

## Patterns and proof

TOAN tricks

TOAN. Double it. Add 4. Divide by 2. The answer is always 2 more than the original number.

Two cards, 1 is blank, the other has a 9 written on it. TOAN, add 1, multiply by 10, subtract 1. Write the answer on a card. Lift both cards – it contains the final total.

Brothers, sisters, nights out.

Write down any 3 digit number. Reverse the digits. Subtract the smaller from the larger. The answer is always a multiple of 99. Prove it.

Show that all 4 digit palindromes are divisible by 11.

calendar magic.

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Joke

3 cups, 12 cubes. Each cup has to have some sugar, and each has to have an odd number of cubes.  
5 costs 60c, 12 cost 1.20, 145 cost 1.80. What did I buy?

Find rules to factor game.

web: Maths Assistance for Practicum Students

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To prove:

The product of 2 consecutive numbers is always a multiple of 2.

The product of 5 consecutive numbers is always a multiple of 5. Extension: The product of 5 consecutive numbers is always a multiple of 60.

The product of 3 consecutive numbers is always a multiple of 6.

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Conjecture is a belief.

Define consecutive number. List 5 consecutive numbers.

Product of two numbers is always a multiple of 2. How do you know?

Product of three numbers is always a multiple of —. How do you know?

$n^2 + n$  is always even. How do you know?

Telephone keypad. sum in any direction is always a multiple of 3. Why? Also true for any 3 x 3 square on any calendar.

Problem for textbook: Given a 100 Square: Add the numbers from 1 to 100. Look for patterns.

100 Square: Fold into quarters. Each set of 4 numbers has the same total!

There are only 14 different calendars! Prove it.

Dates

$28/2 \rightarrow 4/4 \rightarrow 6/6 \rightarrow 8/8 \rightarrow 10/10 \rightarrow 12/12$  and  $9-5 \rightarrow 5-9 \rightarrow 7-11 \rightarrow 11-7$  are all the same day of the week.

Every prime number is one more or one less than a multiple of 6.

Twin primes.  $P - P$  The center number can't be a multiple of 6 so the centre one must be.

Prove: the square of an odd number is always 1 more than a multiple of 8.