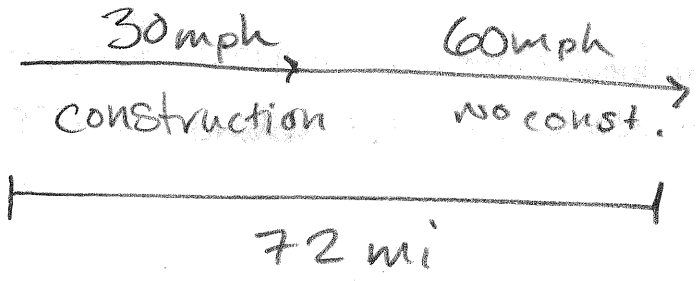
6/5/2014 – Sec 1.3, Sec 1.4, Sec 1.5 (Beginning)

1.1

#75



time 1.5 hrs

	Rate	× time	= distance
const.	30	x	$30x$
NO const.	60	$1.5-x$	$60(1.5-x)$
			+
			72 mi

$$30x + 60(1.5-x) = 72$$

$$30x + 90 - 60x = 72$$

$$-30x + 90 = 72$$
$$-90 \quad -90$$

$$\frac{-30x}{-30} = \frac{-18}{-30}$$

$$x = .6 \text{ hrs}$$

$$.6 \text{ hrs} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = .6(60)$$

$$= \boxed{36 \text{ min}}$$

1.1

#82

1.29	+	1.89	=	1.49
X		20		20 + X

$$1.29x + 1.89(20) = 1.49(20 + x)$$

$$1.29x + 37.8 = 29.8 + 1.49x$$

$$-1.49x \qquad -1.49x$$

$$-0.20x + 37.8 = 29.8$$

$$-37.8 \qquad -37.8$$

$$\frac{-0.2x}{-0.2} = \frac{-8}{-0.2}$$

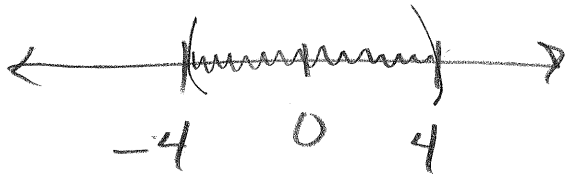
$$x = \boxed{40 \text{ lbs}}$$

Sec 1.3 Absolute Value Equations and Inequalities

Recall Absolute Value of a Number, written $|x|$, is the distance from zero.

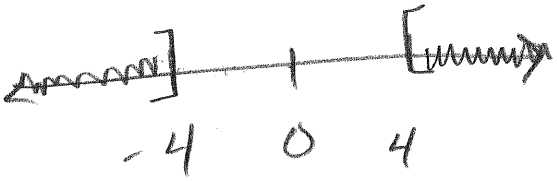
$|x| = 4$ then $x = 4$
$x = -4$

$|x| < 4$



$(-4, 4)$

$|x| \geq 4$



$(-\infty, -4] \cup [4, \infty)$

Solving Equations and Inequalities involving Absolute Values.

1. Get the Absolute Value alone on the left side of the equation/inequality
2. Remove the Absolute Value by using the correct Case

Only if K is positive

Case 1: Equal ($=$)

$|ax+b| = K$ becomes

$ax+b = K$ or $ax+b = -K$

Case 2: Greater than ($>$ or $\geq$)

$|ax+b| \geq K$ becomes

$ax+b \geq k$ or $ax+b \leq -K$

Case 3: Less than ($<$ or $\leq$)

$|ax+b| \leq K$ becomes

$ax+b \leq k$ and $ax+b \geq -k$

alternate way to write

$-K \leq ax+b \leq K$

#13 $-|7p-3|+6=-5$

$-6 \quad -6$

$\frac{-|7p-3|}{-1} = \frac{-11}{-1}$

$|7p-3| = 11$

$7p-3=11$ or $7p-3=-11$

$+3 \quad +3 \qquad +3 \quad +3$

$\frac{7p}{7} = \frac{14}{7} \qquad \frac{7p}{7} = \frac{-8}{7}$

$p = 2 \qquad p = -8/7$

Ans: $\boxed{p = 2, -8/7}$

$\{2, -8/7\}$

#29 $\frac{|5v+1|}{4} + 8 < 9$

$-8 \quad -8$

$\frac{|5v+1|}{4} < 1$

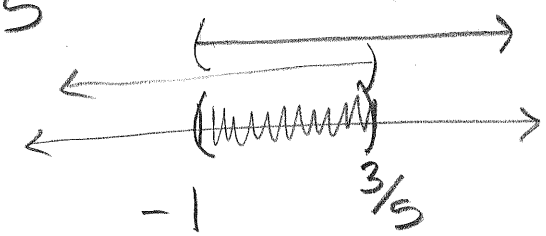
$|5v+1| < 4$

$5v+1 < 4$ and $5v+1 > -4$

$-1 \quad -1 \quad = \quad -1 \quad -1$

$\frac{5v}{5} < \frac{3}{5} \qquad \frac{5v}{5} > \frac{-5}{5}$

$v < 3/5 \qquad v > -1$



$(-1, 3/5)$ $(-1, \infty)$

$(-\infty, -1)$

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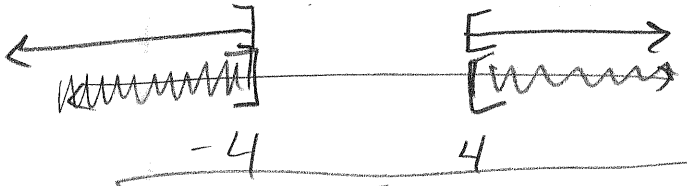
$$-5|v| - 3 \leq -23$$

$$+3 \qquad +3$$

$$\frac{-5|v|}{-5} \leq \frac{-20}{-5}$$

$$|v| \geq 4$$

$$v \geq 4 \quad \text{or} \quad v \leq -4$$



$$(-\infty, -4] \cup [4, \infty)$$

What if k is Negative?

$|4x+5| = -2$ Can't happen!

Ans: No Solution

$|4x+5| \geq -2$ always true

Ans: $(-\infty, \infty)$

$|4x+5| \leq -2$ Can't happen!

Ans: No Solution

27

$-3|m|-2 > 4$

$|m| < -2$ ← No solution!

$\boxed{\emptyset}$

Sec 1.4 Complex Numbers

Defn: the imaginary unit i

Represents the Number whose square is -1.

That is $i^2 = -1$ and $i = \sqrt{-1}$

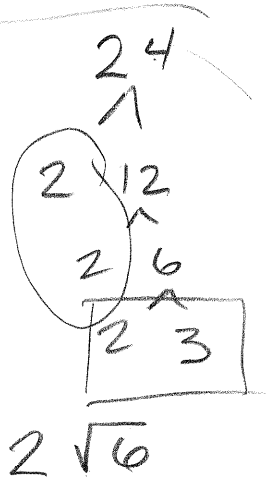
for any square Root of a Negative Number

$$\sqrt{-K} = i\sqrt{K}$$

$$\sqrt{-16} = i\sqrt{16} = i \cdot 4 = 4i$$

$$-\sqrt{-24} = -i\sqrt{24}$$

$$= -2i\sqrt{6}$$



Defn: Complex Numbers are

Numbers that can be written in the form $a + bi$, where a and b are Real Numbers.

Every Real Number:

$$5 = 5 + 0i$$

is also a complex Number.

Standard form: $a + bi$

Standard operations $+, -, \cdot, \div$

add/subtracting: Combine Like terms

#28 a) $(-2 + 5i) + (3 - i)$

$-2 + 5i + 3 - i$

$1 + 4i$

Multiplying: Distribute (aka FOIL)

Remember $i^2 = -1$

#36 a) $(5+2i)(-7+3i)$

$5(-7) + 5(3i) + 2i(-7) + 2i(3i)$

$-35 + 15i - 14i + 6i^2$

$-35 + i + 6i^2(-1)$

$-35 + i + 6(-1)$

$-35 + i - 6$

$\boxed{-41 + i}$

$i = i$

$i^2 = -1$

$i^3 = i \cdot i^2 = i(-1) = -i$

$i^4 = 1$ Reason $i^4 = i^2 \cdot i^2$

$(-1)(-1) = +1$

$i^5 = i^1 \cdot i^4 = 1 \cdot i = i$

$i^6 = i^2 \cdot i^4 = -1 \cdot 1 = -1$

$i^7 = -i$

$i^8 = 1$

$i^{15} = i^3$

$= \boxed{-i}$

$4\overline{)15}$ R 12 → (3)

$i^{293} = i$ ✓

-1

$4\overline{)293}$ R 28 → 73, 1, 3, 12/(1)

$i, -1, -i, 1$

R1 R2 R3 multiple of 4

Division: No i's in denominator!

How to: multiply top and bottom by denominators conjugate

$1+3i$, $1-3i$

$2-5i$, $2+5i$

$0+3i$, $0-3i$

5^{+0i}, 5^{-0i}

$(1+3i)(1-3i)$

$1 - \cancel{3i} + \cancel{3i} - 9i^2$

$1 - 9i^2(-1)$

$1+9$

$\boxed{10}$

$$\frac{6 \cdot (2-5i)}{(2+5i)\cdot(2-5i)}$$

$$\frac{12-30i}{4-\cancel{10i}+\cancel{10i}-25i^2(-1)}$$

$$\frac{12-30i}{4-25(-1)}$$

$$\frac{12-30i}{4+25} = \frac{12-30i}{29} = \frac{12}{29} + \frac{-30}{29}i$$

$a+bi$

Standard Form

-4.3×10^{-12}

$-.0000000000043$

$0 + i = i$

Sec 1.5 Solving Quadratic Equations

Quadratic Equation: $\underbrace{ax^2+bx+c=0}$
Standard form

We solve by

1. Factor then use zero product property
   ($A \cdot B = 0$ then $A=0$ or $B=0$)
2. Square Root Property
3. Completing the square
4. Quadratic Formula

Factoring

1. Rewrite in standard form
2. Factor
3. Set each factor equal to zero
4. Solve
5. Check

#37 $(t+4)(t+7)=54$

$t^2+7t+4t+28=54$

$t^2+11t+28=54$

$-54 \quad -54$

$t^2+11t-26=0$

$-26 \mid 11$

$13, -2 \mid 11$

$(t+13)(t-2)=0$

$t+13=0 \quad t-2=0$

$-13 \quad -13 \quad +2 \quad +2$

$t=-13 \quad t=2$

$\frac{13}{1}=13 \quad \frac{-2}{1}=-2$

$\boxed{t=-13, 2}$

Square Root Property

if $x^2=k$ then $x=\sqrt{k}$ or $x=-\sqrt{k}$

aka $x=\pm\sqrt{k}$

#43 $\sqrt{m^2}=\pm\sqrt{16}$

$m=\pm 4$

$m=4, -4$

Steps to Solve

1. Get Square alone
2. Square Root both sides Remembering the ±
3. Solve and simplify

3 ± 4

#55

$(x-3)^2 + 7 = 2$

$-7 \quad -7$

$\sqrt{(x-3)^2} = \pm\sqrt{-5}$

$x - 3 = \pm\sqrt{-5}$

$x - 3 = \pm i\sqrt{5}$

$+3 \quad +3$

$x = 3 \pm i\sqrt{5}$ ✓

$x = 3 + i\sqrt{5},\ 3 - i\sqrt{5}$