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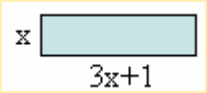
Date: 03/07/97 at 20:49:53 From: Caitlin
Subject: SOLVING QUADRATIC EQUATIONS

A certain rectangle has an area of 80 square units. Its length is one more than three times its width. What are the dimensions of the rectangle? Draw a diagram, solve the problem, and write an equation.

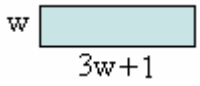
I drew and labeled the diagram with the length as 3x+1 and the width as x.
My equation is (3x+1)(x) = 80.
I am stuck on how to solve the equation. I got as far as 3x^2 + x = 80.
NOW WHAT DO I DO?



Date: 03/10/97 at 04:26:27 From: Doctor Mike
Re: Solving Quadratic Equations

Dear Caitlin,

You made a very good start on the problem.
My only suggestion so far is that
"x" does not always
have to be the unknown.
If you had used "w" for width,
and 3*w+1 for the length,
then it's easy to keep track of what the unknown means when you get to the end of the problem.
This is not an error, just something to think about when you do more and more complicated problems.



If you subtract 80 from both sides you get
3x^2 + x – 80 = 0,
which is a quadratic equation in standard form.

This kind of problem comes up a lot
and there are two main ways to solve it.

LA PRONUNCIA DI SEGNI E OPERAZIONI IN LINGUA INGLESE

+5	"positive five" o anche "plus five"
–5	"negative five" o anche "minus five"
–x	"the opposite of x" o anche "minus x"
10+2	"ten plus two" (pronuncia "plas")
10–2	"ten minus two" (pronuncia "mainəs")
10*2	"ten times two" , "ten multiplied by two"
10:2	"ten divided by two"
10^2	"ten raised to the 2nd power", "ten squared"
A*B=0	"A times B equals (is equal to) 0",
$\sqrt{10}$	"the square root of ten"
$\frac{x}{y}$	"x (pron. ecs) divided by y (pron. uai)" oppure "x over y"

1. If you can factor the equation into the product of 2 things,
then you can make good use of a well-known fact about numbers: if A*B = 0, then either A = 0 or B = 0.

Your equation is sort of tough to factor. The factored version is (3x+16)*(x–5) = 0.
Go ahead and multiply it out to see that it is the same.
Now we know that the width x must satisfy EITHER 3x+16 = 0 OR x–5 = 0
(the main reason anybody factors quadratic expressions is precisely because of that "A*B = 0" rule above).

2. It's time you should memorize **the quadratic formula**.
It says that if an equation is in the form A*x^2+B*x+C = 0, then the 2 **solutions** for that equation **(also called** zeros **because the right side is zero) are given by the formulas:**

$$x = \frac{-B - \text{sqrt}(B\,\hat{}\,2 - 4*A*C)}{2*A} \qquad x = \frac{-B + \text{sqrt}(B\,\hat{}\,2 - 4*A*C)}{2*A}$$

You should go ahead and try this method also.
It is very valuable because
factoring can often be difficult.
You will see again that
one x-value solution is positive and one is negative.
Only the positive one makes sense.
By the way, **"sqrt" means the square root function**.

Of course, you should make sure you get
the same answer by method 1 and by method 2,
and **after you get your answer,**
go back and check to make sure that it works.
In your problem that means
to multiply the width x by the length 3*x+1
and verify that you really get 80 square units.

I hope this helps.

Doctor Mike, The Math Forum

I SIMBOLI DI OPERAZIONE AL COMPUTER

Scrivendo alla tastiera del computer, e in particolare utilizzando del software matematico, si può indicare

- la **moltiplicazione** con l'**asterisco ***,
- la **divisione** con lo "slash" /,
- la **potenza** con l'**accento circonflesso** ^,
- e la **radice quadrata** con **sqrt** (*square root*)

In alternativa a sqrt, si può utilizzare
l'elevamento all'esponente ½: **sqrt(x) = x^(1/2)**
Occhio in quest'ultimo caso alle parentesi,
che sono tutte indispensabili.
Se infatti noi scrivessimo x^1/2, senza parentesi,
il software eleverebbe all'esponente 1 il valore di x
(= lo lascerebbe invariato), poi dividerebbe per 2.
L'effetto sarebbe dunque una divisione per 2
e non una radice quadrata!