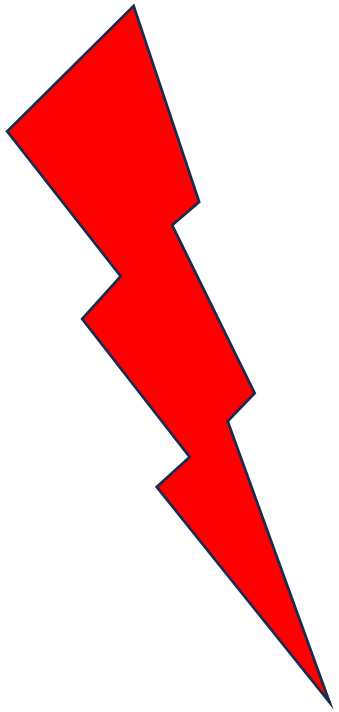
Twierdzenie Karola Omyłka

Każda liczba, która kończy się na *n*, jest podzielna przez *n*.

Karol Omyłek

1 2 5 ~~0~~ 10 20, 50, 100

3 4 ...



1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, $c \cdot 10^i$, gdzie $c \in \{1, 2, 5\}$, $i \in \mathbb{N}$

25, 250, 2500, $c \cdot 10^i$, gdzie $c \in \{1, 2, 5, 5^2\}$

125, 1250, 12500, $c \cdot 10^i$, gdzie $c \in \{1, 2, 5, 5^2, 5^3\}$

4, 8, 40, 80 $c \cdot 10^i$, gdzie $c \in \{1, 2, 2^2, 2^3, 5, 5^2, 5^3\}$

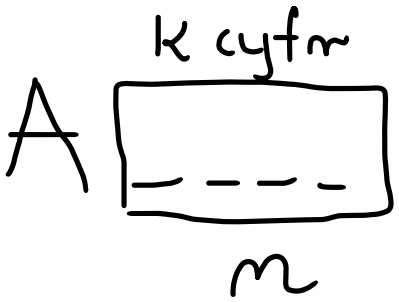
625, … $c \cdot 10^i$, gdzie $c \in \{1, 2, 5, 5^2, 5^3, 5^4, \ldots\}$

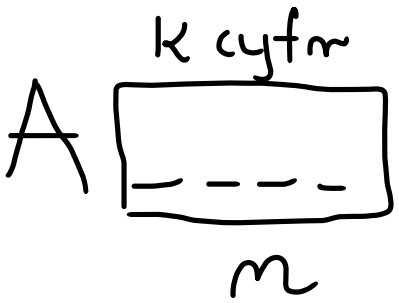
1625

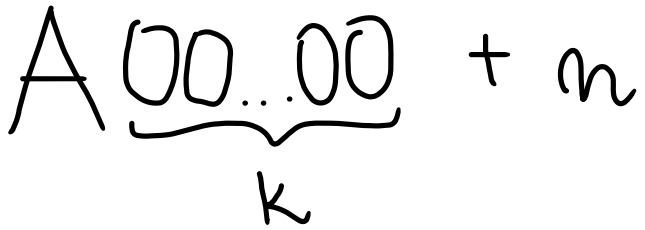
???

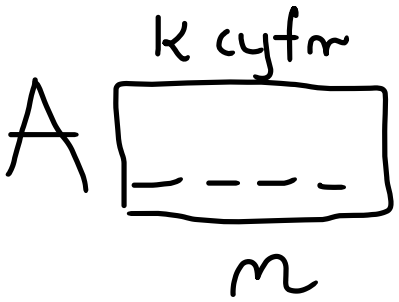
Tylko liczby, które kończą się na $c \cdot 10^j$, gdzie $c \in \{1, 2, 5, 5^2, 5^3\}$, są podzielne przez $c \cdot 10^j$.

Karol Omyłek


k cyfr
A
m

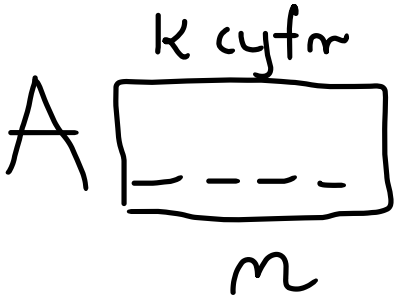

k cyfr
A
m


A 00...00 + n
k



$$A\underbrace{00\ldots00}_{k} + m$$

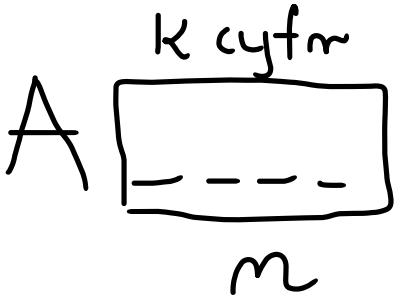
$$= A \cdot 10^{k} + \underbrace{m}_{k \text{ cyfr}}$$



$$A\underbrace{00\ldots00}_{k} + n$$

$$= A \cdot 10^k + \underbrace{n}_{k \text{ cyfr}}$$

$$n \mid 10^k \quad \text{i} \quad n \text{ ma } k \text{ cyfr}$$



$$A\underbrace{00\ldots00}_{k} + n$$

$$= A \cdot 10^k + \underbrace{n}_{k \text{ cyfr}}$$

$$n \mid 10^k \quad \text{i} \quad n \text{ ma } k \text{ cyfr}$$

$$n = 2^a \cdot 5^b$$

$$\mathcal{K} = \{\text{k-cyfrowe obiekty } 10^k\}$$

$$\mathcal{K} = \{\text{k-cyfrowe ołówki } 10^k\}$$

$$= \{n \in \mathbb{N} : 10^{k-1} \leqslant n$$

$$\mathcal{K} = \{\text{k-cyfrowe oktetniki } 10^k\}$$

$$= \left\{ n \in \mathbb{N} : 10^{k-1} \leqslant n \leqslant \frac{10^k}{2} \right\}$$

$$\mathcal{K} = \{\text{k-cyfrowe ołówniki } 10^k\}$$

$$= \{n \in \mathbb{N} : 10^{k-1} \leqslant n \leqslant \frac{10^k}{2} \wedge n = 2^a \cdot 5^b\}$$

$$\mathcal{K} = \{\text{k-cyfrowe okienki } 10^k\}$$

$$= \{n \in \mathbb{N} : 10^{k-1} \leqslant n \leqslant \frac{10^k}{2} \wedge n = 2^a \cdot 5^b$$

$$= \{n \in \mathbb{N} : 10^{k-1} \leqslant n \leqslant 5 \cdot 10^{k-1} \wedge n = 2^a \cdot 5^b\}$$

i) $a = b \Rightarrow a = k-1$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} < 5 \cdot 10^{k-1}$$

a oloyohne

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

$$10^{a-b-1} \leq 2^{a-b} \leq 5 \cdot 10^{a-b-1} \quad / : 2^{a-b-1}$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

$$10^{a-b-1} \leq 2^{a-b} \leq 5 \cdot 10^{a-b-1} \quad / : 2^{a-b-1}$$

$$5^{a-b-1} \leq 2 \leq 5^{a-b}$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

$$10^{a-b-1} \leq 2^{a-b} \leq 5 \cdot 10^{a-b-1} \quad / : 2^{a-b-1}$$

$$5^{a-b-1} \leq 2 \leq 5^{a-b}$$

$a-b-1 = 0$, $a-b = 1$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

$$10^{a-b-1} \leq 2^{a-b} \leq 5 \cdot 10^{a-b-1} \quad / : 2^{a-b-1}$$

$$5^{\underset{0}{a-b-1}} \leq 2 \leq 5^{\underset{1}{a-b}}$$

$$a - b \leq 1 \quad \wedge \quad a - b \geq 1$$

i) $a = b \Rightarrow a = k-1$

$$10^{k-1} \leq 2^{k-1} \cdot 5^{k-1} \leq 5 \cdot 10^{k-1}$$

ii) $a > b \Rightarrow a = k$

$$10^{k-1} \leq 2^{k} \cdot 5^{b} \leq 5 \cdot 10^{k-1}$$

$$10^{a-1} \leq 2^{a} \cdot 5^{b} \leq 5 \cdot 10^{a-1} \quad / : 10^{b}$$

$$10^{a-b-1} \leq 2^{a-b} \leq 5 \cdot 10^{a-b-1} \quad / : 2^{a-b-1}$$

$$5^{\underset{0}{a-b-1}} \leq 2 \leq 5^{\underset{1}{a-b}}$$

$a - b \leq 1 \quad \wedge \quad a - b \geq 1$

$a - b = 1$

iii) $a < b \Rightarrow b = k$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leqslant 2^a \cdot 5^k \leqslant 5 \cdot 10^{k-1}$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

$$10^{b-a-1} \leq 5^{b-a} \quad / : 5^{b-a-1} \qquad \wedge \qquad 5^{b-a} \leq 5 \cdot 10^{b-a-1} \quad / : 5^{b-a}$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

$$10^{b-a-1} \leq 5^{b-a} \quad / : 5^{b-a-1} \qquad \wedge \qquad 5^{b-a} \leq 5 \cdot 10^{b-a-1} \quad / : 5^{b-a}$$

$$2^{b-a-1} \leq 5 \qquad \wedge \qquad 1 \leq 2^{b-a-1}$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

$$10^{b-a-1} \leq 5^{b-a} \quad / : 5^{b-a-1} \qquad \wedge \qquad 5^{b-a} \leq 5 \cdot 10^{b-a-1} \quad / : 5^{b-a}$$

$$2^{b-a-1} \leq 5 \qquad \wedge \qquad 1 \leq 2^{b-a-1}$$

$$1 \leq 2^{b-a-1} \leq 5$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

$$10^{b-a-1} \leq 5^{b-a} \quad / : 5^{b-a-1} \qquad \wedge \qquad 5^{b-a} \leq 5 \cdot 10^{b-a-1} \quad / : 5^{b-a}$$

$$2^{b-a-1} \leq 5 \qquad \wedge \qquad 1 \leq 2^{b-a-1}$$

$$1 \leq 2^{b-a-1} \leq 5$$

$$0 \leq b-a-1 \leq 2$$

iii) $a < b \Rightarrow b = k$

$$10^{k-1} \leq 2^a \cdot 5^k \leq 5 \cdot 10^{k-1}$$

$$10^{b-1} \leq 2^a \cdot 5^b \leq 5 \cdot 10^{b-1} \quad / : 10^a$$

$$10^{b-a-1} \leq 5^{b-a} \leq 5 \cdot 10^{b-a-1}$$

$$10^{b-a-1} \leq 5^{b-a} \quad / : 5^{b-a-1} \qquad \wedge \qquad 5^{b-a} \leq 5 \cdot 10^{b-a-1} \quad / : 5^{b-a}$$

$$2^{b-a-1} \leq 5 \qquad \wedge \qquad 1 \leq 2^{b-a-1}$$

$$1 \leq 2^{b-a-1} \leq 5$$

$$0 \leq b-a-1 \leq 2$$

$$1 \leq b-a \leq 3$$

MMM

$$\mathcal{K} = \{\text{k-cyfrowe ołowniki } 10^k\}$$

$$= \left\{n \in \mathbb{N} : 10^{k-1} \leqslant n \leqslant \frac{10^k}{2} \wedge n = 2^a \cdot 5^b\right\}$$

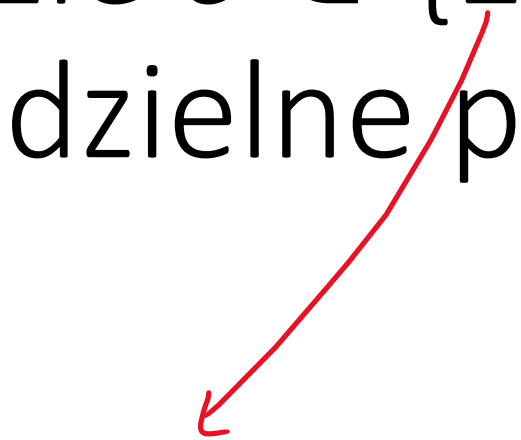
i) $a = b \Rightarrow$ dowolne

ii) $a > b \Rightarrow a - b = 1$

iii) $a < b \Rightarrow 1 \leqslant b - a \leqslant 3$

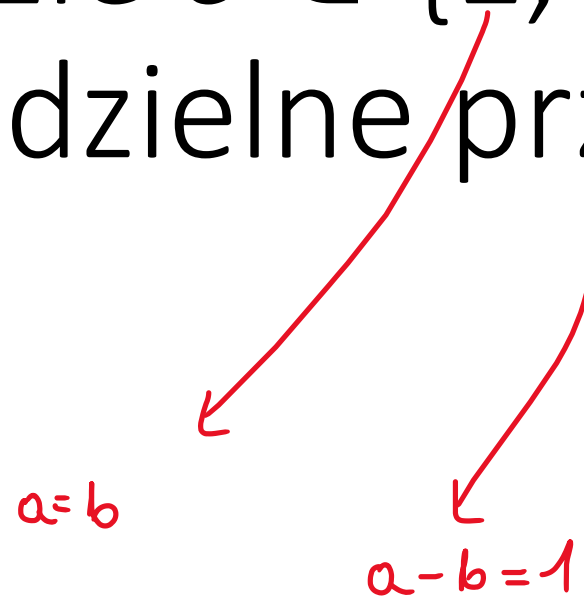
Tylko liczby, które kończą się na $c \cdot 10^j$, gdzie $c \in \{1, 2, 5, 5^2, 5^3\}$, są podzielne przez $c \cdot 10^j$.

Karol Omyłek

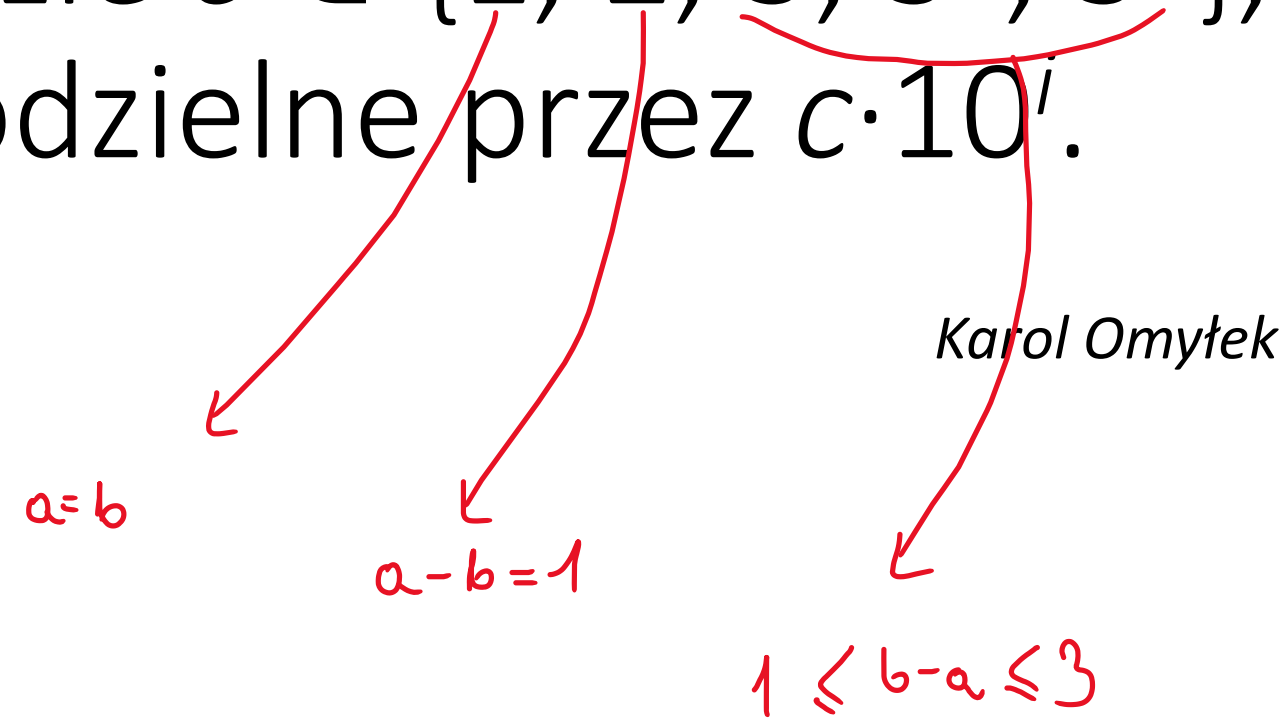


Tylko liczby, które kończą się na $c \cdot 10^j$, gdzie $c \in \{1, 2, 5, 5^2, 5^3\}$, są podzielne przez $c \cdot 10^j$.

Karol Omyłek



Tylko liczby, które kończą się na $c \cdot 10^i$, gdzie $c \in \{1, 2, 5, 5^2, 5^3\}$, są podzielne przez $c \cdot 10^i$.



Karol Omyłek

Co na to AI?

Ty

Dla jakich n zachodzi implikacja: "jeśli liczba kończy się na n, to jest podzielna przez n"?

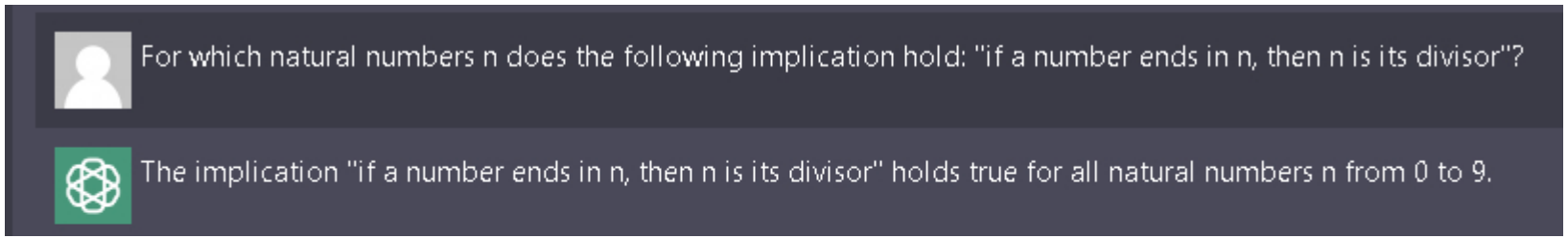
Ty

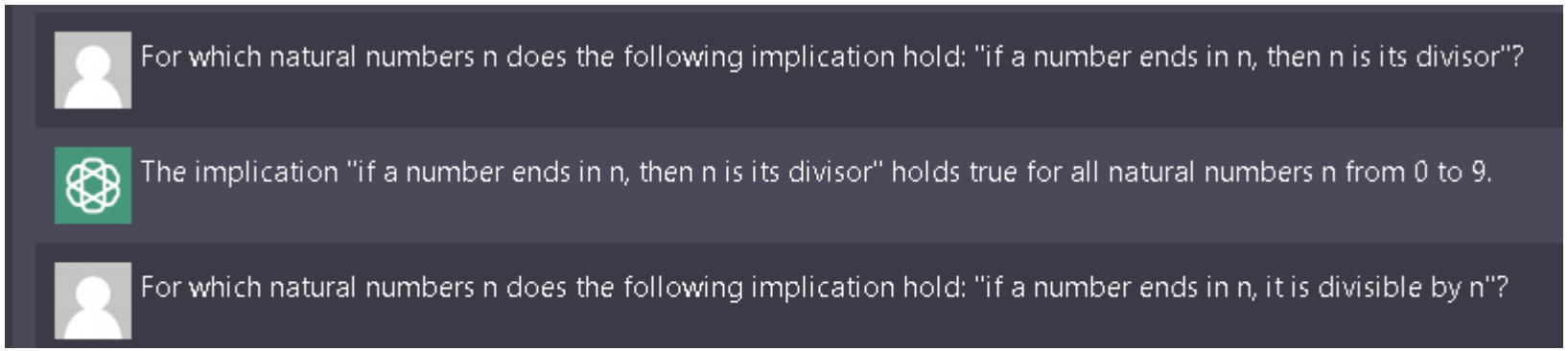
Dla jakich n zachodzi implikacja: "jeśli liczba kończy się na n, to jest podzielna przez n"?

ChatGPT

Implikacja "jeśli liczba kończy się na n, to jest podzielna przez n" zachodzi dla wszystkich liczb n większych od 1.


For which natural numbers n does the following implication hold: "if a number ends in n, then n is its divisor"?


For which natural numbers n does the following implication hold: "if a number ends in n, then n is its divisor"?
The implication "if a number ends in n, then n is its divisor" holds true for all natural numbers n from 0 to 9.


For which natural numbers n does the following implication hold: "if a number ends in n, then n is its divisor"?
The implication "if a number ends in n, then n is its divisor" holds true for all natural numbers n from 0 to 9.
For which natural numbers n does the following implication hold: "if a number ends in n, it is divisible by n"?

For which natural numbers n does the following implication hold: "if a number ends in n, then n is its divisor"?

The implication "if a number ends in n, then n is its divisor" holds true for all natural numbers n from 0 to 9.

For which natural numbers n does the following implication hold: "if a number ends in n, it is divisible by n"?

The implication "if a number ends in n, it is divisible by n" holds true for all natural numbers n from 1 to 9.

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

For n = 1, any number ending in 1 is divisible by 1 because any number divided by 1 is itself.

10/4/2023, 6:50:54 PM

Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

For n = 1, any number ending in 1 is divisible by 1 because any number divided by 1 is itself.

For n = 2, any even number ending in 2 is divisible by 2 because even numbers are divisible by 2.

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

For n = 1, any number ending in 1 is divisible by 1 because any number divided by 1 is itself.

For n = 2, any even number ending in 2 is divisible by 2 because even numbers are divisible by 2.

For n = 5, any number ending in 5 or 0 is divisible by 5 because any number that ends in 5 or 0 is divisible by 10, and if it is divisible by 10, it is also divisible by 5.

10/4/2023, 6:50:54 PM

Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

For n = 1, any number ending in 1 is divisible by 1 because any number divided by 1 is itself.

For n = 2, any even number ending in 2 is divisible by 2 because even numbers are divisible by 2.

For n = 5, any number ending in 5 or 0 is divisible by 5 because any number that ends in 5 or 0 is divisible by 10, and if it is divisible by 10, it is also divisible by 5.

For n = 10, any number ending in 0 is divisible by 10 because any number that ends in 0 is divisible by 10.

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Which natural values of n satisfy the implication: "if a number ends in n, it is divisible by n"?

10/4/2023, 6:51:01 PM

The natural values of n that satisfy the implication "if a number ends in n, it is divisible by n" are 0, 1, 2, 5, and 10.

For n = 0, any number that ends in 0 is divisible by 0 because any number multiplied by 0 is 0.

For n = 1, any number ending in 1 is divisible by 1 because any number divided by 1 is itself.

For n = 2, any even number ending in 2 is divisible by 2 because even numbers are divisible by 2.

For n = 5, any number ending in 5 or 0 is divisible by 5 because any number that ends in 5 or 0 is divisible by 10, and if it is divisible by 10, it is also divisible by 5.

For n = 10, any number ending in 0 is divisible by 10 because any number that ends in 0 is divisible by 10.

These are the natural values of n that satisfy the given implication.