Basics of Bases

Warm-Up!

Try these problems before watching the lesson.

1. Rewrite 123 to show it as multiples of powers of 10.

2. Rewrite the number 12.\overline{34} as a common fraction.

3. What is the sum of the solutions to the equation \((2x + 3)^2 = 6x^2 + 7x + 11\)? Express your answer as a common fraction.

4. How many 3-digit numbers are there?

The Problems

Take a look at the following problems and follow along as they are explained in the video.

5. a) Convert 233\textsubscript{5} to base 10.       b) Convert 233\textsubscript{5/2} to base 10.

6. Convert 254\textsubscript{6} to base 4.

7. What is the product of 52\textsubscript{6} and 43\textsubscript{6}? Write your answer in base 6.

8. If \(a = .\overline{4}_{6}\) and \(b = 12.\overline{3}_{6}\), what is their product in base 4? Express your answer as a common fraction.

9. Assuming \(b\) is positive, what is \(b\) if \((13_{6})^2 = 202_{6}\)?
To extend your understanding and have a little fun with math, try the following activity.

So far, we have talked about fractional bases and positive integer bases, but there are many different types. Let's spend some time looking at negative bases. Keep in mind that each number must be represented in a unique way. This means that you can’t use a negative sign in a negative base number.

- Create an addition and multiplication table for base $-6$. What patterns do you see or what do you notice?
- Simplify the following expressions, with all numbers in base $-6$:
  1. $234 + 152$
  2. $342 + 425$
  3. $42 \times 53$
  4. $123 \times 45$