Math 141, Spring 2012
TEST 2, version A
Chapters 3, 4 & 5

_____ 100 pts

NAME: Answers

Do not use a calculator on this test!

Seat: _____

Show all your work! Full credit is based on work shown!

9pts

1. **Without actually dividing**, use divisibility tests to determine if 85,932 is divisible by each of the following numbers.

a. Does 9 | 85,932? Yes (1 pt) Show the **divisibility test for 9:** (2 pts)

$9 \mid (8+5+9+3+2) \Rightarrow 9 \mid 27$ or 9 must divide the (sum of all digits)

b. Does 7 | 85,932? Yes Show the **divisibility test for 7:**

$85\,93 - 4 = 85\,89$; $858 - 18 = 840$; $84 - 0 = 84$; $8 - 8 = 0$; 7 | 84 or

Double the last digit & subtract from rest of #. Repeat as necessary till the result is small enough to easily see if it is div. by 7.

c. Does 11 | 85,932? Yes Show the **divisibility test for 11:**

$(8+9+2) - (5+3) = 19 - 8 = 11$ or 11 Must divide the difference of the sums from alternate digits

5pts

2. Complete the following five digit number so that it is divisible by 6. Give all possible answers; show the divisibility test for 6.

(2 pts) 53,430 or 53,436

To be divisible by 6 # must be divisible by both 2 & 3. Thus last digit must be even & the sum of all digits must be divisible by 3. (3 pts)

$(5+3+4+3+x)$

$(15+0)$ or $(15+6)=21$

13pts

3. a. The **prime factorization** of 132 is $2 \cdot 2 \cdot 3 \cdot 11$ (2 pts)

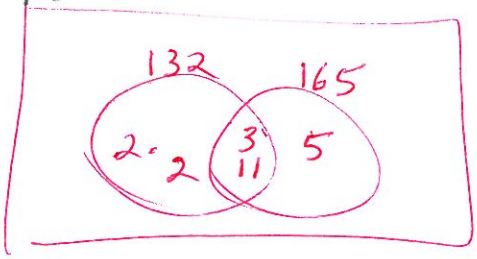
b. The **prime factorization** of 165 is $3 \cdot 5 \cdot 11$ (2 pts)

Show your factor trees here: (2 pts)

132 → $2 \cdot 66$ → $6 \cdot 11$ → $2 \cdot 3$

165 → $5 \cdot 33$ → $3 \cdot 11$

c. Draw a Venn Diagram to show how the prime factors of 132 and 165 are related. (3 pts)



d. The GCF (132, 165) = 33 (2 pts) (-1 pt if 11 has)

e. The LCM (132, 165) = 660 (2 pts)

"Build-up method" $4(165) = 660$

$(132) \cdot 5 = 660$

6pts.

4. Show all your steps in the following addition problem, using the LCM from problem 3e & simplify your answer, if possible.

$\frac{5}{5} \cdot \frac{7}{132} + \frac{13}{165} \cdot \frac{4}{4} = \frac{35}{660} + \frac{52}{660} = \frac{87}{660} = \frac{29}{220}$

$8+7=15$ so its divisible by 3

33

3pts

5. Is 103 a prime number? yes Explain, using the definition of a prime number and divisibility tests:

only need to test for div. by prime #s ≤ $\sqrt{103}$ (1pt) (1pt) (1pt)

Must test for divisibility by 2, 3, 5 + 7

a prime number has exactly two factors, the # itself and 1.

6pts

6. Rewrite each of the following with a single exponent. Include your work to show the rules of exponents that you used.

a. $(7^5 \cdot 7^3) = 7^{(5+3)} = 7^8$

b. $\frac{6^7}{6^3} = 6^{(7-3)} = 6^4$ or $\frac{6\cdot6\cdot6\cdot(6\cdot6\cdot6\cdot6)}{6\cdot6\cdot6}$

c. $6^3 4^2 3^4 = 6^3 \cdot (2^2)^2 \cdot 3^4 = 6^3 \cdot (2^4 \cdot 3^4) = 6^3 \cdot 6^4 = 6^7$

3pts

7. Mentally determine which is larger 9^{11} *or* 3^{20}? 9^{11} (1pt) Justify your answer using the rules of exponents. (2pts)

9^{11}

$(3^2)^{11}$

3^{22}

$> 3^{20}$

3pts

8. Is the set of whole number multiples of four {0, 3, 6, 9, 12, 15, 18, 21, …} **closed** for division? No (1pt)

three

Explain: (2pts)

When you divide two #s from the set, the answer may be a number that is not in the set.

6pts

9. Name three **properties for addition** of whole numbers and give an example for each one.

(order) Commutative Property $5 + 3 = 3 + 5$

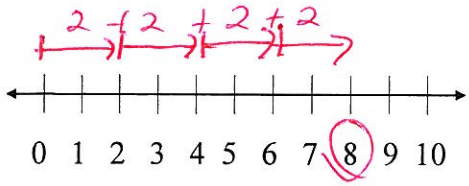
(grouping) Associative Property $(2 + 3) + 4 = 2 + (3 + 4)$

Identity $8 + 0 = 8$

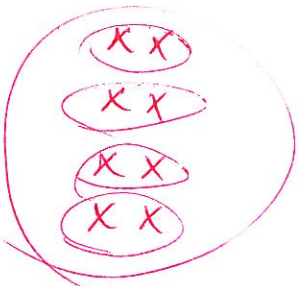
6pts (3 pts each)

10. Illustrate that 4 x 2 = 8, using the following:

a. **number line**



b. **set model**

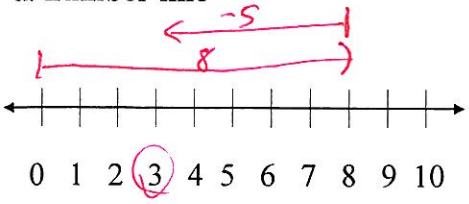


-1pt if either or both illustrate $2 \times 4 = 8$

6pts

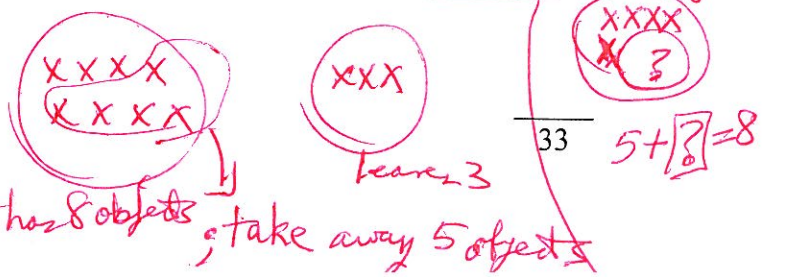
11. Illustrate that 8 – 5 = 3, using:

a. **number line**



b. **set model**

or missing addend



6pts

12. Fill in the blanks using the definition of division, **writing each division equation as a multiplication equation.** (If there is no valid answer put "undefined" and show why.)

a. $35 \div 7 =$ 5 because 5 x 7 = 35

b. $0 \div 12 =$ 0 because $0 \times 12 = 0$

c. $0 \div 0 =$ undefined because there is no unique solution for $\boxed{?} \times 0 = 0$ (1 pt, 1 pt)

2pts

13. Fill in the blank using the **definition of "less than":** $7 < 12$ because $7 + 5 = 12$

6pts (3 pts each)

14. Write out the steps to show an easy way to **mentally calculate** each of the following: Give the exact answer, not an estimate and do not use standard paper and pencil methods.

a. $25 \times 19 - 25 \times 11$ (Distributive prop)

$25(19-11) = 25(8) = 200$

b. $557 - 5 \rightarrow 552$

$+ 395 + 5 \rightarrow + 400$

952

4pts 2 each

15. a. **Estimate** using compatible numbers.

$3426 \div 49 \approx 3500 \div 50$

$= 70$

b. **Estimate** using the range method.

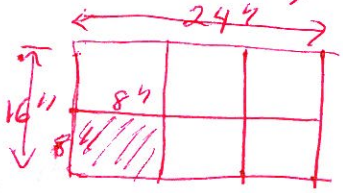
2000	2625	3000
0	420	1000
3000	+ 3376	4000
5000		8000

5pts

16. Rosa wants to make a game board that is 16 inches by 24 inches for a game she has invented. She will use square tiles. What are the dimensions of the **largest tile** Rosa can use? 8 x 8 (1 pt answer)

[Answer this showing all your work & list your problem solving strategies.] (1 pt)

GCF(16,24) = 8



work 3 pts

Draw a diagram or guess + test

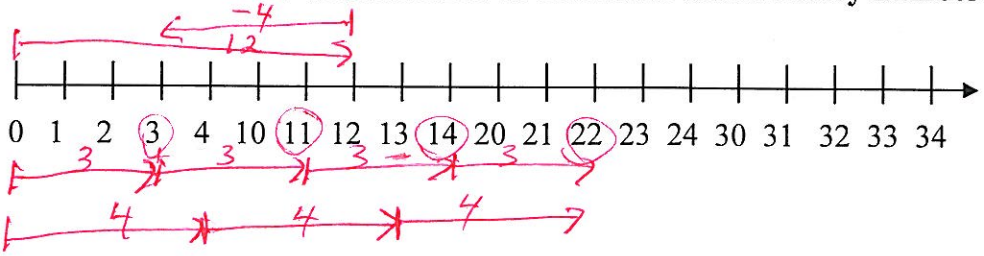
Use properties of #s, GCF

11pts

17. Do each of the following problems in **base five arithmetic:**

Show your work on this number line to illustrate how to determine the necessary number facts.

Subtraction facts (1 pt)



(1 pt) **multiples of 3**

(1 pt) **multiples of 4**

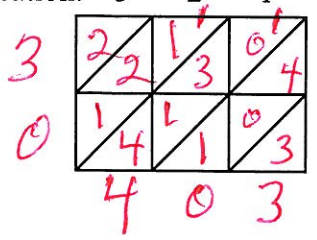
a. Subtract in **base five:** (3 pts)

$$\begin{array}{r} 4\,0\,2 \\ -\ 2\,3\,4 \\ \hline 1\,1\,3 \end{array}$$

12 − 4 = 3

b. Multiply: 321 x 43 in **base five:** using lattice multiplication. (optional check)

$$\begin{array}{r} 3\,2\,1 \\ \times\ 4\,3 \\ \hline 2\,0\,1\,3 \\ 2\,3\,3\,4 \\ \hline 2\,0\,4\,0\,3 \end{array}$$



4 pts # facts, 1 pt + correct

34