

## §1.1 KEY IDEAS

<b>POLYA'S FOUR STEP PROBLEM SOLVING PROCESS</b>
Understand
Devise a Plan
Carry out Plan
Look Back
<b>PROBLEM SOLVING STRATEGIES (exmples)</b>
<b>Making a Drawing</b>
<b>Guessing and Checking</b>
<b>Making a Table</b>
<b>Using a Model</b>
<b>Working Backwards</b>

## §1.2 KEY IDEAS

<b>Patterns in Nature / Number Patterns</b>
<b>Pascal's Triangle</b>
<b>Arithmetic Sequences</b>
Examples D & E
Common Differences
<b>Geometric Sequences</b>
Example F
Common Ratio
<b>Triangular Numbers</b>
Example G
<b>Finite Differences</b>
Examples H & I

<b>Variable</b>
<b>Algebraic Expressions &amp; Evaluating Expressions</b>
Discussion & Example A
<b>Exercise #1</b>
<b>Equations</b>
<b>Solving Equations</b>
<b>Properties of Equalities</b>

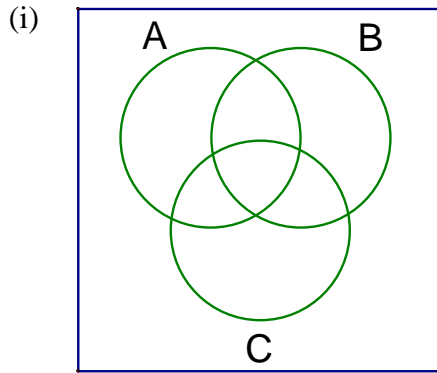
<b>Solving Inequalities</b>
<b>Properties of Inequalities</b>

<b>Set (Describe Set in Words)</b>
<b>Set Elements (List Elements in Set)</b>
<b>Venn Diagrams</b>
<b>Disjoint Sets</b>
<b>Empty Sets</b>
<b>Subset</b>
<b>Proper Subset</b>
<b>Not a Subset</b>

<b>Equal Sets, Not-Equal Sets</b>
<b>1:1 Correspondence, Equivalent Sets</b>
<b>Finite Sets, Infinite Sets</b>
<b>SET OPERATIONS</b>
<b>Intersection (and)</b>
<b>Union (or)</b>
<b>Complement (not A, <math>\sim A</math>, <math>A'</math>)</b>
<b>Universal Set</b>

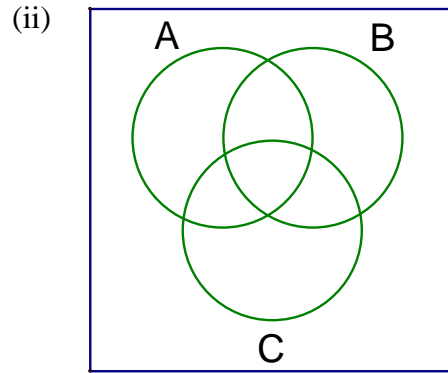
# Math 211 Sets Practice Worksheet

1. Shade the region of the Venn diagram indicated by the following sets.

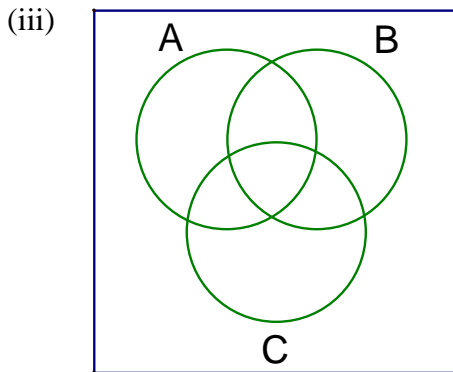


**Shade:**

$$(A' \cup B) \cap C$$

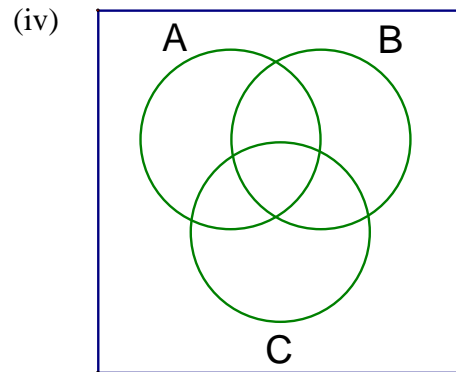


$$(A \cap B)' \cup C$$

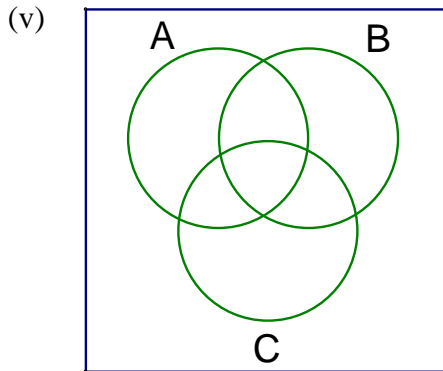


**Shade:**

$$A \cup (C' \cap B)$$

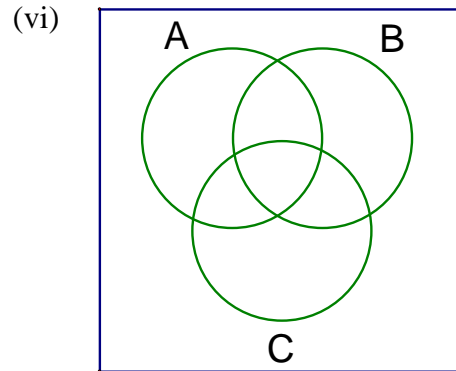


$$(A \cap B)' \cap C$$



**Shade:**

$$A' \cup (C' \cap B)$$



$$(A \cap B)' \cup C$$

## Math 211 Sets Practice Worksheet

2. List the elements in each of the following sets.

Let  $U = \{0,1,2,3,4,5,6,7,8,9,10\}$ ;  $A = \{0,1,2,3,5,8\}$ ;  $B = \{0,2,4,6\}$ ;  $C = \{1,3,5,7\}$

i)  $A \cup B =$

ii)  $B' =$

iii)  $A \cap B' =$

iv)  $B \cup C =$

v)  $B \cup C' =$

vi)  $A' \cup C =$

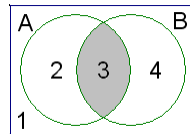
vii)  $(A' \cap C) \cup B =$

viii)  $(A \cup B)' =$

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

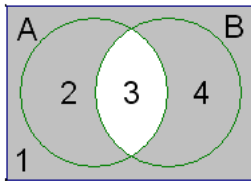
x) Write down a subset of  $A =$

3. Refer to the diagram to answer the questions below. What set notation would you use to represent the following regions?

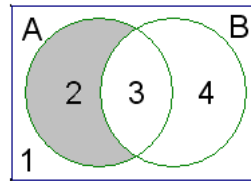


Example: Region 3 could be written as  $A \cap B$

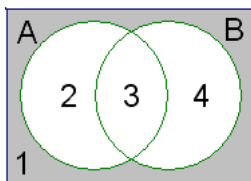
i) Regions 1, 2 and 4 are all shaded



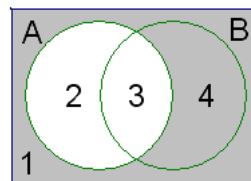
ii) Only Region 2 is shaded.



iii) Only Region 1 is shaded.



iv) Regions 1 and 4 are shaded.

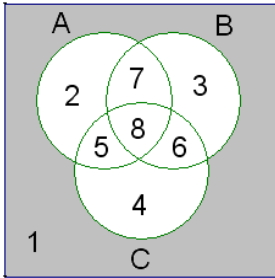




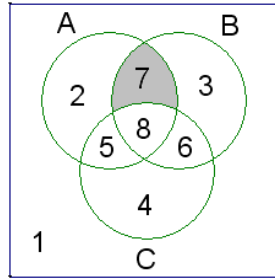
# Math 211 Sets Practice Worksheet

4. Refer to the diagram to answer the questions below.

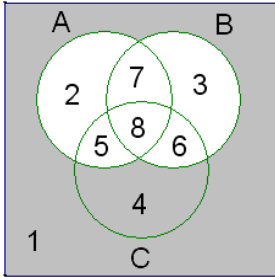
i) Only Region 1 is shaded.



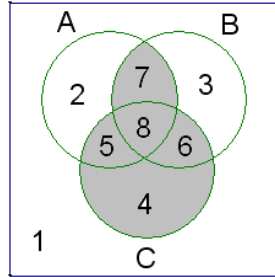
ii) Only Region 7 is shaded.



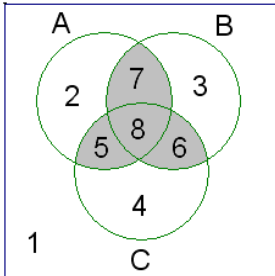
iii) Regions 1 and 4 are shaded.



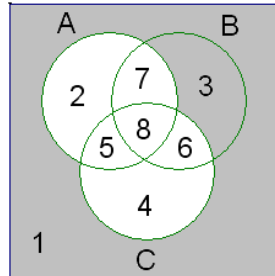
iv) Regions 4, 5, 6, 7 and 8 are shaded.



v) Regions 5, 6, 7 and 8 are shaded.



vi) Regions 1 and 3 are shaded.



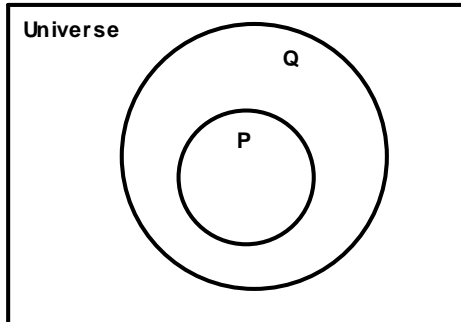
<b>FUNCTIONS</b>
<b>What is a function?</b>
<b>Function Domain</b>
<b>Function Range</b>
<b>Function Examples and Non-Examples (Example C)</b>
<b>RECTANGULAR COORDINATES</b>
<b>Axes, Coordinates, Cartesian Coordinate System</b>
<b>LINEAR FUNCTIONS AND SLOPE</b>
<b>Slope</b>

<b>Y-Intercept</b>
<b>Rate (Examples E, F)</b>
<b>Linear Equations: Slope Intercept</b>
<b>NONLINEAR GRAPHS</b>
<b>Continuous Graph / Example H</b>

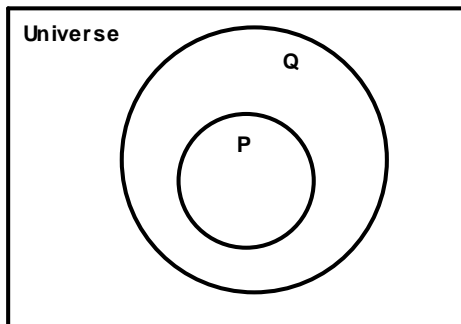
## §2.3 Deductive Reasoning and Conditional Statement Venn Diagram Guide

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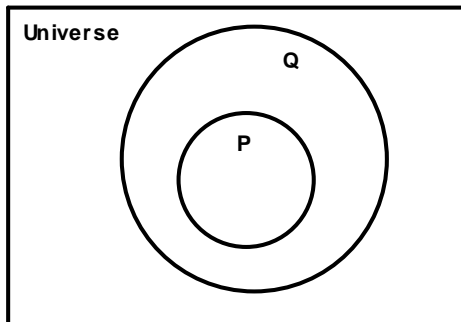
**Conditional Statement: If P then Q**



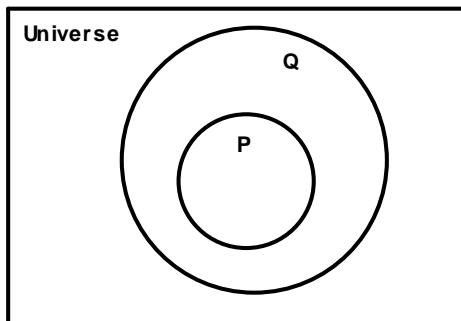
**Invalid Argument: Inverse Statement: If not P then not Q**



**Invalid Argument: Converse Statement: If Q then P**



**Valid Argument: Contrapositive Statement: If not Q then not P**



<b>Induction Reasoning (Chapter 1)</b>
<b>Deductive Reasoning</b>
<b>VENN DIAGRAMS</b>
<b>Premise</b>
<b>Conclusion</b>
<b>Example C</b>
<b>Example D</b>
<b>CONDITIONAL STATEMENTS</b>
<b>Hypothesis</b>

**Conclusion**

*See Deductive Reasoning and Conditional Statement Guide*

**Converse**

**Inverse**

**Contrapositive**

**Grouping**

**Number Bases**

**Base Ten Numeration System**

**Digits**

**Expanded Form of a Number**

**Egyptian Numerals**

<b>Babylonian Numbers</b>
<b>Mayan Numbers</b>



<b>Sums and Addends</b>
<b>Algorithm</b>
<b>Partial Sums (Example C)</b>
<b>Left to Right Addition</b>
<b>NUMBER PROPERTIES / ADDITION OF WHOLE NUMBERS</b>
<b>Closure / Not Closed</b>
<b>Identity</b>
<b>Associative</b>

<b>Commutative</b>
<b>SUBTRACTION MODELS</b>
<b>Missing Addend</b>
<b>Comparison</b>
<b>Take Away</b>

<b>Products: Rectangular Arrays</b>
<b>Tree Diagrams / Example A</b>
<b>MODELS FOR MULTIPLICATION ALGORITHMS</b>
<b>Repeated Addition</b>
<b>Partial Products</b>
<b>NUMBER PROPERTIES / MULTIPLICATION OF WHOLE NUMBERS</b>
<b>Closure / Not Closed</b>
<b>Identity</b>
<b>Commutative</b>

<b>Associative</b>
<b>Distributive over Addition</b>

<b>MODELS FOR DIVISION</b>
<b>Measurement</b>
<b>Sharing</b>
<b>Rectangular Array</b>
<b>Division Theorem</b>
<b>EXPONENTS</b>
<b><math>b^n</math>, <math>b</math> any number, <math>n</math> any whole number, <math>b, n</math> not both zero</b>
<b><math>a^n \times a^m</math>, <math>a</math> any number, <math>n, m</math> any whole numbers except <math>a, n, m = 0</math></b>
<b><math>a^n \div a^m</math>, <math>a</math> any number, <math>n, m</math> any whole numbers except <math>a, n, m = 0</math></b>

<b>Order of Operations</b>
<b>Equal Quotients</b>
<b>Estimation of Quotients</b>
<b>Rounding</b>
<b>Compatible Numbers</b>
<b>Front End Estimation</b>

<b>Factors</b>
<b>Multiples</b>
<b><math>a \mid b</math> (a divides b) and <math>a \nmid b</math> (a does not divide b)</b>
<b>DIVISIBILITY TESTS</b>
<b>2</b>
<b>3</b>
<b>4</b>
<b>5</b>

**6**

**9**

**10**

**Prime Numbers**

**Composite Numbers**

**Prime Number Test**

**Sieve of Eratosthenes**



**What is a common multiple?**

**What is a common factor?**

**Prime Factorization—Example B**

**Fundamental Theorem of Arithmetic**

**PRIME FACTORIZATION**

**Factor Trees**

**Greatest Common Factor**

<b>Least Common Multiple</b>
<b>Relationship between GCF and LCM</b>

<b>Positive and Negative Integers and their Uses</b>
<b>MODELS FOR INTEGER OPERATIONS</b>
<b>Addition</b>
<b>Rules of Signs for Addition</b>
<b>Subtraction</b>
<b>Multiplication</b>
<b>Rules of Signs for Multiplication</b>
<b>Division</b>

<b>Rules of Signs for Division</b>
<b>PROPERTIES OF INTEGERS</b>
<b>Closure / Not Closed</b>
<b>Identity</b>
<b>Commutative</b>
<b>Associative</b>
<b>Distributive Property</b>

## THE FACTOR GAME

Source: Dale Oliver, Humboldt State University

### Two Players

**Materials:** Two sets of same-colored chips or tiles (about 30 each set)  
Game board  
Advanced 108 game board option for college students

Here is a game that can be played in grades 3 through 6. Play at least twice and discuss the winning strategy.

Before the game begins, all of the numbers on the Factor Game sheet are **exposed**. Two players then **cover** the numbers on the sheet according to the legal moves given in the table below.

Rules pertaining to incorrect moves, the end of the game, and the winner of the game are given below the table.

move	player	description/restrictions
1	A	Cover one of the numbers on the page with one of your chip.
2	B	Cover each of the exposed factors of the number that player A just covered.
3	B	Cover one of the exposed numbers which remain that allows player A to complete move 4. If this move cannot be made, the game is over.
4	A	Cover each of the exposed factors of the number that player B just covered.
5	A	Cover one of the exposed numbers which remain that allows player B to complete move 6. If this move cannot be made, the game is over.
6	B	Cover each of the exposed factors of the number that player A just covered.
7	B	Cover one of the exposed numbers which remain that allows player A to complete move 8. If this move cannot be made, the game is over.

...and so on.

### What if player A "forgets" to cover all of the required factors in their first of two moves?

Then player B may cover these missed factors after A has completed the second of two moves. Player B then continues to complete the appropriate two moves. The same holds for player B's forgetfulness.

**When is the game over?** When player A or player B cannot make the second move of their turn as described above.

**Who wins?** We all do, but technically, each player finds the sum of all of the numbers covered by their chips and the player with the largest sum wins.

*Cooperative games:*

- 1) Play so that the sum of the two player's score is as high as possible.
- 2) Play so that the sum of the two player's score is as low as possible.

## Factor Game Board

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

### Advanced Factor Game Board

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108

## Math 211 Skills Test Practice

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No calculators should be used

For each number pair, determine

- the prime factorization
- the GCF of the two numbers and
- the LCM of the two numbers

A	B
74529	30030

A	B
12100	21450

A	B
14176	125125

A	B
36504	72930

A	B
15300	260100

A	B
2475	3510



## Mth 212

## Factors & Multiples Skills Test

You are **required** to pass a Factors and Multiples Skills Test in Mth212. There are 22 problems. You must get at least 18 of them correct to pass the Factors and Multiples Skills Test. You have 30 minutes in which to do this. YOU MAY NOT USE A CALCULATOR. You may use as much scratch paper as you wish.

The test covers factoring whole numbers into primes, finding the Greatest Common Factor (GCF) of sets of whole numbers, and finding the Least Common Multiple (LCM) of sets of whole numbers. If you know the tests for divisibility by 2, 3, 4, 5 and 10, the Factors and Multiples Skills Test will be considerably simpler.

A small amount of time will be provided in class to prepare for the Factors and Multiples Skills Test. However, most of your preparation was done in Mth211. You will receive a Practice Factors and Multiples Skills Test and you should do this practice several times until you are **extremely** comfortable with the problems.

One-half hour of class time during the first or second week of the term will be used to administer the Factors and Multiples Skills Test to your class. (See your class schedule.) If you pass it at that time you will receive 10 points of extra credit towards your Mth212 grade. If you do not pass it you will need to retake it. In order to do a retake you must call Sharyne Ryals, the math department office manager, at 503-838-8465 to make an appointment. There will be NO more class time spent on the Factors and Multiples Skills Test in Mth212.

If you pass the test after the initial class offering but before the end of the fourth week of the term you will receive 5 points extra credit towards your grade in Mth212.

**YOU MUST PASS THE FACTORS AND MULTIPLES SKILLS TEST  
ON OR BEFORE FRIDAY OF DEAD WEEK.**

**IF YOU DO NOT, YOU WILL NEED TO RETAKE MTH212.**

If you retake the Factors and Multiples Skills Test and do not pass it, you should get some help! Immediately! You can see your instructor, use the Tutoring Center, ask another (more skilled) student, and/or review your Mth211 work from Chapter Four in the text.

After three retakes of the Factors and Multiples Skills Test, if you have still not passed, Sharyne will give you a Retake Permission Slip. You are **required** to take this slip to your instructor before you can proceed. Your instructor will provide you with additional, individual assistance and will then write the number of times you can continue retaking the Factors and Multiples Skills Test on the Retake Permission Slip. You must present the completed Retake Permission Slip to Sharyne before further retesting can occur. This process will repeat until you have passed the Factors and Multiples Skills Test or until Dead Week ends, whichever comes first.

If you have any questions now is the time to ask! You are encouraged to contact your instructor:

Email: \_\_\_\_\_@wou.edu

Office Phone: 503-838-8\_\_\_\_\_

**DO NOT DELAY PREPARATION FOR THE FACTORS AND MULTIPLES SKILLS TEST!!!**

**PASS IT THE FIRST TIME AND WIN BIG!**

# **PRACTICE FACTORS & MULTIPLES TEST #1**

Passing criterion is AT LEAST 18 correct in ONE-HALF HOUR.  
You may NOT use a CALCULATOR.

**I. Rewrite as a PRODUCT OF PRIMES.** If the given number is prime, write 'PRIME.'

1.  $213 =$  \_\_\_\_\_      2.  $139 =$  \_\_\_\_\_      3.  $377 =$  \_\_\_\_\_

4.  $272 =$  \_\_\_\_\_      5.  $98 =$  \_\_\_\_\_      6.  $342 =$  \_\_\_\_\_

7.  $131 =$  \_\_\_\_\_      8.  $609 =$  \_\_\_\_\_      9.  $412 =$  \_\_\_\_\_

**II. Find the GREATEST COMMON FACTOR of the following sets of numbers:**

1.  $GCF(45,60) =$  \_\_\_\_\_      2.  $GCF(68,102,136) =$  \_\_\_\_\_

3.  $GCF(106,203) =$  \_\_\_\_\_      4.  $GCF(90,60) =$  \_\_\_\_\_

5.  $GCF(201,67) =$  \_\_\_\_\_

↓ OVER ↓

**III. TRUE or FALSE. Circle your answer.**

- T    F    1. 16779 is a multiple of 47.  
T    F    2. 59 is a factor of 119.  
T    F    3. 750 is a multiple of 25.

**IV. Find the LEAST COMMON MULTIPLE of the following sets of numbers:**

1. LCM(45,60) = \_\_\_\_\_      2. LCM(91,117) = \_\_\_\_\_  
3. LCM(10,15,20) = \_\_\_\_\_      4. LCM(121,77) = \_\_\_\_\_  
5. LCM(80,60) = \_\_\_\_\_

**ANSWER KEY**

**I. PRIMES & COMPOSITES**

1.  $3 \times 71$       2. PRIME      3.  $13 \times 29$       4.  $2 \times 2 \times 2 \times 2 \times 17$       5.  $2 \times 7 \times 7$   
6.  $2 \times 3 \times 3 \times 19$       7. PRIME      8.  $3 \times 7 \times 29$       9.  $2 \times 2 \times 103$

**II. GREATEST COMMON FACTOR**

1.  $3 \times 5$  or 15      2.  $2 \times 17$  or 34      3. 1      4.  $2 \times 3 \times 5$  or 30      5. 67

**III. TRUE OR FALSE**

1. True      2. False      3. True

**IV. LEAST COMMON MULTIPLE**

1.  $2 \times 2 \times 3 \times 3 \times 5$  or 180      2.  $3 \times 3 \times 7 \times 13$  or 819      3.  $2 \times 2 \times 3 \times 5$  or 60  
4.  $7 \times 11 \times 11$  or 847      5.  $2 \times 2 \times 2 \times 2 \times 3 \times 5$  or 240