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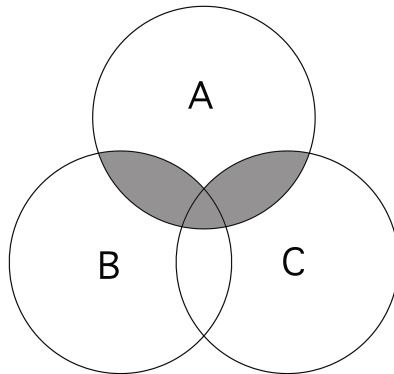
Instructor: Migliore

Multiple Choice

1.(5 pts.) Let $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{3, 4, 5, 7, 8, 9\}$, $C = \{1, 2, 3, 5, 7, 9, 10\}$ be subsets of the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Find $(A \cap B) \cup C'$.

- (a) $\{4\}$ (b) $\{10\}$ (c) $\{3, 5\}$
(d) $\{3, 4, 5, 6, 8\}$ (e) $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

2.(5 pts.) Which of the following corresponds to the area shaded in grey in the following Venn diagram?

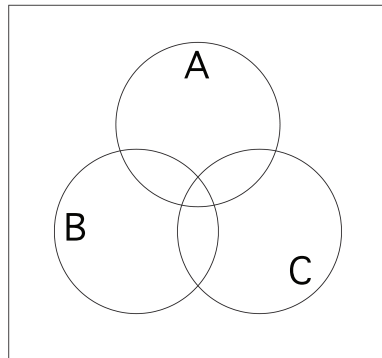


- (a) $A \cap (B \cup C)$ (b) $(A \cap B) \cap (A \cap C)$ (c) $A \cup (B \cup C)$
(d) $A \cup (B \cap C)$ (e) $A \cap (B \cup C)'$

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3.(5 pts.) The Fibonacci School has 300 students. Of these, 150 are Anthropology majors, 170 are Biology majors, 160 are Chemistry majors, 75 are Anthropology and Biology double majors, 95 are Biology and Chemistry double majors, 85 are Anthropology and Chemistry double majors, and 30 are triple majors in Anthropology, Biology and Chemistry. How many of the Fibonacci students do not major in **any** of the three subjects? Feel free to use the following Venn diagram if it helps.



- (a) 25 (b) 35 (c) 45 (d) 55 (e) 65

4.(5 pts.) How many **five-letter** words (including nonsense words) can be made from the letters of

M A T H R O C K S

if the first and last letters have to be vowels and no repetition is allowed?

- (a) 210 (b) 240 (c) 420 (d) 1008 (e) 5040

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5.(5 pts.) A church softball team has 8 men and 7 women. They want to choose 5 men and 5 women to start a game. In how many ways can they do this?

- (a) 56 (b) 75 (c) 77 (d) 1,176 (e) 16,934,400

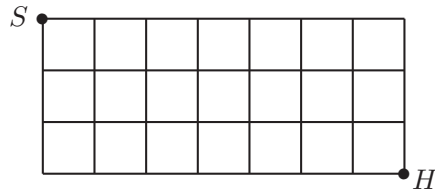
6.(5 pts.) The Chess Club consists of 5 men and 5 women. They are to be photographed for the yearbook. In how many ways can they line up in two rows if the men are to be in the back row and the women are to be in the front row?

- (a) 30 (b) 225 (c) 240 (d) 625 (e) 14,400

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7.(5 pts.) Billy walks the 10 blocks from his house (marked H) to school (marked S), traveling only north and west. How many different routes are possible?



- (a) 10 (b) 21 (c) 84 (d) 120 (e) 720

8.(5 pts.) I have 8 favorite CD's in my collection. On my next car trip, I want to take **at least** 2 of them, but it doesn't matter if it's 2, 3, 4, 5, 6, 7 or all 8 of them. How many choices do I have for the CD's that I take?

- (a) 246 (b) 247 (c) 248 (d) 249 (e) 250

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9.(5 pts.) An experiment consists of flipping a coin 6 times and observing the sequence of heads and tails that occurs. Let E be the event “there are (strictly) more heads than tails.” Find $n(E)$.

- (a) 21 (b) 22 (c) 32 (d) 44 (e) 64

10.(5 pts.) An experiment consists of rolling two dice (say a red one and a green one) and recording the sum of the numbers that appear. Let E be the event that the sum is 6. Find $Pr(E)$.

- (a) $\frac{2}{36}$ (b) $\frac{3}{36}$ (c) $\frac{4}{36}$ (d) $\frac{5}{36}$ (e) $\frac{6}{36}$

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11.(5 pts.) Suppose E and F are two events with $Pr(E) = \frac{1}{4}$, $Pr(F) = \frac{1}{2}$ and $Pr(E \cup F) = \frac{2}{3}$. Find $Pr(E \cap F)$.

- (a) $\frac{1}{12}$ (b) $\frac{1}{8}$ (c) $\frac{1}{6}$ (d) $\frac{1}{4}$ (e) $\frac{1}{3}$

12.(5 pts.) A Spanish class has 10 students, consisting of 8 girls and 2 boys. The teacher is randomly choosing a group of 3 students to take a free trip to Spain. What is the probability that the group includes at least one boy?

- (a) $\frac{2}{3}$ (b) $\frac{3}{5}$ (c) $\frac{8}{15}$ (d) $\frac{7}{15}$ (e) $\frac{1}{15}$

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13.(5 pts.) On a new game show, “The Dice is Trite,” Claire is given a 20-sided die (with the sides labelled from 1 to 20, and all sides equally likely to come up). Each time she rolls it, if it is NOT a 17 she is given \$1,000 and told to roll again. When she rolls a 17, she is done. (For example, if a 17 appears on the fifth roll, she gets \$4,000 since she has \$1,000 for each of the first four rolls and nothing for the fifth roll.) What is the probability that she receives exactly \$2,000 (and not more)? A tree diagram would probably help. Remember that she has to roll a 17 to know she’s done.

(a) $\left(\frac{19}{20}\right)^2 \cdot \frac{1}{20}$

(b) $\left(\frac{19}{20}\right)^2$

(c) $\left(\frac{1}{20}\right)^3$

(d) $\frac{19}{20} \cdot \frac{1}{20}$

(e) $\left(\frac{19}{20}\right)^2 + \frac{1}{20}$

14.(5 pts.) Moe is given a 4-sided die with the numbers 1 to 4 on it. Larry is given a 6-sided die with the numbers 1 to 6 on it. Curly is given an 8-sided die with the numbers 1 to 8 on it. All of them are told to roll their dice once. What is the probability that **none** of them rolls a 1? (All of the dice are “fair.”)

(a) $\frac{1}{192}$

(b) $\frac{96}{192} \left(= \frac{12}{24}\right)$

(c) $\frac{104}{192} \left(= \frac{13}{24}\right)$

(d) $\frac{105}{192} \left(= \frac{35}{64}\right)$

(e) $\frac{191}{192}$

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15.(5 pts.) Three ordinary quarters and a fake quarter with two heads are placed in a hat. One quarter is selected at random and flipped once. What is the probability of getting heads?

- (a) $\frac{1}{4}$ (b) $\frac{3}{8}$ (c) $\frac{1}{2}$ (d) $\frac{5}{8}$ (e) $\frac{3}{4}$

16.(5 pts.) Emily tossed a fair coin five times. We're not sure what the results were, but we know that **at least** four times it came up heads. With this extra information, what is the conditional probability that all five tosses came up heads? In symbolic terms, if E is the event that all five tosses were heads and F is the event that at least four tosses were heads, we want $Pr(E|F)$.

- (a) $\frac{1}{32}$ (b) $\frac{1}{12}$ (c) $\frac{1}{6}$ (d) $\frac{1}{5}$ (e) $\frac{1}{2}$

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17.(5 pts.) Consider the following probability distribution:

k	$Pr(X = k)$
c	$1/6$
9	$1/3$
16	$1/2$

If the mean for this probability distribution is 12, what is c ?

- (a) 4 (b) 6 (c) 8 (d) 10 (e) 12

18.(5 pts.) A restaurant owner decided to keep track of the number of vegetable orders made in a given evening. He produced the following frequency distribution:

Vegetable	number
broccoli	15
cauliflower	10
asparagus	12
peas	13
green beans	20

In the corresponding **relative** frequency distribution, what number appears next to “green beans?”

- (a) $\frac{1}{5}$ (b) $\frac{1}{7}$ (c) $\frac{1}{20}$ (d) $\frac{2}{7}$
(e) cannot be determined from the given information

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19.(5 pts.) A basketball player makes 82% of his free throws. What is the probability that he will make exactly 4 of his next 5 free throws (round to three decimal places)?

- (a) 0.395 (b) 0.401 (c) 0.407 (d) 0.412 (e) 0.418

20.(5 pts.) Find the **variance** for the following frequency distribution:

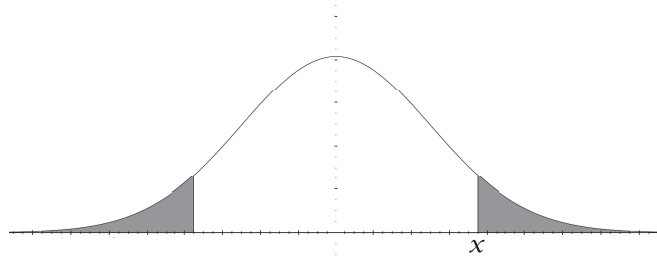
x_i	f_i
3	3
4	3
9	3
12	1
<hr/>	
	10

- (a) 0 (b) 1.02 (c) 9.8 (d) 10.2 (e) 102

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21.(5 pts.) In the following standard normal curve, suppose that the total shaded area is 0.2302. What is x ? (Again, read the question carefully.)



- (a) 1.2 (b) -1.2 (c) 2.4 (d) -2.4 (e) 0.78

22.(5 pts.) Suppose that the height of adult ostriches is normally distributed with a mean $\mu = 2.3$ meters and a standard deviation $\sigma = 0.2$ meters. If an adult ostrich is chosen at random, what is the probability that it is less than 2 meters tall?

- (a) 0.13% (b) 2.28% (c) 6.68% (d) 93.32% (e) 97.72%

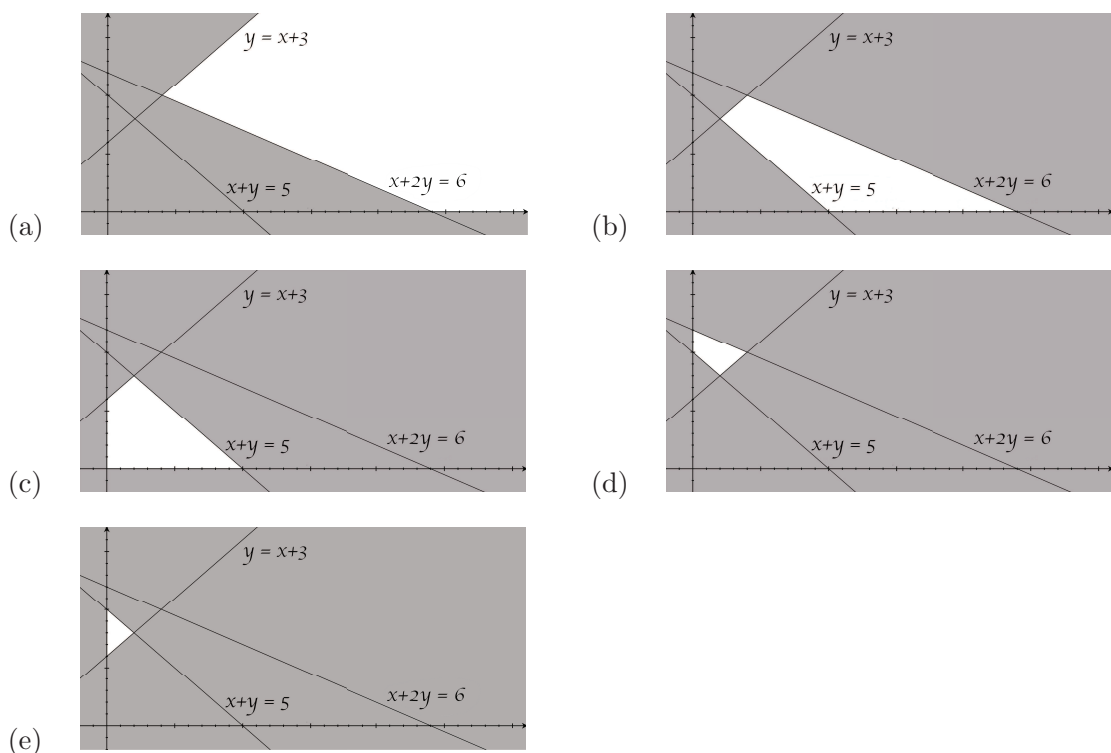
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23.(5 pts.) Which picture represents the feasible set of the following system of inequalities?

$$\begin{aligned} x + 2y &\leq 6 \\ x + y &\geq 5 \\ y &\leq x + 3 \\ x &\geq 0, y &\geq 0 \end{aligned}$$

The lines are already drawn and labeled. You do not need to compute any vertices. **Pay attention to \geq versus \leq !!**



24.(5 pts.) In performing Gaussian Elimination for the following matrix (coming from some system of linear equations)

$$\left[\begin{array}{cc|c} 1 & 2 & 5 \\ 3 & 4 & 6 \end{array} \right]$$

what row operation is the first step?

- (a) $R_2 - 2R_1$ (b) $R_1 - 3R_2$ (c) $R_1 - \frac{1}{2}R_2$
 (d) $R_2 - \frac{1}{2}R_1$ (e) $R_2 - 3R_1$

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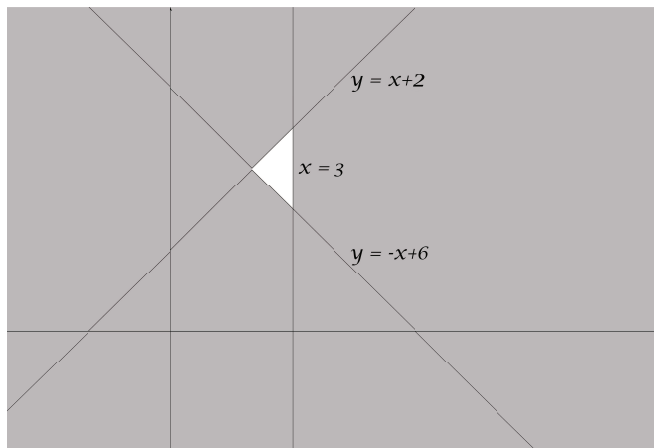
29.(5 pts.) A clothing manufacturer makes denim jackets and hooded fleece jackets. Each denim jacket requires 3 labor-hours for cutting, 2 labor-hours for sewing, and 1 labor-hour for finishing. Each hooded fleece jacket requires 1 labor-hour for cutting, 4 labor-hours for sewing, and 2 labor-hour for finishing. There are 42 labor-hours available for cutting, 90 labor-hours for sewing, and 27 labor-hours for cutting each day. The profit is \$9 per denim jacket and \$5 per hooded fleece jacket. Let x be the number of denim jackets made each day, and let y be the number of hooded fleece jackets made each day. Which of the following is one of the inequalities that come from this information? **Pay attention to \leq versus \geq .**

- (a) $x + y \leq 14$ (b) $3x + y \geq 42$ (c) $3x + 2y \geq 1$
(d) $9x + 5y$ (e) $3x + y \leq 42$

30.(5 pts.) For the inequalities

$$\begin{aligned}y &\leq x + 2 \\x &\leq 3 \\y &\geq -x + 6\end{aligned}$$

the feasible set is given by the following picture.



Find the maximum value of the objective function $4x + 5y$. You will have to figure out the vertices of this feasible set.

- (a) 24 (b) 27 (c) 28 (d) 30 (e) 37

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Areas under the Standard Normal Curve

z	$A(z)$	z	$A(z)$	z	$A(z)$	z	$A(z)$	z	$A(z)$
-3.50	.0002	-2.00	.0228	-.50	.3085	1.00	.8413	2.50	.9938
-3.45	.0003	-1.95	.0256	-.45	.3264	1.05	.8531	2.55	.9946
-3.40	.0003	-1.90	.0287	-.40	.3446	1.10	.8643	2.60	.9953
-3.35	.0004	-1.85	.0322	-.35	.3632	1.15	.8749	2.65	.9960
-3.30	.0005	-1.80	.0359	-.30	.3821	1.20	.8849	2.70	.9965
-3.25	.0006	-1.75	.0401	-.25	.4013	1.25	.8944	2.75	.9970
-3.20	.0007	-1.70	.0446	-.20	.4207	1.30	.9032	2.80	.9974
-3.15	.0008	-1.65	.0495	-.15	.4404	1.35	.9115	2.85	.9978
-3.10	.0010	-1.60	.0548	-.10	.4602	1.40	.9192	2.90	.9981
-3.05	.0011	-1.55	.0606	-.05	.4801	1.45	.9265	2.95	.9984
-3.00	.0013	-1.50	.0668	.00	.5000	1.50	.9332	3.00	.9987
-2.95	.0016	-1.45	.0735	.05	.5199	1.55	.9394	3.05	.9989
-2.90	.0019	-1.40	.0808	.10	.5398	1.60	.9452	3.10	.9990
-2.85	.0022	-1.35	.0885	.15	.5596	1.65	.9505	3.15	.9992
-2.80	.0026	-1.30	.0968	.20	.5793	1.70	.9554	3.20	.9993
-2.75	.0030	-1.25	.1056	.25	.5987	1.75	.9599	3.25	.9994
-2.70	.0035	-1.20	.1151	.30	.6179	1.80	.9641	3.30	.9995
-2.65	.0040	-1.15	.1251	.35	.6368	1.85	.9678	3.35	.9996
-2.60	.0047	-1.10	.1357	.40	.6554	1.90	.9713	3.40	.9997
-2.55	.0054	-1.05	.1469	.45	.6736	1.95	.9744	3.45	.9997
-2.50	.0062	-1.00	.1587	.50	.6915	2.00	.9772	3.50	.9998
-2.45	.0071	-.95	.1711	.55	.7088	2.05	.9798		
-2.40	.0082	-.90	.1841	.60	.7257	2.10	.9821		
-2.35	.0094	-.85	.1977	.65	.7422	2.15	.9842		
-2.30	.0107	-.80	.2119	.70	.7580	2.20	.9861		
-2.25	.0122	-.75	.2266	.75	.7734	2.25	.9878		
-2.20	.0139	-.70	.2420	.80	.7881	2.30	.9893		
-2.15	.0158	-.65	.2578	.85	.8023	2.35	.9906		
-2.10	.0179	-.60	.2743	.90	.8159	2.40	.9918		
-2.05	.0202	-.55	.2912	.95	.8289	2.45	.9929		