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 graphing calculator/spreadsheet software. **You must complete the exam individually. Neither collaboration nor consultation with others is allowed. Use of instructors' solutions manuals or online problem solving services in NOT 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. Amalgamated Furniture Company makes dining room tables and chairs. A table requires 8 labor-hours for assembling and 2 labor-hours for finishing. A chair requires 2 labor-hours for assembly and 1 labor-hour for finishing. The maximum labor-hours available per day for assembling and finishing are 400 and 120, respectively. Production costs are $600 per table and $150 per chair. Let *x* represent number of tables and *y* represent number of chairs made per day. Identify the daily production constraint for assembly:

1. _____

A. $8x + 2y \geq 400$ C. $8x + 2y \leq 400$

B. $2x + y \geq 120$ D. $2x + y \leq 120$

2. Shonda buys an Amalgamated dining room furniture set for $11,000, makes a down payment of 20%, and finances the rest with 60-month store financing at an annual interest rate of 5.1% compounded monthly. What is the amount of her monthly loan payment to amortize the loan?

2. _____

A. $166.47 C. $184.07

B. $165.26 D. $181.87

3. Which of the following statements is **TRUE**:

3. _____

A. If $x \in$ (is a member of) M *and* $x \in N$ then $x \in (M \cup N)$
B. If $x \in M$ *or* $x \in N$ then $x \in (M \cap N)$
C. If $x \in M$ *and* $x \in N$ then $x \in (M \cap N)$
D. None of the above statements are true.

4. Two balls are drawn in succession, without replacement, out of a box containing 2 red and 5 white balls. What is the probability that the first ball drawn is red and the second ball drawn is also red?

4. _____

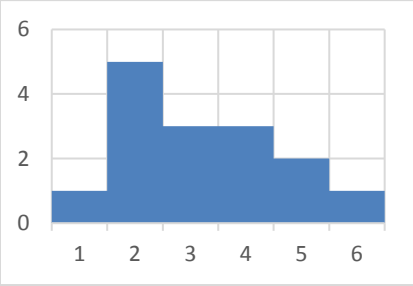
A. $\frac{1}{3}$ B. $\frac{5}{21}$ C. $\frac{10}{21}$ D. $\frac{1}{21}$

5. Which histogram below accurately reflects 15 survey responses presented in the following frequency table?

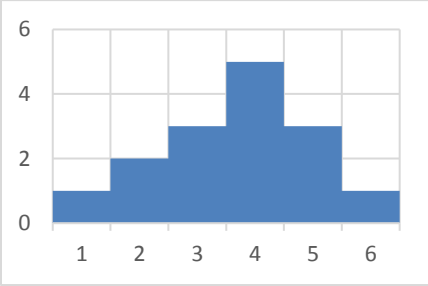
Value	Frequency
1	X
2	XXXXX
3	X
4	X
5	XXXXXX
6	X

5. _____

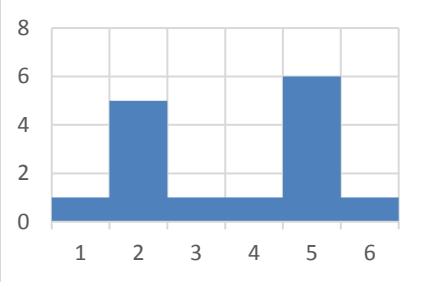
HISTOGRAM A



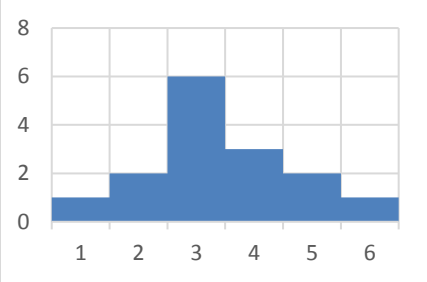
HISTOGRAM C



HISTOGRAM B



HISTOGRAM D

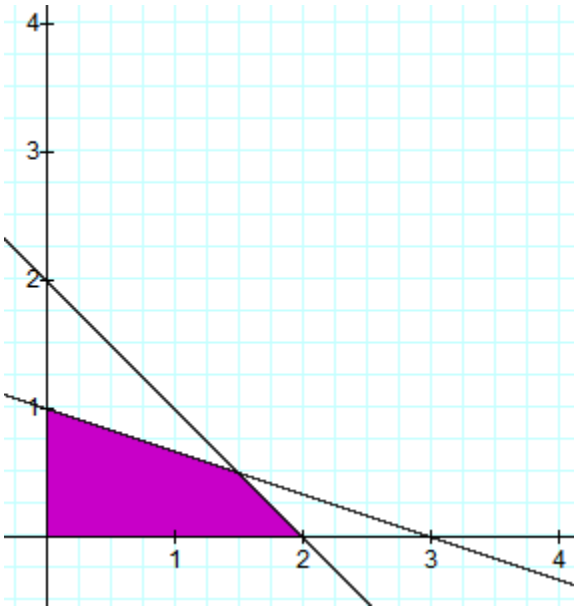


6. Determine which graph shows the correct solution region of the system of linear inequalities:

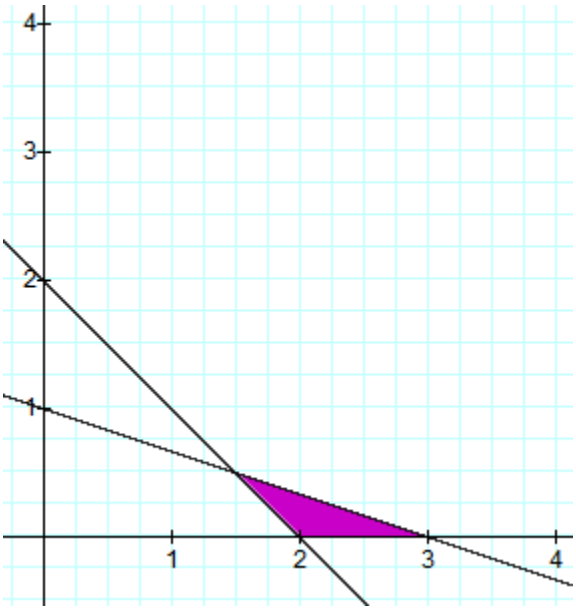
$$x + y \geq 2 \qquad x \geq 0$$
$$x + 3y \geq 3 \qquad y \geq 0$$

6. _____

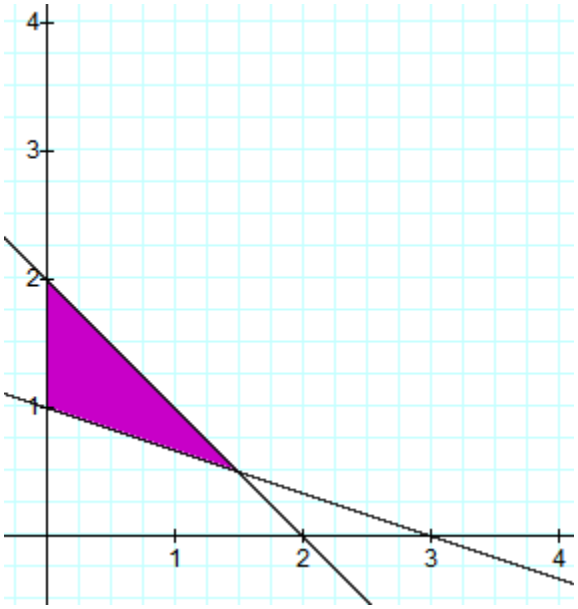
GRAPH A.



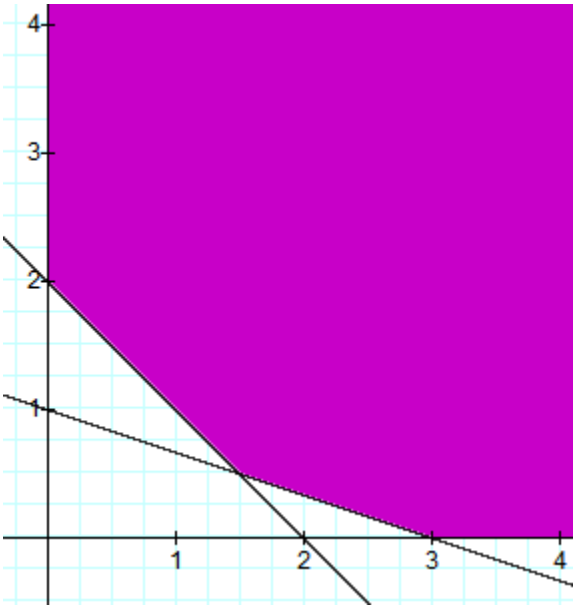
GRAPH B.



GRAPH C.



GRAPH D.



7. Find the equation of the line passing through (5, 2) and (– 2, 1): 7. _____

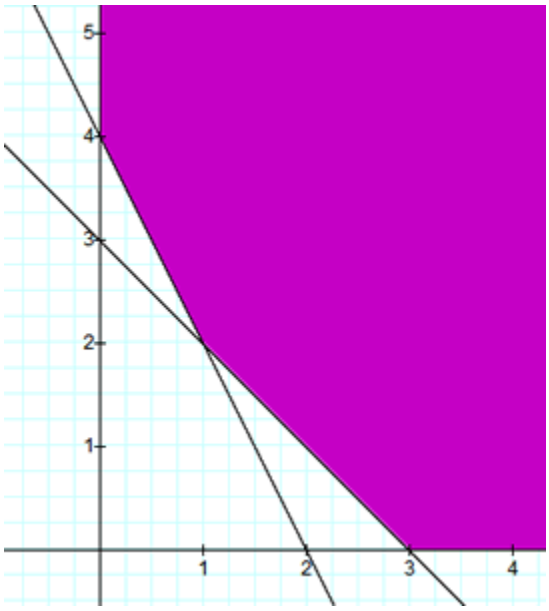
a. $x - y = 3$ b. $3x - 7y = 1$ c. $x - 7y = -9$ d. $x + y = 7$

8. The total amount of money you should deposit in an account paying 8% compounded quarterly in order to receive quarterly payments of $1000 for the next 4 years can be determined using formula for:

8. _____

A. Sequence of payments: present value of an annuity / amortization
B. Sequence of payments: future value of an ordinary annuity
C. Single-payment, compound interest
D. Single-payment, simple interest

9. Which of the corner points for the system of linear inequalities graphed below minimizes the objective function $P = 7x + 6y$?



9. _____

A. (3, 0)
B. (0, 4)
C. (2, 0)
D. (1, 2)

10. The mean time from check-in to completion for a customer service task at the Townsburg branch of the DMV is 112 minutes, with a standard deviation of 18 minutes. Assuming a normal distribution, what is the probability that a randomly chosen customer experiences service done in less than 94 minutes?

10. _____

A. 0.3413
B. 0.4772
C. 0.1587
D. 0.6826

11. Dwayne's Digital Doctors is a small business specializing in personal information technology (IT) device repair. The company has fixed costs of $618 a day and variable costs of $8.50 per IT device repaired. The company charges $60 per IT device repaired. How many IT devices must be brought in for repair each day for this company to break even? *Round answer to the nearest whole device.*

11. _____

A. 73
C. 11
B. 12
D. 7

12. Which of the following statements is **TRUE**? 12. _____

A. If all of the data values in a data set are identical, then the standard deviation is 0.
B. The standard deviation is the square of the variance.
C. The variance can be a negative number.
D. The variance is a measure of central tendency of a data distribution.

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SHORT ANSWER (work NOT required to be shown)

13. For the linear equation $-7x + 4y = 56$:

a. Determine the slope: _____

b. Determine y – intercept if it exists: _____

c. Express equation in *slope-intercept* form: _____

14. Let $n(A) = 92,\ n(B) = 107,\ n(A \cap B) = 67,$ and $n(U) = 140.$

a. Determine $n(B')$: _____

b. Determine $n(A \cup B)$: _____

c. Determine $n(A' \cap B')$: _____

15. The Gallup Organization recently conducted a "straw poll" of 1500 randomly-selected American voters to determine their current Presidential candidate preferences. Voters were also asked their age in years (18 to 39 or 40+). Following table was obtained.

Presidential Candidate Preferred	Voter Age 18 - 39	Voter Age 40 +	Total
Democrat	327	273	600
Independent	163	176	339
Libertarian	65	84	149
Republican	71	341	412
Total	626	874	1500

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

Find the probability that a randomly-selected American voter preferred:

(a) the Libertarian candidate and is age 40+ Answer: _____

(b) the Libertarian candidate or is age 40+ Answer: _____

(c) the Libertarian candidate given that voter is age 40+ Answer: _____

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

16. Seventeen people are summoned to jury duty. 11 are women and 6 are men.

(a) In how many ways can 12 jurists be randomly selected out of the 17 people? **Show work.**

(b) In how many ways can 12 jurists be chosen, if 7 must be women and 5 must be men? **Show work.**

(c) If 12 jurists are randomly selected from the 17 people, what is the probability that 5 are men and 7 are women? *Round answer to nearest ten-thousandth (4 places after decimal).* **Show work.**

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

$$7x + 5y = 4$$
$$5x - 2y = 14$$

18. Vijay wants to start a retirement account that will have $460,000 in it when he retires in 15 years. How much should he invest every six months in his account to do this if interest is 15% compounded semiannually? **Show work.**

A. $4,448.77
C. $4,790.74
B. $4,435.77
D. $17,612.13

19. According to Pricewaterhouse Coopers, "Global State of Information System Security 2015", there were 3.4 million "detected and reported information security incidents" (cyberattacks, etc.) against computer networks in the USA in 2009. In 2014, that number had risen to 42.8 million.

(a) Which of the following linear equations could be used to predict annual number (in millions) of detected and reported information security incidents "*y*" in a given year "*x*", where *x* = 0 represents the year 2009? **Explain/show work.**

$A.\ y = 7.88x + 2009$ $C.\ y = 0.13x + 2009$

$B.\ y = 7.88x + 3.4$ $D.\ y = 0.13x + 3.4$

(b) Use the equation from part (a) to predict the number (in millions) of detected and reported information security incidents in the year 2027. *Round answer to nearest tenth of a million.* **Show work.**

(c) Fill in the blanks to interpret the slope of the equation: The rate of change of detected and reported information security incidents against computer networks in the US with respect to time is _____ per _____. (Include units of measurement.)

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20. Amanda is selling an antique dining room furniture set through a broker. She wants to get $1300 for herself, but the broker gets 15% of the selling price as commission. What should the selling price be? **Show work.**

A. $1380.00 C. $1529.41

B. $1495.00 D. $1411.76

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21. There is a 0.89 probability that MATH 106 students will correctly follow all instructions on the Final Exam. What is the probability that exactly 89 of the 100 students taking MATH 106 in a particular term correctly follow all Final Exam instructions? *Round answer to the nearest ten thousandth (four places after decimal).* **Show work.**

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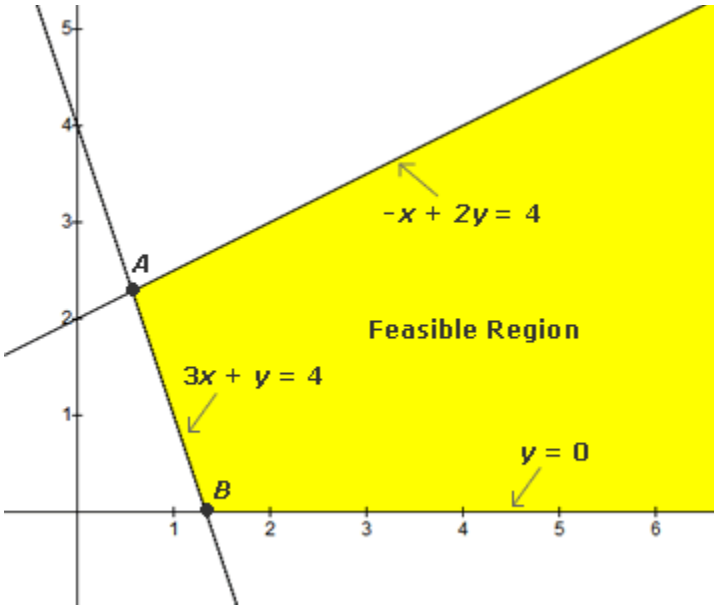
22. The feasible region shown below is bounded by lines $-x + 2y = 4$, $3x + y = 4$, and $y = 0$. Find the coordinates of corner point *A*. **Show work.**



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23. A network security specialist records the number of incoming e-mails containing links that six randomly-selected network users receive in a day. Numbers are 65, 71, 88, 100, 73, and 71.

(a) State the mode (if one exists).

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

(c) Determine the sample mean. **Show work**

(d) Using the sample mean found in part (c), and given that the sample standard deviation of the data set above is 13.24, what percentage of the data set falls within one standard deviation of the mean? **Show work/explanation.**

(d) _____

A. 34.2%
C. 68.3%
B. 66.7%
D. 83.3%

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24. A local car rental agency charted daily demand as shown in the following table:

Number of customers	6	8	10	12	14
Probability	0.15	0.20	0.25	0.30	0.10

Find the expected number of customers. **Show work.**

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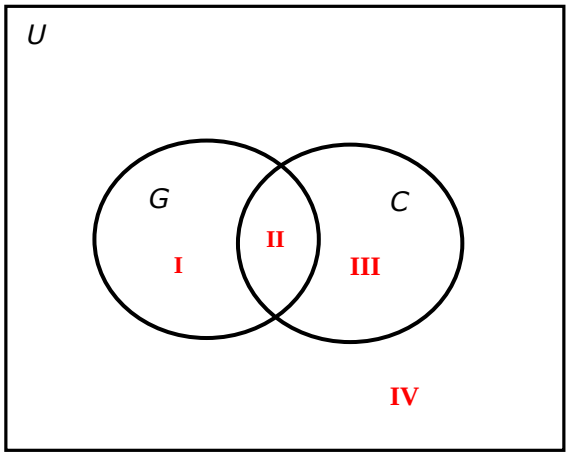
25. A marketing survey of 2000 randomly-selected convenience store customers found that 1415 of them bought a glazed donut yesterday. 1605 said they bought a frosted crème-filled donut yesterday. 180 customers said they bought neither yesterday.

(a) What is the probability that a single randomly-selected customer bought a glazed donut *or* a frosted crème-filled donut yesterday? **Show work.**

(b) Let G = {customers who bought a glazed donut yesterday} and C = {customers who bought a frosted crème-filled donut yesterday}. Determine the number of attendees belonging to each of the regions I, II, III, IV.



Region I: _____ Region II: _____ Region III: _____ Region IV: _____
