

Five Algebra Questions

(and, the answers...)

Topics include distributive property, square roots, absolute value, exponents, fractions, and more.

Algebra basics: "Finding x"

Example: $3x + 11 = 5x + 3$

approach 1: "always balance the equation"

subtract 3 from both sides

$$3x + 11 - 3 = 5x + 3 - 3$$

$$3x + 8 = 5x$$

subtract 3x from both sides

$$3x + 8 - 3x = 5x - 3x$$

$$8 = 2x$$

divide both sides by 2


$$\frac{8}{2} = \frac{2x}{2}$$

$$4 = x$$

Whatever you do to one side, you must do the same to the other side!

approach 2: "move to other side and flip the sign"

move the 3 over to the left side


$$3x + 11 = 5x + 3$$


flip the sign

$$-3 + 3x + 11 = 5x$$

$$3x + 8 = 5x$$

move the 3x over to the right side

$$3x + 8 = 5x$$


$$8 = 5x + (-3x)$$

$$8 = 2x$$

multiply by 1/2

$$1/2(8 = 2x)$$

$$4 = x$$

"When to use the distributive property"

Example: $3(x + 5) + 2(x + 3) = 6x$

Apply the distributive property

$$3x + 15 + 2x + 6 = 6x$$

Collect "like" terms

$$5x + 21 = 6x$$

$$21 = x$$

Example: $37(x + 16) = 74$

Avoid the distributive property

Divide both sides by 37...

$$(x + 16) = 2$$

$$x = -14$$

"Make equations smaller, rather than larger!"

Note: If we distribute...

$$37x + 592 = 74$$

$$37x = -518$$

divide each side by 37

$$x = -14$$

"Avoid fractions until the end"

Example: $2(x + 3) = 7$

Apply the distributive property

$$2x + 6 = 7$$

$$2x = 1$$

$$x = 1/2$$

Note: If we divide each side...

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

subtract 3 from each side...

$$x = \frac{7}{2} - \frac{6}{2}$$

$$x = 1/2$$

"For my final trick, I'll make my number 1 assistant disappear!"

★ THE GREAT HUGH DEENY ★
HD



LanceAF #152 (8-20-14)
mathplane.com

(Hugh receives mixed reviews from the math figures in attendance.)

"Abracadabra.. Presto.. and, Voilà! Nothing remains..."

The David Copper Fieldhouse

Entrance



"Wow.."

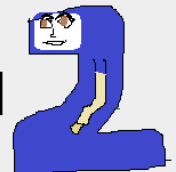
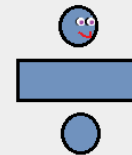
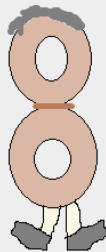
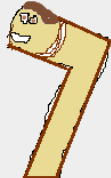
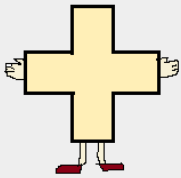
"Ooohh.."

"Big deal. We've made plenty of things disappear."

I know... "NOT impressed."

"I liked the other trick where he cut his assistant in half."

"Me, too..."



The Quizzes-→

Five Algebra Questions I

1) $3.06 + t = 8.7$ Find t:

2) $\frac{-x}{4} = 16$ Find x:

3) $4(x + 2) + 3 = 11$ Find x:

4) $2(x + 5) - 3(y + 6)$ Simplify:

5) $2(w + 7) = 5w - 7$ Find w:

Five Algebra Questions II

1) $\frac{1}{8} + x = \frac{1}{16}$ Find x:

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

3) $\frac{3}{5} + \frac{w}{10} = \frac{7}{20}$ Find w:

4) $.4(y + .3) = y + .6$ Find y:

5) $8(x + 7) + 11 = -13$ Find x:

Five Algebra Questions III

1) $4(x + 9) + 8(3 - x)$ Simplify:

2) $\frac{w}{.3} + .7 = .9$ Find w:

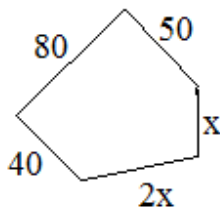
3) $\frac{3}{8} - x = -\frac{1}{4}$ Find x:

4) $11(d + 2) = 6d - 3$ Find d:

5) $-(y + 8) + 1 = 15$ Find y:

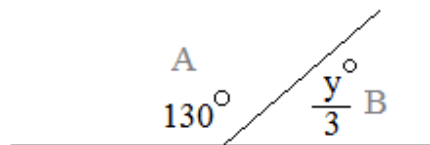
Five Algebra Questions IV

- 1) If the perimeter of the pentagon is 254, then $x =$



- 2) Angles A and B are supplementary (add up to 180 degrees)

Find y :

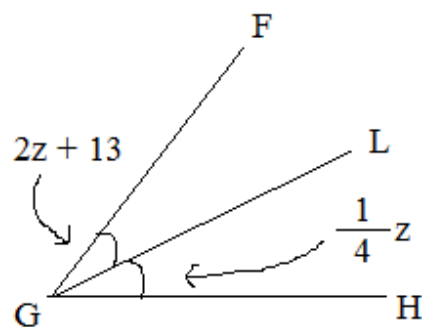


- 3) $.345 + v = .21$ Find v :

- 4) $7(m + 6) - (9m + 12) = 8$ Find m :

- 5) $\angle FGL \cong \angle HGL$
(the angle measures are equal)

Find z :



Five Algebra Questions V

1) $3x^2 + 4 = 31$

2) $|2x + 1| - 5 = 12$

3) $2 + \sqrt{x+1} = 11$

4) $3(x - 5) + 4 = 2x + 7$

5) $\sqrt{2x+1} + 5 = 3$

Five Algebra Questions VI

1) $\frac{2x^2}{3} = \frac{8}{3}$

2) $4\sqrt[3]{3x-1} = 16$

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

4) $-2 + |5x + 3| = 10$

5) $7 + \frac{|x+5|}{2} = 5$

Five Algebra Questions VII

1) $2|x + 5| = 10$

2) $\frac{3}{4}\sqrt{x+3} = 6$

3) $3 + 3x^2 = 12$

4) $-|x - 5| = 5 - 11$

5) $\sqrt{2x - 5} = 11$

Five Algebra Questions VIII

1) $4(x - 3) = 2 + 3(x + 5)$

2) $3x^2 + 8 = 14$

3) $4 + |x - 3| = 17$

4) $\sqrt{x + 3} - 6 = -4$

5) $|x + 5| + 6 = 5$

Five Algebra Questions IX

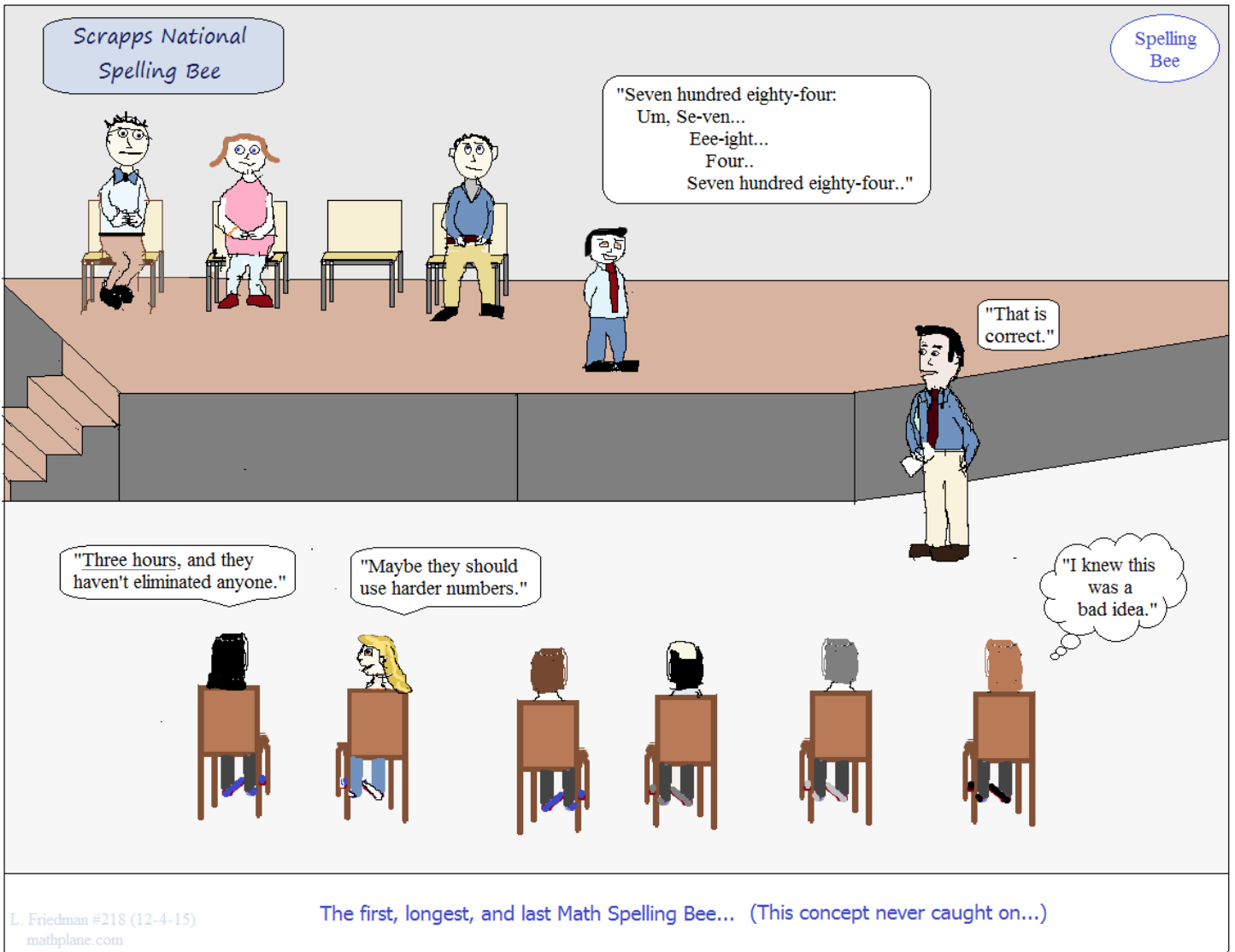
1) $4 + \frac{x^2}{6} = 7$

2) $\frac{|2x+1|}{4} = 3$

3) $\frac{\sqrt{x+5}}{3} = 2(5-2)$

4) $3x^2 = \frac{4}{3}$

5) $14 - |x-5| = 2$



The Answers-→

1) $3.06 + t = 8.7$

Find t:

$$\begin{array}{r} 3.06 + t = 8.70 \\ -3.06 \quad -3.06 \\ \hline 0 + t = 5.64 \end{array}$$

2) $\frac{-x}{4} = 16$

Find x:

$$\begin{array}{l} (-4) \cdot \frac{-1}{4} x = 16 \cdot (-4) \\ x = -64 \end{array}$$

3) $4(x + 2) + 3 = 11$

Find x:

$$\begin{array}{r} 4(x + 2) + 3 = 11 \\ \quad \quad -3 \quad -3 \\ \hline 4(x + 2) = 8 \end{array}$$

divide each side by 4:

$$\begin{array}{l} (x + 2) = 2 \\ \text{then, } x = 0 \end{array}$$

4) $2(x + 5) - 3(y + 6)$

Simplify:

(distribute): $2x + 10 - 3y - 18$

(collect 'like' terms): $2x - 3y - 8$

5) $2(w + 7) = 5w - 7$

Find w:

(distribute): $\begin{array}{r} 2w + 14 = 5w - 7 \\ -2w \quad -2w \end{array}$

(collect 'like' terms):

$$\begin{array}{r} 14 = 3w - 7 \\ +7 \quad +7 \\ \hline 21 = 3w \end{array}$$

$w = 7$

(Note: to check your work
plug your answer into the
original equation!)

Five Algebra Questions II

ANSWERS

1) $\frac{1}{8} + x = \frac{1}{16}$

Find x:

$$\frac{2}{16} + x = \frac{1}{16}$$

$$\frac{-2}{16} \quad \frac{-2}{16}$$

$$x = \boxed{\frac{-1}{16}}$$

2) $-3(x + 5) - 2(x - 5)$

Simplify:

$$-3x - 15 - 2x - (-10)$$

$$-5x - 15 + 10$$

$$\boxed{-5x - 5}$$

3) $\frac{3}{5} + \frac{w}{10} = \frac{7}{20}$

Find w:

$$\frac{12}{20} + \frac{w}{10} = \frac{7}{20}$$

$$(10) \frac{w}{10} = \frac{-5}{20} (10)$$

$$w = \boxed{\frac{-5}{2}}$$

4) $.4(y + .3) = y + .6$

Find y:

$$.4y + .12 = y + .6$$

$$-.4y \quad \quad \quad -.4y$$

$$.12 = .6y + .6$$

$$-.6 \quad \quad \quad -.6$$

$$-.48 = .6y$$

$$y = \boxed{-.8}$$

5) $8(x + 7) + 11 = -13$

Find x:

$$8(x + 7) = -24$$

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

$$x = \boxed{-10}$$

1) $4(x + 9) + 8(3 - x)$ Simplify: (distribute): $4x + 36 + 24 - 8x$

(collect 'like' terms): $-4x + 60$

2) $\frac{w}{.3} + .7 = .9$ Find w:
 $\quad \quad \quad -.7 \quad -.7$

$$\frac{w}{.3} = .2$$

$$w = .06$$

multiply by .3

3) $\frac{3}{8} - x = -\frac{1}{4}$ Find x:
 $\quad \quad \quad \frac{-3}{8} \quad \quad \quad \frac{-3}{8}$

$$-x = \frac{-5}{8}$$

$$x = \frac{5}{8}$$

(divide/multiply by -1)

4) $11(d + 2) = 6d - 3$ Find d:

(distribute left side):

$$11d + 22 = 6d - 3$$

$$\frac{-6d \quad \quad -6d}{5d + 22 = -3}$$

$$\frac{-22 \quad -22}{5d = -25}$$

$$d = -5$$

5) $-(y + 8) + 1 = 15$ Find y:

(Note: to check an answer, just substitute into the original equation!)

$$-y - 8 + 1 = 15$$

$$-y - 7 = 15$$

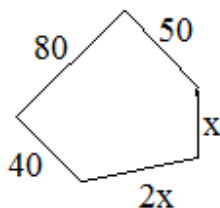
$$\frac{+7 \quad +7}{-y = 22}$$

$$y = -22$$

- 1) If the perimeter of the pentagon is 254, then
- $x =$

$$\begin{aligned} 40 + 80 + 50 + x + 2x &= 254 && \text{perimeter} \\ 170 + 3x &= 254 && \text{collect 'like' terms} \\ 3x &= 84 && \text{divide by 3} \end{aligned}$$

$x = 28$

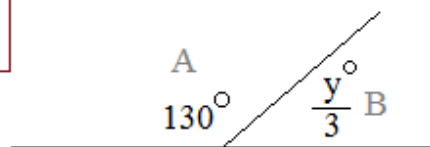


- 2) Angles A and B are supplementary (add up to 180 degrees)

Find y :

$$\begin{aligned} 130 + \frac{1}{3}y &= 180 \\ \frac{1}{3}y &= 50 \end{aligned}$$

$y = 150$



- 3)
- $.345 + v = .21$
- Find
- v
- :

$v = .21 - .345$

$v = .210 - .345$

$v = -.135$

- 4)
- $7(m + 6) - (9m + 12) = 8$
- Find
- m
- :

$7m + 42 - (9m + 12) = 8$

$7m + 42 - 9m - 12 = 8$

$-2m + 30 = 8$

$-2m = -22$

$m = 11$

- 5)
- $\angle FGL \cong \angle HGL$

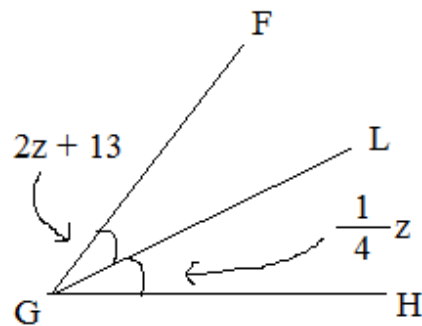
(the angle measures are equal)

Find z :

$2z + 13 = \frac{1}{4}z$

$\frac{4}{7} \cdot \frac{7}{4}z = -13 \cdot \frac{4}{7}$

$z = \frac{-52}{7}$



Five Algebra Questions V

ANSWERS

1) $3x^2 + 4 = 31$

Isolate the x^2

$$3x^2 = 27$$

$$x^2 = 9$$

$$\sqrt{x^2} = \sqrt{9}$$

$x = 3, -3$

"The square root of a square has a plus or minus solution"

2) $|2x + 1| - 5 = 12$

Isolate the absolute value

$$|2x + 1| = 17$$

Split the absolute value

$$2x + 1 = 17 \text{ OR } 2x + 1 = -17$$

$x = 8, -9$

3) $2 + \sqrt{x + 1} = 11$

Isolate the radical

$$\sqrt{x + 1} = 9$$

square both sides

$$x + 1 = 81$$

$x = 80$

to check answers, just plug into original equation

$$2 + \sqrt{(80) + 1} = 11$$

$$2 + 9 = 11$$

$$11 = 11 \checkmark$$

4) $3(x - 5) + 4 = 2x + 7$

distribute

$$3x - 15 + 4 = 2x + 7$$

collect terms

$$3x - 11 = 2x + 7$$

$$x = 18$$

solve

$x = 18$

5) $\sqrt{2x + 1} + 5 = 3$

$$\sqrt{2x + 1} = -2$$

isolate radical

$$2x + 1 = 4$$

square both sides

$$x = 3/2$$

check answer

$$\sqrt{2(3/2) + 1} + 5 = 3$$

$$\sqrt{4} + 5 = 3$$

$$7 \neq 3$$

NO SOLUTION

$$1) \frac{2x^2}{3} = \frac{8}{3} \quad \text{multiply both sides by 3}$$

$$2x^2 = 8$$

divide by 2

$$x^2 = 4$$

square root both sides

$$\sqrt{x^2} = \sqrt{4}$$

Square root of a square has a plus or minus solution

$$x = 2, -2$$

$$2) 4\sqrt{3x-1} = 16$$

$$\text{divide by 4} \quad \sqrt{3x-1} = 4$$

$$\text{square both sides} \quad 3x-1 = 16$$

$$x = \frac{17}{3}$$

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

distribute (to remove parentheses)

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

collect terms

$$2x = x + 12$$

$$x = 12$$

$$4) -2 + |5x + 3| = 10$$

$$\text{isolate absolute value term} \quad |5x + 3| = 12$$

$$\text{split into + and -} \quad \begin{array}{l} 5x + 3 = 12 \\ 5x + 3 = -12 \end{array}$$

$$x = \frac{9}{5} \text{ or } -3$$

(to check, put answers into original equation)

$$5) 7 + \frac{|x+5|}{2} = 5$$

Isolate the absolute value terms

$$\frac{|x+5|}{2} = -2$$

$$|x+5| = -4$$

since absolute value must be positive, there is

NO SOLUTION

If you split into + and -

$$x + 5 = -4 \quad x + 5 = 4$$

$$x = -1 \text{ or } -9$$

But, when you check your answers...

$$7 + \frac{|(-1)+5|}{2} \neq 5 \quad 7 + \frac{|(-9)+5|}{2} \neq 5$$

1) $2|x + 5| = 10$ Isolate the absolute value term

$|x + 5| = 5$ then, split the term + and -

$x = 0, -10$

$x + 5 = +5 \quad x + 5 = -5$

2) $\frac{3}{4}\sqrt{x+3} = 6$

Isolate the radical

$\sqrt{x+3} = \frac{4}{3} (6)$ then, square both sides

$x = 61$

$\sqrt{x+3} = 8$

$x + 3 = 64$

3) $3 + 3x^2 = 12$

$3x^2 = 9$

square root of a square has a positive and negative answer

$x^2 = 3$

$x = \sqrt{3} \text{ or } -\sqrt{3}$

4) $-|x - 5| = 5 - 11$

$-1|x - 5| = -6$

$x - 5 = +6$

$|x - 5| = 6$

$x - 5 = -6$

$x = 11 \text{ or } -1$

5) $\sqrt{2x - 5} = 11$

square both sides

$2x - 5 = 121$

$2x = 126$

$x = 63$

Five Algebra Questions VIII

SOLUTIONS

1) $4(x - 3) = 2 + 3(x + 5)$

distribute to remove the parentheses
 $4x - 12 = 2 + 3x + 15$
 collect terms and solve $x = 29$

To check: plug into original equation

$$4(29 - 3) = 2 + 3(29 + 5)$$

$$104 = 2 + 102$$

$$104 = 104 \checkmark$$

2) $3x^2 + 8 = 14$

isolate the x term.. $3x^2 = 6$
 $x^2 = 2$

then, square root both sides

$x = +\sqrt{2} \text{ or } -\sqrt{2}$

square root of a square has a positive and negative

3) $4 + |x - 3| = 17$

$$|x - 3| = 13$$

$$\begin{array}{l} \swarrow \quad \searrow \\ x - 3 = 13 \quad x - 3 = -13 \end{array}$$

$x = 16 \text{ or } -10$

4) $\sqrt{x + 3} - 6 = -4$

Isolate the radical $\sqrt{x + 3} = 2$
 then, square both sides $x + 3 = 4$

$x = 1$

5) $|x + 5| + 6 = 5$

isolate the absolute value term

$|x + 5| = -1$

since an absolute value is always positive, there is

NO SOLUTION

NOTE: if you split and solve,

$$x + 5 = -1 \quad x + 5 = +1$$

$$x = -6 \quad x = -4$$

But, when you check these answers, they don't work!

$$|(-6) + 5| + 6 = 5 \quad |(-4) + 5| + 6 = 5$$

$$1 + 6 \neq 5 \quad 1 + 6 \neq 5$$

Five Algebra Questions IX

SOLUTIONS

1) $4 + \frac{x^2}{6} = 7$

isolate the square term... $\frac{x^2}{6} = 3$

$x^2 = 18$

then, square root...

$x = \sqrt{18} \text{ or } -\sqrt{18}$

$3\sqrt{2} \text{ or } -3\sqrt{2}$

2) $\frac{|2x+1|}{4} = 3$

split the absolute value

$|2x+1| = 12$

$2x+1 = +12 \quad 2x+1 = -12$

$x = \frac{11}{2} \text{ or } \frac{-13}{2}$

3) $\frac{\sqrt{x+5}}{3} = 2(5-2) \quad \frac{\sqrt{x+5}}{3} = 6$

$\sqrt{x+5} = 18$

$x+5 = 324$

$x = 319$

4) $3x^2 = \frac{4}{3} \quad x^2 = \frac{4}{9}$

$x = +\sqrt{\frac{4}{9}} \text{ or } -\sqrt{\frac{4}{9}}$

$x = 2/3, -2/3$

5) $14 - |x-5| = 2$

$-|x-5| = -12$

multiply by -1 $|x-5| = 12$

$x-5 = 12$

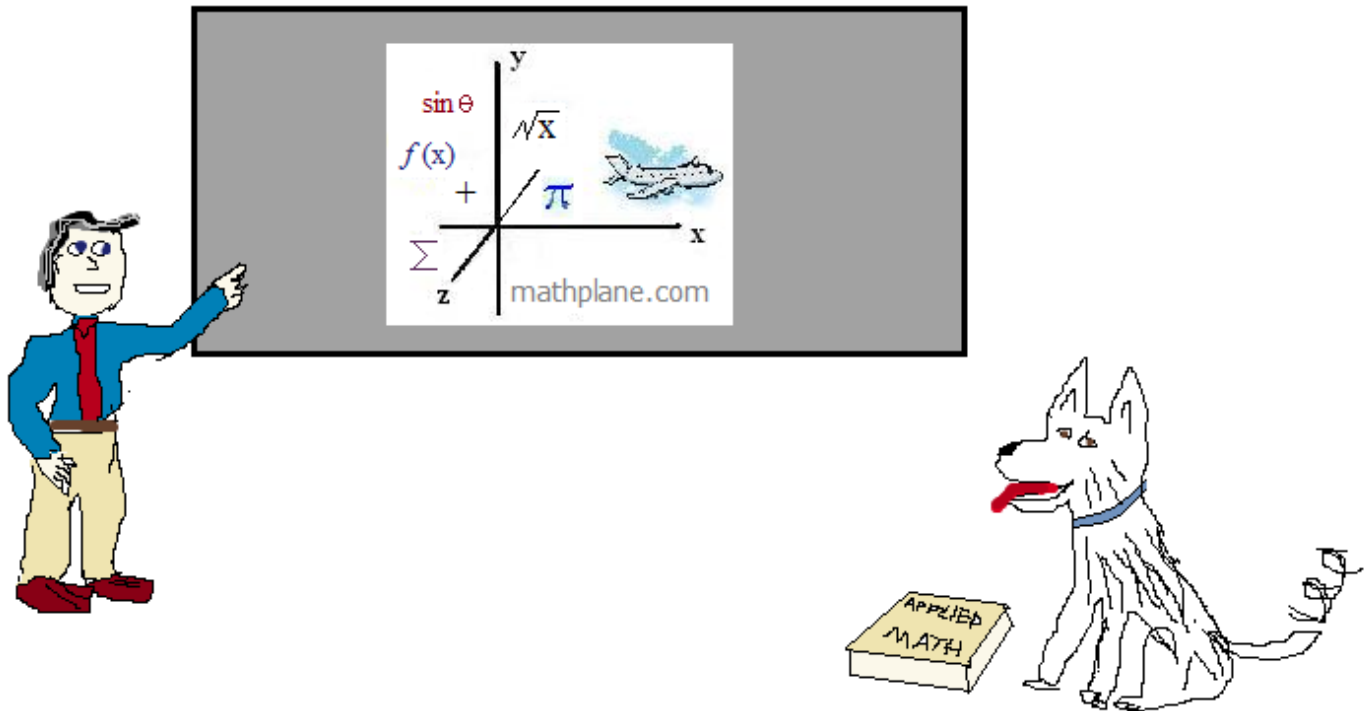
$x-5 = -12$

$x = -7, 17$

Thanks for visiting. (Hope it helped!)

If you have questions, suggestions, or requests, let us know.

Cheers



Also, at TES, TeachersPayTeachers, and Pinterest
And, Mathplane.ORG for mobile and tablets