Answers for Sample Test

Th March 4, 2004

Math 141 - Spring 2004 ____/100 NAME: Key

TEST II

Chapters 3, 4, and 5 Seat: ____

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

9pts

1. **Without actually dividing,** use the divisibility tests to determine if ~~4236~~ 53742 is divisible by each of the following numbers.

a. Does 9 | 53742 ? No (1pt) Show the **divisibility test for 9:** Sum of all digits is divisible by 9. or
2pts 5+3+7+4+2 = 21 9 | 21

b. Does 6 | 53742 ? Yes (1pt) Show the **divisibility test for 6:** Tests for 2 & 3.
the last digit is even (1pt) & the sum of all digits is div by 3 (1pt)

c. Does 4 | 53742? No (1pt) Show the **divisibility test for 4:** 4 must divide the # that is the last 2 digits
4 | 42 2pts

3pts

2. Complete this six digit number so that it is divisible by 11. **Explain the divisibility test for 11.**

9 6 7 2 1 9 (1pt) (9+7+1) − (6+2+7) must be 9

17 − 17 = 0 11 | 0 2pts

4 11 must divide the difference of the sums from every other digit. 4

4pts

3. How could you create a test for divisibility by 12? Write out your test, give an example with a four-digit number to illustrate that your test works.

4pts To be divisible by 12 the # must be divisible by 4 & 3.
So the sum of the digits must be div by 3 & the last 2 digits div by 4.

4pts 12 | 1548 because 3 | (1+5+4+8) and 4 | 48
3 | 18

−1 Not a 4 digit #

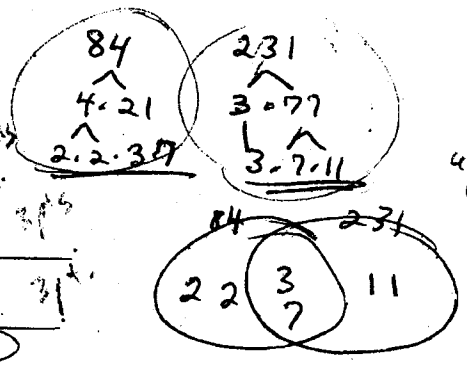
10pts

4. a. The **prime factorization** of 84 is $2 \cdot 2 \cdot 3 \cdot 7$ 2pts

b. The **prime factorization** of 231 is $3 \cdot 7 \cdot 11$ 2pts

c. The **greatest common factor** of 84 and 231 is 21 3pts
for 3, 7: −1pt & 7 −2pts & 3

d. The **least common multiple** of 84 and 231 is 924 3pts.
(−1pt & 2772 + 2 of 7) 2·2·3·7·11



"Build-up" method.
84 · 11 = 924
4 · 231 = 924

5. Show all your steps in the following ~~subtraction~~ addition problem and simplify your answer.

$\frac{11}{11} \cdot \frac{5}{84} + \frac{2}{231} \cdot \frac{4}{4} = \frac{55}{924} + \frac{8}{924} = \frac{63}{924} = \frac{21}{308} = 1\frac{3}{44}$ (1pt) (1pt addition) (1pt) (2pts) −1pt if simplified but not completely.

1 if subtracted

3

3

A prime # is divisible by only itself + 1.

Is 123 a prime number? No 1pt or Explain: It has more than 2 factors 2pts (or) since it is div by 3 (Sum of the digits is 6, it will have a factor of 3) Factors are 1·123 & 3·41 OK if had this

6pts

7. Rewrite each of the following with a single exponent. Include your work to show the exponential rules you used.

a. $(5^3)^4 = 5^{3\cdot4} = 5^{12}$ 1pt (or $5^3 \cdot 5^3 \cdot 5^3 \cdot 5^3$) b. $\frac{8^9}{8^6} = 8^{9-6} = 8^3$ 1pt 1pt c. $12^5 \cdot 3^3 \cdot 4^3 =$ $12^5 \cdot 12^3 = 12^8$ 1pt 1pt *

3pts

8. Is the set of positive odd numbers {1, 3, 5, 7, 9, 11, …} **closed** for multiplication? Yes 1pt

Explain: (Any positive odd # times another positive odd # = pos odd #,) 2pts

Example: $3 \times 5 = 15$

$7 \times 9 = 63$

3pts

9. Is the set of positive odd numbers {1, 3, 5, 7, 9, 11, …} **closed** for division? No 1pt

Explain: $\frac{9}{3} = 3$ but $\frac{9}{5} = 1\frac{4}{5} \notin \{1, 3, 5, \ldots\}$ 2pts

4pts

10. For each of the following, identify the property that is illustrated:

a. $(7 + 2) + 3 = (2 + 7) + 3$ Commutative (order)

b. $3 + (5 + 9) = (3 + 5) + 9$ Associative (grouping)

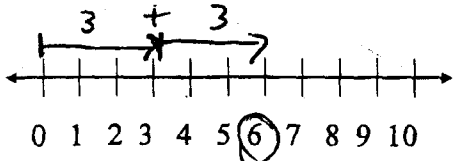
c. $5(6 + 8) = 5(6) + 5(8)$ Distributive

d. $15 + 0 = 15$ Identity

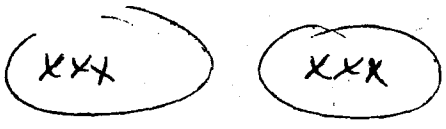
6pts

11. Illustrate that 2 x 3 = 6, using the following: (1pt if 3 sets of 2 for part a or b or both)

a. **number line**



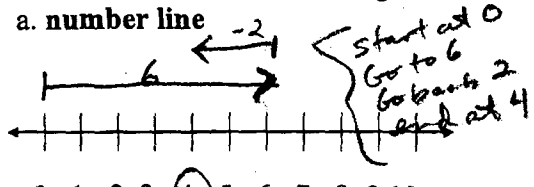
b. **set model** two sets of 3.



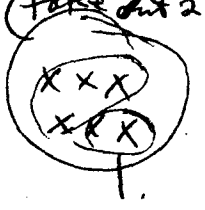
6pts

12. Illustrate that 6 – 2 = 4, using:

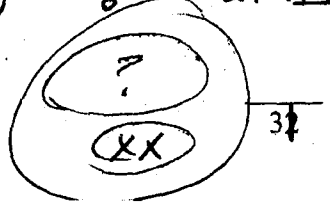
a. **number line**



b. **set model** take away method (take out 2 leave 4)



OR missing addend method $2 + \boxed{?} = 6$



* if 2 + ?

3.2 there exists a unique whole # c ... if and

$a \div b = c$ iff $c \times b = a$

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

a. $42 \div 7 =$ 6 because $6 \times 7 = 42$

b. $7 \div 0 =$ undefined because $\square \times 0 = 7$ (no solution) ok if said $0 \times$ any # $= 0$ and then not 7,

c. $0 \div 7 =$ 0 because $0 \times 7 = 0$

d. $0 \div 0 =$ undefined because $\square \times 0 = 0$ (could be any #) no unique solution

3pts

14. Fill in the blank using the **definition of less than:** $6 < 13$ because $6 + 7 = 13$ (-3pts if said $13 > 6$; -1pt if $13 - 6 = 7$)

6pts

15. Write out the steps to show how you would **mentally calculate** each of the following: Give the exact answer, not an estimate and do not use standard paper and pencil methods. (could say in words)

a. $25 \times 12 \times 4$

$(25 \times 4) \times 12$

$100 \times 12 = 1200$

b. 6×57 (Use the distributive property.)

$6(50+7) = 300 + 42$

$= 342$

(-1pt if said 6 and the 13 in counting or on # line)

6pts

16. a. **Estimate** using compatible numbers.

$8000 \div 80 = 100$ (-1pt if)

$8220 \div 91$

~~$8100 \div 90 = 90$~~

b. Estimate using front-end with adjustment.

(-3pts if rounded: 2000, 3000, 2000, 9000)

$1876 + 3145 + 2478 \approx$

$(1000 + 3000 + 2000) + 1500$ (ok if 1300) $= 7300$ or 7500 (-2pts)

1pt $6000 + 1500$

6pts

17. Jen takes 12 minutes to drive the course of a car-rally video game and return to the starting point. Joe takes 18 minutes. If they start at the same time, after how many minutes will their cars cross the starting point at the same time? 36 min (Show your work and tell what strategies you used.)

(-1pt work, -1pt answer, -1pt strategy)

Make a list (LCM)

12 24 36 48 60 72 ...

18 36 54 72 ...

OK if didn't say use LCM

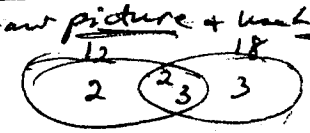
or $LCM(12, 18) = 36$

Use # facts + LCM

or Draw picture + use LCM

12: 4 · 3 → 2 · 2 · 3

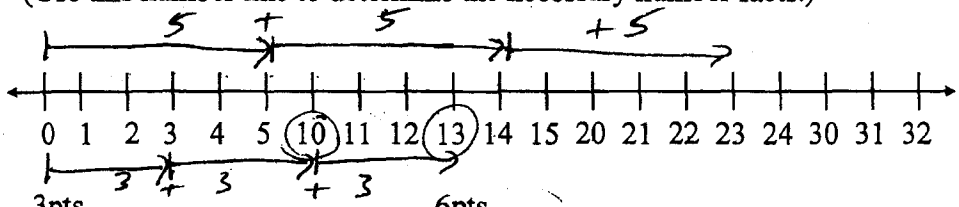
18: 2 · 9 → 2 · 3 · 3



$\rightarrow 2 \cdot 2 \cdot 3 \cdot 3 = 36$

18. Do each of these problems in **base six arithmetic:**

(Use this number line to determine the necessary number facts.)



3pts

a. Subtract: $4152 - 234 = 1354$

(# facts: $12 - 4 = 4$, $10 - 3 = 3$)

6pts

b. Multiply: 523 x 23 in **base six** using lattice multiplication.

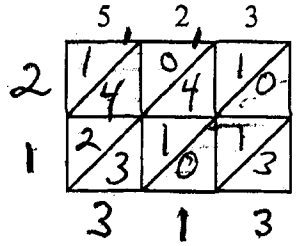
(could check with standard method)

523×23

2413

1450

21313



4pts # facts, 2pts answer (-2pts if added in base ten)

38

(-1pt if small error in adding in base six)