# Question: Give two recursive definitions for the setPOWERS-OF-TWO = {1 2 4 8 16...}Use one of them to prove...

Give two recursive definitions for the set
POWERS-OF-TWO = {1 2 4 8 16...}
Use one of them to prove that the product of two POWERS-OF-TWO is also a POWER-OF-TWO.

## Best Answer

maxewell68
answered this

We require to write the recursive
definition for the set
**POWERS - OF - TWO:**
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We use two steps to define a function with the set of
nonnegative integers as its domain:
**BASIS STEP**: Specify the value of the function at zero
**RECURSIVE STEP:** Give a rule for finding its value
at an integer from its values at
smaller integers.
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.Recursive definition of **POWERS - OF - TWO**

**BASIS STEP**: $2^0 = 1$

**RECURSIVE STEP**: $2^n = 2^{n-1} \cdot 2$
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We require to prove that the product of two
**POWERS - OF - TWO** is also a **POWERS - OF - TWO.**
Suppose $2^m$ and $2^n$ are the two powers -of - two.
Then the product $= 2^m \cdot 2^n$

$$= \left(2^{m-1} \cdot 2\right)\left(2^{n-1} \cdot 2\right)$$

$$= 2^{m-1+n-1+2}$$

$$= 2^{m+n}$$

Which is again a power-of-two.

1 Comment

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See answer
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