Department of Mathematics
University of Notre Dame
Math 10120 – Finite Math
Spring 2019

Name:_____

Instructor: Juan Migliore

Exam 3

April 18, 2019

This exam is in two parts on 12 pages and contains 15 problems worth a total of 100 points. You have 1 hour and 15 minutes to work on it. You may use a calculator, but no books, notes, or other aid is allowed. Be sure to write your name on this title page and put your initials at the top of every page in case pages become detached.

You must record on this page your answers to the multiple choice problems.

The partial credit problems should be answered on the page where the problem is given. The spaces on the bottom right part of this page are for me to record your grades, **not** for you to write your answers.

Place an × through your answer to each problem.

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7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

MC. _____
11. _____
12. _____
13. _____
14. _____
15. _____

Tot. _____

Multiple Choice

1. (5 pts.) The 50 students in Math 456 took a 10-point quiz, and the following gives the number of students scoring 10, 9, 8, 7 and 6. (No other scores were obtained.)

score	10	9	8	7	6
number of students	22	12	6	7	3

Find the **relative frequency** of the score "10."

(a) 0.22 (b) 0.44 (c) 22 (d) 0.2 (e) 0.1

2. (5 pts.) There are six students shooting baskets. The first five made 10, 8, 11, 6 and 13 baskets, respectively. How many baskets must the sixth student make in order for the average (mean) number for all six to be 10?

(a) 10 (b) 11 (c) 12 (d) 13 (e) 14

3. (5 pts.) Find the population variance for the following set of data (up to 2 decimal places). [Note that this is asking for the variance, **not** the standard deviation.]

$$11, 13, 8, 14, 9.$$

(a) 4.8 (b) 0 (c) 2.28 (d) 26 (e) 5.2

4. (5 pts.) A box contains 8 blue balls, 6 red balls and 4 green balls, all mixed together. A ball is selected randomly from the urn. If it is green, you stop. If it is not green, you throw it away (NOT back in the urn) and select another one randomly. This is repeated until you select a green ball. Let X denote the random variable that gives the number of times you selected a ball. (For example, if you didn't get a green ball on the first selection but did on the second selection then $X = 2$ because you drew a total of two balls.) What values may X assume?

(a) $\{1, 2, 3, \ldots, 15\}$ (b) $\{2, 3, \ldots, 15\}$ (c) $\{1, 2, 3, \ldots, 14\}$

(d) $\{1, 2, 3, \ldots, 18\}$ (e) $\{2, 3, \ldots, 14\}$

5. (5 pts.) An urn contains three balls marked "1," three balls marked "2" and three balls marked "3." Claire selects two balls at random. Let X be the sum of the numbers on the two selected balls. Find the probability distribution for X. [Hint: notice that $4 = 1 + 3 = 2 + 2$.]

(a)

x	$P(x)$
2	2/36
3	8/36
4	16/36
5	8/36
6	2/36

(b)

x	$P(x)$
2	4/36
3	9/36
4	10/36
5	9/36
6	4/36

(c)

x	$P(x)$
2	3/36
3	8/36
4	14/36
5	8/36
6	3/36

(d)

x	$P(x)$
2	4/36
3	8/36
4	12/36
5	8/36
6	4/36

(e)

x	$P(x)$
2	3/36
3	9/36
4	12/36
5	9/36
6	3/36

$X=2: \frac{C(3,2)}{C(9,2)} = \frac{3}{36} = \frac{1}{12}$

$X=3: \frac{C(3,1)\cdot C(3,1)}{C(9,2)} = \frac{9}{36} = \frac{1}{4}$

$X=4: \frac{C(3,2)}{C(9,2)} + \frac{C(3,1)C(3,1)}{C(9,2)} = \frac{3}{36} + \frac{9}{36} = \frac{12}{36} = \frac{1}{3}$

2 and 2 1 and 3

X	$P(X)$
2	
3	
4	
5	
6	

6. (5 pts.) Compute the **standard deviation** $\sigma(X)$ for the random variable defined as follows (to two decimal places):

x_i	p_i
10	0.3
20	0.2
30	0.5

Pretend we did 100 trials

x_i	freq (out of 100)
10	30
20	20
30	50

(a) 8.72 (b) 22 (c) 0 (d) 8.84 (e) 8.93

$\sigma^2(X) = 0.3(10-22)^2 + 0.2(20-22)^2 + 0.5(30-22)^2$

$= 0.3(144) + 0.2(4) + 0.5(64)$

$= 43.2 + 0.8 + 32$

$= 76$

$\sigma(X) = \sqrt{76} = 8.72$

$E(X) = \frac{10(30) + 20(20) + 30(50)}{100}$

$= 10\left(\frac{30}{100}\right) + 20\left(\frac{20}{100}\right) + 30\left(\frac{50}{100}\right)$

$= 10(0.3) + 20(0.2) + 30(0.5)$

$= 3 + 4 + 15 = 22$

7. (5 pts.) Some data has a mean of $\mu = 32$ and standard deviation $\sigma = 2.5$. Find the z-score for a score of 28 (up to 2 decimal places).

(a) 1.6 (b) -4 (c) -2 (d) -1.6 (e) 2

8. (5 pts.) A multiple choice exam has 10 questions, each containing 5 possible answers. Lee randomly guesses all the answers. You fail if you get 0 to 7 right and pass if you get 8 to 10 right. What is the probability that Lee will pass the exam?

(a) $\left(\frac{1}{5}\right)^8\left(\frac{4}{5}\right)^2+\left(\frac{1}{5}\right)^9\left(\frac{4}{5}\right)^1+\left(\frac{1}{5}\right)^{10}\left(\frac{4}{5}\right)^0$

(b) $C(10,8)\left(\frac{1}{2}\right)^8\left(\frac{1}{2}\right)^2+C(10,9)\left(\frac{1}{2}\right)^9\left(\frac{1}{2}\right)^1+C(10,10)\left(\frac{1}{2}\right)^{10}\left(\frac{1}{2}\right)^0$

(c) $C(10,8)\left(\frac{1}{5}\right)^8\left(\frac{4}{5}\right)^2+C(10,9)\left(\frac{1}{5}\right)^9\left(\frac{4}{5}\right)^1+C(10,10)\left(\frac{1}{5}\right)^{10}\left(\frac{4}{5}\right)^0$

(d) $\left(\frac{1}{2}\right)^8\left(\frac{1}{2}\right)^2+\left(\frac{1}{2}\right)^9\left(\frac{1}{2}\right)^1+\left(\frac{1}{2}\right)^{10}\left(\frac{1}{2}\right)^0$

(e) $C(10,8)\left(\frac{4}{5}\right)^8\left(\frac{1}{5}\right)^2+C(10,9)\left(\frac{4}{5}\right)^9\left(\frac{1}{5}\right)^1+C(10,10)\left(\frac{4}{5}\right)^{10}\left(\frac{1}{5}\right)^0$

9. (5 pts.) The weights of the members of some population are normally distributed with a mean of 30 lbs and a standard deviation of 8 lbs. Let X be the random variable corresponding to this normal distribution. If a member of that population is chosen at random, find $P(28 \leq X \leq 32)$.

(a) 9.87% (b) 98.76% (c) 49.38% (d) 19.74% (e) 38.30%

10. (5 pts.) Which of the following points is in the feasible region for the following system of inequalities? (Be careful with $\leq$ versus $<$ and with $\geq$ versus $>$.)

$$2x + 3y \geq 4$$
$$5x - 6y < 4$$
$$x \geq 0, \quad y \geq 0$$

(a) $(2, 1)$ (b) $(1, 1)$ (c) $(-1, 2)$ (d) $(0, 1)$ (e) $(2, 0)$

$2(2)+3(1) \geq 4$ ✓
$5(2)-6(1) < 4$ ✗

$2(1)+3(1) \geq 4$ ✓
$5(1)-6(1) < 4$ ✓

Partial Credit

You must show all of your work on the partial credit problems to receive credit! Make sure that your answer is clearly indicated. You're more likely to get partial credit for a wrong answer if you explain your reasoning.

11. (10 pts.) A shelf contains 10 CDs, of which 6 are Beatles and 4 are Simon and Garfunkel. These CDs are all mixed together, and Emily randomly chooses two to take with her on a trip. Let X be the random variable counting **the number of Beatles CDs that she picks**.

(a) What are the possible values that X may take?

(b) Find the probability distribution for X.

(c) What is the expected value for this probability distribution? [It is not necessarily going to be an integer.]

12. (10 pts.) Exactly 10% of a certain population own a Harry Potter book. Suppose that 10,000 people are chosen at random and asked if they own a Harry Potter book.

[Note: the formulas

$$\begin{aligned} \mu &= np \\ \sigma &= \sqrt{npq} \end{aligned}$$

may be useful in this problem.]

(a) (3 points) Find the mean and standard deviation of this binomial distribution.

$\mu = np = 10000(0.1) = 1000$

$\sigma = \sqrt{npq} = \sqrt{10000(0.1)(0.9)} = \sqrt{900} = 30$

(b) (7 points) Use the normal approximation to the binomial distribution to estimate the probability that between 909 and 1037 of the 10,000 people that were randomly chosen own a Harry Potter book.

$P_B(909 \le X \le 1037) \approx P_N(908.5 \le X \le 1037.5)$

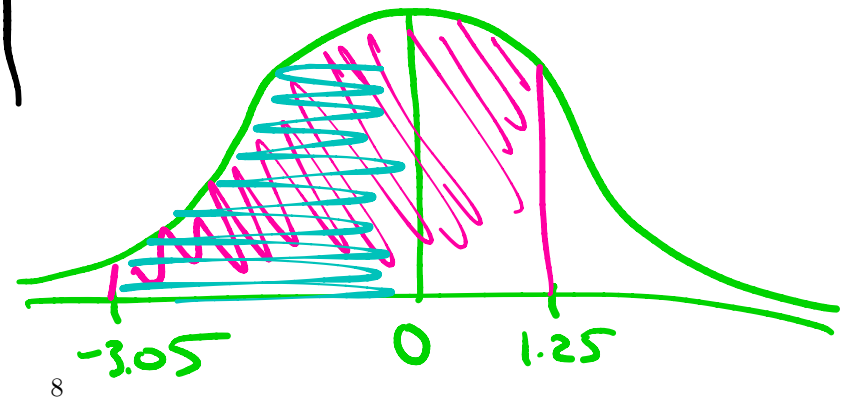
$X = 908.5 \rightarrow z = \frac{908.5 - 1000}{30} = -\frac{91.5}{30} = -3.05$

$X = 1037.5 \rightarrow z = \frac{1037.5 - 1000}{30} = \frac{37.5}{30} = 1.25$

$= P_N(-3.05 \le z \le 1.25)$

$= 0.4989 + 0.3944$

$= 0.8933$



13. (10 pts.) Wolfgang wants to buy some boxes of chocolates and some bags of chocolates. Each box costs \$15, contains 30 chocolates, and weighs 2 pounds. Each bag costs \$18, contains 20 (fancier) chocolates, and weighs 3 pounds. He wants the total number of chocolates to be at least 150, and he wants the total weight to be at most 40 pounds. Let x be the number of boxes that he buys and let y be the number of bags that he buys. He wants to choose x and y so that he minimizes the amount of money that he spends.

(a) Find the objective function for this linear programming problem.

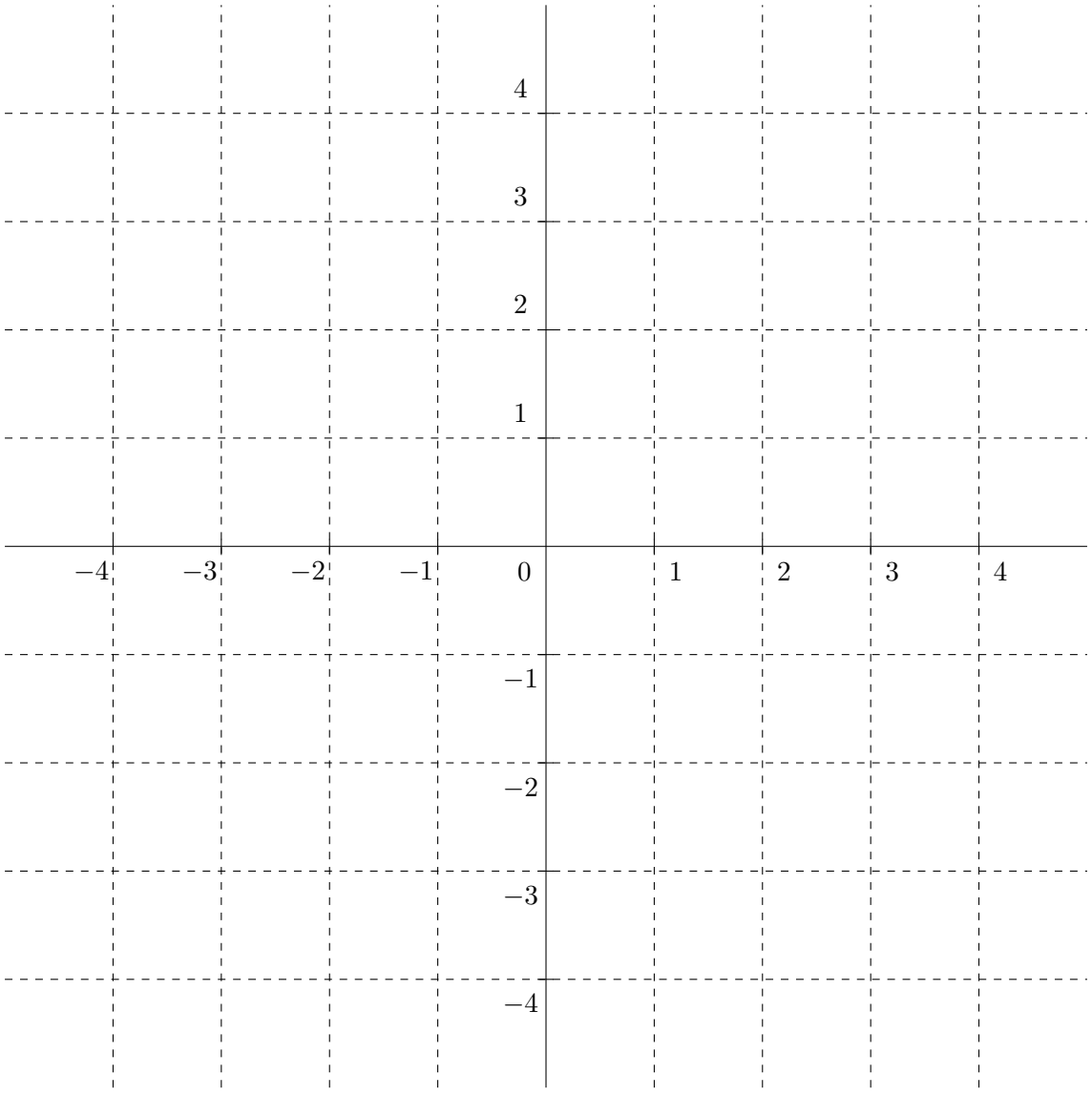
(b) Do we want to maximize or minimize the objective function?

(c) Write the constraints (inequalities) for this problem. **(You do NOT have to solve the corresponding optimization problem. Stop after you write the constraints.)**

14. (10 pts.) Consider the following system of inequalities:

$$\begin{aligned} 2x - y &\leq 2 \\ x + y &\leq 2 \\ x &\geq 0 \\ y &\geq 0. \end{aligned}$$

Sketch the feasible set using the following axes. **Be sure to label the lines**, shade the feasible set, and label *all* the corners of the feasible set.

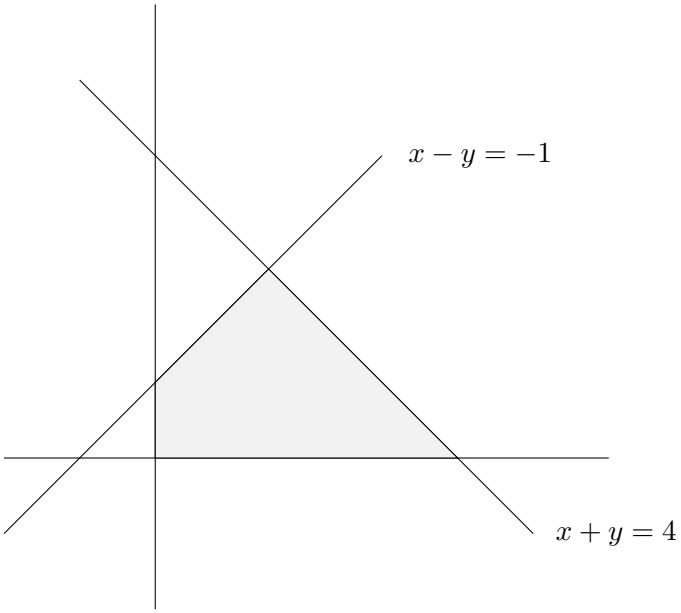


15. (10 pts.)

Consider the constraints

$$x - y \geq -1$$
$$x + y \leq 4$$
$$x \geq 0, y \geq 0$$

The following is a sketch of the feasible region.

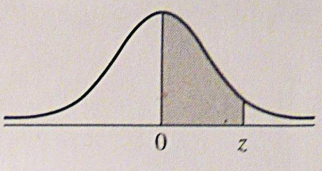


(a) Find the coordinates of the corners of the feasible region and label the picture accordingly.

(b) What is the maximum possible value of the objective function $z = 2x + 3y$?

(c) What values of x and y maximize the objective function $z = 2x + 3y$?

Area Under the Standard Normal Curve



z	A	z	A	z	A	z	A	z	A	z	A	z	A
0.00	0.0000	0.50	0.1915	1.00	0.3413	1.50	0.4332	2.00	0.4773	2.50	0.4938	3.00	0.4987
0.01	0.0040	0.51	0.1950	1.01	0.3438	1.51	0.4345	2.01	0.4778	2.51	0.4940	3.01	0.4987
0.02	0.0080	0.52	0.1985	1.02	0.3461	1.52	0.4357	2.02	0.4783	2.52	0.4941	3.02	0.4987
0.03	0.0120	0.53	0.2019	1.03	0.3485	1.53	0.4370	2.03	0.4788	2.53	0.4943	3.03	0.4988
0.04	0.0160	0.54	0.2054	1.04	0.3508	1.54	0.4382	2.04	0.4793	2.54	0.4945	3.04	0.4988
0.05	0.0199	0.55	0.2088	1.05	0.3531	1.55	0.4394	2.05	0.4798	2.55	0.4946	3.05	0.4989
0.06	0.0239	0.56	0.2123	1.06	0.3554	1.56	0.4406	2.06	0.4803	2.56	0.4948	3.06	0.4989
0.07	0.0279	0.57	0.2157	1.07	0.3577	1.57	0.4418	2.07	0.4808	2.57	0.4949	3.07	0.4989
0.08	0.0319	0.58	0.2190	1.08	0.3599	1.58	0.4430	2.08	0.4812	2.58	0.4951	3.08	0.4990
0.09	0.0359	0.59	0.2224	1.09	0.3621	1.59	0.4441	2.09	0.4817	2.59	0.4952	3.09	0.4990
0.10	0.0398	0.60	0.2258	1.10	0.3643	1.60	0.4452	2.10	0.4821	2.60	0.4953	3.10	0.4990
0.11	0.0438	0.61	0.2291	1.11	0.3665	1.61	0.4463	2.11	0.4826	2.61	0.4955	3.11	0.4991
0.12	0.0478	0.62	0.2324	1.12	0.3686	1.62	0.4474	2.12	0.4830	2.62	0.4956	3.12	0.4991
0.13	0.0517	0.63	0.2357	1.13	0.3708	1.63	0.4485	2.13	0.4834	2.63	0.4957	3.13	0.4991
0.14	0.0557	0.64	0.2389	1.14	0.3729	1.64	0.4495	2.14	0.4838	2.64	0.4959	3.14	0.4992
0.15	0.0596	0.65	0.2422	1.15	0.3749	1.65	0.4505	2.15	0.4842	2.65	0.4960	3.15	0.4992
0.16	0.0636	0.66	0.2454	1.16	0.3770	1.66	0.4515	2.16	0.4846	2.66	0.4961	3.16	0.4992
0.17	0.0675	0.67	0.2486	1.17	0.3790	1.67	0.4525	2.17	0.4850	2.67	0.4962	3.17	0.4992
0.18	0.0714	0.68	0.2518	1.18	0.3810	1.68	0.4535	2.18	0.4854	2.68	0.4963	3.18	0.4993
0.19	0.0754	0.69	0.2549	1.19	0.3830	1.69	0.4545	2.19	0.4857	2.69	0.4964	3.19	0.4993
0.20	0.0793	0.70	0.2580	1.20	0.3849	1.70	0.4554	2.20	0.4861	2.70	0.4965		
0.21	0.0832	0.71	0.2612	1.21	0.3869	1.71	0.4564	2.21	0.4865	2.71	0.4966		
0.22	0.0871	0.72	0.2642	1.22	0.3888	1.72	0.4573	2.22	0.4868	2.72	0.4967		
0.23	0.0910	0.73	0.2673	1.23	0.3907	1.73	0.4582	2.23	0.4871	2.73	0.4968		
0.24	0.0948	0.74	0.2704	1.24	0.3925	1.74	0.4591	2.24	0.4875	2.74	0.4969		
0.25	0.0987	0.75	0.2734	1.25	0.3944	1.75	0.4599	2.25	0.4878	2.75	0.4970		
0.26	0.1026	0.76	0.2764	1.26	0.3962	1.76	0.4608	2.26	0.4881	2.76	0.4971		
0.27	0.1064	0.77	0.2794	1.27	0.3980	1.77	0.4616	2.27	0.4884	2.77	0.4972		
0.28	0.1103	0.78	0.2823	1.28	0.3997	1.78	0.4625	2.28	0.4887	2.78	0.4973		
0.29	0.1141	0.79	0.2852	1.29	0.4015	1.79	0.4633	2.29	0.4890	2.79	0.4974		
0.30	0.1179	0.80	0.2881	1.30	0.4032	1.80	0.4641	2.30	0.4893	2.80	0.4974		
0.31	0.1217	0.81	0.2910	1.31	0.4049	1.81	0.4649	2.31	0.4896	2.81	0.4975		
0.32	0.1255	0.82	0.2939	1.32	0.4066	1.82	0.4656	2.32	0.4898	2.82	0.4976		
0.33	0.1293	0.83	0.2967	1.33	0.4082	1.83	0.4664	2.33	0.4901	2.83	0.4977		
0.34	0.1331	0.84	0.2996	1.34	0.4099	1.84	0.4671	2.34	0.4904	2.84	0.4977		
0.35	0.1368	0.85	0.3023	1.35	0.4115	1.85	0.4678	2.35	0.4906	2.85	0.4978		
0.36	0.1406	0.86	0.3051	1.36	0.4131	1.86	0.4686	2.36	0.4909	2.86	0.4979		
0.37	0.1443	0.87	0.3079	1.37	0.4147	1.87	0.4693	2.37	0.4911	2.87	0.4980		
0.38	0.1480	0.88	0.3106	1.38	0.4162	1.88	0.4700	2.38	0.4913	2.88	0.4980		
0.39	0.1517	0.89	0.3133	1.39	0.4177	1.89	0.4706	2.39	0.4916	2.89	0.4981		
0.40	0.1554	0.90	0.3159	1.40	0.4192	1.90	0.4713	2.40	0.4918	2.90	0.4981		
0.41	0.1591	0.91	0.3186	1.41	0.4207	1.91	0.4719	2.41	0.4920	2.91	0.4982		
0.42	0.1628	0.92	0.3212	1.42	0.4222	1.92	0.4726	2.42	0.4922	2.92	0.4983		
0.43	0.1664	0.93	0.3238	1.43	0.4236	1.93	0.4732	2.43	0.4925	2.93	0.4983		
0.44	0.1700	0.94	0.3264	1.44	0.4251	1.94	0.4738	2.44	0.4927	2.94	0.4984		
0.45	0.1736	0.95	0.3289	1.45	0.4265	1.95	0.4744	2.45	0.4929	2.95	0.4984		
0.46	0.1772	0.96	0.3315	1.46	0.4279	1.96	0.4750	2.46	0.4931	2.96	0.4985		
0.47	0.1808	0.97	0.3340	1.47	0.4292	1.97	0.4756	2.47	0.4932	2.97	0.4985		
0.48	0.1844	0.98	0.3365	1.48	0.4306	1.98	0.4762	2.48	0.4934	2.98	0.4986		
0.49	0.1879	0.99	0.3389	1.49	0.4319	1.99	0.4767	2.49	0.4936	2.99	0.4986		

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Department of Mathematics
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Math 10120 – Finite Math
Spring, 2020

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Practice Exam 3a

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7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

MC. _____
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Tot. _____

Multiple Choice

1. (5 pts.) In Camelot the average temperature at noon is 80°F. In a particular week, the temperatures at noon on the first six days were 78, 79, 81, 78, 79 and 80 (degrees Fahrenheit). What did the temperature need to be on the seventh day of that week in order for the average to indeed by 80° for that week?

(a) 85 (b) 81 (c) 82 (d) 83 (e) 84

2. (5 pts.) In Camelot, in a particular week the temperatures at noon were 76, 81, 83, 78, 83, 80 and 79 (degrees Fahrenheit). The mean of these seven numbers is 80 – you do not have to verify this. To the nearest three decimal places, what was the (population) *standard deviation* (not variance) of the temperatures over those seven days?

(a) 5.714 (b) 0 (c) 6.325 (d) 40 (e) 2.390

3. (5 pts.) In a tray of 10 Halloween cookies, 3 have peanuts in them and 7 don't. Four are selected at random and the number of selected cookies containing peanuts is noted. Let X be the number of cookies containing peanuts. Find the probability distribution of X.

(a)

x	$P(x)$
0	1/4
1	1/4
2	1/4
3	1/4

(b)

x	$P(x)$
0	1/6
1	1/2
2	3/10
3	1/30

(c)

x	$P(x)$
0	1/8
1	3/8
2	3/8
3	1/8

(d)

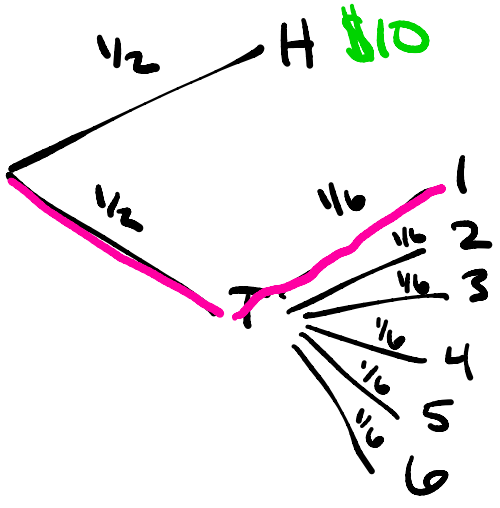
x	$P(x)$
0	1/6
1	1/6
2	1/10
3	1/30

(e)

x	$P(x)$
0	1/30
1	1/6
2	1/2
3	3/10

4. (5 pts.) Your flaky uncle Bob gives you the following present for your birthday. First he has you flip a coin. If it's heads he gives you \$10. If it's tails he has you roll a die, and he gives you a number of dollars equal to whatever the die shows. How much money do you expect to make from this game? (Hint: it might be helpful to make a tree diagram.)

(a) \$13.50 (b) \$1.75 (c) \$8.50 **(d) \$6.75** (e) \$4.43



X	$P(X)$
1	1/12
2	1/12
3	1/12
4	1/12
5	1/12
6	1/12
10	1/2

$$E(X) = 1\left(\tfrac{1}{12}\right) + 2\left(\tfrac{1}{12}\right) + 3\left(\tfrac{1}{12}\right) + 4\left(\tfrac{1}{12}\right) + 5\left(\tfrac{1}{12}\right) + 6\left(\tfrac{1}{12}\right) + 10\left(\tfrac{1}{2}\right)$$

$$= \frac{21}{12} + 5 = \frac{81}{12}$$

$$= 6.75$$

5. (5 pts.) The Flyers and the Rangers compete in the NHL playoffs in a best-of-five series, so the team that wins three games is the winner. (As soon as one team reaches its third win, the series is over and that team wins the series.) In any given game, the probability that the Flyers win is 3/4. Find the probability that the Flyers win in *exactly* four games. (Warning: you have to exclude the possibility that they win in three games!) The following answers are rounded to one decimal place.

(a) $27/64 = 42.2\%$ (b) $3/16 = 18.8\%$ (c) $3/4 = 75\%$

(d) $27/256 = 10.5\%$ (e) $81/256 = 31.6\%$

L W W W → Prob: $\frac{1}{4}\cdot\frac{3}{4}\cdot\frac{3}{4}\cdot\frac{3}{4} = \frac{27}{256}$

W L W W → Prob: $\frac{27}{256}$

W W L W → Prob: $\frac{27}{256}$

$\frac{27}{256}\cdot 3 = \frac{81}{256}$

W W W L

Another way.

$C(4,3)\left(\frac{3}{4}\right)^3\left(\frac{1}{4}\right)^1 - \left(\frac{3}{4}\right)^3\left(\frac{1}{4}\right) = \frac{81}{256}$

Excluding WWWL

$p = \frac{3}{4}$ $q = \frac{1}{4}$

6. (5 pts.) At Canta Ford Autos the manager knows that 20% of the people that enter the dealership wind up buying a car. If 10 (unrelated) people come on a particular day, what is the probability that at most 3 will buy cars? (Round percentages to two decimal places.)

(a) 46.83% (b) 87.91% (c) 74.14% (d) 58.65% (e) 64.31%

7. (5 pts.) Suppose a random variable X has the standard normal distribution. If $P(-0.33 \leq X \leq b) = 0.3935$, what is b?

(a) 1.13 (b) 0.27 (c) 0.72

(d) 1.25 (e) 0.63

8. (5 pts.) In 2017, the average SAT score for students admitted to St. Patrick's college was 1479 with standard deviation 50. Suppose the distribution of SAT scores can be modelled by a normal distribution and let X be the score of a random student. Find $P(X \leq 1390)$.

(a) 0.7258 (b) 0.4625 (c) 0.9625

(d) 0.9250 (e) 0.0375

9. (5 pts.) Which of the following points is in the feasible region for the following system of inequalities: (Remember to take note of $\leq$ vs $<$ and $\geq$ vs $>$.)

$$x + y \geq 5$$
$$4x - 3y \leq 4$$
$$x \geq 0,\ y \leq 6$$

(a) (1, 3) (b) (5, 1) (c) (1, 7)

(d) (2, 3) (e) (0, 6)

10. (5 pts.) Alice has invited the Mad Hatter, the Dormouse, and the March Hare to a tea party. She wants to brew tea and bake cookies for the party, but has only 2 hours to do so. It takes her 10 minutes to brew a cup of tea and 15 minutes to bake each cookie (she can only brew one cup of tea or bake one cookie at a time). She also wants to make sure there are enough cups of tea and cookies for everyone at the party to have at least one thing to eat or drink. Let x be the number of cups of tea and y be the number of cookes she can bake. Which of the following inequalities properly describe all constraints on Alice?

(a) $x + y \geq 4$; $10x + 15y \leq 120$; $x \geq 0$; $y \geq 0$.

(b) $x + y \geq 4$; $15x + 10y \leq 120$; $x \geq 0$; $y \geq 0$.

(c) $x + y \leq 4$; $10x + 15y \leq 120$; $x \geq 0$; $y \geq 0$.

(d) $x + y \geq 4$; $15x + 10y \leq 120$.

(e) $x + y \geq 4$; $10x + 15y \leq 120$.

Partial Credit

You must show all of your work on the partial credit problems to receive credit! Make sure that your answer is clearly indicated. You're more likely to get partial credit for a wrong answer if you explain your reasoning.

11. (10 pts.) Alice plays the following game at the carnival. She gets to pick (without replacement) two balls from a hat with 4 red, 3 blue and 2 green balls. Each ball is worth a certain amount of money.

- A red ball is worth \$2.
- A blue ball is worth \$1.
- A green ball is worth \$0.

Her winnings are the sum of the amounts the balls she picks are worth. Let X be the amount Alice wins.

(a) Give the complete probability distribution for X. (A tree diagram might help.)

(b) What is the expected value of X (assuming that it doesn't cost any money to play the game)?

(c) Suppose now that the carnival decided to charge \$3 to play the game. On a given day 100 people play the game. How much money (up to 2 decimal places) should the carnival expect to make?

12. (10 pts.) In an experiment, I roll a four sided die (with sides numbered 1, 2, 3 and 4) and a three sided die (with sides numbered 1, 2 and 3). Let X be the sum of the numbers that come up.

(a) What are the values that X can take?

(b) Find the probability distribution of X.

(c) Compute $E[X]$ and $\sigma(X)$. (Round your answers to two decimal places.)

13. (10 pts.) In a basketball competition against the Red Queen, Alice is required to attempt 20 free throws. The probability that she makes a throw is 0.7, independent of other throws.

(a) Find the probability that Alice makes exactly 17 of the throws? You do not need to simplify your answer.

(b) Find the probability that she makes at least 17 of the throws? You do not need to simplify your answer.

(c) Compute the mean and standard deviation of X, where X is the number of throws that Alice makes. (Round your answers to two decimal places.)

(d) Draw the normal curve that best approximates the distribution of X. Make sure to label the mean and standard deviation.

14. (10 pts.) The scores on a certain standardized test are normally distributed with a mean of 148 and a standard deviation of 16.

(a) Sketch a normal curve corresponding to this distribution and shade the area corresponding to the probability that someone scores 164 or less. Be sure to label where the mean is in your sketch.

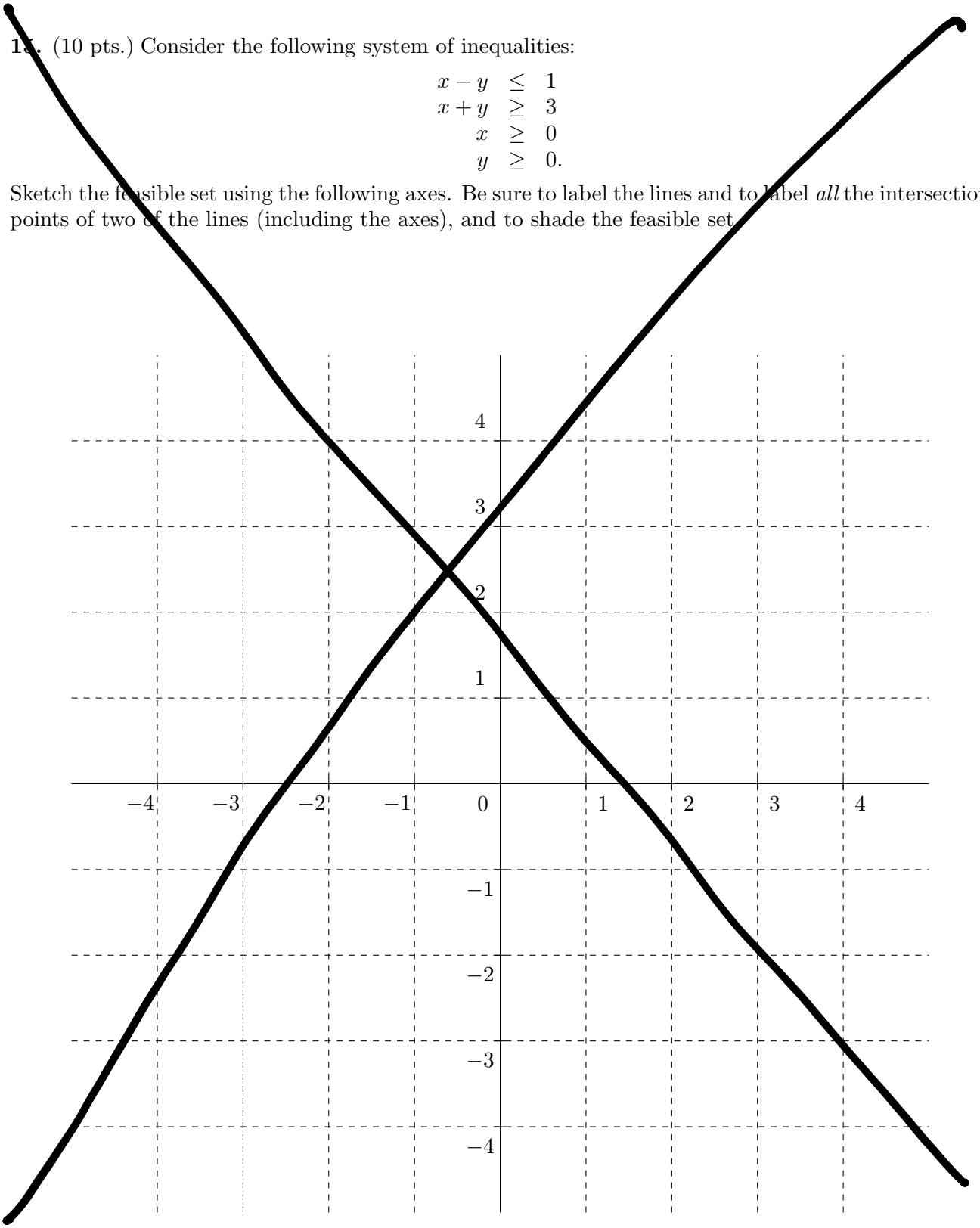
(b) A score is selected at random. Find the probability that it is between 152 and 168.

(c) Emily took the exam and was told that 99% of all scores were less than or equal to hers. What was her score? Explain your answer.

15. (10 pts.) Consider the following system of inequalities:

$$\begin{aligned} x - y &\leq 1 \\ x + y &\geq 3 \\ x &\geq 0 \\ y &\geq 0. \end{aligned}$$

Sketch the feasible set using the following axes. Be sure to label the lines and to label *all* the intersection points of two of the lines (including the axes), and to shade the feasible set.



Department of Mathematics
University of Notre Dame
Math 10120 – Finite Math
Fall 2017

Name:_____

Instructor: Juan Migliore

Exam 3

November 14, 2017.

This exam is in two parts on 0 pages and contains 0 problems worth a total of 100 points. You have 1 hour and 15 minutes to work on it. You may use a calculator, but no books, notes, or other aid is allowed. Be sure to write your name on this title page and put your initials at the top of every page in case pages become detached.

You must record on this page your answers to the multiple choice problems.

The partial credit problems should be answered on the page where the problem is given. The spaces on the bottom right part of this page are for me to record your grades, **not** for you to write your answers.

Place an × through your answer to each problem.

1.	(●)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(●)
3.	(a)	(●)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(●)	(e)
5.	(a)	(b)	(c)	(d)	(●)
6.	(a)	(●)	(c)	(d)	(e)
7.	(a)	(b)	(●)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(●)
9.	(a)	(b)	(c)	(●)	(e)
10.	(●)	(b)	(c)	(d)	(e)

MC. _____
11. _____
12. _____
13. _____
14. _____
15. _____

Tot. _____