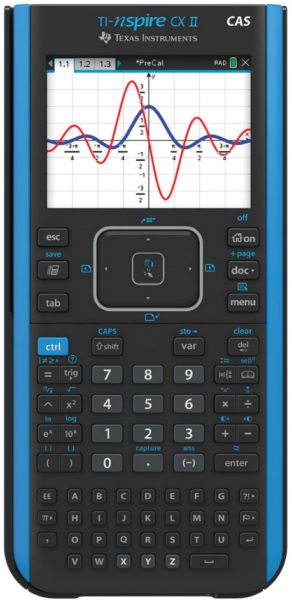
Leveraging TI-84 CE and TI-Nspire™ CX Technology for SAT® Test Success



Teachers Teaching with Technology™
Professional Development from Texas Instruments

Expected Outcomes

- » I can leverage the TI-84 CE and TI-Nspire™ CX effectively to promote student success.
- » I can discuss and motivate strategies to implement on the SAT® with students.

SAT ® Strategies to be Covered

- » Substitute numbers
- » Substitute ordered pairs
- » Using graphs
- » Using tables
- » Truth statements

Substitute Numbers

- » Easier to calculate when using numbers instead of variables.
- » Make sure numbers you pick make the question true
- » Try to stay away from choosing 0 and 1

If $\frac{a}{b} = 4$, what is the value of $\frac{8b}{a}$?

a) 0

b) 2

c) 4

d) 8

Using strategy

$a = 8, b = 2$

$\frac{8b}{a} \Rightarrow \frac{8(2)}{(8)} \Rightarrow 2$

$\frac{a}{b} = 4 \quad \Rightarrow \quad \frac{b}{a} = \frac{1}{4}$

$\frac{8b}{a} = 8\left(\frac{1}{4}\right) = 2$

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

If $a^2 + b^2 = z$, and $ab = y$, which of the following is equivalent to $4z - 8y$?

$a = 2, b = 3 \Rightarrow z = 13, y = 6$

Using strategy

$4z - 8y \Rightarrow 4(13) - 8(6) \Rightarrow 4$

a) $(a - 2b)^2$ $(2 - 2(3))^2 \Rightarrow 16$

b) $(2a - 2b)^2$ $(2(2) - 2(3))^2 \Rightarrow 4$

c) $(4a - 4b)^2$ $(4(2) - 4(3))^2 \Rightarrow 16$

d) $(4a - 8b)^2$ $(4(2) - 8(3))^2 \Rightarrow 256$

$4z - 8y$

$4(a^2 + b^2) - 8(ab)$

$4a^2 - 8ab + 4b^2$

$(2a - 2b)^2$

In the equation $\frac{a-b}{a} = c$, if *a* is positive and *b* is negative, which of the following must be true?

a) $c > 1$

~~b)~~ $c = 1$

~~c)~~ $c = -1$

~~d)~~ $c < -1$

Using strategy

$a = 2, b = -3$

$$\frac{a-b}{a} = c$$

$$\frac{2-(-3)}{2} = c$$

$$2.5 = c$$

$$\frac{positive - negative}{positive} = c$$

$$\frac{positive}{positive} = c$$

$$c > 1$$

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

In the equation $y = x^2 - a$, *a* is positive constant and the graph of the equation in the *xy*-plane is a parabola. Which of the following is an equivalent form of the equation?

~~a)~~ $y = (x + a)(x - a)$ $(2 + 9)(2 - 9) \Rightarrow -77$

b) $y = (x + \sqrt{a})(x - \sqrt{a})$ $(2 + \sqrt{9})(2 - \sqrt{9}) \Rightarrow -5$

~~c)~~ $y = (x + \frac{a}{2})(x - \frac{a}{2})$ $\left(2 + \frac{9}{2}\right)\left(2 - \frac{9}{2}\right) \Rightarrow -16.25$

~~d)~~ $y = (x + a)^2$ $(2 + 9) \Rightarrow 122$

Difference of squares

$y = (x + \sqrt{a})\ (x - \sqrt{a})$

Using strategy

$x = 2, a = 9$

$y = (2)^2 - 9$

$y = -5$

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Substituting Zero (and One)

- Quickly substitute zero for all the variables and the answer choices.
- Eliminate the answer choices that don't work.
- Repeat the steps substituting the number one for all variables

$$x^2 + 8x + 15$$

Which of the following is equivalent to the expression above?

a) $(x+4)^2 + 1$ $\quad (0+4)^2+1 \Rightarrow 17$

b) $(x+4)^2 - 1$ $\quad (0+4)^2-1 \Rightarrow 15 \quad (1+4)^2-1 \Rightarrow 24$

c) $(x-4)^2 + 1$ $\quad (0-4)^2+1 \Rightarrow 17$

d) $(x-4)^2 - 1$ $\quad (0-4)^2-1 \Rightarrow 15 \quad (1-4)^2-1 \Rightarrow 8$

$x^2 + 8x + 15$

$(x^2+8x+16) + 15 - 16$

$(x+4)^2-1$

Using strategy

$x = 0$

$(0)^2+8(0) + 15$

15

$x = 1$

$(1)^2+8(1) + 15$

24

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Which of the following is equivalent to $(2x^2-4)-(-5x^2+4x-6)$?

a) $7x^2-4x+2$ $7(0)^2-4(0)+2 \Rightarrow 2$

~~b)~~ $7x^2+4x-2$ $7(0)^2+4(0)-2 \Rightarrow -2$

~~c)~~ $-3x^2-4x-10$ $-3(0)^2-4(0)-10 \Rightarrow -10$

~~d)~~ $-3x^2+4x-10$ $-3(0)^2+4(0)-10 \Rightarrow -10$

$2x^2-4+5x^2-4x+6$

$7x^2-4x+2$

Using strategy

$x=0$

$(2(0)^2-4)-(-5(0)^2+4(0)-6)$

2

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Which of the following is equivalent to $\frac{x^2+5x+7}{x-2}$?

Using strategy

~~a)~~ $x+3+\frac{1}{x-2}$ $\quad 0+3+\frac{1}{0-2} \Rightarrow 2.5$

~~b)~~ $x+3+\frac{13}{x-2}$ $\quad 0+3+\frac{13}{0-2} \Rightarrow -3.5$

~~c)~~ $x+7-\frac{7}{x-2}$ $\quad 0+7+\frac{7}{0-2} \Rightarrow 3.5$

d) $x+7+\frac{21}{x-2}$ $\quad 0+7+\frac{21}{0-2} \Rightarrow -3.5$

$x = 0$

$\frac{(0)^2+5(0)+7}{0-2} \Rightarrow -3.5$

$x = 1$

$\frac{(1)^2+5(1)+7}{1-2} \Rightarrow -13$

$$\begin{array}{r} x+3 \\ x-2\overline{)\,x^2+5x+7} \\ \underline{-(x^2-2x)} \\ 3x+7 \\ \underline{-(3x-6)} \\ 13 \end{array}$$

$x+3+\frac{13}{x-2}$

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Substitute Ordered Pairs

» When you see an ordered pair, write *x* and *y* below the coordinates.

» Try substituting the *x* and *y* values into the equation to eliminate answers

In the *xy*-plane, the point $(\overset{(x,\,y)}{2,\ 4})$ lies on the graph of the function $f(x) = 2x^2 - ax + 4$. What is the value of *a* ?

<u>Using strategy</u>

$$4 = 2(2)^2 - a(2) + 4$$

$$4 = 8 - 2a + 4$$

$$4 = a$$

$$3x + 4y = 7$$
$$2y - x = -9$$

Which is the solution (x, y) to the system of equations above?

	(x, y)	
~~a)~~	$(4,1)$	$3(4) + 4(1) = 7$ *yes* $2(1) - (4) = -9$ *no*
~~b)~~	$(3, -5)$	$3(3) + 4(-5) = 7$ *no* $2(-5) - (3) = -9$ *no*
c)	$(5, -2)$	$3(5) + 4(-2) = 7$ *yes* $2(-2) - (5) = -9$ *yes*
~~d)~~	$(-6, -7)$	$3(-6) + 4(-7) = 7$ *no* $2(-7) - (-6) = -9$ *no*

Using Graphs

- Graph both sides of an equation to solve equations.
- Use a graph to find key points of interest for a function/equation.
- Use a graph to solve a system of equations.

For what value of x is $|x + 1| + 2$ equal to 1?

A) 0
B) 1
C) 2
D) There is no such value

$|x + 1| + 2 = 1$

$|x + 1| = -1$

We hope!

No solution!!

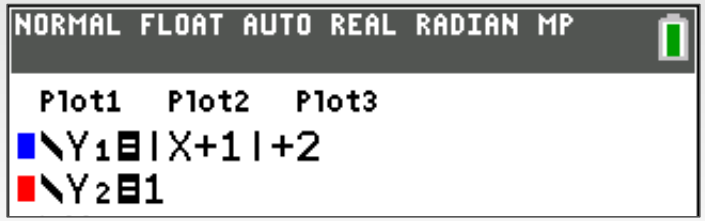
$x + 1 + 2 = 1 \rightarrow x = -2$ Or…$x + 1 = 1 \rightarrow x = 0$

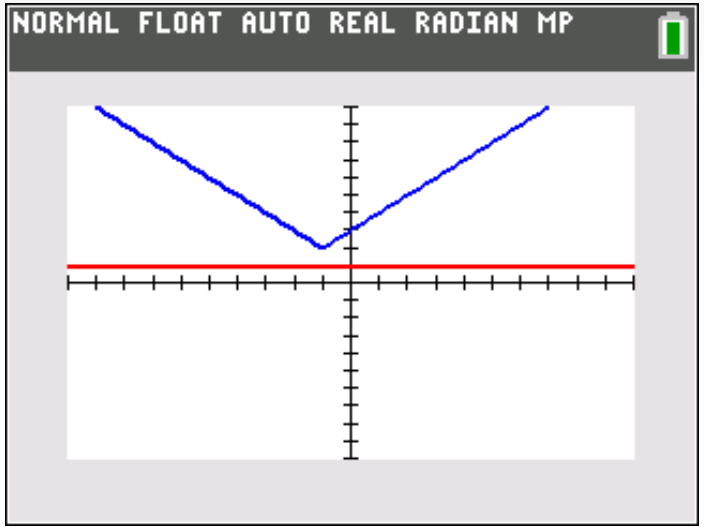
Trouble!!

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

For what value of x is $|x + 1| + 2$ equal to 1?

A) 0
B) 1
C) 2
D) There is no such value





Teachers Teaching with Technology™
Professional Development from Texas Instruments

If $\frac{3}{7}x = \frac{5}{3}$, what is the value of x?

A) $\frac{9}{35}$

B) $\frac{5}{7}$

C) $\frac{7}{5}$

D) $\frac{35}{9}$

$$\frac{3}{7}x = \frac{5}{3}$$

$$\frac{7}{3} \cdot \frac{3}{7}x = \frac{5}{3} \cdot \frac{7}{3}$$

Trouble!!

$$x = \frac{35}{9}$$

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

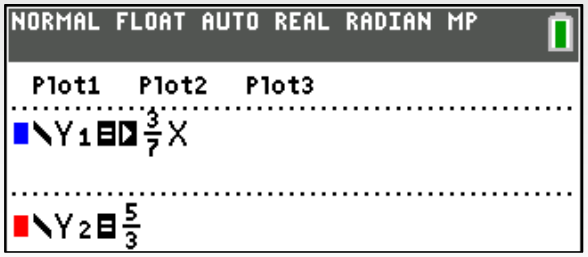
If $\frac{3}{7}x = \frac{5}{3}$, what is the value of x?

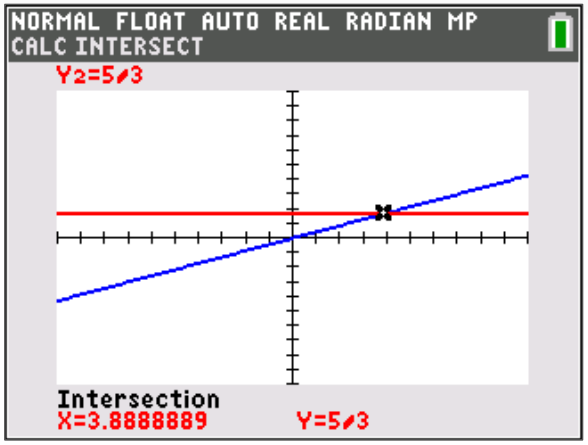
A) $\frac{9}{35}$

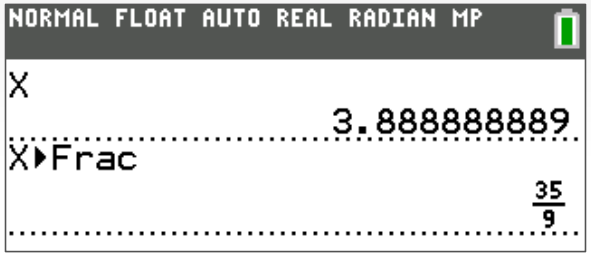
B) $\frac{5}{7}$

C) $\frac{7}{5}$

D) $\frac{35}{9}$







Teachers Teaching with Technology™
Professional Development from Texas Instruments

The line with the equation $\frac{2}{3}x + \frac{5}{4}y = 3$ is graphed in the xy-plane. What is the y-coordinate of the y-intercept of the line?

'Grid-In Problem'

y-intercept is where <u>x = 0</u>.

$$\frac{2}{3}(0) + \frac{5}{4}y = 3$$

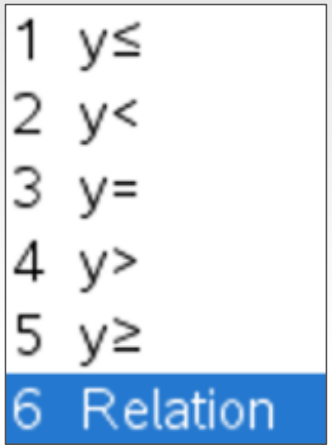
$$\frac{5}{4}y = 3$$

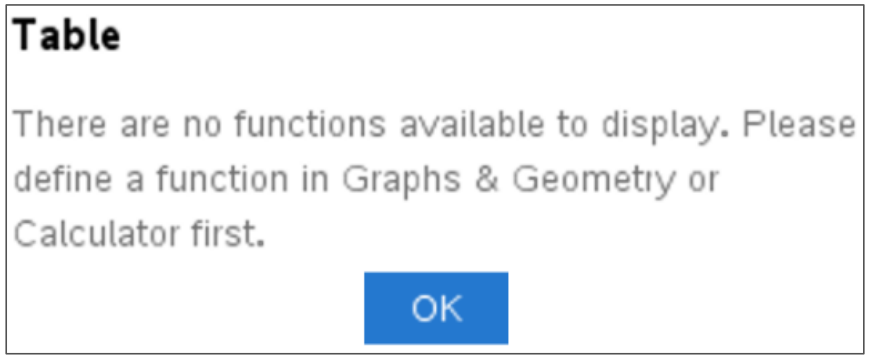
Trouble!!

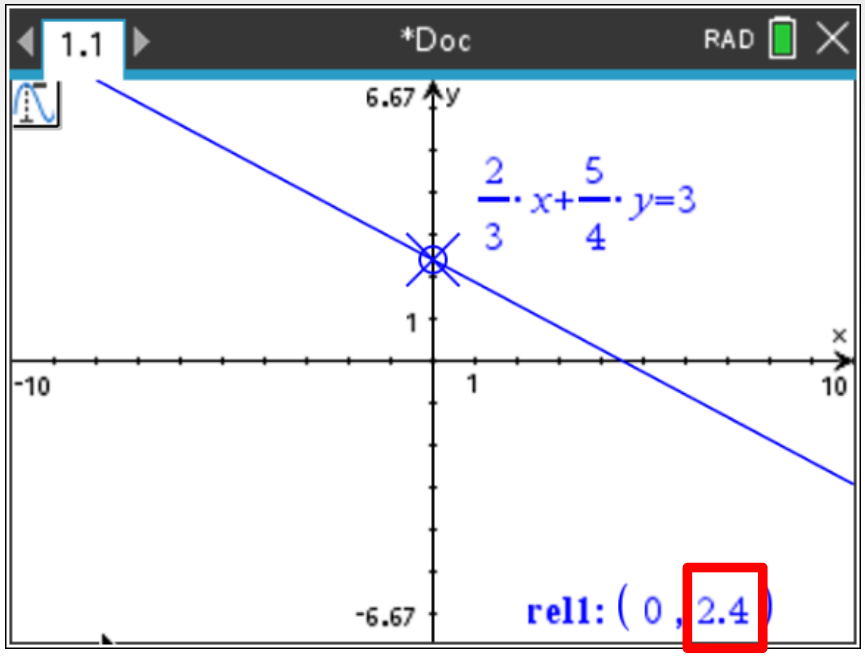
$$\frac{4}{5} \cdot \frac{5}{4}y = 3 \cdot \frac{4}{5} \rightarrow \boxed{y = \frac{12}{5}}$$

Teachers Teaching with Technology™
Professional Development from Texas Instruments

The line with the equation $\frac{2}{3}x + \frac{5}{4}y = 3$ is graphed in the xy-plane. What is the y-coordinate of the y-intercept of the line?







Teachers Teaching with Technology™
Professional Development from Texas Instruments

A bowling alley sells pizza for $9.50 each and sodas for $3 each. The bowling alley's revenue from selling a total of 92 pizzas and sodas in one day was $516.50. How many pizzas were sold that day?

A) 28

B) 37

C) 46

D) 52

x = # of pizzas

y = # of sodas

$x + y = 92$

$9.50x + 3y = 516.5$

Elimination

Substitution

Time & Trouble!!

Time saver….Graphing!!

Teachers Teaching with Technology™
Professional Development from Texas Instruments

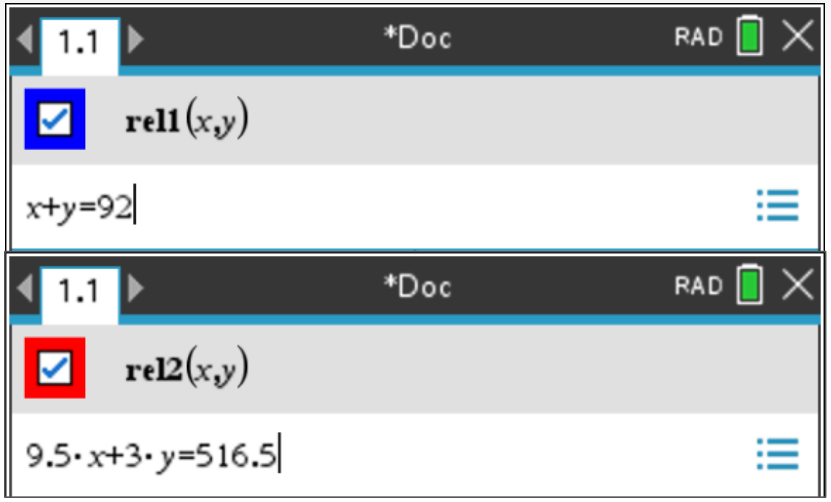
A bowling alley sells pizza for $9.50 each and sodas for $3 each. The bowling alley's revenue from selling a total of 92 pizzas and sodas in one day was $516.50. How many pizzas were sold that day?

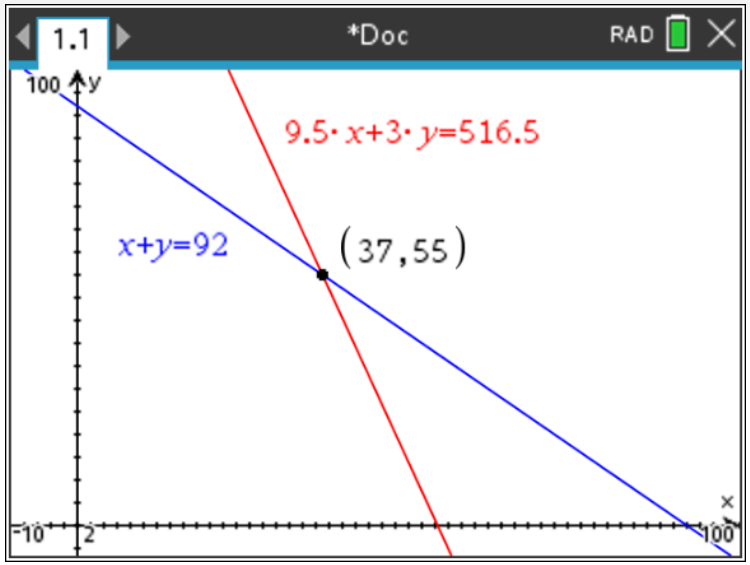
A) 28

B) 37

C) 46

D) 52





Teachers Teaching with Technology™
Professional Development from Texas Instruments

Using Tables

- Use tables to help solve equations and systems of equations.
- Set up table to input the independent variable values.

If the ordered pair (x, y) satisfies the following system of equations, what is one possible value of x?

$$y = 2x^2 - x + 3$$
$$y = 6x + 7$$

'Grid-In Problem'

$2x^2 - x + 3 = 6x + 7$

Trouble?!?

$2x^2 - 7x - 4 = 0$

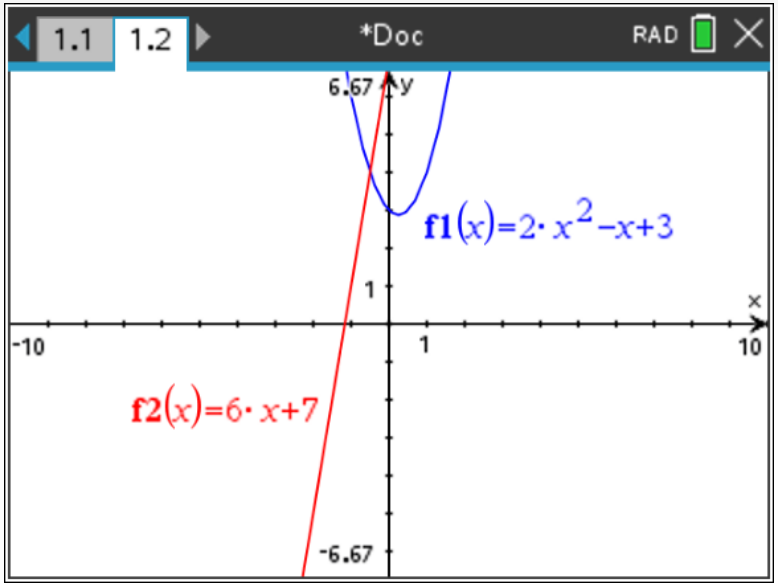
$(2x + 1)(x - 4) = 0$ → $x = -\frac{1}{2}$ or $x = 4$

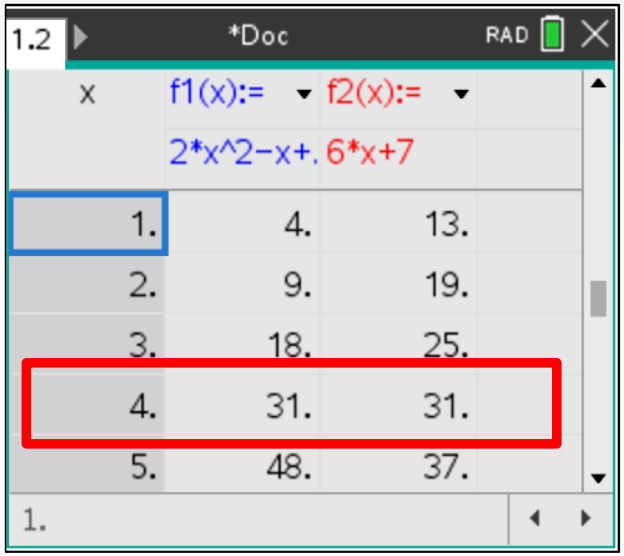
T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

If the ordered pair (x, y) satisfies the following system of equations, what is one possible value of x?

$$y = 2x^2 - x + 3$$
$$y = 6x + 7$$

'Grid-In Problem'





Teachers Teaching with Technology™
Professional Development from Texas Instruments

Which of the following values of x is NOT a solution to the equation below?

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

$$\left(\sqrt{x^2}\right)^2 = (x)^2$$

$$x^2 = x^2 \rightarrow ???$$

Trouble!!

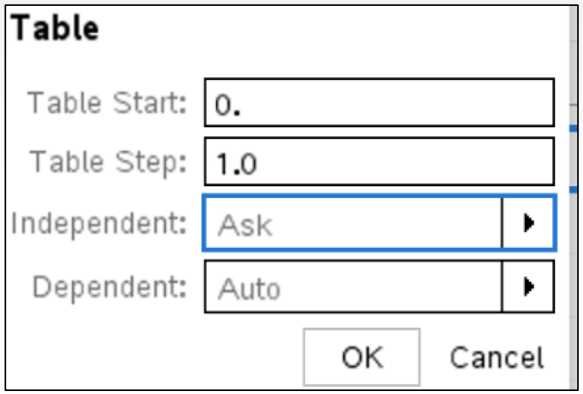
A) -2
B) 0
C) 2
D) 4

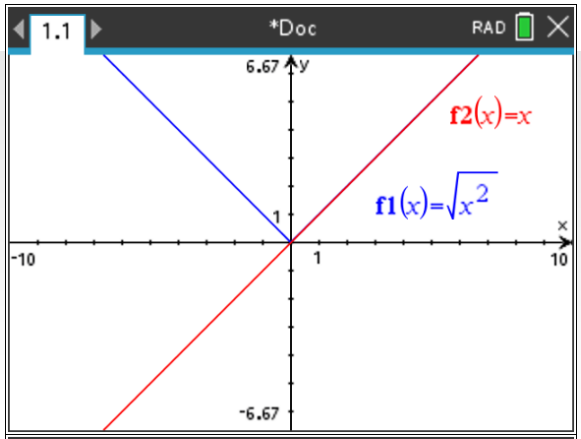
T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

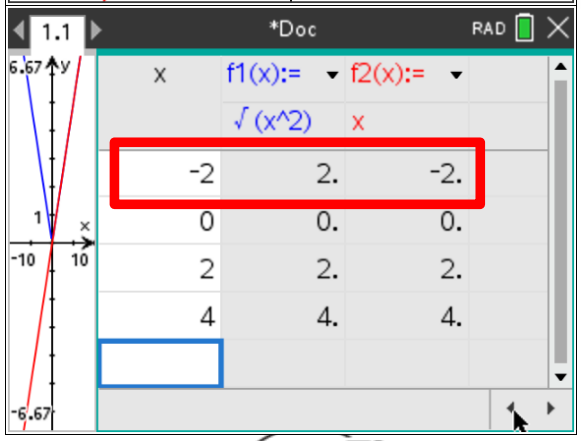
Which of the following values of x is NOT a solution to the equation below?

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

A) -2
B) 0
C) 2
D) 4







Teachers Teaching with Technology™
Professional Development from Texas Instruments

Some values of the linear function *f* are shown in the table above. Which of the following defines *f* ?

2 2

x	1	3	5
f(x)	9	15	21

6 6

Slope: 6/2 = 3

A) $f(x) = 2x + 9$

B) $\boxed{f(x) = 3x + 6}$

C) $f(x) = 4x + 1$

D) $f(x) = 5x$

f(x) = 3x + b

f(1) = 3(1) + b = 9 → 3 + b = 9 → b = 6

f(x) = 3x + 6

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

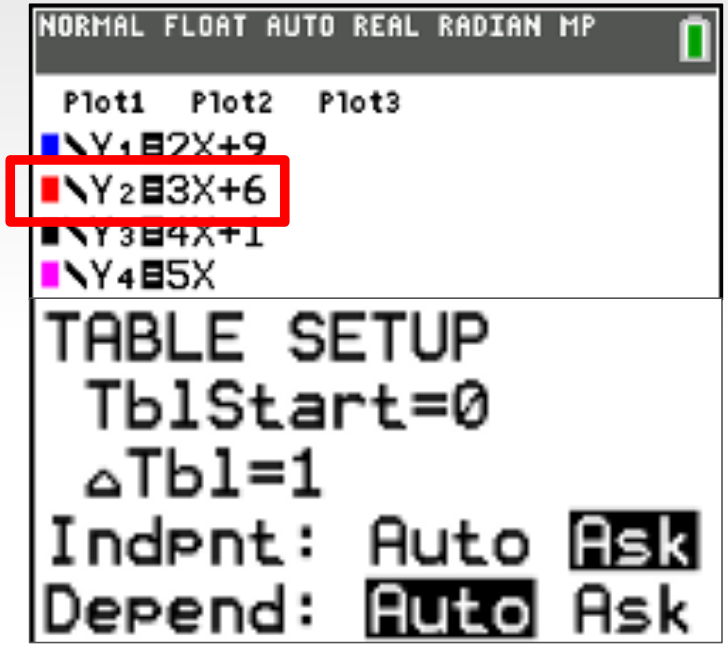
Some values of the linear function *f* are shown in the table above. Which of the following defines *f* ?

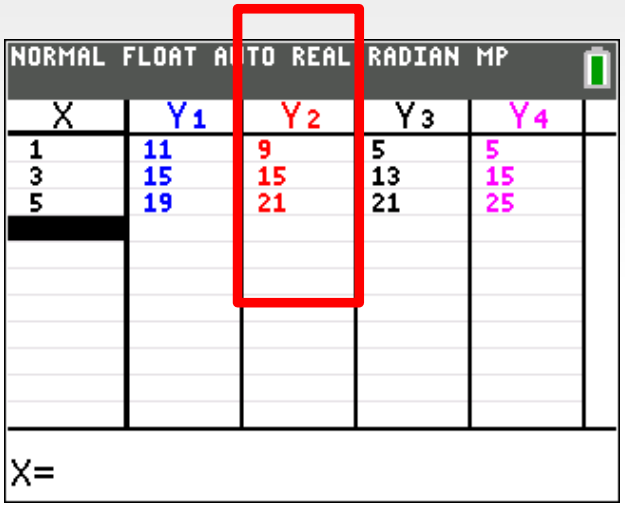
A) $f(x) = 2x + 9$

B) $f(x) = 3x + 6$

C) $f(x) = 4x + 1$

D) $f(x) = 5x$





Teachers Teaching with Technology™
Professional Development from Texas Instruments

Truth Statements

» Find solutions to equations by verifying whether a typed equation is ‘true’ or ‘false’.

Clare will mix x milliliters of a 15% by mass acid solution with y milliliters of a 25% by mass acid solution in order to create an 19% by mass solution. The equation below represents this situation. If Clare uses 120 milliliters of the 15% by mass acid solution, how many milliliters of the 25% by mass acid solution must she use?

$$0.15x + 0.25y = 0.19(x + y)$$

a) 40

b) 80

c) 100

d) 120

$$0.15(120) + 0.25y = 0.19(120 + y)$$

$$18 + 0.25y = 22.8 + 0.19y$$

$$0.06y = 4.8$$

$$y = 4.8/0.06 = \underline{80}$$

Decimals = Trouble!!

T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

Clare will mix x milliliters of a 15% by mass acid solution with y milliliters of a 25% by mass acid solution in order to create an 19% by mass solution. The equation below represents this situation. If Clare uses 120 milliliters of the 15% by mass acid solution, how many milliliters of the 25% by mass acid solution must she use?

$$0.15x + 0.25y = 0.19(x + y)$$

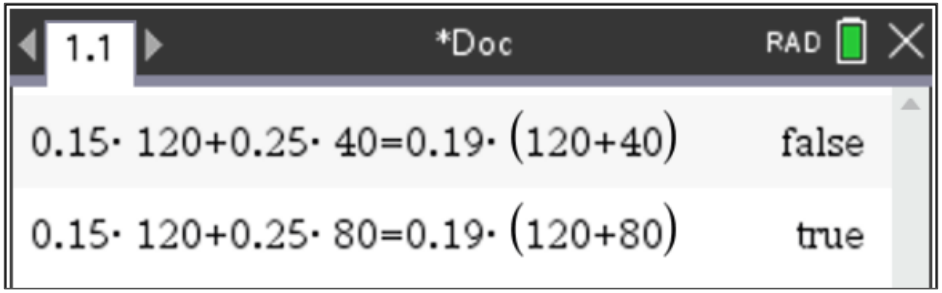
a) 40

b) 80

c) 100

d) 120

$$0.15(120) + 0.25y = 0.19(120 + y)$$



Teachers Teaching with Technology™
Professional Development from Texas Instruments

In the equation $(ax + 2)^2 = 16$, a is a constant. If $x = -1$ is one solution to the equation, what is a possible value of a?

a) -14
b) -6
c) -2
d) 2

$(-1a + 2)^2 = 16$

$(-a + 2)(-a + 2) = 16$

Trouble?!?

$a^2 - 4a + 4 = 16$

$a^2 - 4a - 12 = 0$

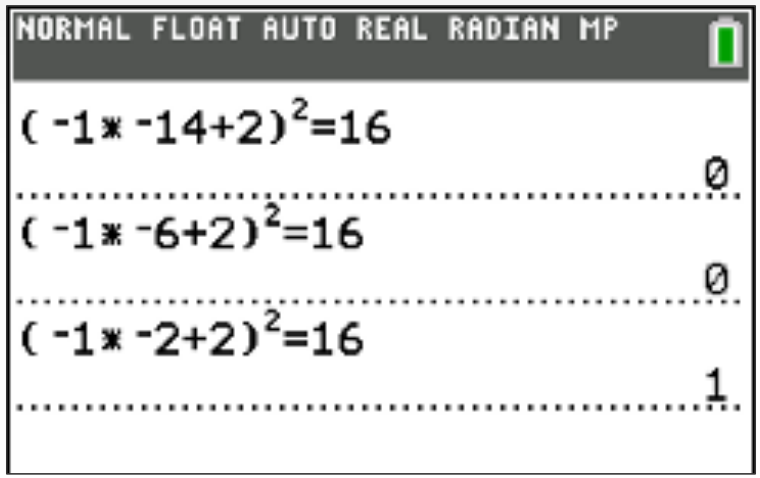
$(a - 6)(a + 2) = 0$ → $a = 6$ or $a = -2$

T³
Teachers Teaching with Technology™
Professional Development from Texas Instruments

In the equation $(ax + 2)^2 = 16$, a is a constant. If $x = -1$ is one solution to the equation, what is a possible value of a?

$(-1a + 2)^2 = 16$

a) -14
b) -6
c) -2
d) 2



True!!

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Solve $5 - x = 2(x - 1) - 3x$

A) no solution
B) 0
C) 1
D) 2

$5 - x = 2x - 2 - 3x$

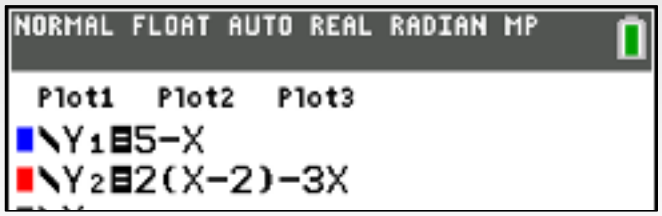
$5 - x = -x - 2$

$5 = -2$ ← Trouble!

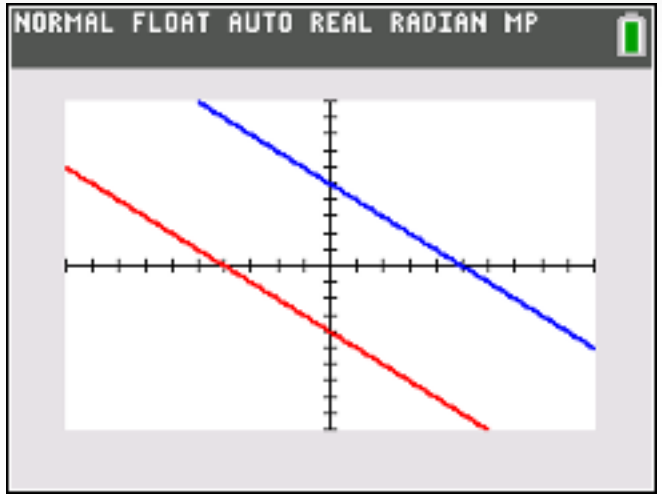
T³ Teachers Teaching with Technology™
Professional Development from Texas Instruments

Solve $5 - x = 2(x - 1) - 3x$

A) no solution
B) 0
C) 1
D) 2



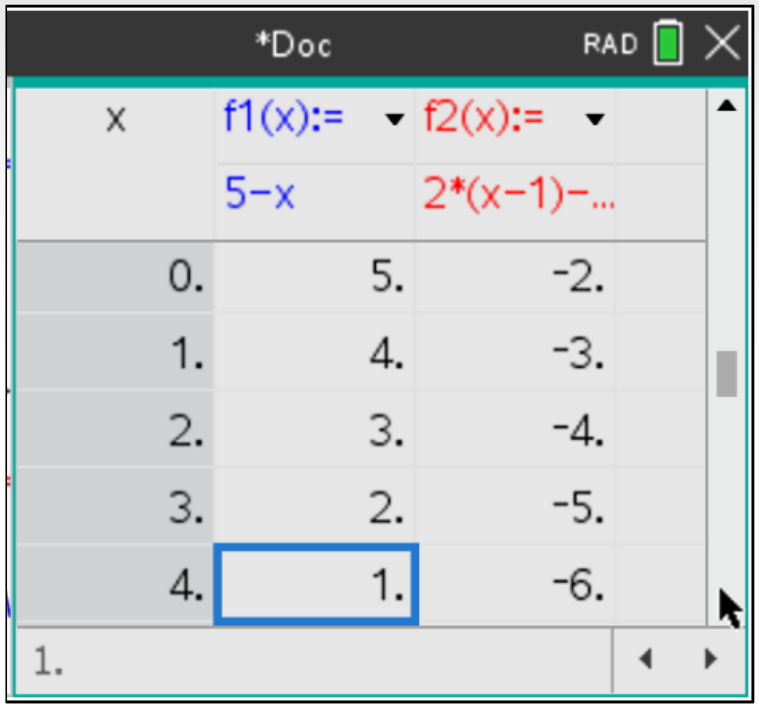
Graph



Teachers Teaching with Technology™
Professional Development from Texas Instruments

Solve $5 - x = 2(x - 1) - 3x$

A) no solution
B) 0
C) 1
D) 2



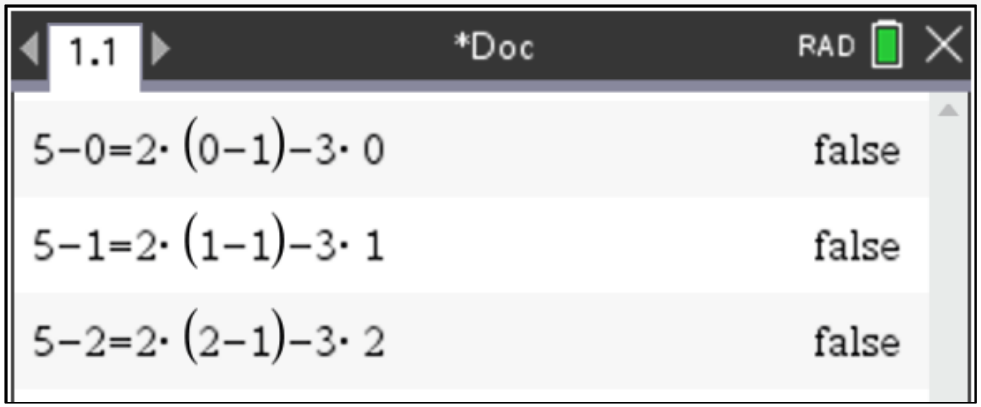
Table

Teachers Teaching with Technology™
Professional Development from Texas Instruments

Solve $5 - x = 2(x - 1) - 3x$

A) no solution
B) 0
C) 1
D) 2

Truth Statements



T³
Teachers Teaching with Technology™
Professional Development from Texas Instruments