Imaginary Numbers and the Quadratic Formula

In the real world, it is not possible to square root a negative number. However, higher math often depends on the ability to do so. This is where *imaginary numbers* come into play. Whenever you see a negative inside of a radical, just remember that , so you can take out the negative by putting an out front.

Simplify the radicals.

|  |  |  |  |
| --- | --- | --- | --- |
| **EXAMPLE** | **EXAMPLE** | **EXAMPLE** | **EXAMPLE** |
| 1. | 2. | 3. | 4. |
| 5. | 6. | 7. | 8. |
| 9. | 10. | 11. | 12. |

Determine the *solutions* to the quadratics below using the quadratic formula (shown below). Remember, whenever you have the square root of a negative number, you have to take the negative out and make it an .

|  |  |
| --- | --- |
| 13. Solve . | 14. Solve |
| 15. Solve . | 16. Solve . |
| 17. Solve . | 18. Solve . |

So far, we have worked with negative radicals, turning them into imaginary numbers . The next piece is knowing what happens when you raise an imaginary number to a power (use an exponent on it). This is where I use what I call the circle of .



So, according to the circle above, . If I kept going around the circle as my exponent got bigger, I would know how to simplify my imaginary number. Go around the circle to simplify the imaginary numbers below.

|  |  |  |  |
| --- | --- | --- | --- |
| 19. | 20. | 21. | 22. |
| 23. | 24. | 25. | 26. |
| 27. | 28. | 29. | 30. |
| 31. | 32. | 33. | 34. |

So far, they’ve all been in order. Now, we’re going to mix things up a bit. Don’t worry, though—I’ll give you a trick to make things easier.

and if you multiply by 1 or or, thn you’re not changing anything. doesn’t change the answer.

THIS MEANS…

You can always get rid of —whatever REMAINS is the problem you’re actually solving. The is just extra.

So, here's **the trick**:

Divide the exponent by 4.

The REMAINDER is the only part of the exponent you need. The rest can just be canceled out.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EXAMPLE** |  |  | **Same problem…the short version:** | | |
| **EXAMPLE** |  | *Ignore everything except the remainder…* |

|  |  |  |  |
| --- | --- | --- | --- |
| **EXAMPLE** | 35. | 36. | 37. |
| **EXAMPLE** | 38. | 39. | 40. |