Math 115

Summer 2017

Lecture 2

Solving linear Eqns & inequalities

Ch.2

Linear Eqn $\Rightarrow$ $ax + b = c$

$3x - 7 = 23$, $-4x + 8 = -40$, $\frac{1}{2}x - \frac{2}{3} = \frac{5}{6}$

$2(x-1) + 8 = -3x + 10$, $4x + 3(2x-1) = 15$

$.05x + .1(x-4) = .85$

Solution is a numerical value which makes both sides of the equation equal.

Is -4 a Solution for $3x+10=2$?

$3(-4)+10=2$

$-12+10=2$

$-2=2$

False

-4 is not a Solution.

Is 3 a Solution for $2x^2+5=7x+2$?

$2(3)^2+5=7(3)+2$

$2\cdot 9+5=7\cdot 3+2$

$18+5=21+2$

$23=23$ ✓ True

3 is a Solution.

Properties of equality:

If $A=B$, then

$A+C=B+C$

$A-C=B-C$

$A\cdot C=B\cdot C$

$\frac{A}{C}=\frac{B}{C}$, $C\neq 0$

When Solving linear equations, we could have

- Exactly one Soln.
- infinitely many Solns.
- No Solution

When Solving linear eqn:

we want the variable on the left-hand Side, and numbers on the Right-hand side of $=$.

Solve

$x + 8 = -12$

$x + 8 - 8 = -12 - 8$

$x + 0 = -20$

$\boxed{x = -20}$

All answers must be given in a Solution Set.

$\{-20\}$

Solve $x - 17 = -27$

$x - 17 + 17 = -27 + 17$

$x + 0 = -10$

$\boxed{x = -10}$

Soln Set $\{-10\}$

Solve $-3x = -15$

$\frac{-3}{-3}x = \frac{-15}{-3}$

$1x = 5$

$\boxed{x = 5}$

$\{5\}$

Solve $\frac{x}{4} = -15$

$\frac{1}{4} \cdot \frac{x}{4} = 4 \cdot (-15)$

$1 \cdot x = -60$

$\boxed{x = -60}$

$\{-60\}$

Solve

$2x + 11 = -41$

$2x + 11 - 11 = -41 - 11$

$2x + 0 = -52$

$2x = -52$

$\frac{2}{2}x = \frac{-52}{2}$

$1x = -26$

$x = -26$

$\{-26\}$

Solve

$3x - 7 = 11$

$3x - 7 + 7 = 11 + 7$

$3x + 0 = 18$

$3x = 18$

$\frac{3}{3}x = \frac{18}{3}$

$1x = 6$

$x = 6$

$\{6\}$

The difference of twice some number and 13 is equal to -25. Find the number.

Let x be the number.

$2x - 13 = -25$

$2x - 13 + 13 = -25 + 13$

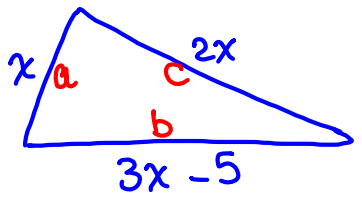
$2x = -12$

$x = \frac{-12}{2}$

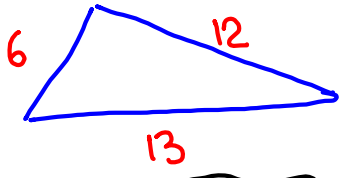
$x = -6$

the number is -6.

Use the Shape below



$P = a + b + c$



The three sides are 6ft, 12 ft, and 13 ft.

Find all three sides if the perimeter is 31 ft.

$P = 31$

$x + 3x - 5 + 2x = 31$

$6x - 5 = 31$

$6x = 31 + 5$

$6x = 36$

$x = \frac{36}{6}$ $\boxed{x = 6}$

Solve

$2(x-3) + 6 = -20$

Hint: Distribute & Simplify

$2x - 6 + 6 = -20$

$2x = -20$

$x = \frac{-20}{2}$

$\boxed{x = -10}$

$\{-10\}$

Do not use $\emptyset$ for 0.

Solve

$3(x+4) + 2(x-3) = 6$

$3x + 12 + 2x - 6 = 6$

$5x + 6 = 6$

$5x = 6 - 6$

$5x = 0$

$x = \frac{0}{5}$

$\boxed{x = 0}$

$\{0\}$

3 times the sum of some number and 4 increased by the number is equal to 36.

Find the number.

Let x be the number

$3(x+4)+x=36$

$3x+12+x=36$

$4x+12=36$

$4x=36-12$

$4x=24$

$x=\frac{24}{4}$

$x=6$

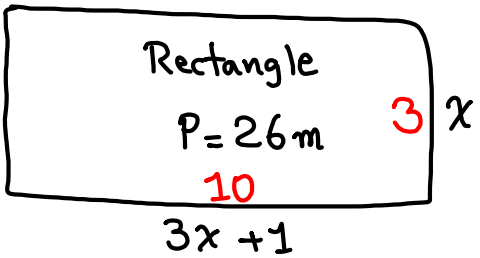
The number is 6.

Use the information given below to find the area

Hint: $P=2L+2W$

$A=LW$

Be aware of units.



$=3(3)+1=9+1=10$

$P=26$

$2L+2W=26$

$2(3x+1)+2(x)=26$

$6x+2+2x=26$

$8x+2=26$

$8x=26-2$

$8x=24$

$x=3$

$A=LW$

$=10(3)=30$

Area is $30\ m^2$.

Solve

$\frac{2}{3}x - \frac{1}{2} = \frac{5}{6}$

Hint: Find & multiply everything with the LCD.

LCD = 6

$\cancel{6}^{2} \cdot \frac{2}{\cancel{3}}x - \cancel{6}^{3} \cdot \frac{1}{\cancel{2}} = \cancel{6} \cdot \frac{5}{\cancel{6}}$

$4x - 3 = 5$

$4x = 5 + 3$

$4x = 8$

$x = \frac{8}{4}$

$\boxed{x = 2}$

$\{2\}$

Solve

$\frac{3}{4}(x-2) + \frac{2}{3}x = \frac{-7}{12}$

use LCD to clear fractions.

LCD = 12

$\cancel{12}^{3} \cdot \frac{3}{\cancel{4}}(x-2) + \cancel{12}^{4} \cdot \frac{2}{\cancel{3}}x = \cancel{12} \cdot \frac{-7}{\cancel{12}}$

$9(x-2) + 8x = -7$

$9x - 18 + 8x = -7$

$17x = -7 + 18$

$17x = 11$

$\boxed{x = \frac{11}{17}}$

$\left\{\frac{11}{17}\right\}$

Solve

$$\frac{2}{3}(x-4)-\frac{1}{5}(x+3)=\frac{-3}{10}$$

LCD = 30

$$\cancel{30}^{10}\cdot\frac{2}{\cancel{3}}(x-4)-\cancel{30}^{6}\cdot\frac{1}{\cancel{5}}(x+3)=\cancel{30}^{3}\cdot\frac{-3}{\cancel{10}}$$

$$20(x-4)-6(x+3)=-9$$

$$20x-80-6x-18=-9$$

$$14x-98=-9$$

$$14x=-9+98$$

$$14x=89$$

$$x=\frac{89}{14}$$

$$\left\{\frac{89}{14}\right\}$$

$-\frac{2}{3}$ times the sum of twice some number and -8 reduced by $\frac{3}{5}$ of the number is equal to 20. Find the number. Let x be the number,

$$-\frac{2}{3}\cdot(2x+-8)-\frac{3}{5}\cdot x=20$$

The number is $-\frac{220}{29}$.

$$-\frac{2}{3}(2x-8)-\frac{3}{5}x=20$$

LCD = 15

$$\cancel{15}^{5}\cdot\frac{-2}{\cancel{3}}(2x-8)-\cancel{15}^{3}\cdot\frac{3}{\cancel{5}}x=15\cdot 20$$

$$-10(2x-8)-9x=300$$

$$-20x+80-9x=300$$

$$-29x=300-80$$

$$-29x=220$$

$$x=\frac{220}{-29}$$

$$x=\frac{-220}{29}$$

Solve $3x + 17 = x - 13$

$3x - x = -13 - 17$

$2x = -30$

$x = \frac{-30}{2}$

$\boxed{x = -15}$

$\{-15\}$

Solve $2x - 25 = -3x + 45$

$2x + 3x = 45 + 25$

$5x = 70$

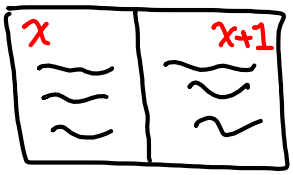
$\boxed{x = 14}$

$\{14\}$

Lisa opened her math book.

The sum of two facing pages was 51.

What are the page numbers?



$x + x + 1 = 51$

$2x + 1 = 51$

$2x = 51 - 1$

$2x = 50$

$x = \frac{50}{2}$ $\boxed{x = 25}$

The page numbers were 25 & 26.

Solve

$4(x-3)-8=2x+80$

$4x-12-8=2x+80$

$4x-20=2x+80$

$4x-2x=80+20$

$2x=100$

$\boxed{x=50}$ $\{50\}$

There were 39 students in a math class. The number of females was twice the number of males. How many females were in that math class?

Total = 39 $\Rightarrow$ Males + Females = 39

Males $\rightarrow x$ $\quad x+2x=39$

Females $\rightarrow 2x \rightarrow 2(13)=26$ $\quad 3x=39$

$x=13$

26 Females

Solve

$\frac{1}{2}(x-2)-\frac{1}{4}(x+4)=\frac{1}{3}(x-15)$

LCD = 12

$6(x-2)-3(x+4)=4(x-15)$

$6x-12-3x-12=4x-60$

$3x-24=4x-60$

$3x-4x=-60+24$

$-x=-36$

$-1x=-36$

$x=\frac{-36}{-1}$

$x=36$

$\{36\}$

Solve

1) $6x-3(2x-4)=6$

$6x-6x+12=6$

$12=6 \Rightarrow 0=-6$

False

No Solution

$\emptyset$

Do not write $\{\emptyset\}$ as Your final answer

2) $4(x-1)+14=2(2x+5)$

$4x-4+14=4x+10$

$4x+10=4x+10$

$4x-4x=10-10$

$0=0$

True

Infinitely Many Solns.

All Real numbers

$\mathbb{R}$

Translate only:

7 less than | 3 times square of some number | is | 40.

A less B ⇒ A − B

A less than B ⇒ B − A

$3 \cdot x^2 - 7 = 40$

$3x^2 - 7 = 40$

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10 more than 4 times the difference between some number and −8 is equal to 20 added to the number squared.

10 more than | 4 times the difference between Some number and −8 | is equal to | 20 added to | the number squared.

A more than B ⇒ B + A

A added to B ⇒ B + A

$4(x - (-8)) + 10 = x^2 + 20$

$-(-) = +$

$4(x + 8) + 10 = x^2 + 20$

Translate only:

A minus B
A less B

Square root of some number, A − B
reduced by −10 is equal to the number
minus 8.

$$\sqrt{x} - -10 = x - 8$$

$$\sqrt{x} + 10 = x - 8$$

Some number subtracted from twice its square is equal to zero.

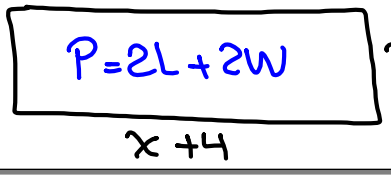
A subtracted from B
$\Rightarrow$ B − A

$$2 \cdot x^2 - x = 0$$

$$2x^2 - x = 0$$

Do not use $\emptyset$ for zero.

Find expression for perimeter in simplest form.



$P = 2L + 2W$
$= 2(x+4) + 2(x-4)$
$= 2x + 8 + 2x - 8 = \boxed{4x}$

Evaluate b^2-4ac for $a=3$, $b=-1$, and $c=-4$.

$=(-1)^2-4(3)(-4)$

$=1+48=\boxed{49}$

Evaluate $\dfrac{-b-\sqrt{b^2-4ac}}{2a}$ for $a=4$, $b=7$, $c=3$.

$\dfrac{-7-\sqrt{7^2-4\cdot4\cdot3}}{2\cdot4}=\dfrac{-7-\sqrt{49-48}}{8}$

$=\dfrac{-7-\sqrt{1}}{8}=\dfrac{-8}{8}=\boxed{-1}$

Evaluate $\dfrac{-b-\sqrt{b^2-4ac}}{2a}$

for $a=5$, $b=-3$, and $c=-8$

$=\dfrac{-(-3)-\sqrt{(-3)^2-4(5)(-8)}}{2(5)}=\dfrac{3-\sqrt{9+160}}{10}$

$=\dfrac{3-\sqrt{169}}{10}=\dfrac{3-13}{10}=\dfrac{-10}{10}=\boxed{-1}$

Name the properties used:

$7(x+1)-3(2x+3)+2$

$=7x+7\cdot 1-3(2x)-3(3)+2$ Dist.

$=7x+7-(3\cdot 2)x-9+2$ Identity, Associative

$=7x+7-6x-7$ Simplify

$=7x-6x+7-7$ Commutative

$=1x+0$ Simplify, inverse

$=x$ Identity.

The sum of two numbers is 26. One of them is 6 less than the other one. Find their product.

First Number + Second Number $= 26$

16 10

$x + x-6 = 26$

$2x-6=26$

$2x=32$

$x=16$

Their Product is 160.

Due Today: Online Quiz by 5:00 PM

Due Tomorrow @ 6:00 AM: WP 1

Due Tomorrow @ 10:15 AM: SG 1