



9) If  $U = \{40, 41, 42, 43, 44, 45, 46\}$ ,  $A = \{41, 43, 46\}$  and  $B = \{41, 45\}$ , find each of the following:

- a)  $A \cup B$    b)  $A \cap B$    c)  $A \times B$    d)  $n(A)$

10) List the elements of the set  $A = \{x \mid x \in \mathbb{N} \text{ and } 5 \leq x < 10\}$

11) List all subsets of  $C = \{1, 2, 3, 4\}$

12) Given  $U = \{1, 2, 3, \dots, 30\}$     $A = \{1, 3, 5, 7, 11, 13, 17, 19\}$   
 $B = \{x \mid x \in \mathbb{N} \text{ \& } 15 < x < 25\}$     $C = \{x \mid x \text{ is an odd number \& } 19 \leq x < 30\}$ .

- a)  $A \cap B$    e)  $B - C$   
 b)  $A \cup B$    f) Show  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$   
 c) Is  $A \cup (B \cup C) = (A \cup B) \cup C$ ?   g)  $(B - C) \cap \overline{A}$   
 d) Show  $A \cup B = \overline{A \cap B}$    h)  $n(B - A)$

13) Given  $U$  and the disjoint sets  $A$  and  $B$  ( $A$  and  $B$  being proper subsets of  $U$ ) find:

- a)  $A \cap U$    b)  $A \cap B$    c)  $A - B$    d)  $B - A$    e)  $A \cup U$    f)  $B \cap \emptyset$    g)  $B \cup \emptyset$   
 h)  $A \cap \overline{A}$    i)  $B \cup \overline{B}$    j)  $B \cap U$

14)  $A = \{1, 2, 3, 4\}$     $B = \{2, 3\}$  Use  $\in$ ,  $\notin$ ,  $\subseteq$ ,  $\subset$ , and  $\not\subseteq$ .

- a)  $\emptyset \dots A$    b)  $B \dots A$    c)  $\{2\} \dots B$    d)  $\{2, 3\} \dots B$   
 e)  $1 \dots A$    f)  $A \dots B$    g)  $5 \dots A$    h)  $2 \dots B$

15) Indicate the following sets by shading:

- a)  $(C - A) \cap B$    b)  $C - (A \cap B)$

**Decide whether the sets are equal.**

16)  $\{4, 8, 12, 16, 32\}$  and  $\{4, 8, 12, 16, \dots, 32\}$

**Decide whether the statement is true or false.**

17)  $\{a \mid a \text{ is an odd integer}\} \subset \{b \mid b \text{ is a positive integer}\}$

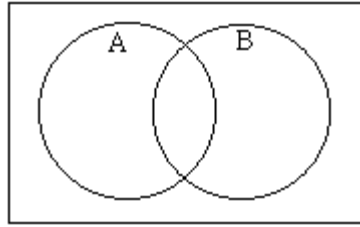
18)  $\emptyset \subseteq \{6, 12, 18, 24, 30\}$

**Decide whether the sets are equivalent.**

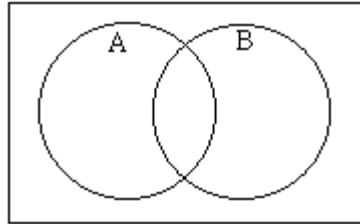
19)  $\{62, 24, 87, 0, 68\}$  and  $\{z, n, c, s, y\}$

Shade the Venn diagram to represent the set.

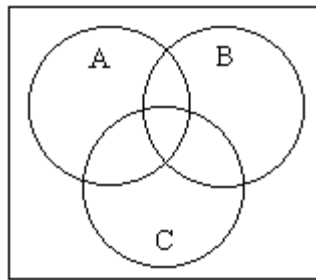
20)  $\overline{A} \cap \overline{B}$



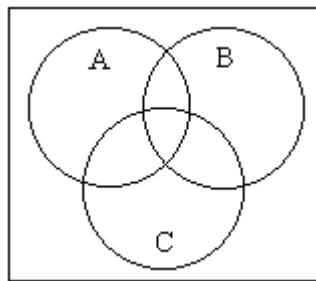
21)  $(A \cup B) \cap \overline{(A \cap B)}$



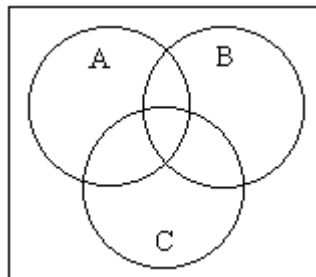
22)  $\overline{C} \cap (A \cup B)$



23)  $[(A \cap B) \cup C] - A$

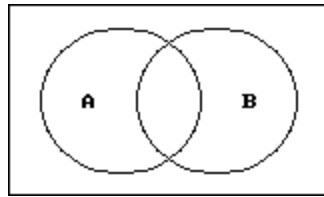
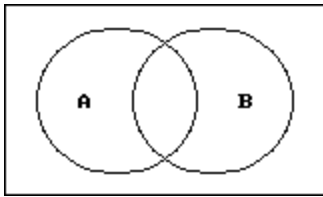


24)  $\overline{(A \cup B)} - C$

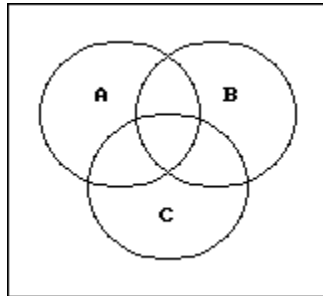
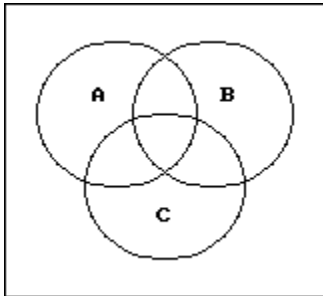


Use a Venn diagram to decide if the statement is true or false.

25)  $A \cap \overline{B} = \overline{B - A}$

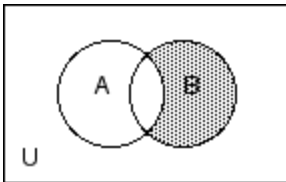


26)  $B \cup (A \cap C) = (A \cup B) \cap (B \cup C)$

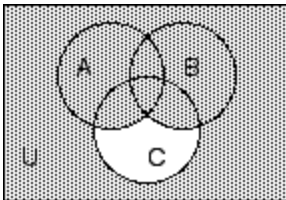


Write a description of the shaded region using the symbols  $A, B, C, \cup, \cap, -$ , and  $\overline{\quad}$  as needed.

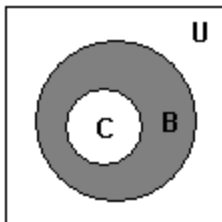
27)



28)



29)



Find the cardinal number of the indicated set.

30) Given:

$$n(A) = 70$$

$$n(B) = 78$$

$$n(C) = 72$$

$$n(A \cap B) = 14$$

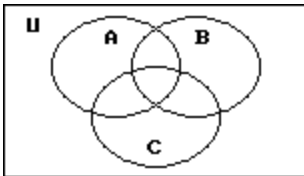
$$n(A \cap C) = 16$$

$$n(B \cap C) = 10$$

$$n(A \cap B \cap C) = 8$$

$$n(\overline{A \cap B \cap C}) = 141$$

Find  $n(U)$



31) At East Zone University (EZU) there are 897 students taking College Algebra or Calculus. 520 are taking College Algebra, 450 are taking Calculus, and 73 are taking both College Algebra and Calculus. How many are taking Algebra but not Calculus?

32) A survey of a group of 115 tourists was taken in St. Louis. The survey showed the following:

64 of the tourists plan to visit Gateway Arch;

48 plan to visit the zoo;

11 plan to visit the Art Museum and the zoo, but not the Gateway Arch;

13 plan to visit the Art Museum and the Gateway Arch, but not the zoo;

19 plan to visit the Gateway Arch and the zoo, but not the Art Museum;

7 plan to visit the Art Museum, the zoo and the Gateway Arch;

16 plan to visit none of the three places.

How many plan to visit the Art Museum only?

33) True or False?

a)  $A - B = B - A$

b)  $\emptyset \subset A$

c)  $A \subseteq U$

d) If  $A \cup C = A$ , then  $A \subseteq C$

e) If  $B \subset C$ , then  $B \cap C = B$

f)  $(A \cap B) \cap C = A \cap (B \cap C)$

g)  $A \cup \overline{A} = \emptyset$

h)  $A \cap \overline{A} = U$

i)  $B - \overline{B} = \emptyset$

- 34) If  $A = \{1, 2, 3\}$      $B = \{m, n, x\}$
- How many 1-1 correspondences are possible?
  - find  $A \times B$
  - $n(A \times B) = ?$
  - Is  $A \times A$  a function from  $A$  to  $A$ ?
  - How many proper subsets does  $A$  have?

- 35)  $A = \{11, 8, 9\}$   
 $B = \{13, 4\}$   
 Find  $A \times B$ .

- 36)  $f(x) = 3x - 2$   
 $f(0) = ?$   
 $f(1) = ?$

- 37) Give the rule
- | $x$ | $f(x)$ |
|-----|--------|
| 0   | 2      |
| 1   | 3      |
| 2   | 6      |
| 3   | 11     |

- 38) Given the function  $f(x) = 3x - 1$  and the domain  $D = \{0, 3, 5\}$ , find the associated range.

- 39) Given  $f(x) = 2x - 1$  and  $g(x) = x - 7$  find each of the following:

- a.  $(f \circ g)(-4)$                       b.  $g(f(5))$                       c.  $(g \circ f)(x)$

- 40) Which of the following relations is a function from the set of first components to the set of the second components?

- a)  $\{(1, 1), (2, 4), (3, 4)\}$       b)  $\{(4, 1), (5, 1), (6, 1)\}$       c)  $\{(1, 5), (2, 6), (1, 3)\}$

- 41) To call country A you pay \$1.19 for the first minute and 75¢ each additional minute.

Complete the ordered pairs  $(x, y)$ , when  $x$  is the number of minutes and  $y$  is the cost of the call.

- a)  $(1, )$       b)  $(2, )$       c)  $(3, )$       d)  $( , \$8.69)$

Also, write a rule that lets you figure out the cost of the call as a function of the number of minutes.

42) Draw Venn Diagrams:

$$A = \{x \mid x \text{ is a positive divisor of } 12\}$$

$$B = \{x \mid x \text{ is a positive divisor of } 20\}$$

Can you use this diagram to find the greatest common divisor of 12 and 20?

43) Which are equivalent? Which are equal?

a)  $A = \{1, 2, 3\}$    b)  $B = \{ \}$    c)  $C = \{\emptyset\}$    d)  $D = \{1\}$    e)  $E = \emptyset$    f)  $F = \{3, 7, 8\}$   
g)  $G = \{3\}$    h)  $H = \{2, 1, 3\}$

44) In a certain town there live 150 men: 80 are married, 70 have a telephone, 75 own a car, 55 are married and have a telephone, 35 have a telephone and a car, 40 are married and have a car, and 30 are married, have a car and have a telephone. How many men are single and do not have either a car or a telephone?

45) Write 1492 in Roman numerals.

46) Rewrite the following division sentence as a multiplication sentence; then rewrite the multiplication sentence as a NEW division sentence.

$$320,544 \div 224 = 1431$$

47) If it takes 30 seconds to make each cut, how long will it take to cut 16 boards that are 15 feet long into boards that are 5 feet long if only one board can be cut at a time? (careful—make a drawing)

48) Kathy's VISA *charge account* has a starting balance of \$617. She makes purchases of \$80, \$90, \$55, and \$26. She makes a payment of \$23 and returns some merchandise for \$41. What is her balance at this time?

49) I am thinking of a whole number. If I divide it by 11, then multiply by 15, then subtract 18, and then add 60, I end up with 87. What was my original number?

50) Find  $-x$  when  $x = -3$ .

51) Add:  $9 + (-14) + (-7) + 17 + (-12)$

52) Use a property of subtraction to rewrite each of the following as a sum.

a)  $5 - 4$

b)  $-2 - (-3)$

c)  $-2 - 2$

53) Simplify:  $-6 - 54 \div 3(2) + 4^2$

54) Simplify:  $-6 - 9(4) + 2$

55) In a chemical experiment the temperature is  $-48^{\circ}\text{C}$  at 3:00 P.M. What is temperature at 3:21 P.M. if the temperature increases  $3^{\circ}\text{C}$  per minute?

56) Classify each of the following as true or false.

a) If a number is divisible by 8 and 2, then it is divisible by 16.

b) If  $x|(a + b)$ , then  $x|a$  or  $x|b$ .

c)  $0|4$ .

57) Which of the following numbers are divisible by 3?                      2448, 7367, 6353, 5175

58) Which of the following numbers are divisible by 8?                      1014, 711, 4279, 135

59) Which of the following numbers are divisible by 6?                      4942, 9090, 7436, 3744

60) Find all the factors of:            a) 33                      b) 72

61) Write the prime factorization of 300.

62) What is the greatest prime number to consider to test whether or not 531 is prime?

63) Farmer Welsh has 725 pear trees. He wants to plant them in rows that have the same number of trees in each row. Since his property is approximately square, what are his best options?

64) At 12:00 P.M. David and Tanya are sitting in class. Every 35 seconds David looks up to see if Tanya is looking at him. Every 49 seconds Tanya looks up to see if David is looking at her. If they immediately look back at their desks each time, how long will it be before they make eye contact?

65) Find the least number divisible by each natural number greater than 3 and less than 15.

66) Carol has five times as much money as Nina, and Nina has \$8 less than Lynn. If  $n$  represents the amount Nina has, represent the total amount that Carol, Nina and Lynn have together.



- 67) A teacher instructs her class as follows:  
Take any number and subtract 12 from it. Now multiply that difference by 5. Next add 20, and divide the sum by 5. If you now add 16 to the quotient and tell me the number. I will tell you the number you started with. Show how it is possible for the teacher to find the starting number.
- 68) Last week Mrs. Baker's cats got into Mrs. Murphy's chicken coop with her chickens. During the commotion, I counted 26 heads and 60 feet. None of the animals was harmed. How many of Mrs. Baker's cats were in the coop with how many of Mrs. Murphy's chickens?
- 69) Classify as True or False:  
a) Every set is a subset of itself.  
b) If  $A = \{ 2, 3, 4, 5, 6, 7 \}$ , then  $n(A) = 5$ .
- 70) Find the 8th term of this sequence: 32, 16, 8, 4, .....
- 71) Tom's income has been increasing each year by the same amount. The first year his income was \$25,900, and the fifteenth year his income was \$60,900. In what year will his income be \$85,900?
- 72) Convert 29 to base three.
- 73) Convert  $423_{five}$  to base ten.
- 74) Tell the place value for the underlined numbers: a)  $\underline{9}4598$                       b)  $\underline{2}48_{six}$
- 75) For each of the following identify the rational number property which is illustrated:  
a)  $9 + (6 + 4) = 9 + (4 + 6)$   
b)  $-3(x + 8) = -3x + -24$   
c)  $4 + 0 = 4$
- 76) Draw a diagram of the collection of base pieces representing the following number.  $143_{five}$ .
- 77) Add or multiply in the bases indicated:  
a)  $50303_{six} + 244_{six}$                       b)  $212_{five} \times 13_{five}$
- 78) Use the indicated model to perform the following: Show your work.  
a)  $7 + 3$  (number line and charged field)      b)  $3 \times (-5)$  (charged field)  
c)  $-7 - 4$  (charged field)

79) Write the first 15 natural numbers in base five.

80) Find the missing numbers in each of the following.

$$\begin{array}{r} \text{a) } \square 3 \square 8 \\ + 4 8 3 \square \\ \hline 6 \square 7 3 \end{array} \qquad \begin{array}{r} \text{b) } 9 5 \square \\ \times \quad 3 \\ \hline \square \square \square 1 \end{array}$$

81) Use both traditional and the lattice multiplication algorithm to perform the following multiplication.  $149 \times 58$

82) A siren blows every 45 seconds. Find the number of times it blows in 15 minutes.

83) Find the additive inverse of a. 3      b. -7      c.  $2x - 5y$

84) Decide whether the following are true or false using only the divisibility tests. Give a reason for your answer.

$$\text{a) } 9|56,892 \qquad \text{b) } 15|87,465$$

85) Find: a) GCD(12, 80) b) LCM(20, 36)

86) Use the Euclidean Algorithm to find the GCD and LCM of 200 and 2924.

87) List all primes that must be checked in order to determine if 519 is prime.

88) What is the smallest counting number divisible by 2, 4, 6, 12 and 15?

89) Simplify: a)  $6 - (-5) \times 4$       b)  $12 - 4 \times 6 \div 3 + 9 - 2^3$

90) Solve this equation:  $-2x - 15 = 27$

91) The annual sales for certain computers were \$7,800 one year and \$14,950 the next. Assuming that the price of computers was the same each of the two years, how many computers were sold each of the two years? (there is more than one possibility---list all the possible answers)

92) Write the preceding and succeeding number for each of the following:

$$\text{a) } 767_{\text{eight}} \qquad \text{b) } \text{XIX}$$

93) Estimate each answer. Show how you arrived at your answer.

a)  $345 \cdot 76$

b)  $78 \overline{)65,789}$

**TRUE/FALSE**

94) The empty set is a subset of every set.

95)  $5 \notin \{3, 4, 6, 7\}$

96) Commutativity does not hold for division.

97) If  $b$  is a whole number, then  $b \div 0 = 0$  and  $0 \div b$  is undefined.

98) For all whole numbers  $a$ ,  $a^0 = 1$ .

99) The number 12 is a multiple of 24.

100) The smallest number that has factors of 2, 3, 4, 5, and 6 is 120.

Answer Key

Testname: PRACTICE FINAL REVISED SPRING 2009

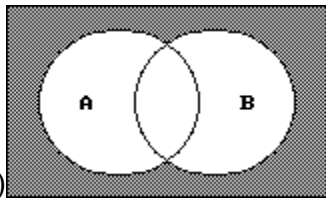
- 1) a)  $a_{14} = 42$       b) 115
- 2) 20, 50, 80, 110, 140 and 20, 40, 80, 160, 320
- 3) 131, 177, 233
- 4) 6, 13, 32, 69, 130
- 5)  $36, n^2$
- 6) 78, 2850
- 7) {a,e,r,t}
- 8)  $n(A) = 5$

- 9) a) { 41, 43, 45, 46 }    b) { 41 }
- c) { ( 41, 41), ( 41, 45), ( 43, 41), ( 43, 45), ( 46, 41), ( 46, 45) }    d) 3

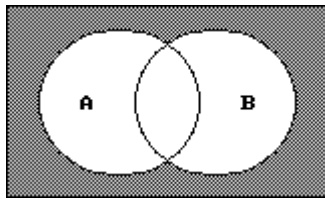
10)  $A = \{5, 6, 7, 8, 9\}$

- 11)  $\phi, \{1\}, \{2\}, \{3\}, \{4\}, \{1,2\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{2, 4\}, \{3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{2, 3, 4\}, \{1, 3, 4\}, \{1, 2, 3, 4\}$

- 12) a) {17, 19}
- b) {1, 3, 5, 7, 11, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24}
- c) No



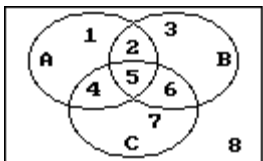
d) Show  $\overline{A \cup B}$



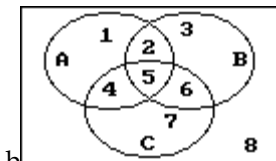
$\overline{A} \cap \overline{B}$

- e) {16, 17, 18, 20, 22, 24}
- g) {16, 18, 20, 22, 24}
- h) 7
- 13) a) A    b)  $\emptyset$     c) A    d) B    e) U    f)  $\emptyset$     g) B    h)  $\emptyset$     i) U    j) B
- 14) a)  $\subset$     b)  $\subset$     c)  $\subset$     d)  $\subseteq$     e)  $\in$     f)  $\not\subseteq$     g)  $\notin$     h)  $\in$

15)



Sections 6



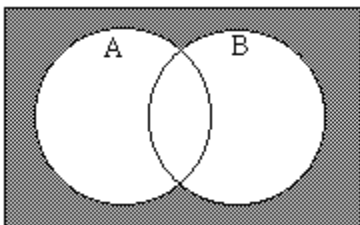
b) Section 4,6,7

- 16) No
- 17) False
- 18) True
- 19) Yes

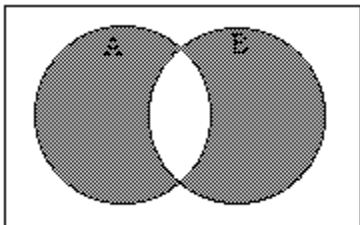
Answer Key

Testname: PRACTICE FINAL REVISED SPRING 2009

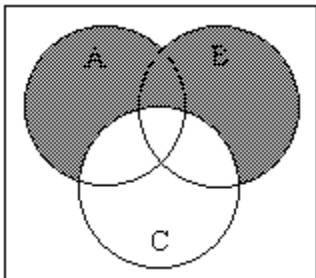
20)



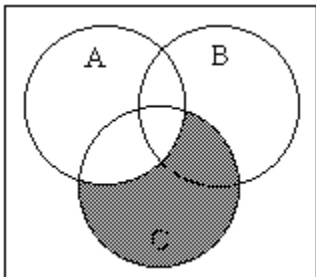
21)



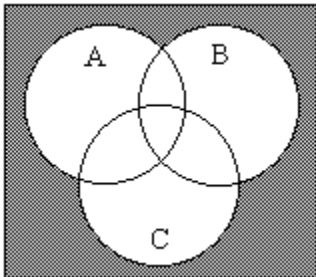
22)



23)



24)



25) False

26) TRUE

27)  $B \cap \bar{A}$

28)  $(A \cup B) \cup \bar{C}$

29)  $B - C$

30) 329

Answer Key

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31) 447

32) 13

33) a) F      b) T      c) T      d) F      e) T      f) T      g) F      h) F      i) F

34) a)  $3 \times 2 \times 1$

b)  $\{(1,m), (1,n), (1,x), (2, m), (2, n), (2, x), (3, m), (3, n), (3, x)\}$ ,

c) 9

d) NO

e)  $2^3 - 1 = 7$

35)  $\{(11, 13), (11, 4), (8, 13), (8, 4), (9, 13), (9, 4)\}$

36)  $f(0) = -2$

$f(1) = 1$

37)  $f(x) = x^2 + 2$

38)  $\{-1, 8, 14\}$

39) a. -23      b. 2      c.  $2x - 8$

40) a) yes b) yes c) no

41) a) (1, 1.19)      b) (2, 1.94)      c) (3, 2.69),      d) (11, 8.69)

$y = .44 + .75x$

42) GCD = 4

43) A = H, A equiv. F equiv.H, C equiv. D equiv. G, E = B, B equiv.E

44) 25

45) MCDXCII

46)  $1431 \times 224 = 320,544$        $320,544 \div 1431 = 224$

47) 16 minutes

48) \$804

49) 33

50) 3

51) - 7

52) a)  $5 + (- 4)$     b)  $- 2 + 3$     c)  $-2 + (- 2)$

53) - 26

54) - 40

55)  $15^\circ \text{C}$

56) a) False      b) False    c) False

57) 2448, 5175

58) none of these

59) 9090, 3744

60) a) 1, 3, 11, 33      b) 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

61)  $2^2 \cdot 3 \cdot 5^2$

62) 23

63) 25 rows of 29 trees or

29 rows of 25 trees

64) 245 seconds

65) 360,360

Answer Key

Testname: PRACTICE FINAL REVISED SPRING 2009

- 66)  $7n + 8$  dollars  
67) To tell the student's number the teacher merely subtracts 8 from the student's answer.  
68) 4 cats and 22 chickens  
69) a) True b) False  
70)  $\frac{1}{4}$   
71) 25 the year  
72) 1002three  
73) 113  
74) a) thousand b)  $6^2$  or 36  
75) a) Commutative Property of +  
b) Distributive property of X over +  
c) Identity Property of Addition  
76) one  $5 \times 5$ , four  $5 \times 1$ 's, and three  $1 \times 1$ 's  
77) a) 50551six b) 3311five  
78) a) 10 b) - 15 c) - 11  
79) ( 1,2,3,4,10,11,12,13,14,20,21,22,23,24,30)five  
80) 1,3,5,1 b) 7,2,8,7  
81) 8642  
82) 20 times  
83) a) -3 b. 7 c.  $-2x + 5y$   
84) a) no 9 does not divide 30(sum)  
b) yes divisible by 3 and 5  
85) a) 4 b) 180  
86) GCD = 4 LCM = 146,200  
87) 2, 3 ,5, 7, 11, 13, 17, 19  
88) 60  
89) a) 26 b) 5  
90) - 21  
91) If \$650 12 and 23, if \$325 24 and 46, if \$130 60 and 115 etc.  
92) a) 766eight, 770eight  
b) XVIII XX  
93) a) 28,000 b) 800  
94) TRUE  
95) TRUE  
96) TRUE  
97) FALSE  
98) TRUE  
99) FALSE  
100) False