Maths

Proof by Counter Example

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Please note some slides do have colour font on them

Proof by counter example

1. For each statement, say whether it is true or false.
Write down a counterexample for each false statement.

a) The difference of two even numbers is even.

b) The product of two odd numbers is even.

2. Eva says,
"All odd numbers between 2 and 14 are prime."

Give a counter example to show that Eva is incorrect.

Proof by counter example

3. If $x < 1$ and $y < 1$ then $xy < 1$

Find a counter example to show that the statement is false.

4. For all values of a, $4a < 5a$.

Find a counter example to show that the statement is false.

5. $xy > x + y$

Find a counter example to show that the statement is false.

6. If $ax = bx$ then $a = b$

Find a counter example to show that the statement is false.

Answers

Proof by counter example

1. For each statement, say whether it is true or false.
Write down a counterexample for each false statement.

a) The difference of two even numbers is even. True

b) The product of two odd numbers is even. False $3 \times 7 = 21$

2. Eva says,
"All odd numbers between 2 and 14 are prime."

Give a counter example to show that Eva is incorrect.

3 5 7 9 11 13

9 is a non-prime odd number between 2 and 14

Proof by counter example

3. If $x < 1$ and $y < 1$ then $xy < 1$

Find a counter example to show that the statement is false.

If $x = -1$ and $y = -2$, $xy = 2$

4. For all values of a, $4a < 5a$.

Find a counter example to show that the statement is false.

If a $= 0$, $4a = 0$ and $5a = 0$

5. $xy > x + y$

Find a counter example to show that the statement is false.

If $x = 1$ and $y = 2$, $xy = 2$ and $x + y = 3$
$2 \not> 3$

6. If $ax = bx$ then $a = b$

Find a counter example to show that the statement is false.

If a $= 3$, $b = 4$ and $x = 0$
then $ax = bx = 0$ but $3 \neq 4$