Math in Action (MAT 130)
Fall 2015
Exam 2
11/4/2015
Time Limit: 60 Minutes

Name (printed): Solution

Signature: _____

Section number: _____

Directions:

This test is one hour long. No phone, **NO CALCULATOR**, no electronics, no notes, no talking to friends, etc. You may use only a pen or pencil. Absolutely no cheating!

No scrap paper! If you need some you may use the back side of this exam.

Read carefully. Show your work. Check your work.

Do not turn to the next page or begin the test until the professor and/or TA's say so.

Do not write below this line.

Grade Table (for teacher use only)

Question	Points	Score
1	30	
2	20	
3	20	
4	20	
5	10	
Total:	100	

The exam is out of 100 points.

1. (30 points)

   (a) (10 points) Harpur College is given 100 iPads by the University to use as it pleases. The administration decides to apportion the iPads amongst each division of the college (Arts and Humanities, Science and Math, Social Sciences, and Interdisciplinary Programs) based on enrollment. Apportion the iPads using Hamilton's method.

1 1 2
3602
2246
3049
+ 1103
10,000

SD = 10,000 / 100 = 100

Division:	Art& Human.	Sci.& Math	Soc. Sci.	Interdisc.	Total
Enrollment	3602	2246	3049	1103	10,000
# of iPads: 100			Standard Divisor: 100		
Exact Quota	36.02	22.46	30.49	11.03	XXXXX
Lower Quota	36	22	30	11	99
Fract. Part	.02	.46	.49	.03	XXXXX
Surplus	0	0	1	0	
Total	36	22	31	11	100

Use your answers from above to determine the results of the first round of Webster's Method. A second table has been provided for your convenience.

Division:	Art& Human.	Sci.& Math	Soc. Sci.	Interdisc.	Total
Enrollment	3602	2246	3049	1003	
# of iPads: 100			Standard Divisor: 100		
Exact Quota	36.02	22.46	30.49	10.03	XXXXX
Rounded Quota	36	22	30	10	98

   (b) (5 points) Does the first round of Webster's method apportion exactly 100 iPads? If not, should we increase or decrease the divisor? No; decrease

   (c) (5 points) If at the end of the second step your new divisor apportions 115 iPads would you increase the divisor, decrease the divisor, or leave it as is?

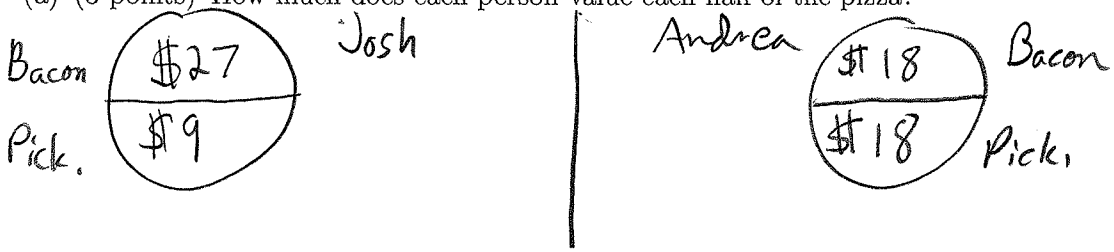
   (d) (10 points) Round the following exact quotas according to the apportionment method. Some geometric means have been done for you.

Exact Quota	4.454	3.282	7.482	8.567	2.383
Jefferson's Method	4	3	7	8	2
Adams' Method	5	4	8	9	3
Webster's Method	4	3	7	9	2
Huntington-Hill	4	3	7	9	2

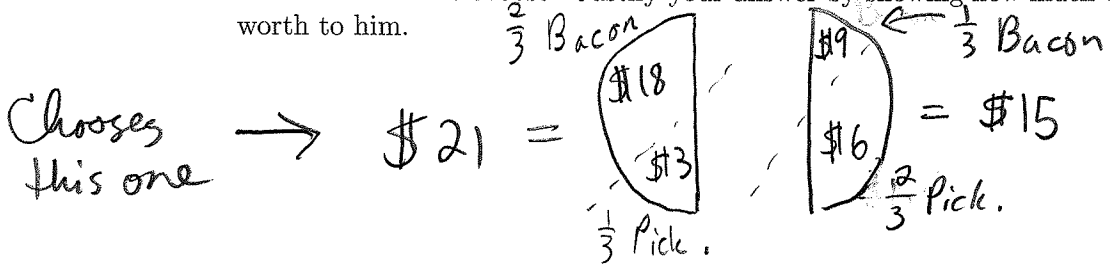
$\sqrt{2\times 3}$	$\sqrt{3\times 4}$	$\sqrt{4\times 5}$	$\sqrt{5\times 6}$	$\sqrt{6\times 7}$	$\sqrt{7\times 8}$	$\sqrt{8\times 9}$
2.449	3.464	4.472	5.477	6.481	7.483	8.485

2. (20 points) Josh and Andrea decide to go to their favorite pizzeria where they order an extra large pizza (which costs \$36). One half of the pizza has bacon and the other half has pickles. Josh likes bacon 3 times as much as pickles and Andrea likes bacon and pickles equally.

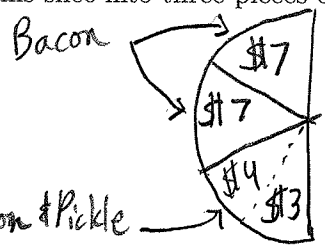
   (a) (3 points) How much does each person value each half of the pizza?



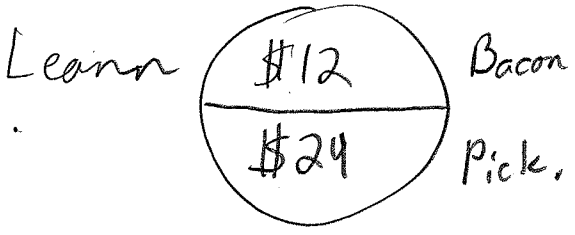
   (b) (7 points) Andrea gets to go first and cuts the pizza into two pieces. On piece has 1/3 of the pickle half and 2/3 of the bacon half while the other has 2/3 of the pickle half and 1/3 of the bacon half. Josh now gets to choose one of the two pieces. Which one will he choose? Justify your answer by showing how much each piece is worth to him.



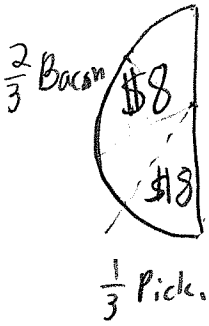
   (c) (5 points) Right as Josh chooses his piece, his friend Leann comes bursting into the restaurant completely famished and in need of food. Josh and Andrea decide to let her in on their pizza and so must continue the cut and choose method to make sure Leann gets an equal share of the pizza. Now both Josh and Andrea must each divide their slice one more time. Indicate with a clear diagram one way in which Josh may divide his slice into three pieces of equal value.



   (d) (5 points) If Leann likes pickles twice as much as bacon, which one of Josh's three slices from part (c) will she choose?



Josh's Half in Leann's View:



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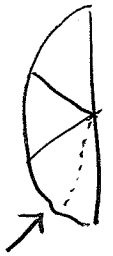
2d) (cont.)



Leonn chooses the slice which contains both bacon and pickles because she values the pickle part of Josh's half equally as much as the bacon part. Therefore if she takes the slice with pickles and bacon it will be worth more than half of Josh's slice in her view.

3. (20 points) Mr. Pewterschmidt decides to buy a new car, boat and helicopter. As a result he gives the old ones to be divided up among Meg, Christ and Stewie however they see fit. The Griffin children decide to divide everything up using the sealed bids method. Using the tables below, carry out the division of the objects.

	Meg	Chris	Stewie
Car	700	800	(1100)
Boat	(350)	300	200
Helicopter	(750)	400	200
Total Value	1800	1500	1500
Fair Share	600	500	500
Allocated	1100	0	1100
Difference	-500	500	-600
Surplus = 600			
Surplus Share	200	200	200

Summary

	Meg	Chris	Stewie
Item(s)	Boat & Helicopter	Nothing	Car
Item's Value	1100	0	1100
Cash	-300	700	-400
Total	800	700	700

4. (20 points) Aloysius, Balthazar, Calamity, Dagmar, Englebert, Flavian, and Joe team up to conquer an island. After their victory they decide to divide the island amongst each other using the claim and challenge method. They proceed in the exact order that they're listed in. Suppose Dagmar starts the fourth round, and also claims her piece in the fourth round. Also suppose that Flavian wins in the fifth round.

   (a) (5 points) How many rounds are needed to complete the allocation.

   6

   (b) (5 points) Who got their pieces in the first three rounds?

   Aloysius, Balthazar & Calamity

   (c) (5 points) Describe the fifth round in terms of claims, challenges and passes by each player. Englebert cuts a piece. Flavian challenges, Joe passes. Thus Flavian claims the 5th piece

   (d) (5 points) Who will go first in the sixth round?

   Englebert

5. (10 points) True or False (Circle one, no need to explain.)

   (2 points each.)

   True or (**False**) In a claim and challenge involving 1,000 people there would be 998 rounds.

   True or (**False**) Jefferson's method never violates the quota criterion.

   True or (**False**) The cut and choose method always produces a fair division, but never an envy-free one.

   True or (**False**) The sealed bids method will always produce an envy free division.

   True or (**False**) Two people trying to figure out how to divide a house willed to them is an example of a continuous fair division problem.