now add to the problem a constraint $x_1 - x_2 \leq 1$. Resolve the problem, and answer the following questions.



x_1	x_2	z

24. How many vertices does the feasible region have?
 a. 3 b. 4 c. 5 d. 6 e. none of the above
25. What is the maximal value of the objective function?
 a. 15 b. 14.8 c. 16.00 d. 16.62 e. none of the above
26. What is the value of x_1 at maximum?
 a. 0 b. 1.55 c. 3 d. 2.4 e. none of the above
27. What is the value of x_2 at maximum?
 a. 1.4 b. 3.38 c. 0 d. 4 e. none of the above
28. What is the minimal value of the objective function?
 a. 5 b. 6 c. 6.5 d. 8 e. none of the above
29. What is the value of x_1 at minimum?
 a. 0 b. 1.55 c. 1.75 d. 2.5 e. none of the above
30. What is the value of x_2 at minimum?
 a. 0 b. 0.75 c. 1.4 d. 2.5 e. none of the above

Apply exponential smoothing with trend using $\alpha = 0.2$ and $\beta = 0.3$ and answer the following questions.

t	x_t
1	30
2	32
3	26
4	27
5	25
6	23

31. What is the initial trend?
a. -1.4 b. -1.6 c. -2.0 d. -2.6 e. none of the above
32. What is the final trend?
a. -1.4 b. -1.6 c. -2.0 d. -2.6 e. none of the above
33. What is the smoothed value for the sixth period?
a. 20.0 b. 22.2 c. 23.0 d. 23.6 e. none of the above
34. What is the forecast for period 7?
a. 20.6 b. 22.0 c. 22.3 d. 23.6 e. none of the above
35. What is the forecast for period 8?
a. 20.4 b. 22.0 c. 22.2 d. 19.0 e. none of the above

The Excel output on the next page is based on a linear programming problem of maximizing the profit from selling various sandwiches using a limited numbers of buns, patties, etc. Refer to this table in answering the following Questions.

36. What is the total profit?
a. 300 b. 400 c. 680 d. 670 e. none of the above
37. What will be your profit if you raise the profit on a chicken sandwich by 20%?
a. 716 b. 670 c. 724 d. cannot be determined from the table e. none of the above
38. What will be your profit if you lower the profit on a double by 20%?
a. 580 b. 590 c. 670 d. cannot be determined from the table e. none of the above
39. You found out that 100 buns are not suitable for use and must be thrown away. What will be your profit?
a. 610 b. 680 c. 590 d. cannot be determined from the table e. none of the above
40. You found out that you have 100 more buns than you previously thought. What will be your profit?
a. 670 b. 730 c. 770 d. cannot be determined from the table e. none of the above

Target Cell (Max)

Cell	Name	Original Value	Final Value
\$F\$3	Profit	0	670

Adjustable Cells

Cell	Name	Original Value	Final Value
\$B\$2	Ham burgers	0	0
\$C\$2	Chicken	0	300
\$D\$2	Cheeseburgers	0	0
\$E\$2	Double	0	400

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
\$F\$4	Buns	700	\$F\$4<=\$G\$4	Binding	0
\$F\$5	Patties	800	\$F\$5<=\$G\$5	Not Binding	200
\$F\$6	Cheese	800	\$F\$6<=\$G\$6	Binding	0
\$F\$7	C.Patties	300	\$F\$7<=\$G\$7	Binding	0

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
\$B\$2	Ham burgers	0	0	0.6	0.3	0.2
\$C\$2	Chicken	300	0	0.9	1E+30	0.3
\$D\$2	Cheeseburgers	0	-0.1	0.7	0.1	1E+30
\$E\$2	Double	400	0	1	1E+30	0.2

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H.Side	Allowable Increase	Allowable Decrease
\$F\$4	Buns	700	0.6	700	200	0
\$F\$5	Patties	800	0	1000	1E+30	200
\$F\$6	Cheese	800	0.2	800	0	800
\$F\$7	C.Patties	300	0.3	300	0	200