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Workforce Development:

Module 3

1.1 Lessons Abbreviation Key Table

C = Calculator Lesson
P = Pre-algebra Lesson
A = Algebra Lesson
G = Geometry Lesson
T = Trigonometry Lesson
S = Special Topics

The number following the letter is the Lesson Number.

E = Exercises with Answers: Answers are in brackets **[ ]**.
EA = Exercises Answers: (only used when answers are not on the same page as the exercises.)
ES = Exercises Supplemental: Complete if you feel you need additional problems to work.

1.2 Exercises Introduction

Why do the Exercises?

Mathematics is like a "game." The more you practice and play the game the better you will understand and play it.

The Foundation's Exercises, which accompany each lesson, are designed to reinforce the ideas presented to you in that lesson's video.

It is unlikely you will learn math very well by simply reading about it or listening to Dr. Del, or anyone else, or watching someone else doing it.

You WILL learn math by "doing math."

It is like learning to play a musical instrument, or write a book, or play a sport, or play chess, or cooking.

You will learn by practice.

Repetition is the key to mastery.

You will make mistakes. You will sometimes struggle to master a concept or technique. You may feel frustration sometimes “**WE ALL DO**.”

But, as you learn and do math, you will begin to find pleasure and enjoyment in it as you would in any worthwhile endeavor. Treat it like a sport or game.

These exercises are the KEY to your SUCCESS!

ENJOY!

INTRODUCTION TO ALGEBRA

Algebra is a "technology" for finding unknown numbers, **X**, **Y**, **Z**, etc., from known numbers **A**, **B**, **C**, etc. In our Foundation course, we will only deal with one unknown number, usually denoted **X**, but we could denote it with any symbol.

The Algebra technique is to create an Equation involving the unknown number **X** and the known numbers **A**, **B**, **C**, etc., based on their known relationships and then "solving" the equation for the unknown, and checking the answer.

Step 1 is to “**create**” the equation between **X** and the knowns.

Step 2 is to "**solve**" this equation by finding out what value of **X** makes the equation true when substituted for **X**.

Step 3 is to "**verify**" or "**check**" the solution by making the substitution.

Simple Example: [Word Problem] Three years from now Mary will be twice as old as Joe who is 7 years old today. How old is Mary now?

Step 1. Let **X** be Mary's age today. This is the unknown we want to find. In three years Mary will be **X + 3** years old. In three years Joe will be **7 + 3 = 10** years old. So, we are given that in three years **X + 3 = 2x10 = 20**

Step 2. Solve the equation. By trial and error, it appears **17** might be the answer.

Step 3. Check. Substitute **17** for **X**.   **17 + 3 = 20**. So, **17** is the answer.

Now, in general, it is not too hard to do Step 1. Define what X stands for and then relate the given facts to X and create an equation.

Step 2 can be very easy; or, very difficult, to solve. In the Foundation course, we will deal with equations that arise in many common situations, and these are usually easy to solve.

Step 3 is quite easy with a calculator.

A1 LESSON: FOUR WAYS TO SOLVE AN ALGEBRA EQUATION

Suppose you have an equation with one unknown, **X**. How can you solve it?

There are essentially four ways.

1. __Guess the answer__. Check to see if you are right. This is a good way with really simple equations. It can be the best way with very complicated equations **IF** you have a computer to help. This is then called **Numerical Analysis**.

2. __Apply a Formula__. This is fine **IF** you know an appropriate formula. This is useful if you are solving the same type of equation frequently and have the formula available. However, it can be quite difficult to find or remember the correct formula. Formulas are often given in Handbooks for special situations.

3. __Apply a Process__. This is the best way for certain equations, and it is how we will solve most of our equations in this Foundation course, and in the real world.

4. __Apply a Power Tool__. This is the best way for complex equations. One great tool for this is Mathematica. This is how engineers solve most of their equations. But, you must learn to use this tool first. We will cover it extensively in the upper Tiers in our advanced training. If also applies to other types of equations.

In our Foundation course, we will learn to __Apply a Process__. This usually is easier than trying to find the correct formula. It is faster and more accurate for certain types of equations we will be dealing with.

A1E

Four Ways to Solve an Algebra Equation

Suppose you have an equation with one unknown, X. How can you solve it?

What are the Four Ways to solve an equation?

1.

2.

3.

4.

Which way will be utilize and learn in the Foundations Course? Why?

Four Ways to Solve an Algebra Equation

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What are the Four Ways to solve an equation?

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Which way will be utilized and learned in the Foundations Course? Why?

In our Foundation course, we will learn to Apply a Process. This usually is easier than trying to find the correct formula. It is faster and more accurate for certain types of equations we will be dealing with.

Four Ways to Solve an Algebra Equation

1. In the PMF, what do we want to know about an Algebra Equation?

2. Why do we normally use Applying a Process instead of Applying a Formula to solve algebra equations?

Four Ways to Solve an Algebra Equation Answers: [ ]

1. In the PMF, what do we want to know about an Algebra Equation?

[**We want to see if we can find the value of the unknown in the equation, most generally denoted by X!**]

2. Why do we normally use Applying a Process instead of Applying a Formula to solve algebra equations?

[**Applying a Formula only works for special types of problems and specific formulas, and requires a good deal of memorization. Applying a Process allows us to work with many types of equations with needing to memorize specific formulas!**]

A2 LESSON: THE RULE OF ALGEBRA

Suppose we have an equation to solve. It will have a Left Side (**LS**) and a Right Side (**RS**) either of which might contain the unknown, **X**, and other known numbers. (Any letter could be the unknown.)

Equation: **LS** = **RS** Can switch sides **RS** = **LS**

THE RULE of Equation Solving is: You may do the same thing to both sides of the equation and obtain a new equation:

1. **LS** + A = **RS** + A, **LS** - A = **RS** – A Add or Subtract a Number to both sides of the equation.
2. **LS**xA = **RS**xA, **LS**÷A = **RS**÷A Multiply or Divide a Number
3. 1/**LS** = 1/**RS** Invert both sides
4. $(LS)^2 = (RS)^2$ Square both sides
5. √**LS** = √**RS** Square Root Both Sides
6. SIN (**LS**) = SIN (**RS**) Take the SIN of both sides.
7. Any legitimate math operation to both sides.

The idea is to apply a sequence of operations or transformations to both sides until you arrive at:

X = Number "The Solution"

Then <u>check your answer</u> by substituting this Number into the Equation in place of **X** and see that both sides are equal.
We will see many examples of this in the lessons to follow. These are the kinds of Equations you will be solving in the "real world."

A2E

THE RULE OF ALGEBRA

Suppose we have an equation to solve. It will have a Left Side (**LS**) and a Right Side (**RS**) either of which might contain the unknown, **X**, and other known numbers. (Any letter could be the unknown.)

Equation: **LS** = **RS** Can switch sides **RS** = **LS**

1. What is **THE RULE** of Equation Solving?

2. Give examples of applying this Rule.

3. Describe the process you will use to solve an equation using this Rule.

4. After you have a solution: **X** = Number, what should you always do, especially if the answer is important?

THE RULE OF ALGEBRA

Suppose we have an equation to solve. It will have a Left Side (**LS**) and a Right Side (**RS**) either of which might contain the unknown, **X**, and other known numbers. (Any letter could be the unknown.)

Equation: **LS** = **RS** Can switch sides **RS** = **LS**

1. **THE RULE** of Equation Solving is: *You may do the same thing to both sides of the equation and obtain a new equation:*

2. Examples:

1) **LS** + **A** = **RS** + **A**, **LS** - **A** = **RS** - A (add or subtract a number to both sides of the equation)
2) **LS**x**A** = **RS**x**A**, **LS**÷**A** = **RS**÷**A** (multiply or divide a number)
3) 1/**LS** = 1/RS (invert both sides)
4) $(\mathbf{LS})^2 = (\mathbf{RS})^2$ (square both sides)
5) √**LS** = √**RS** (square root both sides)
6) SIN (**LS**) = SIN (**RS**) (take the SIN of both sides)
7) Any legitimate math operation to both sides.

3. The idea is to apply a sequence of operations or transformations to both sides until you arrive at:

X = Number "**The Solution**"

4. Then <u>check your answer</u> by substituting this Number into the Equation in place of **X** and see that both sides are equal.
We will see many examples of this in the lessons to follow. These are the kinds of Equations you will be solving in the "real world."

THE RULE OF ALGEBRA

1. When solving an equation, any math operation (adding, subtracting, multiplying, etc.) done to one side of the equation must be ___________________________. *fill in the blank*

2. If we solved the equation X + 3 = 8, and got X = 6, what IMPORTANT STEP would help us realize we made a mistake?

THE RULE OF ALGEBRA Answers: [ ]

1. When solving an equation, any math operation (adding, subtracting, multiplying, etc.) done to one side of the equation must be [done to the other side of the equation].

2. If we solved the equation X + 3 = 8, and got X = 6, what IMPORTANT STEP would help us realize we made a mistake?
   [**If we checked our solution by plugging it back into the original equation we would see that X = 6 gives 9 = 8, which is obviously incorrect!**]

A3 LESSON: X + A = B THIS IS AN EASY LINEAR EQUATION

What can you do to both sides to get closer to a solution?

X + A - A = B - A [subtract **A** from both sides] [transpose **A**]

Thus: X = B – A since A - A = **0** and X + **0** = X

Example: X + 2 = 5 [subtract **2** from both sides]

Solution: X = X + 2 - 2 = 5 - 2 = 3

Example: X - 7 = -13 [add **7** to both sides]

Solution: X = X - 7 + 7 = -13 + 7 = -6 [we have transposed **7**]

Example: 8.13 = -7.19 + X

Same as: X - 7.19 = 8.13 [since can switch sides]

Solution: Add 7.19 to both sides. X = 15.32 (use calculator)

Example: X + (-18.4) = +√37.9

Same as: X - 18.4 = 6.16 [take square root +(-) = -]
X = X - 18.4 + 18.4 = 6.16 + 18.4 = 24.56 = 24.6
[add 18.4]

Example: X - **SIN**(37°) = [COS(68°)]2 [do not be intimidated

SIN(37°) = .6018 COS(68°) = .3746 $(.3746)^2$ = .1403

SO: X - .6018 = .1403 and

THUS: X = .7421

A3E

X + A = B   THIS IS AN EASY LINEAR EQUATION

X + A - A = B - A   [subtract A from both sides] [transpose A]

Thus: X = B – A   since   A - A = 0   and   X + 0 = X

Solve for X, the Unknown

1. X + 42 = 59
2. X - 17 = -43
3. 8.13 = -17.19 + X
4. X + (-28.4) = $+\sqrt{87.9}$
5. 6.5 - X = 23.5
6. 5432 = X + 4375
7. X - $\sqrt{675}$ = $\sqrt{9876}$
8. X - 3/4 = 9/13
9. 6/7 = 8/11 – X
10. 0.00035 + X = 0.0017
11. X - SIN(37°) = $[\text{COS}(68°)]^2$
12. COS(48°) = TAN(78°) – X
13. $(13.4 + 9.7)^2$ + X = 87.4^2

A3EA

X + A = B THIS IS AN EASY LINEAR EQUATION Answers: [ ]

X + A - A = B - A [subtract A from both sides] [transpose A]

Thus: X = B – A since A - A = 0 and X + 0 = X

1. X + 42 = 59	[**17**]
2. X - 17 = -43	[**-26**]
3. 8.13 = -17.19 + X	[**25.32**]
4. X + (-28.4) = +√87.9	[**37.8**]
5. 6.5 - X = 23.5	[**-17**]
6. 5432 = X + 4375	[**1057**]
7. X - √675 = √9876	[**125.4**]
8. X - 3/4 = 9/13	[**75/52=123/52**]
9. 6/7 = 8/11 – X	[**-10/77**]
10. 0.00035 + X = 0.0017	[**0.00135**]
11. X - SIN(37°) = $[\text{COS}(68°)]^2$	[**0.742**]
12. COS(48°) = TAN(78°) – X	[**4.035**]
13. $(13.4 + 9.7)^2 + X = 87.4^2$	[**7105.2**]

A3ES

X + A = B THIS IS AN EASY LINEAR EQUATION

Answers: [ ]

1. $X + 54 = 100$	[**X = 46**]
2. $8.7 - X = 4.9$	[**X = 3.8**]
3. $X + (-0.567) = 3.14$	[**X = 3.707**]
4. $X + \sqrt{25} = 10$	[**X = 5**]
5. $17^2 - X = 100$	[**X = 189**]
6. $X - SIN(30°) = 1$	[**X = 1.5**]
7. $X - 5/6 = 4/5$	[**X = 1.633**]
8. $7/6 = 8/5 - X$	[**X = 0.433**]
9. $0.3017^4 + X = 0.0012^2$	[**X = -0.0083**]
10. $[COS(180°)]^2 - X = SIN(270°)$	[**X = 2**]
11. $\pi - X = \pi/2$	[**X = π/2**]
12. $(2^3 + X) - 4 = (2^2 + 3^2)$	[**X = 9**]

A4 LESSON: AX = B THIS IS AN EASY LINEAR EQUATION

What can you do to both sides to get closer to a solution?

$X = AX/A = B/A$ [divide both sides by **A**] **Note**: $A/A = 1$

Example: $3X = 12$

Solution: $X = 3X/3 = 12/3 = 4$ [divide by **3** both sides always]

Example: $2.16X = -56.3$

Solution: $X = -56.3/2.16 = -26.0648 = -26.1$

Example: $-37.8 = -6.78X$

Solution: $-6.78X = -37.8$ [switch sides]

Then: $X = (-37.8)/(-6.78) = 5.6$ [divide by -6.78]

Example: $(3.85)^2X = \sqrt{349}/\ \mathbf{SIN}(79^0)$ [easy does it!]

$(3.85)^2 = 14.8$ $\sqrt{349} = 18.7$ $\mathbf{SIN}\ (79^0) = .982$

So: $14.8X = 18.7/.982 = 19.0$ $X = 1.29$ [divide by 14.8]

Always simplify the numbers first, and then solve the equation. The calculator makes this easy. Also, always **CHECK** your answer by plugging it back into the equation and being sure both sides are equal.

$(3.85)^2 x 1.29 = 19.1$ $\sqrt{349}/\ \mathbf{SIN}(79^o) = 19.0$ [round off error]

A4E

AX = B   THIS IS AN EASY LINEAR EQUATION

What can you do to both sides to get closer to a solution?

$X = AX/A = B/A$ [divide both sides by **A**]   **Note**: $A/A = 1$

Solve for **X,** the Unknown

1. $4X = 12$
2. $2.16X = -56.3$
3. $-37.8 = -6.78X$
4. $0.003X = 0.15$
5. $(4/5)X = 7/9$
6. $(1+3)^2X = \sqrt{65}$
7. $(3.85)^2X = \sqrt{349}/\,\mathbf{SIN}(79^0)$ {Easy does it!}
8. $(1 + 2/3) = (7/12)X$
9. $2345X = 9876$
10. $54.5 = -87.7X$
11. $\mathbf{COS}(32^o)X = 3\mathbf{SIN}(32^o)$
12. $X = 3\mathbf{TAN}(32^o)$

A4EA

AX = B THIS IS AN EASY LINEAR EQUATION Answers: [ ]

What can you do to both sides to get closer to a solution?

X = **AX/A** = **B/A** [divide both sides by **A**] **Note**: **A/A** = 1

Solve for **X**, the Unknown

1. 4**X** = 12	[**3**]
2. 2.16**X** = -56.3	[**-26.1**]
3. -37.8 = -6.78**X**	[**5.58**]
4. 0.003**X** = 0.15	[**50**]
5. (4/5)**X** = 7/9	[**35/36 = 0.97**]
6. $(1+3)^2$**X** = √65	[**0.5**]
7. $(3.85)^2$**X** =√349/ **SIN**(79^0)	[**1.28**]
8. (1 + 2/3) = (7/12)**X**	[**20/7 = 2 6/7 = 2.86**]
9. 2345**X** = 9876	[**4.2**]
10. 54.5 = -87.7**X**	[**-0.62**]
11. **COS**(32^o)**X** = 3**SIN**(32^o)	[**1.875**]
12. **X** = 3**TAN** (32^o)	[**1.875**]

A4ES

AX = B THIS IS AN EASY LINEAR EQUATION Answers: [ ]

1. $5X = 27.25$ [**X = 5.45**]
2. $67 - 2 = 13X$ [**X = 5**]
3. $5.1X - 3 = 2.1$ [**X = 1**]
4. $9 = 3X + 17$ [**X = - 2.6**]
5. $(5^2)X = 1000$ [**X = 40**]
6. $TAN(30°)X = 18$ [**X = 31.18**]
7. $(\sqrt{169})X = 26$ [**X = 2**]
8. $(-7/8) = (-8/5)X$ [**X = 0.5469**]
9. $[SIN(60°)]^2X = 3$ [**X = 4**]
10. *In the equation AX = B, when solving it we would divide B by A. Notice how dividing B by A is the same as MULTIPLYING B by (1/A).* In the equation, (2/3)X = 2, we would solve by dividing 2 by (2/3). If we want to think in terms of multiplication, what we would multiply 2 by instead?

    [**We would think of multiplying 2 by the reciprocal of 2/3, which is 3/2.**]

11. $(\sqrt{36})[COS(60°)]^2 = SIN(270°)X$ [**X = -1.5**]
12. $3X + 3X + 3X = -0.62612$ [**X = -0.0696**]

A5 LESSON: AX+B = CX+D THIS IS AN EASY LINEAR EQUATION

What can you do to both sides to get closer to a solution?

Get all the **X** terms on one side and numbers on other side.

$AX - CX = D - B$ or $(A - C)X = D - B$ [distributive law]

$X = (D - B)/(A - C)$ [divide both sides by (A - C)]

Example: $3X + 7 = 5 - 7X$

Solution: $3X + 7X = 5 - 7$ **or** $10X = -2$ **or** $X = -2/10 = -.5$

Example: $-18.3X + 4.6X - 22.4 = 13.9X - 45.4 + 3.9X$

$-18.3X + 4.6X -13.9X - 3.9X = -45.4 + 22.4$

$(-18.3 + 4.6 -13.9 -3.9)X = -31.5X = -23.0$

$X = -23.0/-31.5 = .730$

Once again…always do the numerical calculations first.

Example: $(2.13)^2X - \text{LOG}(345) = 1/\text{COS}(12.5^o) + \sqrt{(5 + 1/.15)}X$

$(2.13)^2 = 4.54$ $\text{LOG}(345) = 2.54$

$\text{COS}(12.5^o) = .976$ $1/.976 = 1.024$

and: $\sqrt{(5 + 1/.15)} = \sqrt{(5 + 6.67)} = 3.42$ [easy w/calculator]

$4.54X - 2.54 = 1.024 + 3.42X$

or: $(4.54 - 3.42)X = 1.024 + 2.54$

$1.12X = 3.56$

$X = 3.56/1.12 = 3.18$ [you check the answer]

$(2.13)^2x3.18 - \text{LOG}(345) = 11.9 = 1/\text{COS}(12.5^o) +$

$\sqrt{}(5 + 1/.15)3.18$

A5E

AX + B = CX + D   THIS IS AN EASY LINEAR EQUATION.

Solve for X, the Unknown. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $3X + 7 = 5 - 7X$
2. $3.2X - 9 = 4.1X + 7.8$
3. $-12X - 98 = 23X + 76$
4. $0.002X - 0.015 = 0.0087 - 0.005X$
5. $(3/4)X - 2/7 = (4/5)X + 3/8$
6. $\mathbf{SIN}(28^{o})X - 1.4 = \mathbf{COS}(28^{o})X + 2.3$
7. $-18.3X + 4.6X - 22.4 = 13.9X - 45.4 + 3.9X$
8. $(2.13)^2X - \mathbf{LOG}(345) = 1/\mathbf{COS}(12.5^{o}) + \sqrt{(5 + 1/0.15)}\ X$
9. $2\ {\scriptstyle 5/6}X - 7.1 = 7\ {\scriptstyle 2/3}X + 3.2$
10. $(1/7)X + 2/3 = (3/8)X - 4/9$
11. $2.4 - 3.5X = 7.8 - 1.2X$
12. $(\mathbf{LOG}54)X + 45^2 = \mathbf{SIN}(45^{o}) - (4.5)^2X$
13. $X - \mathbf{LN}(60) = 3 - 2X$
14. $45 - 17X = 8X + 76$

A5EA

AX + B = CX + D This is an easy Linear Equation Answers: [ ]

Solve for **X**, the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $3X + 7 = 5 - 7X$ [**-0.2**]
2. $3.2X - 9 = 4.1X + 7.8$ [**-18.7**]
3. $-12X - 98 = 23X + 76$ [**-4.97**]
4. $0.002X - 0.015 = 0.0087 - 0.005X$ [**3.39**]
5. $(3/4)X - 2/7 = (4/5)X + 3/8$ [**-13 3/14 = -185/14 = -13.21**]
6. $\mathbf{SIN}(28^o)X - 1.4 = \mathbf{COS}(28^o)X + 2.3$ [**-8.95**]
7. $-18.3X + 4.6X - 22.4 = 13.9X - 45.4 + 3.9X$ [**0.73**]
8. $(2.13)^2X - \mathbf{LOG}(345) = 1/\mathbf{COS}(12.5^o) + \sqrt{(5 + 1/.15)}X$ [**3.18**]
9. $2\ 5/6X - 7.1 = 7\ 2/3X + 3.2$ [**-2.13**]
10. $(1/7)X + 2/3 = (3/8)X - 4/9$ [**4 92/117 = 560/117 =4.79**]
11. $2.4 - 3.5X = 7.8 - 1.2X$ [**-2.35**]
12. $(\mathbf{LOG}54)X + 45^2 = \mathbf{SIN}(45^o) - (4.5)^2X$ [**-92.09**]
13. $X - \mathbf{LN}(60) = 3 - 2X$ [**2.37**]
14. $45 - 17X = 8X + 76$ [**-1.24**]

A5ES

AX + B = CX + D This is an easy Linear Equation   Answers: [ ]

1. $4x - 17 = -35 - 5X$ [**X = -2**]
2. $25 + 3.5X = -25 + 7.5X$ [**X = 12.5**]
3. $6^2X - 24 = 36 + 18X$ [**X = 3.333**]
4. $0.375 + 4.25X = 1.525 - 8.125X$ [**X = 0.0929**]
5. $\mathrm{SIN}(45°)X - 4 = 12 - \mathrm{COS}(45°)X$ [**X = 11.31**]
6. $(\sqrt{144})X - 2^4 = 3^3 + (\sqrt{36})X$ [**X = 7.167**]
7. $\mathrm{LOG}(15)X + 1 = \mathrm{LN}(25) + 2X$ [**X = -2.693**]
8. $1/\mathrm{COS}(0°) -4X = -1/\mathrm{SIN}(90°) + (3/4)X$ [**X = 0.421**]
9. $\pi X - 2/3\pi = 3\pi X - 8/3\pi$ **HINT: What can be removed from both sides of the equation?***

   [**Since Pi is on either side of the equation, it can be removed.**] [**X = 1**]
10. $2\mathrm{TAN}(45°)X + 2X - 0.375 = \mathrm{SIN}(12.5°)X - \sqrt{0.025}$

    [**X = 0.0573**]
11. $(1/4)^2X - 25.67 = 27X + 6.022$ [**X = -1.176**]
12. $[\mathrm{LN}(25-7.4)]^2X - 17 = 1/\mathrm{LOG}(2) - 3\mathrm{COS}(37°)X$

    [**X = 1.19**]

A6 LESSON: A/X = C/D THIS IS AN EASY LINEAR EQUATION

What can you do to both sides to get closer to a solution?

Flip both sides: X/A = D/C **then** X = Ax(D/C)

Example: 3/X = 12/5

Solution: X/3 = 5/12 **then** X = 3x(5/12) = 1.25

Example: 2.16/X = -56.3 **then** X/2.16 = 1/-56.3

Solution: X = 2.16/-56.3 = -.038 (check: 2.16/-.038 = -56.8)

Example: -37.8 = -6.78/X

Solution: -6.78/X = -37.8 (switch sides)

Then: X = (-6.78)/(-37.8) = .18 (flip and multiply by -6.78)

Example: $(3.85)^2$/X =√349/ **SIN**(79^0)

$(3.85)^2$ = 14.8 √349 = 18.7 **SIN** (79^0) = .982

So: 14.8/X = 18.7/.982 = 19.0 **or** X = 14.8/19.0 = .78

Always simplify the numbers first, and then solve the equation. Also, always **CHECK** your answer by plugging it back into the equation and being sure both sides are equal.

$(3.85)^2$/.78 = 19.0 √349/ **SIN**(79^o) = 19.0

A6E

A/X = C/D THIS IS AN EASY LINEAR EQUATION.

Flip both sides: X/A = D/C **then** X = Ax(D/C)

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $3/X = 12/5$
2. $2.16/X = -56.3$
3. $-37.8 = -6.78/X$
4. $(3.85)^2/X = \sqrt{349}/$ **SIN**(79^0)

Always simplify the numbers first and then, solve the equation. Also, always **CHECK** your answer by plugging it back into the equation and being sure both sides are equal.

5. **SIN**$(23^o)/X =$ **COS**(54^o)
6. $23^2 = (12.5)^2/X$
7. $(3/4)/X = 9/16$
8. **LOG**$(4235)/X = \text{LN } 435$
9. $10.5/X = 9.8/4.1$
10. $(5^2 + 7^2)/X = 1/(0.05)^2$
11. **COS**$(37^o)/$**SIN**$(37^o) = 1/X$

A6EA

$A/X = C/D$ **This is an easy Linear Equation** Answers: [ ]

Flip both sides: $X/A = D/C$ **then** $X = Ax(D/C)$

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $3/X = 12/5$ [**1.25**]
2. $2.16/X = -56.3$ [**-0.038**]
3. $-37.8 = -6.78/X$ [**0.179**]
4. $(3.85)^2/X = \sqrt{349}/$ **SIN**(79^0) [**0.779**]

Always simplify the numbers first, and then solve the equation. Also, always **CHECK** your answer by plugging it back into the equation and being sure both sides are equal.

5. **SIN**$(23^o)/X =$ **COS**(54^o) [**0.665**]
6. $23^2 = (12.5)^2/X$ [**0.295**]
7. $(3/4)/X = 9/16$ [**1 1/3 = 4/3 = 1.33**]
8. **LOG**$(4235)/X =$ **LN** 435 [**0.597**]
9. $10.5/X = 9.8/4.1$ [**4.39**]
10. $(5^2 + 7^2)/X = 1/(0.05)^2$ [**0.185**]
11. **COS**$(37^o)/$**SIN**$(37^o) = 1/X$ [**0.754**]

A6ES

A/X = C/D This is an easy Linear Equation Answers: [ ]

1. $4/X = 1$ [**X = 4**]
2. $10/X = 2/4$ [**X = 20**]
3. $17/X = 1/17$ [**X = 289**]
4. $\mathrm{SIN}(30°)/X = 1/\mathrm{COS}(60°)$ [**X = 0.25**]
5. $25.3/X = -98.1/27.6$ [**X = -7.12**]
6. $(\sqrt{225})/X = 12/19$ [**X = 23.75**]
7. $23.6/-0.025 = 1112/X$ [**X = -1.178**]
8. $\mathrm{SIN}(56°)/X = \mathrm{COS}(27°)$ [**X = 0.93**]
9. $\mathrm{TAN}(75°)/\mathrm{COS}(23.5°) = \mathrm{SIN}(14°)/X$ [**X = 0.0594**]
10. $\mathrm{LOG}(92)/X = 15/\mathrm{LN}(25)$ [**X = 0.4214**]
11. $\pi/X = 1/2$ [**X = 2π**]
12. $-\mathrm{COS}(180°)/2X = 43\mathrm{SIN}(25°)/3.643$ [**X = 0.1002**]

A7 LESSON: $AX^2 = B$ THIS IS AN EASY NON-LINEAR EQUATION

What can you do to both sides to get closer to a solution?

$X^2 = B/A$ (divide by A) **now** take the square root both sides

$X = \sqrt{(B/A)}$ [**Note:** Answer could be **+** or **-**]

Example: $X^2 = 387$ X = 19.7 **or** -19.7 [$\sqrt{387} = 19.7$]

Example: $SIN(125^o)X^2 = (5.4 + 3.4)^2$ (simplify numbers first)

$SIN(125^o) = .819$ $(5.4 + 3.4)^2 = (8.8)^2 = 77.4$

So: $.819X^2 = 77.4$ **or** $X^2 = 77.4/.819$ **or** $X^2 = 94.55$

So: X = 9.7

Check: $SIN(125^o)x(9.7)^2 = 77.07$ [close enough due to **r/o**]

Note: $X = \sqrt{94.55} = 9.724$ to more digits

Then: $SIN(125^o)x(9.724)^2 = 77.5$

Always be aware of how many digits are really significant and the unavoidable round off (**r/o**) error. Ask yourself: How accurate or precise can I measure, or do I need to measure?

A7E

$AX^2 = B$ THIS IS AN EASY NON-LINEAR EQUATION

$X^2 = B/A$ (divide by A) **now** take the square root both sides

$X = \sqrt{(B/A)}$ [**Note:** Answer could be **+** or **-**]

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $X^2 = 387$
2. $\text{SIN}(125^o)X^2 = (5.4 + 3.4)^2$
3. $X^2 = 23^2$
4. $X^2 = (\sqrt{78})^2$
5. $X^2 = \text{LOG}(98)$
6. $\text{SIN}(34^o) = \text{COS}(23^o)X^2$
7. $(3/4)X^2 = 9/16$
8. $X^2 = 16A^2$
9. $X^2 = (\text{SIN}(78^o))^2 + (\text{COS}(78^o))^2$
10. $X^2 = \text{COS}^{-1}[(3^2 + 4^2 - 6^2)/2x3x4]$
11. $X^2 = \sqrt{81}$

A7EA

$AX^2 = B$ THIS IS AN EASY NON-LINEAR EQUATION Answers:[ ]

$X^2 = B/A$ (divide by A) **now** take the square root both sides

$X = \sqrt{B/A}$ [**Note:** Answer could be **+** or **-**]

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $X^2 = 387$ [**19.7**]
2. $SIN(125^o)X^2 = (5.4 + 3.4)^2$ [**9.7**]
3. $X^2 = 23^2$ [**23**]
4. $X^2 = (\sqrt{78})^2$ [**√78**]
5. $X^2 = LOG(98)$ [**1.41**]
6. $SIN(34^o) = COS(23^o)X^2$ [**0.779**]
7. $(3/4)X^2 = 9/16$ [**0.866**]
8. $X^2 = 16A^2$ [**4A**]
9. $X^2 = (SIN(78^o))^2 + (COS(78^o))^2$ [**1**]
10. $X^2 = COS^{-1}[(3^2 + 4^2 - 6^2)/2x3x4]$ [**10.8**]
11. $X^2 = \sqrt{81}$ [**3**]

A7ES

$AX^2 = B$ **THIS IS AN EASY NON-LINEAR EQUATION** Answers:[ ]

1. $X^2 = 81$ **[X = ±9]**
2. $X^2 = 169$ **[X = ±13]**
3. $3X^2 = 45$ **[X = ±3.87]**
4. $X^2 = 275^2$ **[X = ±275]**
5. $SIN(35°)X^2 = 65$ **[X = ±10.645]**
6. $(3/7)X^2 = (19/8)$ **[X = ±2.354]**
7. $LOG(8.756)X^2 = LN(253)$ **[X = ±2.423]**
8. $X^2 = \pi^2$ **[X = ±π]**
9. $3X^2 = \sqrt{121}$ **[X = ±1.915]**
10. $X^2 = SIN(65°) - COS(45°)$ **[X = ±0.4463]**
11. $4X^2 = (2^4 + 3^3 + 4^2)^2$ **[X = ±29.5]**
12. $X^2 = (3\pi^2)^2$ **[X = ±3π²]**

A8 LESSON: $A\sqrt{X} = B$ THIS IS AN EASY NON-LINEAR EQUATION

What can you do to both sides to get closer to a solution?

$\sqrt{X} = B/A$ (divide by A) **now** take the square both sides

$X = (B/A)^2$ [**Note:** Answer will be positive]

Example: $\sqrt{X} = 387$ $X = 149{,}769$ which is $(387)^2$

How many digits are significant…**probably 3.**
150,000 is good enough.

Example: $\mathbf{SIN}(125^o)\sqrt{X} = (5.4 + 3.4)^2$ (simplify numbers first)

$\mathbf{SIN}(125^o) = .819$ $(5.4 + 3.4)^2 = (8.8)^2 = 77.4$

So: $.819\sqrt{X} = 77.4$ **or** $\sqrt{X} = 77.4/.819$ **or** $\sqrt{X} = 94.55$

or $X = 8940$

Check: $\mathbf{SIN}(125^o) \times \sqrt{8940} = 77.4$

Always be aware of how many digits are really significant and the unavoidable round off (**r/o**) error. Ask yourself: How accurate or precise can I measure, or do I need to measure?

A8E

$A\sqrt{X} = B$ This is an easy non-Linear Equation

$\sqrt{X} = B/A$ (divide by A) **now** take the square both sides

$X = (B/A)^2$ [**Note:** Answer will be positive]

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but is easy with the **TI-30XA**.

1. $\sqrt{X} = 387$
2. $\sqrt{X} = -23.5$
3. $\sqrt{X} = 7/8$
4. $3.5\sqrt{X} = 98.2$
5. $78 = 4.2\sqrt{X}$
6. $\sqrt{X} = 6^2$
7. $\sqrt{X} = \sqrt{17}$
8. $\mathbf{SIN}(125^o)\sqrt{X} = (5.4 + 3.4)^2$ (simplify numbers first)
9. $\sqrt{X} = \mathbf{LOG}(6754)$
10. $\sqrt{X} = \mathbf{SIN}^2(65^o) + \mathbf{COS}^2(65^o)$

A8EA

$A\sqrt{X} = B$ This is an easy non-Linear Equation

Answers:[ ]

$\sqrt{X} = B/A$ (divide by A) **now** take the square both sides

$X = (B/A)^2$ [**Note:** Answer will be positive]

Solve for **X,** the **Unknown**. **Note:** The Algebra is easy. The arithmetic can be complicated but easy with the **TI-30XA**.

1. $\sqrt{X} = 387$ [**149,769**]
2. $\sqrt{X} = -23.5$ [**552.25**]
3. $\sqrt{X} = 7/8$ [**0.766 or 49/64**]
4. $3.5\sqrt{X} = 98.2$ [**787**]
5. $78 = 4.2\sqrt{X}$ [**345**]
6. $\sqrt{X} = 6^2$ [**1296**]
7. $\sqrt{X} = \sqrt{17}$ [**17**]
8. $\text{SIN}(125^o)\sqrt{X} = (5.4 + 3.4)^2$ [**8937**]
9. $\sqrt{X} = \text{LOG}(6754)$ [**14.67**]
10. $\sqrt{X} = \text{SIN}^2(65^o) + \text{COS}^2(65^o)$ [**1**]

A8ES

$A\sqrt{X} = B$ This is an easy non-Linear Equation

Answers:[ ]

1. $\sqrt{X} = 9$ [**X = 81**]
2. $\sqrt{X} = 3/4$ [**X = 9/16**]
3. $2.5\sqrt{X} = 10$ [**X = 16**]
4. $\sqrt{X} = COS(30°)$ [**X = 0.75**]
5. $\sqrt{X} = \sqrt{225}$ [**X = 225**]
6. $\sqrt{X} = COS(75°)/LOG(25)$ [**X = 0.0343**]
7. $\sqrt{X} = COS(45°) + SIN(45°)$ [**X = 2**]
8. $(\sqrt{X})^2 = (30.25)^2$ [**X = 915.0625**]
9. $\sqrt{X} = [COS(12.5°) + TAN(12.5°)]/SIN(12.5°)$ [**X = 30.636**]
10. $\sqrt{25}\sqrt{X} = 2000$ [**X = 160000**]
11. $\sqrt{(16X)} = 24$ **HINT:* $\sqrt{(16X)} = \sqrt{16}\sqrt{X}$* [**X = 36**]
12. $SIN(87°)\sqrt{25X} = LOG(63)$ [**X = 0.3604**]