

King Fahd University of Petroleum and Minerals  
Department of Mathematics  
**Math 105**  
**Final Exam**  
**213**  
**August 11, 2022**  
**Net Time Allowed: 180 Minutes**

**MASTER VERSION**

1. A person invested 20,000 SR, part at an interest rate of 6% annually and the remainder at 7% annually. The total interest at the end of 1 year was equivalent to an annual  $6\frac{3}{4}\%$  on the entire 20,000. How much was invested at 7%?

- (a) 15000 SR \_\_\_\_\_(correct)  
(b) 5000 SR  
(c) 14000 SR  
(d) 6000 SR  
(e) 18000 SR

2. The retailer wishes to make a profit of 20% on the selling price  $p$ , at what price  $p$  should the product be sold, if  $C$  is the cost of product

- (a)  $\frac{C}{0.8}$  SR \_\_\_\_\_(correct)  
(b)  $0.2C$  SR  
(c)  $0.8C$  SR  
(d)  $\frac{C}{0.2}$  SR  
(e)  $0.2 + C$  SR

3. A company produces alarm clocks. During the regular workweek, the labor cost for producing one clock is 2.00 SR. However, if a clock is produced on overtime, the labor cost is 3.00 SR. Management has decided to spend no more than a total of 25000 SR per week for labor. The company must produce 11,000 clocks this week. What is the minimum number of clocks that must be produced during the regular work week?

- (a) at least 8000 clocks \_\_\_\_\_(correct)
- (b) must be 6000 clocks
- (c) at most 9000 clocks
- (d) at least 7000 clocks
- (e) at most 8000 clocks

4. A T-shirt manufacturer produces  $N$  shirts at a total labor cost (in SR) of  $1.3N$  and a total material cost of  $0.4N$ . The fixed cost for the plant is 6500 SR. If each shirt sells for 3.50 SR. How many must be sold by the company to realize a profit?

- (a) at least 3612 shirts \_\_\_\_\_(correct)
- (b) at most 3612 shirts
- (c) must be 3611 shirts
- (d) at least 3611 shirts
- (e) at most 3611 shirts

5. Which of the following lines are perpendicular?

$$l_1 : 3x + y = 4$$

$$l_2 : x + 6y - 4 = 0$$

$$l_3 : 4x - y + 3 = 0$$

$$l_4 : x - 3y + 1 = 0$$

(a)  $l_1$  and  $l_4$  \_\_\_\_\_(correct)

(b)  $l_1$  and  $l_3$

(c)  $l_2$  and  $l_4$

(d)  $l_3$  and  $l_4$

(e)  $l_1$  and  $l_2$

6. A straight line passes through  $(1, 2)$  and  $(-3, 8)$ . Find the point on it that has an  $x$ -coordinate of 5.

(a)  $(5, -4)$  \_\_\_\_\_(correct)

(b)  $(-4, 5)$

(c)  $(5, 8)$

(d)  $(5, -8)$

(e)  $(5, 2)$

7. A manufacturer sells a product at 8 SR per unit, selling all that is produced. Fixed cost is 5000 SR and a variable cost per unit is  $\frac{22}{9}$  (Saudi Riyals). Find the total revenue (in SR) at the break-even point.

- (a) 7200 \_\_\_\_\_(correct)  
(b) 900  
(c) 5000  
(d) 7000  
(e) 8200

8. The reduced row echelon form of  $\begin{bmatrix} 2 & 3 & -1 \\ 2 & 1 & 5 \\ 1 & 1 & 1 \end{bmatrix}$  is

- (a)  $\begin{bmatrix} 1 & 0 & 4 \\ 0 & 1 & -3 \\ 0 & 0 & 0 \end{bmatrix}$  \_\_\_\_\_(correct)  
(b)  $\begin{bmatrix} 1 & 1 & 4 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$   
(c)  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$   
(d)  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$   
(e)  $\begin{bmatrix} 1 & 0 & -3 \\ 0 & 1 & 4 \\ 0 & 0 & 0 \end{bmatrix}$

9. Consider the following Linear Programming Problem,  
 Minimize  $C = 8x + 6y$   
 subject to the constraints

$$\begin{cases} 3x + 2y \geq 160 \\ 5x + 2y \geq 200 \\ x + 2y \geq 80 \\ x, y \geq 0 \end{cases}$$

The values of  $x$  and  $y$  that minimize  $C$  and its minimum value are

- (a)  $x = 40, y = 20, C = 440$  \_\_\_\_\_(correct)  
 (b)  $x = 20, y = 40, C = 400$   
 (c)  $x = 10, y = 40, C = 320$   
 (d)  $x = 40, y = 10, C = 380$   
 (e)  $x = 30, y = 15, C = 330$

10. Consider the following linear Programming Problem

$$\text{Maximize } Z = x_1 - 12x_2 + 4x_3$$

subject to

$$4x_1 + 3x_2 - x_3 \leq 1$$

$$x_1 + x_2 - x_3 \geq -2$$

$$-x_1 + x_2 + x_3 \geq -1$$

$$x_1, x_2, x_3 \geq 0$$

If values of  $x_1 = A, x_2 = B$  and  $x_3 = C$  that maximize  $Z$  then  $A + B + C =$

- (a) 4 \_\_\_\_\_(correct)  
 (b) 5  
 (c) 6  
 (d) 7  
 (e) 3

11. Consider the following linear programming problem

$$\text{Maximize } W = 28y_1 + 2y_2 + 16y_3$$

subject to

$$y_1 + 2y_2 - 3y_3 \leq 2$$

$$4y_1 - y_2 + 8y_3 \leq 2$$

$$y_1, y_2, y_3 \geq 0$$

the values of  $y_1, y_2, y_3$  that maximize  $W$  and its maximum value are

- (a)  $y_1 = \frac{2}{3}, y_2 = \frac{2}{3}, y_3 = 0$ , and  $W = 20$  \_\_\_\_\_(correct)
- (b)  $y_1 = 0, y_2 = 0, y_3 = 20$ , and  $W = 20$
- (c)  $y_1 = \frac{2}{3}, y_2 = 0, y_3 = 0$ , and  $W = 20$
- (d)  $y_1 = 0, y_2 = 4, y_3 = 6$ , and  $W = 20$
- (e)  $y_1 = 4, y_2 = 6, y_3 = 0$ , and  $W = 20$

12. As a hedge against inflation, an investor purchased a 1972 Gran Torino in 1990 for \$100,000. It was sold in 2000 for \$300,000. At what effective rate did the car appreciate in value?

- (a) 11.61% \_\_\_\_\_(correct)
- (b) 10.61%
- (c) 12.61%
- (d) 09.61%
- (e) -11.61%

13. If the rate of inflation for certain goods is  $7\frac{1}{4}\%$  compounded daily. Considered as 365 regular days, approximately how many years will it take for the average price of such goods to double?

- (a) 9.56 years \_\_\_\_\_(correct)
- (b) 8.56 years
- (c) 10.56 years
- (d) 11.56 years
- (e) 7.56 years

14. A 7% compounded quarterly is equivalent to

- (a) 6.94% compounded continuously. \_\_\_\_\_(correct)
- (b) 6.98% compounded continuously.
- (c) 7.04% compounded continuously.
- (d) 7.1% compounded continuously.
- (e) 7.14% compounded continuously.

15. At the beginning of each quarter, 150 SR is deposited into a savings account that pays 6% compounded quarterly. In an other account 100 SR is deposited on the 6% compounded quarterly. Find the total balance in the accounts at the end of three years.

- (a) 2105 SR \_\_\_\_\_(correct)  
(b) 2205 SR  
(c) 2005 SR  
(d) 1905 SR  
(e) 2305 SR

16. A lecture hall has five doors. In how many ways can a student enter the hall by one door and exit by a different door?

- (a) 20 \_\_\_\_\_(correct)  
(b) 25  
(c) 125  
(d) 50  
(e) 120

17. In a mathematics class with 12 students, the instructor wants homework problems 1,3,5 and 7 put on the board by four different students. In how many ways can the instructor assign the problems?

- (a) 11880 \_\_\_\_\_(correct)  
(b) 495  
(c) 18180  
(d) 945  
(e) 11088

18. A sports team plays 11 games. In how many ways can the outcomes of the games result in four wins, five losses and two ties.

- (a) 6930 \_\_\_\_\_(correct)  
(b) 9630  
(c) 6903  
(d) 9603  
(e) 6390

19. The director of research and development for a company has nine scientists who are equally qualified to work on projects  $A$ ,  $B$ , and  $C$ . In how many ways can the director assign three scientists to each project?

(a) 1680 \_\_\_\_\_(correct)

(b) 504

(c) 84

(d) 120

(e) 20

20. A student answers each questions on a 10-question true-false examination in a random fashion. If each question is worth 10 points. What is the probability that the student scores 90 or more points

(a) 0.0107 \_\_\_\_\_(correct)

(b) 0.11

(c) 0.001

(d) 0.011

(e) 0.00107

21. Box 1 contains three red and two white balls. Box 2 contains two red and two white balls. A box is chosen at random and then a ball is chosen at random from it. What is the probability that the ball is white?

(a) 0.45 \_\_\_\_\_(correct)

(b) 0.2

(c) 0.55

(d) 0.8

(e) 0.54

22. A fair die is rolled two times in succession, find the probability of getting a total greater than 7, given that the first roll is greater than 3.

(a)  $\frac{2}{3}$  \_\_\_\_\_(correct)

(b)  $\frac{1}{3}$

(c)  $\frac{3}{7}$

(d)  $\frac{1}{4}$

(e)  $\frac{3}{4}$

23. A fair die is rolled seven times find the probability of getting a number less than 4 each time.

(a)  $\frac{1}{128}$  \_\_\_\_\_(correct)

(b)  $\frac{28}{128}$

(c)  $\frac{21}{128}$

(d)  $\frac{128}{28}$

(e)  $\frac{128}{21}$

24. A charitable organization is having a raffle for a single prize of 5000 SR. Each raffle ticket costs 2 SR and 8000 tickets have been sold. Find the expected gain for the purchaser to two tickets.

(a)  $-2.75$  SR (a loss) \_\_\_\_\_(correct)

(b)  $2.75$  SR (a profit)

(c)  $-3.75$  SR (a loss)

(d)  $3.75$  SR (a profit)

(e)  $-0.75$  SR (a loss)

25. Each question in a six-question multiple choice quiz has four choices, only one of which is correct. If a student guesses at all six questions, find the probability that exactly three will be correct.

- (a) 0.132 \_\_\_\_\_(correct)  
(b) 0.312  
(c) 0.123  
(d) 0.231  
(e) 0.213

26. From an ordinary deck of 52 playing cards, 7 cards are randomly drawn in succession with replacement. Find the probability that there are at least four hearts.

- (a) 0.071 \_\_\_\_\_(correct)  
(b) 0.107  
(c) 0.017  
(d) 0.701  
(e) 0.0071

27. The weekly salaries of 10,000 employees of a large corporation are assumed to be normally distributed with mean 640 SR and standard deviation 56 SR. How many employees earn less 570 SR per week?

Standard Normal Cumulative Probability Values are given as:

$$P(Z < -1) = 0.1587, \quad P(Z < -1.25) = 0.1056, \quad P(Z < -1.5) = 0.0668,$$

$$P(Z < -2) = 0.0228, \quad P(Z < 1.25) = 0.8944, \quad P(Z < 1.5) = 0.9332,$$

- (a) 1056 \_\_\_\_\_(correct)
- (b) 1587
- (c) 8944
- (d) 9332
- (e) 1506

28. Find an estimate of the standard deviation of the following data for the marks obtained in a test by students

Range	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	6	16	24	25	17

- (a) 11.78 \_\_\_\_\_(correct)
- (b) 11.99
- (c) 17.18
- (d) 18.17
- (e) 17.81