King Fahd University of Petroleum and Minerals
Department of Mathematics

Math 105
Final Exam
242
15 May 2025

EXAM COVER

Number of versions: 8
Number of questions: 20

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Net Time Allowed: 120 Minutes

MASTER VERSION

1. Suppose consumers will purchase q units of a product at a price of $\frac{200}{q}+3$ dollars per unit. The minimum number of units that must be sold in order that sales revenue be greater than \$9000 is

   (a) 2934 _____ (correct)

   (b) 2944

   (c) 2932

   (d) 2935

   (e) 2943

2. In testing an experimental diet for hens, it was determined that the average live weight w (in grams) of a hen was statistically a linear function of the number of days d after the diet began, where $0 \leq d \leq 50$. Suppose the average weight of a hen beginning the diet was 40 grams and 25 days later it was 675 grams. Then the average weight of a hen when $d = 10$ is

   (a) 294 grams _____ (correct)

   (b) 304 grams

   (c) 305 grams

   (d) 295 grams

   (e) 425 grams

3. If the solution of the system $\begin{cases} x+y+z=-1 \\ 3x+y+z=1 \\ 4x-2y+2z=0 \end{cases}$ is (a,b,c). Then $a+b+c=$

(a) -1 _____(correct)

(b) -3

(c) 2

(d) -2

(e) 0

4. Using the simplex method:
Minimize

$$Z = 2x_1 + 2x_2$$

Subject to

$$\begin{aligned} x_1 + 4x_2 &\geq 28 \\ 2x_1 - x_2 &\geq 2 \\ -3x_1 + 8x_2 &\geq 16 \\ x_1, x_2 &\geq 0 \end{aligned}$$

If the answer is: $Z = a$ where $x_1 = b$, $x_2 = c$, then $a+b+c=$

(a) 30 _____(correct)

(b) 20

(c) 10

(d) 6

(e) 4

5. A Canadian postal code consists of a string of four characters, of which two are letters and two are digits, which begins with a letter and for which each letter is followed be a (single) digit. The percentage of Canadian postal codes that begin with B3H is

   (a) 0.015% _____ (correct)

   (b) 15%

   (c) 0.17%

   (d) 0.038%

   (e) 38%

6. Suppose that $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ is the sample space for an experiment with events $E = \{1, 3, 5\}$ $F = \{3, 5, 7, 9\}$ $G = \{2, 4, 6\}$, then $(E \cup G) \cap F' = ...$

   (a) $\{1, 2, 4, 6\}$ _____ (correct)

   (b) $\{3, 5\}$

   (c) $\{1, 2, 4, 6, 8, 9\}$

   (d) $\{1, 4, 6, 9\}$

   (e) $\{1, 2, 3, 4, 5, 6, 7, 9\}$

7. If $P(E) = \frac{1}{3}$, $P(E \cup F) = \frac{1}{2}$, and $P(E \cap F) = \frac{1}{12}$, then $P(F) = ...$

(a) $\frac{1}{4}$ (correct)
(b) $\frac{1}{6}$
(c) $\frac{1}{24}$
(d) $\frac{1}{3}$
(e) $\frac{1}{12}$

8. Given $P(E) = 0.6$. Then the odds that E will occur is

(a) $6 : 4$ (correct)
(b) $6 : 10$
(c) $4 : 10$
(d) $4 : 14$
(e) $6 : 2$

9. A tall hat contains two yellow and three red rabbits. If two rabbits are randomly pulled from the hat without replacement, then the probability that the second rabbit pulled is yellow, given that the first rabbit pulled is red is

(a) $\frac{1}{2}$ (correct)
(b) $\frac{3}{5}$
(c) $\frac{4}{5}$
(d) $\frac{6}{25}$
(e) $\frac{3}{4}$

10. If events E and F are independent with $P(E'|F') = \frac{1}{4}$, then $P(E)$ is

(a) $\frac{3}{4}$ (correct)
(b) $\frac{1}{4}$
(c) $\frac{1}{2}$
(d) $\frac{1}{16}$
(e) $\frac{3}{16}$

11. The effective rate of interest (rounded to four decimal places) that is equivalent to a nominal rate of 8% compounded semiannually is

    (a) 0.0816 _____(correct)

    (b) 0.2813

    (c) 0.0216

    (d) 0.1821

    (e) 0.0426

12. Given an interest rate of 4% compounded annually, then the present value of a generalized annuity of \$100, due at the end of each year for two years, and \$200, due thereafter at the end of each year for three years is

    (a) 701.755 _____(correct)

    (b) 712.385

    (c) 601.755

    (d) 612.755

    (e) 722.725

13. Let $p = \sqrt{q+10}$ be the supply equation for a manufacturer's product, and suppose the demand equation is $p = 20 - q$. Then the equilibrium point is

(a) $(15, 5)$ _____ (correct)

(b) $(15, 7)$

(c) $(26, 7)$

(d) $(26, 4)$

(e) $(14, 6)$

14. If (a, b, c) is the solution of the linear system $\begin{cases} x - y - 3z = -5 \\ 2x - y - 4z = -8 \\ x + y - z = -1 \end{cases}$

Then $a + b + c = ...$

(a) -1 _____ (correct)

(b) 2

(c) 1

(d) -2

(e) 0

15. A basket contains ten balls, each of which shows a number. Two balls show a 1, three balls show a 2, and five balls show a 3. A ball is randomly selected and the number that shows X is observed, then $E(X) = ...$

(a) 2.3 (correct)

(b) 2.4

(c) 3.3

(d) 3.4

(e) 5.3

16. A fair coin is tossed six times, then the probability of getting at least two heads is

(a) $\frac{57}{64}$ (correct)

(b) $\frac{58}{64}$

(c) $\frac{56}{64}$

(d) $\frac{59}{64}$

(e) $\frac{54}{64}$

17. The random variable X has the following distribution

X	$P(X = x)$
2	
4	0.3
6	0.1
7	0.2

Then $\sigma^2 = ...$

(a) 3.8 _____ (correct)

(b) 3.4

(c) 3.2

(d) 3.9

(e) 4

18. The probability that a certain baseball player gets a hit is 0.4, then the probability that if he goes to bat five times, he will get at least one hit is

(a) 0.9222 _____ (correct)

(b) 0.7139

(c) 0.8721

(d) 0.9519

(e) 0.8000

19. The yearly income for a group of $10,000$ professional people is normally distributed with $\mu = \$60,000$ and $\sigma = \$5000$, how many of these people have a yearly income over $\$70,000$? (where $A(2) = 0.4772$, $A(2.2) = 0.4861$, $A(3) = 0.4987$)

(a) 228 _____(correct)

(b) 328

(c) 258

(d) 218

(e) 388

20. Maximize the objective function

$$p = 2x + 4y$$

Subject to the constraints

$$\begin{aligned} 2x + y &\leq 8 \\ 2x + 3y &\leq 12 \\ x &\geq 0 \\ y &\geq 0 \end{aligned}$$

(a) 16 _____(correct)

(b) 14

(c) 17

(d) 8

(e) 20