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LAST NAME:_____   FIRST NAME:_____

UIN: _____   EXAM SEAT NUMBER: _____

"An Aggie does not lie, cheat, or steal or tolerate those who do"

On my honor as an Aggie, I have neither given nor received unauthorized aid on this exam.

SIGNATURE:_____

- Read and follow all instructions and read each question carefully.

- Each question is worth 4.5 points, for a total of 99 points, plus 1 point for filling out your Scantron form correctly.

- Put your name on your Scantron form as **last name, first name**. In the **Test No.** box fill in the exam version from the top right of this page. It is 2A or 2B for this exam.

- You may not start this exam until the starting time is called. You must put your pencils down when the ending time is called. Starting the exam before time is called or refusing to stop when time is called is considered **Academic Dishonesty**.

- Mark the correct answer on your Scantron form, and on this exam. Next to your last name on your Scantron, put a small smiley face. **Scantrons will not be returned.**

- You may not collaborate with your neighbors on this exam.

- The only things on your desk and in sight are pencils, erasers, calculator (without a case) student ID. Your student ID must be out on your desk. **No hats, no sunglasses, no wallets, no cellphones, no calculator cases.**

- Everything else should be put away in your backpack or bag and put underneath your desk. If you do not have a backpack or bag to stow things in, you must put your things at the front or back of the classroom, away from your desk.

- In particular, your cellphone must be turned off and put away during this exam.
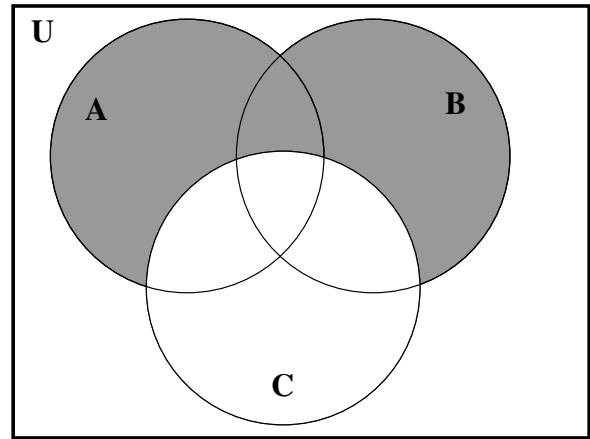
- GOOD LUCK!!!!!!!

1. Which inequality is represented by the graph? The feasible region is shaded.

   (a) $3x - y \leq 0$
   (b) $3x - y > 0$
   (c) $x - 3y \leq 0$
   (d) $x - 3y \geq 0$
   (e) $x - 3y > 0$

feasible region
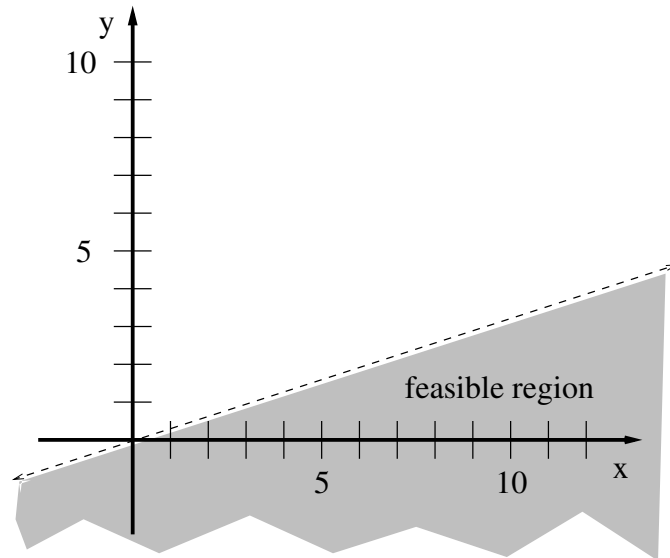
2. Which of the choices below describes the shaded region in the Venn diagram? The sets A, B, and C are the circles labeled in the figure.

   (a) $A \cup B \cup C^c$
   (b) $A \cap B \cap C^c$
   (c) $(A \cap B) \cup C^c$
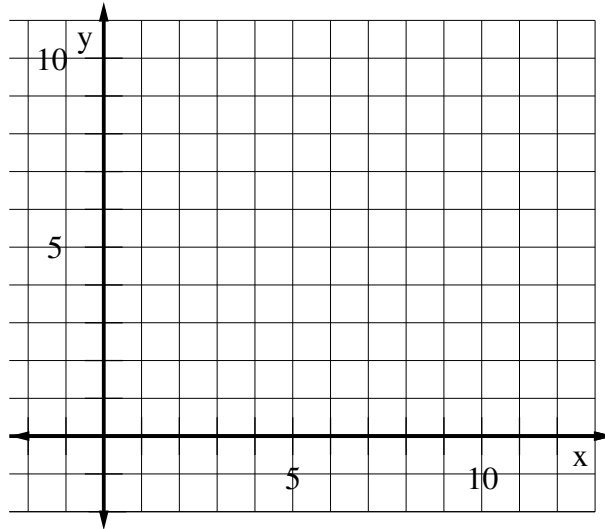   (d) $(A \cup B) \cap C^c$
   (e) $(A \cup B)^c \cap C$

3. Three students need to pick from 11 books to do book reports. If each student must pick a different book for his or her report, how many ways can the books be selected?

   (a) 33
   (b) 165
   (c) 990
   (d) 1,000
   (e) none of these

4. How many corner points does the feasible region for these inequalities have?

$$
\begin{array}{rclcl}
x & + & 2y & \leq & 10 \\
2x & - & 3y & \geq & 0 \\
 & & y & \geq & 0 \\
 & & x & \geq & 1 \\
 & & x & \leq & 6
\end{array}
$$

(a) 3

(b) 4

(c) 5

(d) 6

(e) none of these

5. A math student gets to choose two problems out of four to complete for a homework assignment. The problems are A, B, C, and D. What is the sample space?

(a) $S = \{A, B, C, D\}$

(b) $S = \{AB, AC, AD, BC, BD, CD\}$

(c) $S = \{AA, AB, AC, AD, BB, BC, BD, CC, CD, DD\}$

(d) $S = \{AB, AC, AD, BA, BC, BD, CA, CB, CD\}$

(e) none of these

6. Given: $n(U) = 30$, $n(A) = 8$, $n(B) = 18$ and $n(A \cup B) = 23$ what is $n(A^c \cup B)$?

(a) 40

(b) 25

(c) 22

(d) 15

(e) none of these

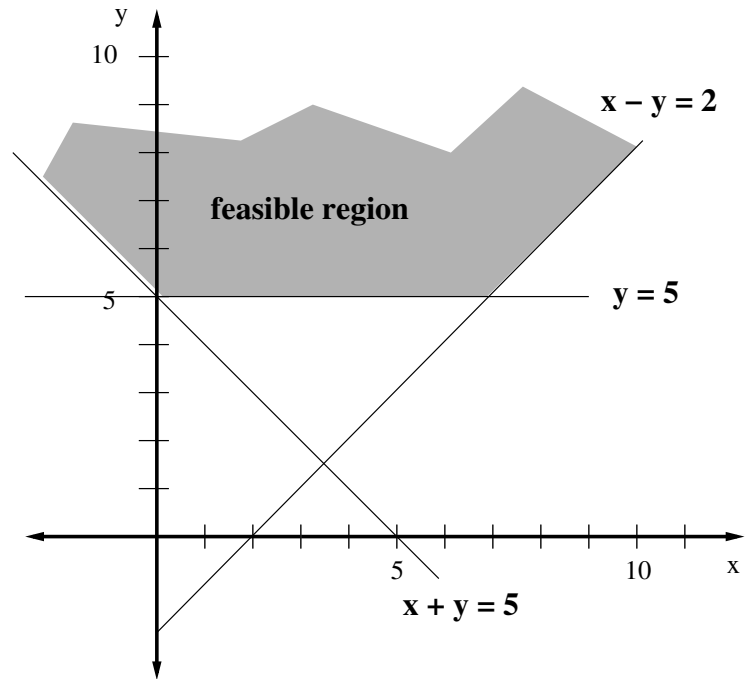7. Identify the system of inequalities which has the feasible region shaded in the picture.

(a) $\begin{cases} x & - & y & \geq & 2 \\ x & + & y & \geq & 5 \\ & & y & \geq & 5 \end{cases}$

(b) $\begin{cases} x & - & y & \leq & 2 \\ x & + & y & \geq & 5 \\ & & x & \geq & 0 \\ & & y & \geq & 5 \end{cases}$

(c) $\begin{cases} x & - & y & \geq & 2 \\ x & + & y & \leq & 5 \\ & & y & \geq & 5 \end{cases}$

(d) $\begin{cases} x & - & y & \leq & 2 \\ x & + & y & \leq & 5 \\ & & y & \geq & 5 \end{cases}$

(e) $\begin{cases} x & - & y & \leq & 2 \\ x & + & y & \geq & 5 \\ & & y & \geq & 5 \end{cases}$

Use these sets to answer the following two questions.

$$U = \{a, b, c, d, e, f, g, h, i, j, k\} \quad A = \{d, e, f, g, h, i\} \quad B = \{a, b, c, k\} \quad C = \{d, f, h, k\}$$

8. Which of these statements are TRUE?

   I. $A \cap B = \emptyset$ II. $A \cup B = U$ III. $k \in A^c \cap C$

   (a) I, II and III are true
   (b) only I and III are true
   (c) only III is true
   (d) only I is true
   (e) none of these

9. Which of these statements are TRUE?

   I. $h \subset A$ II. $A \cup (B \cap C) = \{d, e, f, g, h, i, k\}$ III. $B \subseteq A^c$

   (a) I, II and III are true
   (b) only II and III are true
   (c) only III is true
   (d) only II is true
   (e) none of these

Use the Venn diagram to answer the questions on this page. Sets F, C, and S are represented by circles in the Venn diagram. A group of grandparents is surveyed. Set F is the number who are on Facebook. Set C is the number who own and use cellphones. Set S is the number who use Skype.
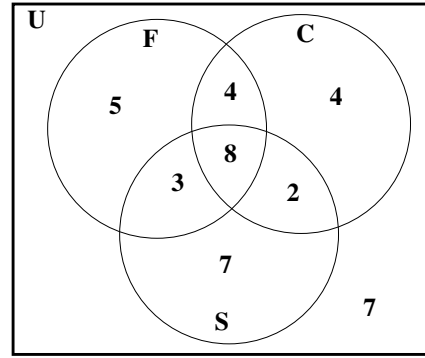
10. How many grandparents use **at most** one of these technologies?

   (a) 23
   (b) 17
   (c) 16
   (d) 9
   (e) 7

11. How many grandparents use either Facebook or cellphones, but who do not use Skype?

   (a) 9
   (b) 11
   (c) 13
   (d) 15
   (e) 20

12. What is $n\left[C \cup (F \cap S)^c\right]$?

   (a) 37
   (b) 26
   (c) 25
   (d) 21
   (e) 18

13. How many 5 digit numbers are there if the digits cannot be repeated and the last digit must be a 2 or a 4?

    (a) $5,376$

    (b) $6,048$

    (c) $10,080$

    (d) $10,752$

    (e) $12,096$

14. A family invests up to \$15,000, with x dollars to be invested in Fund A, y dollars to be invested in Fund B, and z dollars to be invested in Fund C. What is the inequality represented by the following sentence?

    "Fund C is more risky than Fund A or B, and so the family will put at most 25% of the total investment in C."

    (a) $z < 0.25(x + y)$

    (b) $z \leq 0.25(15000)$

    (c) $z \leq 0.25(x + y)$

    (d) $z \leq 0.25(x + y + z)$

    (e) $z < 0.25(x + y + z)$

15. An experiment consists of rolling two six-sided dice and counting the total number of dots that come up. What is the event, E, that the sum is less than or equal to 6?

    (a) $E = \{(1,1), (1,2), (1,3), (1,4), (1,5), (2,2), (2,3), (2,4), (3,3)\}$

    (b) $E = \{1, 2, 3, 4, 5, 1, 2, 3, 4, 5\}$

    (c) $E = \{x \mid 1 \leq x \leq 6\}$

    (d) $E = \{2, 3, 4, 5, 6\}$

    (e) $E = \{1, 2, 3, 4, 5, 6\}$

For the following question, use the feasible region shaded below.

A (0,0)   J (4.5, 7)
B (0,4)   K (6.5, 0)
C (0,7)
D (0, 10)
E (2,0)
F (3,2)
G (2,7)
H (6,0)
I (4,4)
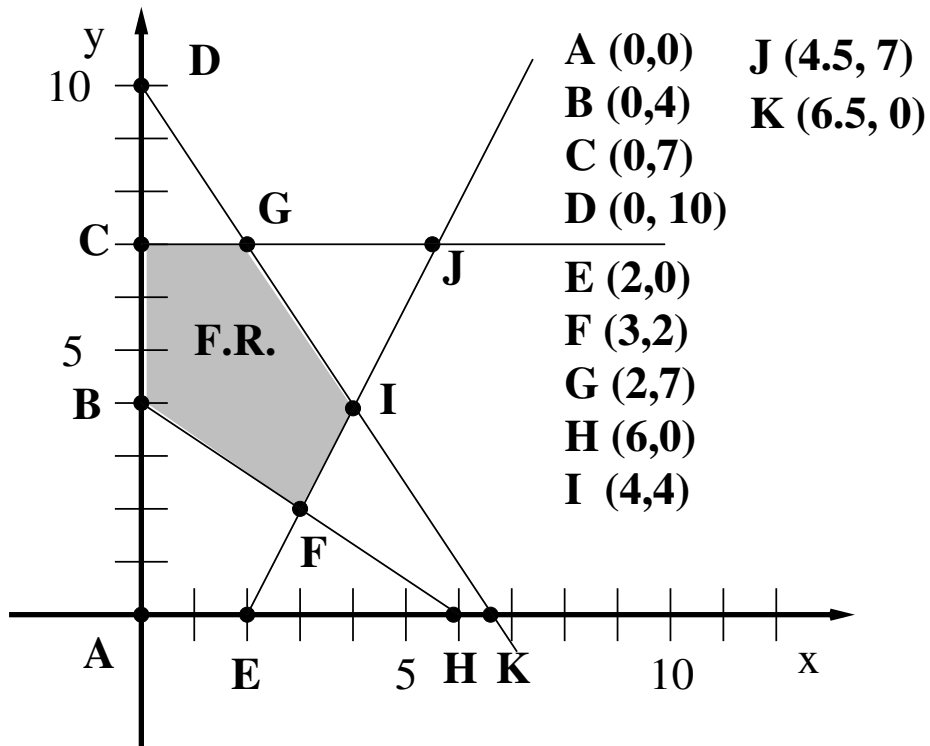
16. Where is $P = 2x + 3y$ minimized?

   (a) $\overline{BF}$
   (b) B
   (c) F
   (d) G
   (e) $\overline{GI}$

17. How many distinct rearrangements are there of 3 red crayons, 2 blue crayons, a purple crayon, a black crayon, and 4 green crayons? All crayons of the same color are identical.

   (a) 24
   (b) 120
   (c) 138, 600
   (d) 1, 663, 200
   (e) 39, 916, 800

For the 4 problems on this page, assume you have a bag containing

- 5 red blocks
- 7 green blocks
- 2 blue blocks
- 8 yellow blocks

18. How many ways can you pick 5 blocks from the bag without replacement and get exactly 3 green blocks?

    (a) 140
    (b) 3,675
    (c) 420
    (d) 96,777,450
    (e) 44,100

19. How many ways can you pick 5 blocks without replacement from the bag and get at least one red block from the bag?

    (a) 11,900
    (b) 17,766
    (c) 20,146
    (d) 26,333
    (e) 29,925

20. How many ways can you pick 5 blocks from the bag without replacement and get exactly 3 red blocks or exactly 2 green blocks?

    (a) 10,915
    (b) 130,980
    (c) 281,905,470
    (d) 10,705
    (e) 102

21. How many ways can you pick 5 blocks from the bag without replacement and get exactly 5 of the same color?

    (a) 9,360
    (b) 1,900
    (c) 1176
    (d) 78
    (e) 20

22. Where does the maximum of the objective function $P = 2x + y$ occur? The feasible region is shaded and labeled in the diagram.

(a) F

(b) G

(c) E

(d) D

(e) none of these

A (0,1)   E (7/2, 11/2)
B (0,4)   F (14/3, 6)
C (0,6)   G (8,1)
D (0,9)