Chapter 3

Equations and Inequalities

3-1B Write Equations

Main Idea: Write algebraic equations from verbal sentences and problem situations.

Vocabulary:

Equation – mathematical sentence stating that two quantities are equal

Variable – a symbol, usually a letter, used to represent a number in mathematical expressions or sentences

Defining a variable – assigning a variable to represent the unknown quantity

Write equations: translate verbal model using one of the four operations

Steps:

1) What are you trying to solve for?
   (identify the unknown/variable)

2) Look for keywords

3) Write equation

4) Check that your equation makes sense. Did you answer the question?

ADD +	SUBTRACT -	MULTIPLY x	DIVIDE ÷	EQUALS =
more than	less than/ fewer than	of	out of	is
increased by	decreased by	multiplied by	divided by	are
the sum of	difference between/of	product of	quotient of	was
plus	minus	times	per/a	were
added to	subtracted from			will be
combined, together	gave away/sold/ used/ lost			gives
total				sold for

Example:

The cost of a book purchased online plus $5 shipping and handling comes to a total of $29. Write an equation to find the cost of the book.

Example:

Morgan is driving to his sister's home. He has 174 miles to go after dinner. He has driven 532 miles. Define a variable. Then write an equation that could be used to find the distance of the whole trip.

Example:

The 8th grade class has $35 less in its treasury than the 7th grade treasury. Given s, the number of dollars in the 7th grade treasury, write an equation that can be used to find e, the number of dollars in the 8th grade treasury.

Example:

After dropping 12°C, the temperature outside was -5°C. Define a variable. Then write an equation to model the situation.

Homework:

Workbook p. 43 #1-7 and p.44 choose 6

3-1C Solve Addition and Subtraction Equations

Main Idea: Solve equations using the Subtraction and Addition Properties of Equality.

Properties of Equality:

Subtraction Property of Equality: If you subtract the same number from each side of an equation, the two sides remain equal.

Addition Property of Equality: If you add the same number from each side of an equation, the two sides remain equal.

Inverse operations: operations that 'undo' each other

Solve $7 = 15 + c$

Solve $-5 = z - 16$

Example:

At high tide, the top of a coral formation is 2 feet above the surface of the water. This represents a change of -6 feet from the height of the coral above the water at low tide. Write and solve an equation to determine h, the height of the coral above the water at low tide.

Activity

Homework:

p. 164 #9 – 23 odd, 24 – 26, 28

LSowatsky

3-1D Solve Multiplication and Division Equations

Main Idea: Solve equations by using the Division and Multiplication Properties of Equality.

Properties of Equality:

Division Property of Equality: If you divide the same number from each side of an equation, the two sides remain equal.

Multiplication Property of Equality: If you multiply the same number from each side of an equation, the two sides remain equal.

Examples:

Solve 7z = -49

Solve $\dfrac{c}{9} = -6$

Example:

Carlos lives 4 times the distance Jeremy lives from school. Carlos lives 9 miles from the school. How far does Jeremy live from school?

Homework:

p.168 #9 – 21 odd, 22 - 26, 31, 38

3-2B Solve two-step equations

Main Idea: Solve two-step equations.

Vocabulary:

Two – step equation: equation that contains two operations

Coefficient: The numerical factor of a term that contain a variable

Example:

Solve 5y + 1 = 26   Solve 8 – 3x = 14

Example: Solve.

$$-4 = \frac{1}{3}z + 2$$

Example:

Kaitlyn wants to put trim molding around a rectangular table. The length of the table is 45 inches and she has 150 inches of trim. Solve the equation

150 = 2w + 90 to find the width of the table.

Homework:

p.175 #13 – 33 odd, 37 - 40

3-2C Write Two-Step Equations

Main Idea: Write two-step equations that represent real-world situations.

Translate Sentences Into Equations

- Handout – staple/glue in notebook

Homework:

Workbook p.

Chapter 3 MidchapterTest

LSowatsky

3-3A Graph inequalities

Main Idea: Write and graph inequalities.

What is an inequality?

- It is a range of values, not just ONE set number
- It is an algebraic relation showing that a quantity is greater than or less than another quantity.

Speed limit:

$$55 \leq x \leq 75$$

Symbols:

$<$ **Less than**

$>$ **Greater than**

$\leq$ **Less than OR EQUAL TO**

$\geq$ **Greater than OR EQUAL TO**

Solutions....

YOU CAN HAVE A RANGE OF ANSWERS......
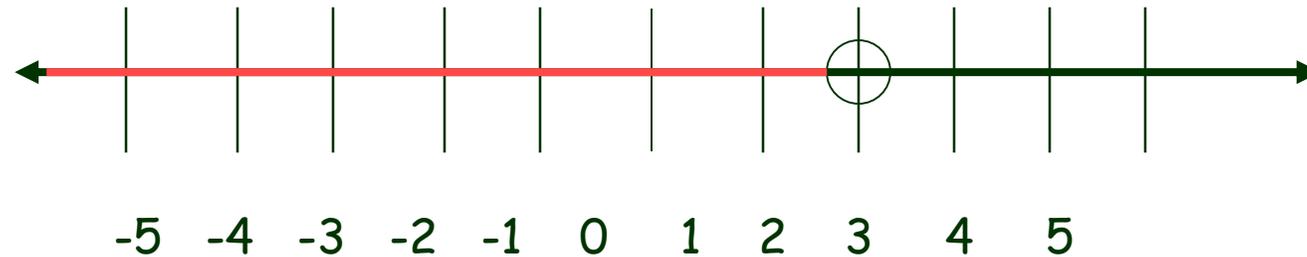
All real numbers less than 2

x< 2

Solutions continued….
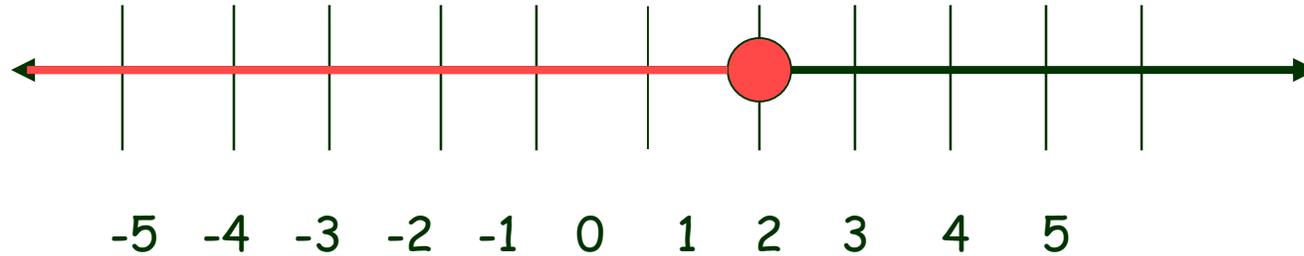
ALL REAL NUMBERS LESS THAN OR EQUAL TO 1

$$x \leq 1$$
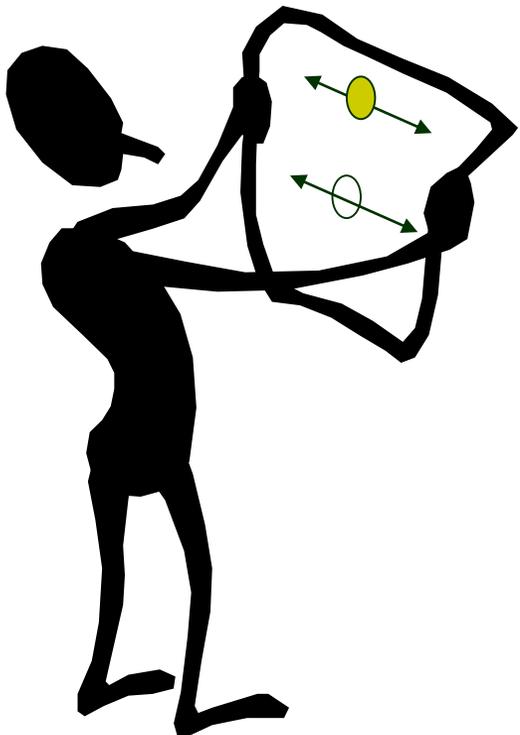
Did you notice,

Some of the dots were solid and some were open?

$x < 2$

-5 -4 -3 -2 -1 0 1 2 3 4 5

$x \leq 1$

-5 -4 -3 -2 -1 0 1 2 3 4 5
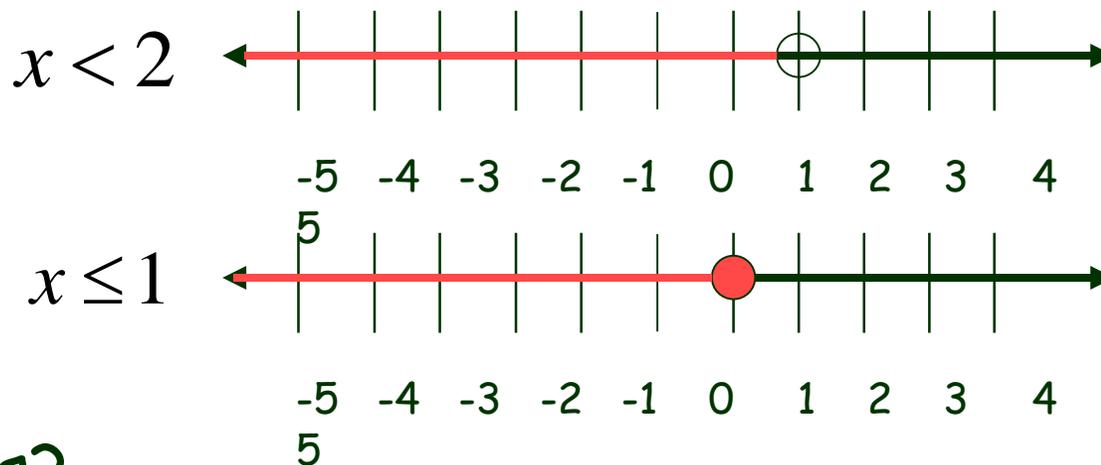
Why do you think that is?

If the symbol is > or < then dot is open because it can not be equal.

If the symbol is ≥ or ≤ then the dot is solid, because it can be that point too.

Write and Graph a Linear Inequality

Sue ran a 2-K race in 8 minutes. Write an inequality to describe the average speeds of runners who were faster than Sue. Graph the inequality.

Faster average speed $> \dfrac{\text{Distance}}{\text{Sue's Time}}$

$$s > \dfrac{2}{8}$$

$$s > \dfrac{1}{4}$$
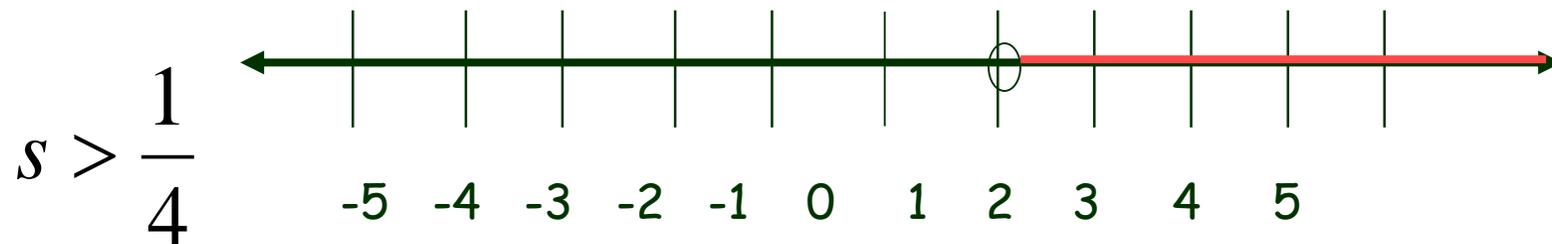
Examples: Write an inequality for each sentence and graph on a number line.

1) Luke needs less than 2 hours to paint his room.

2) Lena walked more than 20 miles for charity.

3) At least $30 must be spent to get a discount on the groceries.

4) There can be at most 5 people in the car.

Determine the truth of an inequality – check to see if a given value makes the inequality true or false

1) $x - 4 < 6; x = 0$

2) $3x \geq 4; x = 1$

Homework:

Workbook p.

LSowatsky
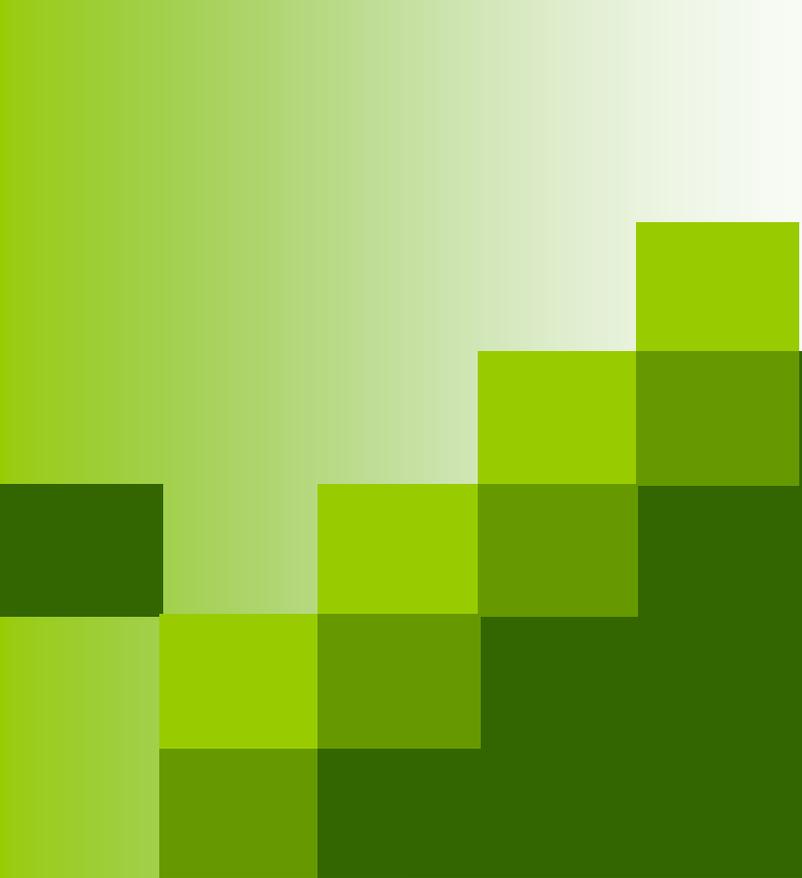
3-3B Solve Inequalities by Addition or Subtraction

Main Idea: Solve and graph one-step inequalities by using the Addition or Subtraction Properties of Inequality.

Solving an Inequality:

Solving a linear inequality in one variable is much like solving a linear equation in one variable.

Isolate the variable on one side using inverse operations.

Solve using addition:

Add the same number to EACH side.

$$x - 3 < 5$$

Solving Using Subtraction:

Subtract the same number from EACH side.

$$x + 6 \geq 10$$

Using Subtraction:

$$x + 5 \geq 3$$ Graph the solution.

-5 -4 -3 -2 -1   0   1   2   3   4   5
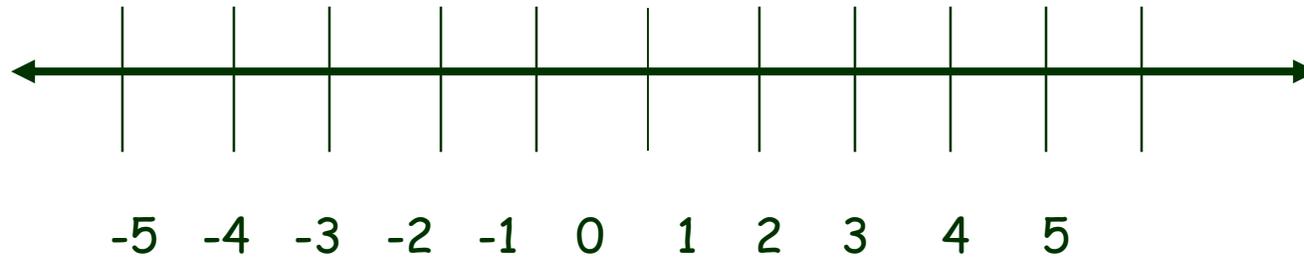
Using Addition:

$$-2 > n - 4$$

Graph the solution.

```
<————|——|——|——|——|——|——|——|——|——|——|————>
     -5  -4  -3  -2  -1  0   1   2   3   4   5
```
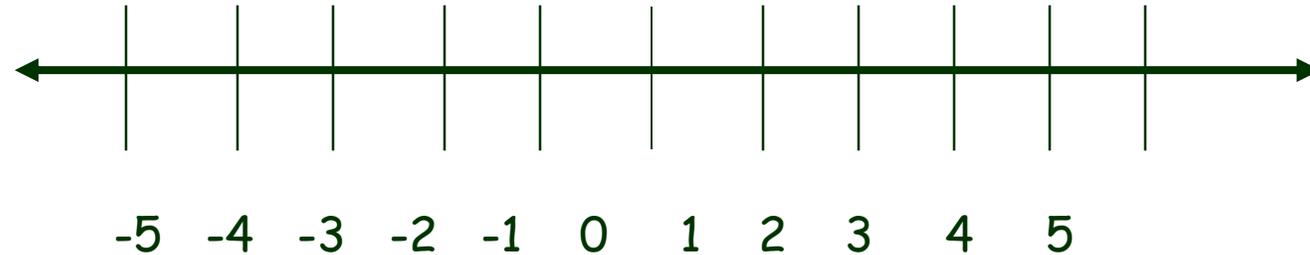
Homework:

p. 189 #1 – 17

3-3C Solve Inequalities by Multiplication or Division

Main Idea: Solve and graph one-step inequalities by using the Multiplication or Division Properties of Inequality.

Solving Inequalities Using Multiplication:

Multiply each side by the same positive number.

$$\frac{1}{2}x > 3$$

Solving Inequalities Using Division:

Divide each side by the same positive number.

$$3x \le 9$$

Multiply or Divide by a Negative Number:

NOTE:

When you **multiply or divide** each side of an inequality by a **negative number**, you must **reverse the inequality symbol** to maintain a true statement.

Solving by multiplication of a negative

Multiply each side by the same **negative number** and **REVERSE** the inequality symbol.

$$-x < 4 \qquad \text{Multiply by (-1).}$$

$$x > -4$$

Solving by dividing by a negative

Divide each side by the same **negative number** and **reverse** the inequality symbol.

$$-2x \leq 6$$

Example: Each of the 20 questions on a math test is worth 4 points. Write and solve an inequality to find how many questions you must answer correctly to earn a score of at least 68 points.

Homework:

p. 194 # 1 – 23 odd, 24, 26, 28

LSowatsky

3-4A Solve Two-Step Inequalities

Main Idea: Solve and graph two-step inequalities in one variable.

Two-Step Inequalities:

- Contains two operations
- Use inverse operations to undo each operation in reverse order

Example: Solve 5m - 8 > 12
Graph the solution.

Example: Solve 12 - 3a > 18
Graph the solution.

Which graph shows the solution to 2x - 10 ≥ 4?

1.
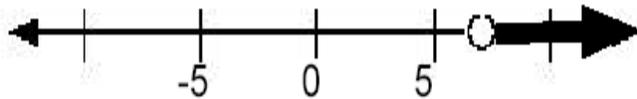
2.
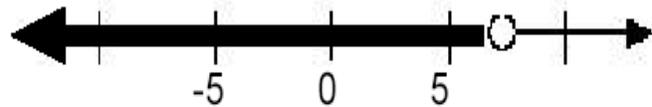
✓ 3.
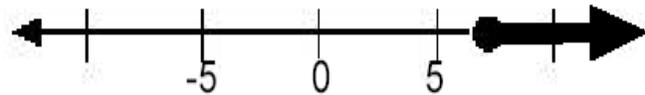
4.
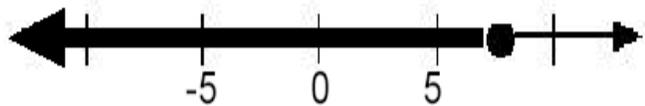
Solve -2x + 6 ≥ 3x – 4

1. $x \geq -2$
2. $x \leq -2$
3. $x \geq 2$
4. $x \leq 2$ ✔

Example: Will needs at least $350 for a new video game system. He has already saved $60. He earns $10.00 and hour at his part-time job. Write and solve an inequality to find how many hours he will need to work to buy the system.

Homework:

p. 200 #1 – 33 odd, 37

LSowatsky

3-4B Compound Inequalities

Main Idea: Write and graph compound inequalities in one variable.

Difference between <u>and</u> and <u>or</u>
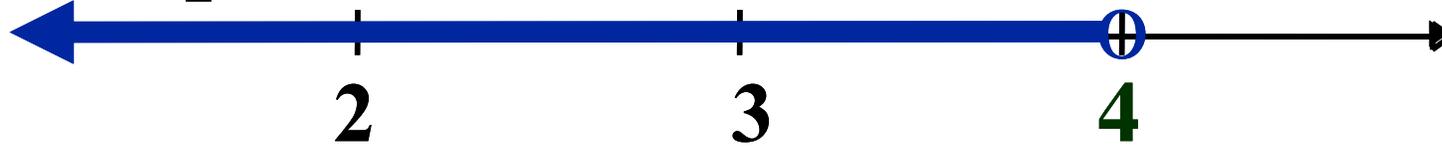
AND means intersection

-what do the two items have in common?
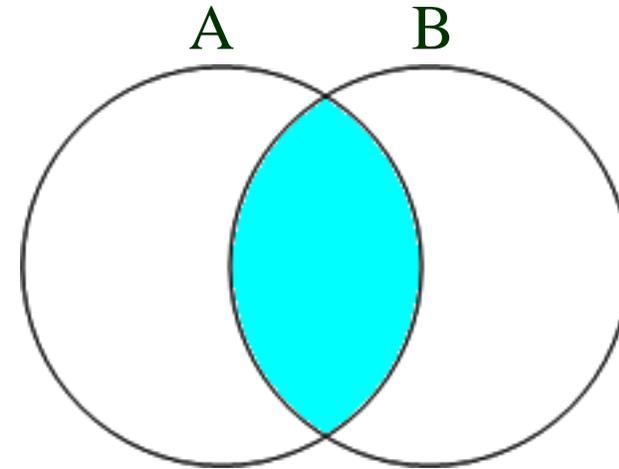
OR means union

-if it is in one item, it is in the solution
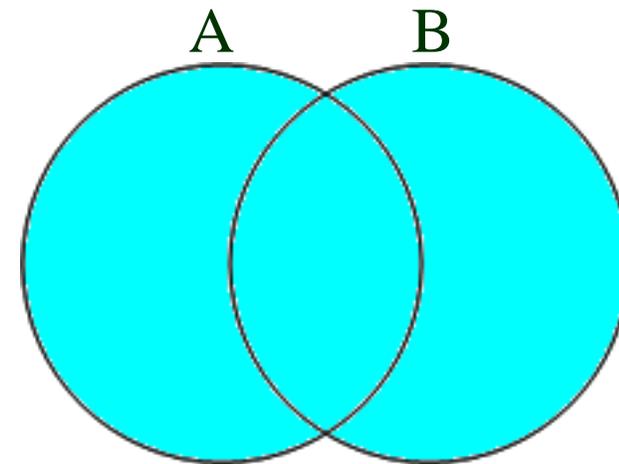
Example: Graph $x < 4$ and $x \geq 2$
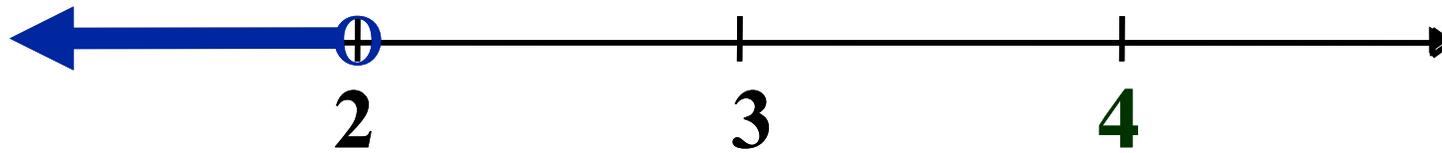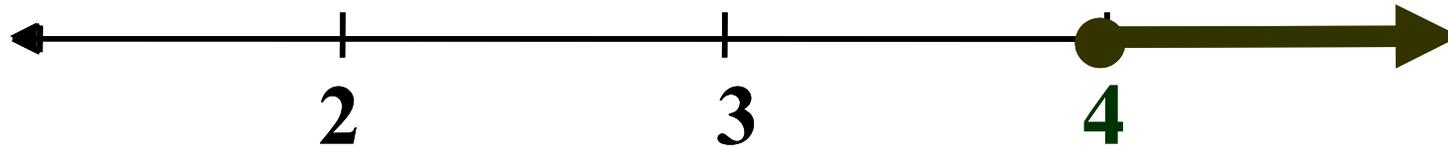
a) Graph $x < 4$

b) Graph $x \geq 2$

c) Combine the graphs

d) Where do they intersect?

Example: Graph $x < 2$ or $x \geq 4$

a) Graph $x < 2$

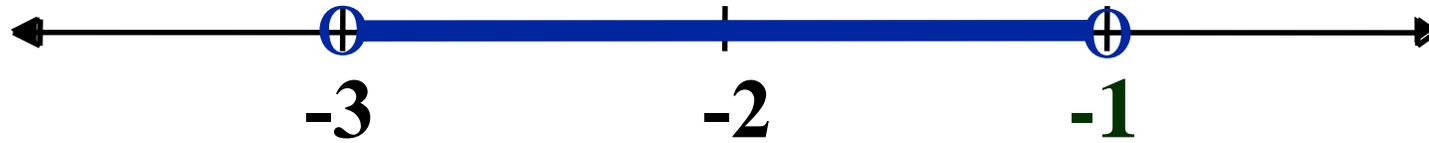### b) Graph $x \geq 4$

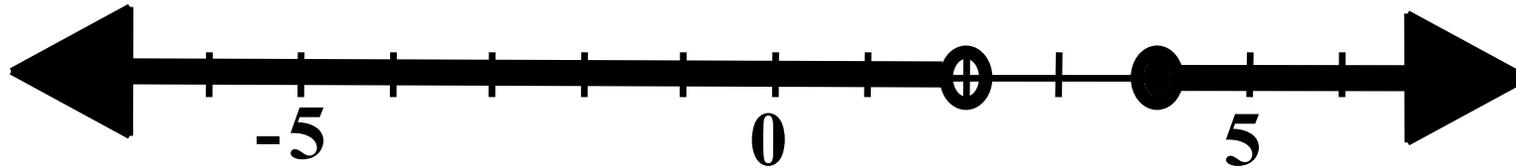### c) Combine the graphs

3) Which inequalities describe the following graph?

1. y > -3 or y < -1
2. ✔ y > -3 and y < -1
3. y ≤ -3 or y ≥ -1
4. y ≥ -3 and y ≤ -1

9) Graph $x < 2$ or $x \geq 4$

7) 2x < -6 and 3x ≥ 12

LSowatsky

Example: Graph 3 < 2m – 1 < 9

Example: Graph $x < 2$ or $x \geq 4$

Homework:

Workbook p.

Chapter 3 End Test