[8] points

1. Evaluate or simplify each of the following.

a) $\frac{12!}{10!} + 0! + 1! + 2!$

$\frac{12 \cdot 11 \cdot \cancel{10!}}{\cancel{10!}} + 1 + 1 + 2 \cdot 1 = \boxed{136}$

b) $\frac{(n+1)!}{(n-1)!}$

$\frac{(n+1)(n)\cancel{(n-1)!}}{\cancel{(n-1)!}} = \boxed{n(n+1)}$

[8pts]

2. At a university fraternities and sororities can be named using either two or three of the letters from the Greek alphabet, in which there are exactly 24 letters.

a) How many different names exist if no letter is allowed to repeat?

$24 \cdot 23 \cdot 22 + 24 \cdot 23 = 12696$

b) How many different names exist if repetition is allowed?

$24 \cdot 24 \cdot 24 + 24 \cdot 24 = \underline{14400}$

[10 pts]

3. A professional golfer sinks a putt 85% of the time. If he plays a nine hole course and takes exactly one putt on each of the holes, what is the probability he *** you don't need to compute, just set up***

a) makes exactly six of them

${}_9C_6 (.85)^6 (.15)^3$

b) makes at least seven of them

${}_9C_7 (.85)^7 (.15)^2 + {}_9C_8 (.85)^8 (.15)^1 + {}_9C_9 (.85)^9 (.15)^0$

[8 pts]
4. How many ways can:

a) three desserts be chosen from 10 on a menu?

$_{10}C_3 = 120$

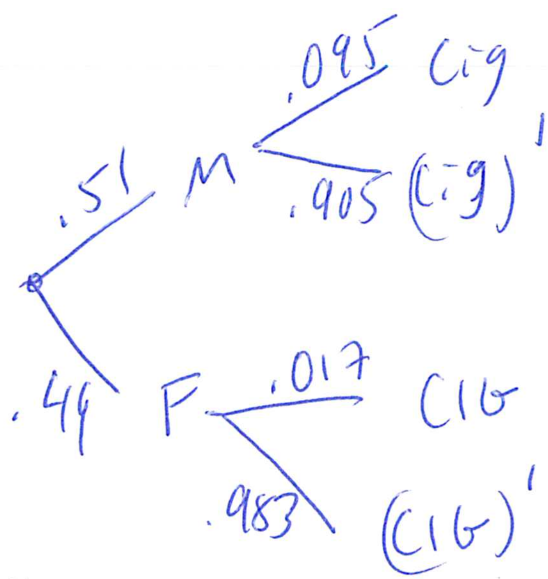
b) the top 3 favorite desserts be listed, in order, from 10 desserts.

$_{10}P_3 = 720$

[12 pts]

5. In Orange County, 51% of the adults are males (thus, 49% of adults are females). Also, 9.5% of males smoke cigars, whereas 1.7% of females smoke cigars (based on data from the Substance Abuse and Mental Health Services Administration).

a) Construct a tree diagram for this information, labeling all probabilities and outcomes.



b) Use Baye's Theorem to find the probability that the person is a male, given that he smokes a cigar. Round to 4 decimal places.

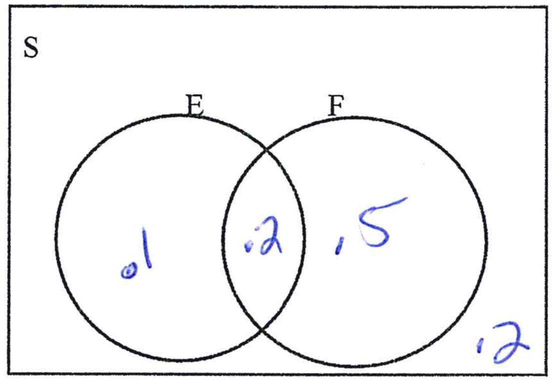
$$P(M|Cig) = \frac{P(M \cap Cig)}{P(C)} = \frac{.51(.095)}{.51(.095)+(.017)(.49)}$$

$$= \boxed{.8533}$$

[14 pts]

6. Let E and F be events of sample space S. Let $P(E) = 0.3$, $P(E \cap F) = 0.2$ and $P(F) = 0.7$.

a) Complete the Venn diagram representing this information.



b) Find $P(E \cup F)$

.8

c) Find $P(E | F)$ $\frac{P(E \cap F)}{P(F)}$

$= \frac{.2}{.7} = 2/7$

d) $P(F | E')$

$\frac{P(F \cap E')}{P(E')} = \frac{.5}{.7} = 5/7$

[14 pts]

7. Use the table to find the probability (as a fraction – don't need to reduce) that a randomly selected student:

		Prize preference			
		MP3	Camera	Bike	
Sex	Man	117	50	60	227
	Woman	130	91	30	251
		247	141	90	478

a) is a male

$\frac{227}{478}$

b) has a prize preference of MP3 or Camera

$\frac{388}{478}$

c) is male given the prize preference is a bike.

60/90

d) is female and has a prize preference that is a bike

$\frac{30}{478}$

[12 pts]

8. The following augmented matrices represent systems of linear equations in variables *x, y,* and *z*. In each case state the general solution or that no solution exists. Write answer in (x,y,z) form. Use t as the parameter if needed.

a. $\left[\begin{array}{ccc|c} 1 & 1 & 1 & 34 \\ 0 & 2 & 3 & 18 \\ 0 & 0 & 1 & -2 \end{array}\right]$ $\boxed{(24, 12, -2)}$

$z=-2$

$2y+3(-2)=18$

$2y=24$

$y=12$

$x+12+-2=34$

$x=24$

b. $\left[\begin{array}{ccc|c} 1 & 0 & -3 & 1 \\ 0 & 1 & 6 & -4 \\ 0 & 0 & 0 & 0 \end{array}\right]$

$z=t$

$y+6t=-4$

$y=-4-6t$

$x-3(t)=1$

$x=1+3t$

$\boxed{(1+3t, -4-6t, t)}$

[13 pts]

9. At a price of $12.59 per box of grapefruit, the supply is 595,000 boxes and the demand is 650,000 boxes. At a price of $13.19 per box, the supply is 695,000 and the demand is 590,000 boxes. Assume that the relationship between price and supply is linear and that the relationship between price and demand is linear.

a) Find the price-**supply** equation of the form p=mx+b, where x is the number of boxes. Do not round.

$m=\dfrac{13.19-12.59}{695000-595000}=.000006$

$y-12.59=.000006(x-595000)$

$\boxed{y=.000006x+9.02}$

b) Suppose t the price-**demand** equation is p = - 0.00001x+19.09, where x is the number of boxes, find the equilibrium quantity and price.

Quanity: 629375 boxes

Price: $12.80

$.000006x+9.02=-.00001x+19.09$

$x=629375$

$y=-.00001(629375)+19.09$

$=12.79625$

[8 pts]

10. Formulate an LP model for the following problem. (DO NOT ATTEMPT TO SOLVE IT!!)

In Karla's garden shop, she makes two kinds of mixture for planting: gardening mixture and potting mixture. A package of gardening mixture requires 2 lb of soil, 1 lb of peat pss and 1 lb of fertilizer. A packing of potting mixture requires 1 lb of soil, 2 lb of peat moss, and 3 lb of fertilizer. She has at most 16 lb of soil, 11 lb of peat moss, and 15 lb of fertilizer. A package of garden mixture sells for \$3 and a package of potting mixture sells for \$5. Assuming all mixtures made will sell, how many packages of teach type of mixture should be made to maximize revenue? First define variables, then set up only.

Max $R = 3x + 5y$

$2x + y \le 16$ soil

$x + 2y \le 11$ moss

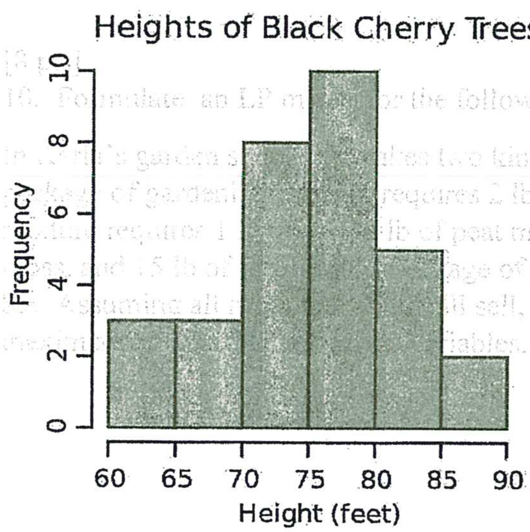
$x + 3y \le 15$ fert.

$x, y \ge 0$.

X = # of packs garden mx.

y = # of packs potting mx.

11. [10 pts]



a) What percent of this sample of black cherry trees are between 70-75 feet tall? Round to the nearest hundredth of a percent.

$\frac{3}{31} = 25.81\%$

b) What is the average (mean) height of this sample of black cherry trees? Round to 2 decimal places and put units on answer.

62.5	3	187.5
67.5	3	202.5
72.5	8	580
77.5	10	775
82.5	5	412.5
87.5	2	175
	31	2332.5

$\frac{2332.5}{31}$

75.24 ft

[12]

12. What is the mean, median and mode for the following? If needed, round to 3 decimal places.

14, 18, 13, 20, 48, 10, 12, 20

Mean: 19.375

Median: 16

Mode: 20

10 12 13 14 18 20 20 48

Med

[16 pts]

13. Consider the following linear programming problem.

Maximize $P = 40x + 50y$

Subject to
$2x + y \le 14$ L1
$x + y \le 8$ L2
$x,\ y \ge 0$

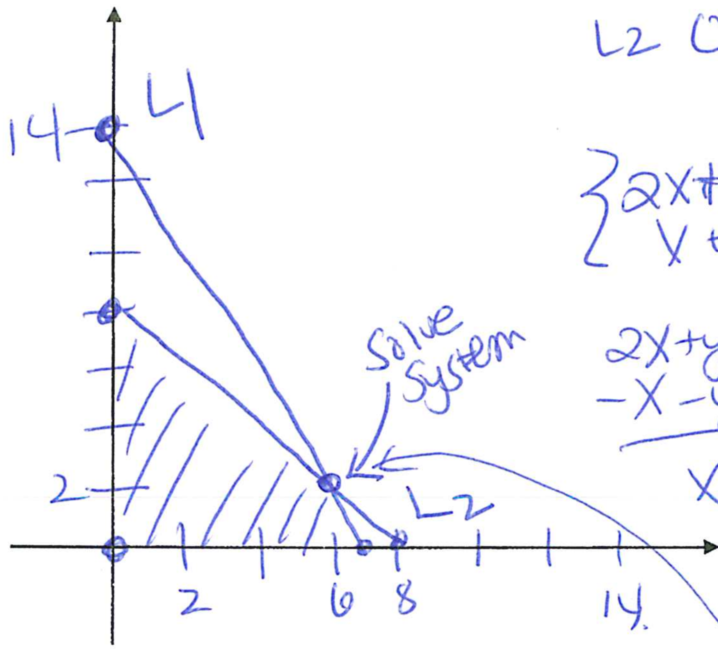
L1
(0,14)
(7,0)

L2
(0,8)
(8,0)

Check:
(0,0)
L1 $0 \le 14$ ✓
L2 $0 \le 8$ ✓

a) Shade the feasible region labeling ALL corner points, use algebra to verify.

CP	40x+50y
(0,0)	0
(0,8)	400
(6,2)	340
(7,0)	280



$\begin{cases} 2x+y=14 \\ x+y=8 \end{cases}$

$2x+y=14$
$-x-y=-8$
$x=6$
$6+y=8$
$y=2$
(6,2)

b) Solve the problem geometrically and report the complete solution.

Max is 400 @ (0,8)

[8 pts]

14. In order to join a dancing club, there is a \$30 startup fee and a \$12 monthly fee.

a) Write a linear equation that expresses the total cost C for x months.

$C = 30 + 12x$

b) Use your equation to find how many months it would take to spend \$132. Show all your work algebraically.

$132 = 30 + 12x$

$102 = 12x$

$8.5 = x$

8.5 mo

[12 pts]

15. A manufacturer has a monthly fixed cost of $150,000 and a production cost of $18 for each unit produced. The product sells for $24 a unit.

a) Determine the cost of producing x units per week.

$C = 150000 + 18x$

b) Determine the revenue of selling x units a week.

$R = 24x$

c) What is the break even point? Find both coordinates and include units. Must do algebraically.

$24x = 150000 + 18x$

$6x = 150000$

$x = 25000$ units

$\$ \Rightarrow$

$24(25000)$

$600,000

[15 pts]

16. If the universal set is U= {a,b,c,d,e,f,g,h} A = {a,b,c,d,e,f} B = {a,d,f,g} and C = {g,h},

Find:

a) $A \cup B$ $= \{a, b, c, d, e, f, g\}$

b) $A \cap B$ $\{a, d, f\}$

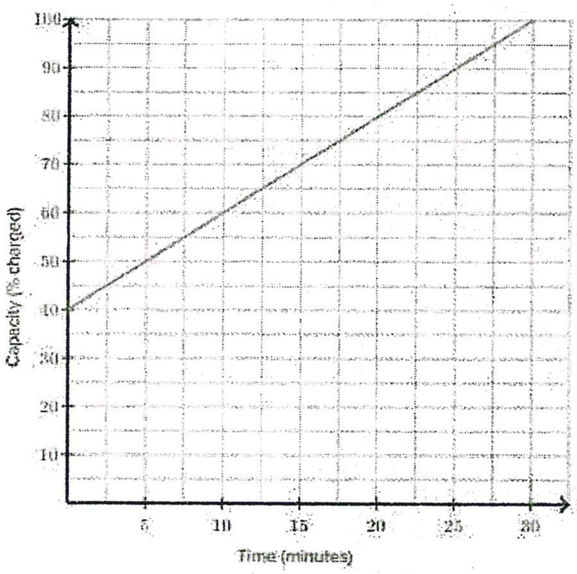
c) $A \cap C$ $\emptyset$

d) B' $\{b, c, e, h\}$

e) n(C) 2

[10 pts]

17. A battery was charged at a constant rate. The graph below describes the percentage of the battery's capacity that is charged as a function of time (in minutes)



a) What is the slope? Include units

2%/min.

b) Write the equation of this line in slope intercept form, were x is the time in minutes.

$y = 2x + 40$

[10 pts]

18. A box contains 5 red balls and 9 green balls. Find the probabilities (to 2 decimal places) that if two balls are selected a random,

a) the first is a red and the second is a green, if the first ball is replaced prior to the second being chosen.

$\frac{5}{14} \cdot \frac{9}{14} = \frac{45}{196} = \boxed{.23}$

b) the first is green and the second is green, if the first ball is not replaced prior to the second being chosen.

$\frac{9}{14} \cdot \frac{8}{13} = \frac{72}{182} = .40$