

MATH 106 FINAL EXAMINATION

This is an open-book exam. You may refer to your text and other course materials as you work on the exam, and you may use a calculator. **You must complete the exam individually. Neither collaboration nor consultation with others is allowed.**

Record your answers and work on the separate answer sheet provided.

There are 25 problems.

Problems #1–12 are Multiple Choice.

Problems #13–15 are Short Answer. (Work not required to be shown)

Problems #16–25 are Short Answer with work required to be shown.

MULTIPLE CHOICE

1. Hal purchases a car for \$21,000, makes a down payment of 20%, and finances the rest with a 4-year car loan at an annual interest rate of 4.2% compounded monthly. What is the amount of his monthly loan payment?

1. _____

- A. \$380.83
- B. \$408.80
- C. \$476.04
- D. \$511.00

2. Find the result of performing the row operation $5R_1 + R_2 \rightarrow R_2$

2. _____

$$\left[\begin{array}{ccc|c} 1 & 2 & 0 & -1 \\ -5 & -3 & 9 & 1 \\ 5 & -1 & -2 & 7 \end{array} \right]$$

A. $\left[\begin{array}{ccc|c} 1 & 2 & 0 & -1 \\ 0 & -4 & 7 & 8 \\ 5 & -1 & -2 & 7 \end{array} \right]$

B. $\left[\begin{array}{ccc|c} 1 & 2 & 0 & -1 \\ 0 & 7 & 9 & -4 \\ 5 & -1 & -2 & 7 \end{array} \right]$

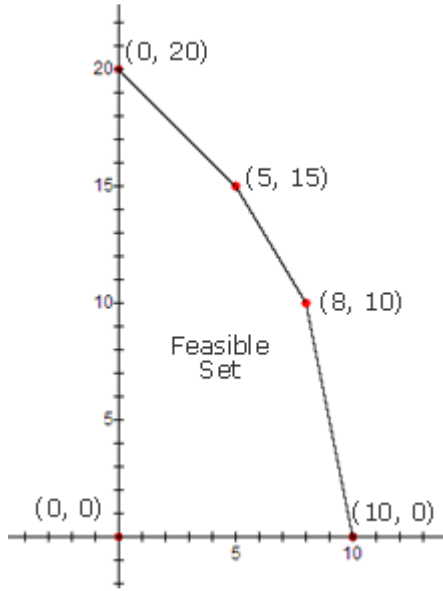
C. $\left[\begin{array}{ccc|c} 1 & 2 & 0 & -1 \\ 0 & -3 & 9 & 1 \\ 5 & -1 & -2 & 7 \end{array} \right]$

D. $\left[\begin{array}{ccc|c} 1 & 2 & 0 & -1 \\ -5 & -3 & 9 & 1 \\ 0 & -11 & -2 & 12 \end{array} \right]$

3. Find the values of x and y that maximize the objective function $7x + 2y$ for the feasible region shown below.

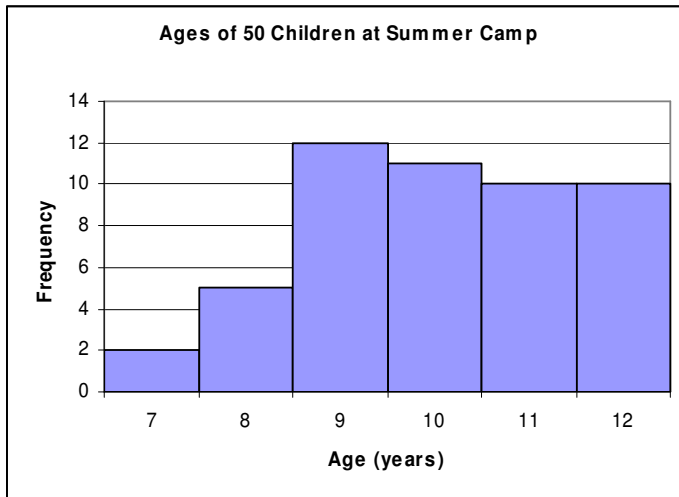
3. _____

- A. $(x, y) = (0, 20)$
- B. $(x, y) = (5, 15)$
- C. $(x, y) = (8, 10)$
- D. $(x, y) = (10, 0)$



4. The histogram and frequency distribution below show the distribution of ages of 50 children at a summer camp.

4. _____



Age	Number of occurrences
7	2
8	5
9	12
10	11
11	10
12	10

Find the relative frequency associated with age 11.

- A. 0.10
- B. 0.20
- C. 0.22
- D. 10.00

5. Determine which shaded region corresponds to the solution region of the system of linear inequalities

$$x + 4y \geq 4$$

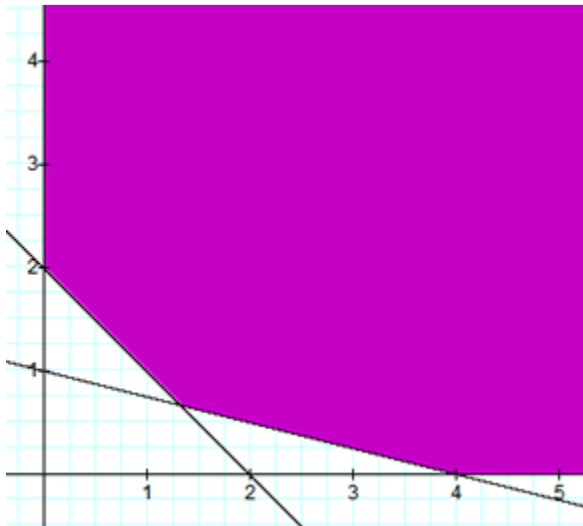
$$x + y \geq 2$$

$$x \geq 0$$

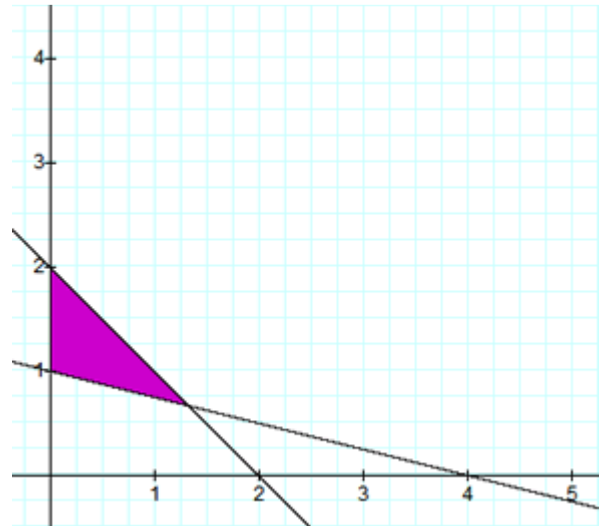
$$y \geq 0$$

5. _____

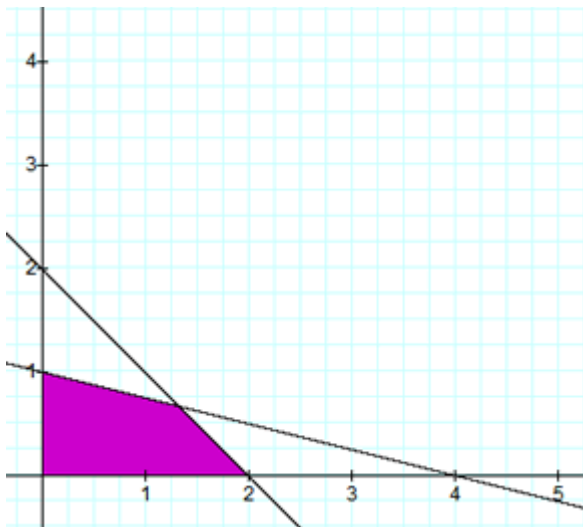
GRAPH A.



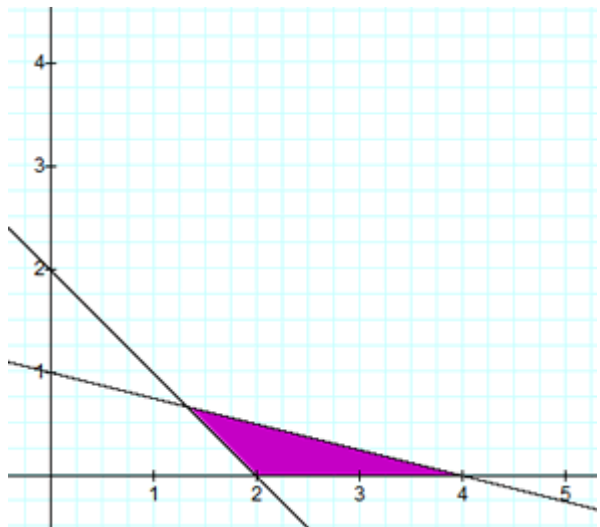
GRAPH B.



GRAPH C.



GRAPH D.



For #6 and #7:

A merchant makes two raisin nut mixtures.

Each box of mixture A contains 12 ounces of peanuts and 5 ounces of raisins, and sells for \$4.20.

Each box of mixture B contains 9 ounces of peanuts and 2 ounces of raisins, and sells for \$2.80.

The company has available 3,600 ounces of peanuts and 1,000 ounces of raisins. The merchant will try to sell the amount of each mixture that maximizes income.

Let x be the number of boxes of mixture A and let y be the number of boxes of mixture B.

6. State the objective function.

6. _____

- A. $3,600x + 1,000y$
- B. $4.2x + 2.8y$
- C. $12x + 9y$
- D. $21x + 7y$

7. Since the merchant has 3,600 ounces of peanuts available, one inequality that must be satisfied is:

7. _____

- A. $9x + 12y \geq 3,600$
- B. $12x + 9y \geq 3,600$
- C. $12x + 9y \leq 3,600$
- D. $4.2x + 2.8y \leq 3,600$

8. A jar contains 6 red jelly beans, 9 yellow jelly beans, and 21 orange jelly beans.

Suppose that each jelly bean has an equal chance of being picked from the jar.

If a jelly bean is selected at random from the jar, what is the probability that it is **not yellow**?

8. _____

- A. $\frac{1}{4}$
- B. $\frac{2}{3}$
- C. $\frac{3}{4}$
- D. $\frac{8}{9}$

9. When solving a system of linear equations with the unknowns x_1 , x_2 , and x_3 , the following reduced augmented matrix was obtained.

9. _____

$$\left[\begin{array}{ccc|c} 1 & 0 & -8 & 4 \\ 0 & 1 & 3 & 5 \\ 0 & 0 & 0 & 0 \end{array} \right] \text{ What can be concluded about the solution of the system?}$$

- A. The number of solutions cannot be determined.
- B. There are no solutions.
- C. There is exactly one solution.
- D. There are infinitely many solutions.

10. Which of the following is **NOT** true?

10. _____

- A. If events E and F are independent events, then $P(E \cap F) = 0$.
- B. A probability must be less than or equal to 1.
- C. If only two outcomes are possible for an experiment, then the sum of the probabilities of the outcomes is equal to 1.
- D. If an event cannot possibly occur, then the probability of the event is 0.

11. In a certain manufacturing process, the probability of a type I defect is 0.08, the probability of a type II defect is 0.13, and the probability of having both types of defects is 0.06. Find the probability that neither defect occurs.

11. _____

- A. 0.94
- B. 0.85
- C. 0.79
- D. 0.73

12. Which of the following statements is **NOT** true?

12. _____

- A. The variance is a measure of the dispersion or spread of a distribution about its mean.
- B. The standard deviation is the square root of the variance.
- C. If all of the data values in a data set are identical, then the standard deviation is 0.
- D. The variance can be a negative number.

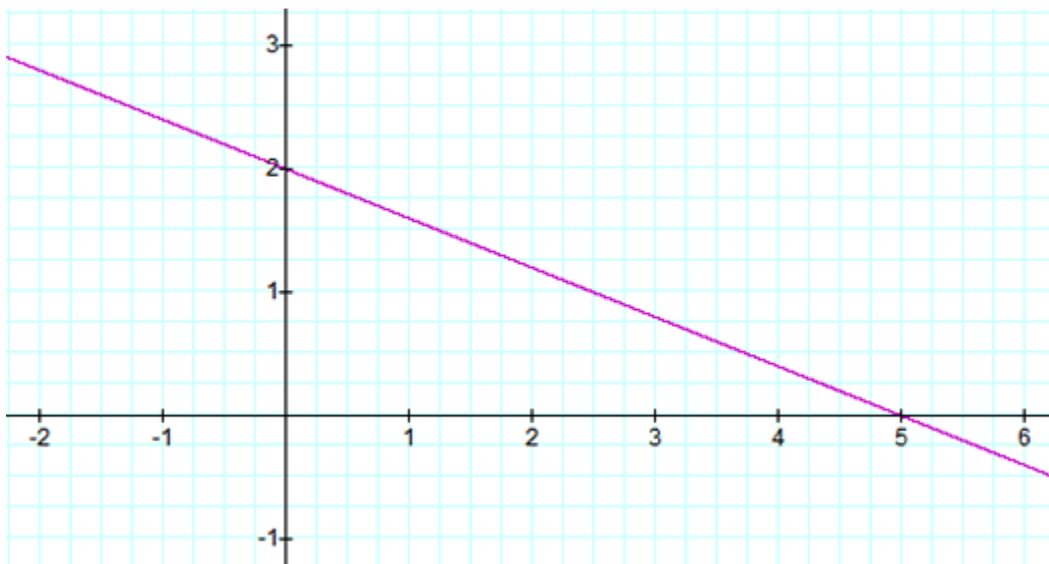
SHORT ANSWER:

13. Let the universal set $U = \{1, 2, 3, 4, 5, 6, 7\}$. Let $A = \{2, 3, 5\}$ and $B = \{4, 5, 7\}$.

Determine the set $A \cap B'$.
(Be sure to notice the complement symbol applied to B)

Answer: _____

14. Consider the following graph of a line.



(a) State the x -intercept.

Answer: _____

(b) State the y -intercept.

Answer: _____

(c) Determine the slope.

Answer: _____

(d) Find the standard form of the line, $Ax + By = C$

Answer: _____

(e) Find the slope-intercept form of the equation of the line. Answer: _____

15. A student organization surveyed their members about their enrollment status. 350 members responded to the question “Are you a part-time student or a full-time student?” and the following table was compiled.

	Male	Female	Totals
Part-time	110	140	250
Full-time	30	70	100
Totals	140	210	350

(Report your answers as fractions or as decimal values rounded to the nearest hundredth.)

Find the probability that a randomly selected survey respondent is:

- (a) a female part-time student. Answer: _____
- (b) a female or a part-time student. Answer: _____
- (c) part-time, given that the respondent is a female student. Answer: _____

SHORT ANSWER, with work required to be shown, as indicated.

16. For a seven year period, Mike deposited \$600 each quarter into an account paying 4.8% annual interest compounded quarterly. (Round your answers to the nearest cent.)

- (a) How much money was in the account at the end of 7 years? **Show work.**
- (b) How much interest was earned during the 7 year period? **Show work.**

Mike then made no more deposits or withdrawals, and the money in the account continued to earn 4.8% annual interest compounded quarterly, for 3 more years.

- (c) How much money was in the account after the 3 year period? **Show work.**
- (d) How much interest was earned during the 3 year period? **Show work.**

17. Three flags are arranged vertically on a flagpole, with one flag at the top, one flag in the middle, and one flag at the bottom. To create the flagpole arrangement, 16 flags are available, each flag a different color. How many different flagpole arrangements of 3 flags are possible?

18. A group meeting is attended by 15 delegates.

(a) In how many ways can the group choose 6 delegates to form a negotiation panel? **Show work.**

(b) 10 of the delegates are from Atlantis and 5 of the delegates are from Zedonia. In how many ways can the group choose 6 delegates to form the negotiation panel, if 3 delegates must be from Atlantis and 3 delegates must be from Zedonia? **Show work.**

(c) If a 6-person negotiation panel is selected at random from the 15 delegates, what is the probability the negotiation panel consists of 3 delegates from Atlantis and 3 delegates from Zedonia? **Show work.**

19. In 1972, there were 3.4 trillion cigarettes purchased worldwide, and in 1988, there were 4.6 trillion cigarettes purchased worldwide. Let y be the number of cigarettes purchased worldwide (in trillions) in the year x , where $x = 0$ represents the year 1972.

(a) Which of the following linear equations could be used to predict the number of trillions of cigarettes y purchased worldwide in a given year x , where $x = 0$ represents the year 1972?

Explain/show work.

- A. $y = 0.075x + 3.4$
- B. $y = 1.2x - 14.6$
- C. $y = 1.2x + 3.4$
- D. $y = 3.4x + 4.6$

(b) Use the equation from part (a) to estimate the number of cigarettes purchased worldwide in the year 2004. **Show work.**

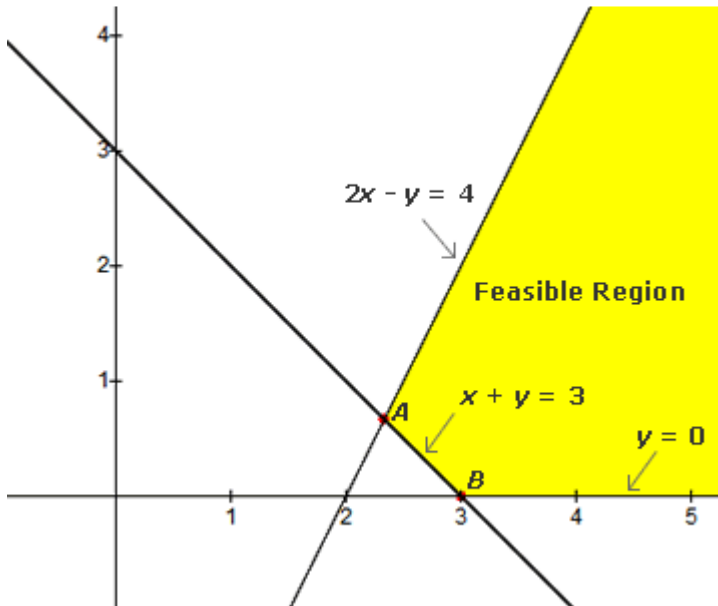
(c) Fill in the blanks to interpret the slope of the equation: The rate of change of cigarettes purchased worldwide with respect to time is _____ per _____. (Include units of measurement.)

20. Solve the system of equations using elimination by addition or by augmented matrix methods (your choice). **Show work.**

$$x + 4y = 7$$

$$3x + 14y = 15$$

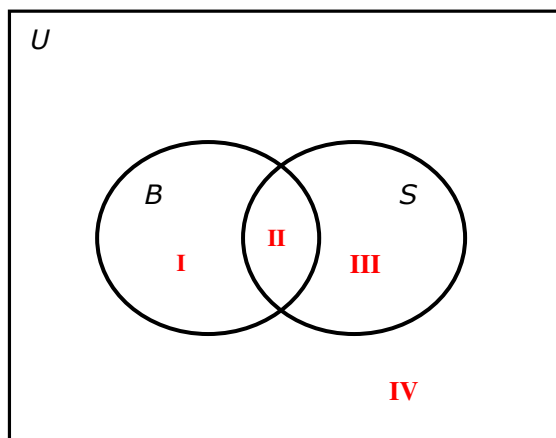
21. The feasible region shown below is bounded by lines $2x - y = 4$, $x + y = 3$, and $y = 0$. Find the coordinates of corner point A. **Show work.**



22. A survey of 150 adults in Metropolis found the following: 60 of the adults regularly take the bus. 102 regularly take the subway. 130 regularly take the bus or the subway (or both).

(a) How many of the surveyed adults regularly take both the bus and the subway? **Show work.**

(b) Let $B = \{\text{bus riders}\}$ and $S = \{\text{subway riders}\}$. Determine the number of surveyed adults belonging to each of the regions I, II, III, IV.



23. Consider the sample data 77, 38, 62, 43, 77, 45, 64.

(a) State the mode.

(b) Find the median. **Show work/explanation.**

(c) State the mean.

(d) The sample standard deviation is 16.2. What percentage of the data fall within one standard deviation of the mean? **Show work/explanation.**

(d) _____

- A. 50%
 - B. 57%
 - C. 68%
 - D. 71%
-

24. If the probability distribution for the random variable X is given in the table, what is the expected value of X ? **Show work.**

x_i	-40	20	30	40
p_i	0.40	0.25	0.20	0.15

25. The probability that a voting-age adult in 2008 voted in the presidential election was .57. Five voting-age adults in 2008 were randomly selected. Find the probability that exactly 2 of the 5 adults voted in the presidential election. **Show work.**
