A pattern of triangles

MYP 1–2

Instructions

1. A child is playing with toothpicks. The sequence of his game is shown below.

2. Explore the pattern created by the child: number of toothpicks vs triangles.

3. Express your findings as a general rule.

4. Write a justification about why your general rule works for any case of the pattern. Use mathematical terminology and write a logical, concise and complete explanation.
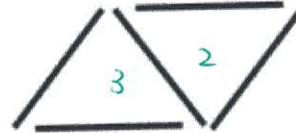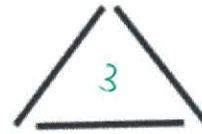
Toothpicks	Triangles
3	1
5	2
7	3
9	4
11	5

(+2 between each toothpicks value)

Possible patterns (findings).

- 2 triangles is made by 5 toothpicks.
- \# of toothpicks are always odd numbers
- ② each additional triangles needs 2 toothpicks (first triangle is always made of 3).
- ① The number of ~~triangles~~ toothpicks is twice the number of triangles plus one.

① I will test my rule for 9 triangles. According to my rule, the number of toothpicks needed will be.

$$2(9) + 1 = 19 \text{ toothpicks.}$$

↑ \# of triangles

Checking my rule with a diagram

9 triangles, 19 toothpicks.

∴ My rule works!

② I will test my rule for 9 triangles. According to my rule:

1st triangle	Each additional triangles(s)
3	+ 8(2).
= 3	+ 16 = 19

toothpicks.

Checking my rule with the diagram

9 triangles, 19 toothpicks.

∴ My rule works!

A game about subtraction

MYP 1–2

Instructions

Reference

$99 \times 1 = 99$
$99 \times 2 = 198$
$99 \times 3 = 297$
$99 \times 4 = 396$
$99 \times 5 = 495$
$99 \times 6 = 594$
$99 \times 7 = 693$
$99 \times 8 = 792$
$99 \times 9 = 891$

1. Solve the following subtractions.

$381 - 183 = 198$

$632 - 236 = 396$

$732 - 237 = 495$

Other Examples:

$754 - 457 = 297$

$682 - 286 = \cancel{444}\ 396$

$541 - 145 = 396$

$901 - 109 = 792.$

2. Explore the operations and answers.

3. Explain your findings using words and a general rule.

4. Justify that your general rule works for any case.

5. Write instructions to explain to your parents how to use your finding as a game. Use mathematical terminology and remember to write a logical, concise and complete explanation.

Observations (findings).

- The sum of the digits always add up to 18.
- The 10s digit is ALWAYS equal to 9.
- The 1s and 100s digits will always add up to 9.
* The difference is always a multiple of 99, where the hundreds difference is the multiplier.
- In the first number, the hundreds digit is always bigger than the ones digit
- The answer of the hundreds digit is always the difference between the hundreds digits minus one.

I will now test my rules with an example above

$754 - 457$

according to my rule, the result would be the difference of the hundreds digits multiplied by 99.
therefore $(7-4) \times 99 = 297.$

Checking: $\overset{6\ 4}{7\cancel{5}4}$
$\underline{-\ 457}$
297 ∴ my rule works

Verifying my rule with a new example.

$746 - 647$ ∣ Checking my rule.
according to my rule, the answer should be.
$(7-6) \times 99$
$= 99.$

746
$\underline{-\ 647}$
99

∴ my rule works!

IB Taskbank Mathematics

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