

Lecture Guide

Math 90 - Intermediate Algebra

to accompany

Intermediate Algebra, 3rd edition

Miller, O'Neill, & Hyde

Prepared by

Stephen Toner

Victor Valley College

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R.2 – Sets of Numbers

A. Types of Numbers

Natural -

Whole -

Integers -

Rational - any number which can be expressed as the _____ of two numbers, provided the denominator is not zero.

Irrational -

Real -

B. Set Builder Notation

$x > 3$ can be written as

The set of rational numbers can be written as

C. Interval Notation

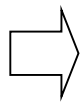
Inequality Graph Interval Notation

R.3 – Operations with Real Numbers

We assume you remember the rules for adding, subtracting, multiplying and dividing real numbers....

Evaluate:

$$(-1)(-1)(-1)(-1) \cdots (-1) \quad (57 \text{ of them})$$



Property: $(-1)^n = \begin{cases} +1, & \text{if } n \text{ is even} \\ -1, & \text{if } n \text{ is odd} \end{cases}$

Be careful! -2^4 versus $(-2)^4$

*Evaluate each if $x = -3$ and $y = -2$:

a. $x^2 - y^2$

b. $2x^2 - 5y$

Simplify using the order of operations:

$$\frac{1}{2} - \left(\frac{2}{3} \div \frac{5}{9} \right) + \frac{5}{6}$$

Simplify using the order of operations:

$$\sqrt{29 - 2^2} + 8 - 3(6 - 2) \div 4 \cdot 5$$

Absolute Values:

R.4 – Simplifying Expressions

A. Properties

Commutative Property...

... of addition

... of multiplication

Associative Property...

... of addition

... of multiplication

Additive Identity

Multiplicative Identity

Additive Inverse

Multiplicative Inverse

Distributive Properties

Which property is illustrated?

$$5 + (x + y) = (x + y) + 5$$

Simplify: $-(2x - 5y) - 3(3x + 2y) - 14x$

Simplify: $6(y - 2) - 3(2y - 5) - 3$

$$-3 \left[3 \left(b - \frac{2}{3} \right) - 2(b + 4) - 6b^2 \right]$$

1.1 – Linear Equations

Solve: $-3x + 8 = 17$

Solve: $13 + 4w = -5(-w - 6) + 2(w + 1)$

When an equation contains fractions, it is usually a good idea to multiply through by the least common denominator to clear the fractions.

Solve: $-\frac{1}{2}y + 4 = \frac{-9}{10}y + \frac{2}{5}$

Solve: $0.4(n + 10) + 0.6n = 2$

There are three classes of equations:

Conditional – the type we've been doing

Identity – "all real numbers" is your solution

Contradiction – there is no solution

Solve: $4z + 2 - 3z + 5 = 3 + z + 4$

Solve: $6(z - 2) = 3z - 8 + 3z$

1.2 – Word Problems

A. Number Problems

Twice the sum of a number and three is the same as 1 subtracted from the number. Find the number.

B. Consecutive Integer Problems

consecutive integers

consecutive odd integers

consecutive even integers

Four times the smaller of two consecutive odd integers is the same as 73 less than 5 times the larger. Find the integers.

Five times the smallest of three consecutive even integers is 10 more than twice the largest. Find the integers.

C. Percentage Word Problems

The price of a used textbook after a 35% markdown is \$29.50. What was the original price?

Robert can take out a 3-yr loan at 8% simple interest or a 2-yr loan at 8.5% simple interest. If he borrows \$7000, how much interest will he pay for each loan? Which option will require less interest?

D. Mixture Problems

One fruit punch has 40% fruit juice and another is 70% fruit juice. How much of the 40% punch should be mixed with 10 gallons of 70% punch to create a fruit punch that is 45% fruit juice?

How many ounces of water must be added to 20 oz. of an 8% salt solution to make a 2% salt solution?

A nut mixture consists of almonds and cashews. Almonds are \$4.98/lb. and cashews are \$6.98/lb. How many pounds of each type of nut must be mixed to produce 16 pounds of a mixture selling for \$5.73/lb.?

E. Investment Problems

4. Raina invested her savings in two investment funds. The amount she invested in Fund A was 3 times as much as the amount she invested in Fund B. Fund A returned a 4% profit and Fund B returned a 6% profit. How much did she invest in Fund A, if the total profit from the two funds together was \$1080?

Amanda borrowed \$6000 from two sources: her parents and a credit union. Her parents charged her 3% simple interest and the credit union charged 8%. If after 1 year she paid \$255 in interest, how much did she borrow from each source?

Distance Problems- General Procedure:

A woman can hike 1 mph faster down a trail than she can on the return trip uphill. It takes 3 hours to get to her destination and 6 hours to return. What is her downhill speed?

F. Distance Problems

Intro: A car travels 221 miles in 3 hours and 15 minutes. How many miles did it travel per hour?

Two cars are 190 miles apart and travel toward each other. They meet in 2 hours. One car travels 5 miles per hour slower than the other car. What are the speeds of both cars?

Two canoes travel down a river starting at 9:00. One canoe travels twice as fast as the other. After 3.5 hours the canoes are 5.25 miles apart. Find the average rate of each canoe.

1.3 – Literal Equations & Geometry Problems

A. Literal Equations

Solve $y = mx + b$ for x .

Solve $a^2 + b^2 = c^2$ for b^2 .

Solve $V = \frac{1}{3}\pi r^2 h$ for h .

Solve $xy - wz = ab$ for w .

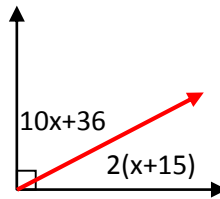
B. Geometry Problems

The length of a rectangle is 4 inches less than twice the width. The perimeter is 112 inches. Find its dimensions.

A triangular garden has sides that can be represented by 3 consecutive integers. If the perimeter is 15 ft, what are the lengths of the sides?

The smallest angle in a triangle is $\frac{1}{2}$ the size of the largest angle. The middle angle measures 25° less than the largest. Find all three angle measures.

Find x:



1.4 – Solving Inequalities

*Be careful to change the direction of the inequality whenever you _____ or _____ each side of the inequality by a _____.

*For each of the following, graph your solutions sets. Also write your solutions using interval notation.

$$-3w - 6 > 9$$

$$-8 < 4k - 7 < 11$$

Words and Inequalities

more than

less than

at least

at most

no more than

no less than

For her phone service, Kira pays a monthly fee of \$20, and she pays an additional \$0.04 per minute of use. The least she has been charged in a month is \$64.76.

What are the possible numbers of minutes she has used her phone in a month? Use m for the number of minutes, and solve your inequality for m .

1.5 – Compound Inequalities

A. Unions and Intersections

\cup

\cap

Given: $A = \{1,2,3\}$; $B = \{2,3,4\}$; $C = \{4,5,6\}$,

Find each of the following:

$A \cup B$

$A \cap B$

$A \cap C$

Find each union or intersection. Write your solution using interval notation.

1. $x < 2$ and $x \leq 3$

2. $x > -4$ or $x \geq 1$

3. $x \leq 6$ and $x > 2$

4. $x > -2$ or $x \leq 1$

5. $x < 0$ or $x \geq \frac{4}{5}$

6. $x > 4$ and $x \leq 3$

7. $x > -6$ or $x + 3 < -2$

8. $3x - 2 > x + 9$ and $2(x + 4) - 7 \leq 17$

1.6 – Absolute Value Equations

Solve: $|x| = 8$

Solve: $|x + 5| = 3$

Solve: $|w| + 4 = -8$

Solve: $|4x + 1| = 6$

Solve: $\left| \frac{w}{2} + \frac{3}{2} \right| - 2 = 7$

Solve: $|9a + 5| = |9a - 1|$

Solve: $\left| \frac{3p+2}{4} \right| = \left| \frac{1}{2}p - 2 \right|$

1.7 – Absolute Value Inequalities

Properties

A. $|x| = a \rightarrow x = -a \text{ or } x = a$

B. $|x| < a \rightarrow -a < x < a$

C. $|x| > a \rightarrow x < -a \text{ or } x > a$

*Solve the following inequalities. Write your solution sets using interval notation.

1. $|x + 5| < 14$

2. $3|2x - 5| + 7 \leq 19$

3. $|5x + 2| - 3 > 8$

4. $|x + 5| + 8 \geq 2$

5. $|x + 5| \leq -6$

6. $5|2x - 1| + 8 \geq 19$

7. $|3 - 7x| < 13$

8. $3 \left| \frac{2x}{3} - 4 \right| + 5 \geq \frac{17}{2}$

Review of Sections 1.5 – 1.7

1. Solve: $x + 2 \geq 5$ and $x - 8 \leq 3$

2. Solve: $|3x - 2| + 4 \geq 17$

3. Solve: $3x + 5 < 17$ or $-2x + 1 > -3$