

— Staple this sheet as a cover for your answer sheets —

Strayer University — Manassas Campus
Quantitative Methods — MAT540
— Fall 2005 —

Final Exam

This is a take-home (open text, open class-notes and open Student Guide) final exam. Read carefully the entire exam before attempting to solve any of the problems and then budget your time: do first what you know best. *Show and submit all your work to justify your answers*; wherever appropriate, identify the given data, the applicable formulae, substitutions and results. **Neither discussion of this test with anyone other than the instructor, nor the use of materials other than the text, class notes or the student guide is permitted.** Give proper credit to any source or shortcut you may use. If using computer software to perform calculations, provide sufficient trace for an unambiguous determination of method. By submitting the exam by the **deadline, Saturday, 12/17/05 11:00 AM**, at the Academic Office of Strayer University of the Manassas Campus or by e-mail, you affirm that you have abided by these rules:

.....
Student's full name

Good luck!

(And, may you need none at all!)

Pb.	Pts	Score	Instructor's Comment
1.	10		
2.	20		
3.	30		
4.	40		
Σ	100		

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Problem 1. (10 points)

The following table shows the amount of daily exercise (in hours) for employees of a company:

	< .50	.50–.75	.75–1.00	>1.00
Female	7	14	33	1
Male	4	22	23	4

Calculate the probability that:

- any one of the employees, regardless of gender, exercises > .75 hrs.
- any one of the employees is male.
- two of the employees (of undetermined gender) each exercise > .75 hrs.
- any one male and any one female employee each exercise > .75 hrs.
- an employees is male, provided that the employee exercises >.75 hrs.
- an employee is both male and exercises > .75 hrs.

Problem 2. (20 points)

The *AutoMotors, Inc.* must decide whether to manufacture a part or to purchase it from a supplier. The resulting profits depend upon the demand on the end product, as shown in the payoff table:

(in \$1,000's)	Low Demand	Medium Demand	High Demand
Decision Alternative	S1	S2	S3
Manufacture, D1	- 20	41	99
Purchase, D2	11	53	75

The probabilities for the different demands are: $P(S1) = 0.22$, $P(S2) = .37$ and $P(S3) = 0.41$.

- Determine the recommendation based on the optimistic, conservative and optimal regret approach. For the latter calculate and display the regret table.
- Use a decision tree and expected values (per decision) to recommend a decision.
- A market study of the potential demand is expected to report either a favorable (F) or an unfavorable (U) condition. The relevant conditional probabilities then are as follows:
 $P(F | S1) = 0.15$, $P(F | S2) = 0.40$, $P(F | S3) = 0.65$,
 $P(U | S1) = 0.85$, $P(U | S2) = 0.60$, $P(U | S3) = 0.35$.
 Calculate the probability that the market research report will be favorable.
- Describe *FF&F, Inc.*'s optimal strategy, using a decision tree diagram w/all above data.
- Calculate the expected value of the market research information.

Problem 3. (30 points)

The following table shows the quarterly revenue (in \$1,000's) from an office suite rental:

	2000	2001	2002	2003	2004
Q1	20.93	27.32	32.91	35.07	38.28
Q2	22.92	30.63	35.27	37.73	41.13
Q3	34.09	43.16	49.78	54.49	59.85
Q4	37.17	47.22	53.01	58.91	64.06

- Using 4-quarter moving averages, predict the Q1/2005 revenue.
- Using exponential smoothing, with $\alpha = 0.35$, predict the Q1/2005 revenue.
- Adjust the analysis from part b., using $\beta = 0.20$, and predict the Q1/2005 revenue.
- From the above data, determine the (unmodified) trend function, $T_t = b_0 + b_1t$.
- Determine first the seasonal factors, and then use them to adjust the trend function based forecasts for all four quarters of 2005.
- Using MAD, compare the above prediction methods for the Q1/2005 revenue.
- Calculate the correlation coefficient for the original data sequence, and state its meaning.
- Try using the seasonal indices from part e. to adjust the predictions in parts a.–c.

Problem 4. (40 points)

Consider the linear programming model where the objective function $Z = 9x + 5y$, with $x, y \geq 0$, is to be maximized, subject to the four constraints:

$$(1) x - 4y \leq 0, \quad (2) 7x + 4y \leq 280, \quad (3) 3x + 9y \leq 180, \quad (4) 3x + 8y \leq 240.$$

- Carefully construct the feasible region graphically and calculate the coordinates of all corners. Draw the axes to scale (use graph paper or a plotting software).
- Determine the optimal point and the value of Z at the optimal point.
- Determine the slack/surplus value in each of the constraint for your solution to part b.
- Determine the ranges within which the two coefficients in Z may vary without changing your result in part b.
- Change constraint (1) into $x - 3y \leq 0$ and (3) into $3x + 6y \leq 180$. Determine the effects on the feasible region, optimal point and the value of Z at the (new) optimal point.
- With the linear programming model changed in part e., restrict now x, y to be integers, and determine the optimal point(s), the value of Z and the slack/surplus for each constraint at the (new) optimal point(s).