Number Machine Detectives

HOST GUIDE - includes solutions | A4 | v1.0.0

2-6 players, with an adult host | Suggested ages 8-11 | Plan 15-25 minutes

Keep this guide with the adult host. Let the group try before offering hint 1, then hint 2. Read the explanation only when the group is ready to check its work.

Support your group

Use a calculator for arithmetic if needed, while players decide which operation comes next. Label the four boxes so nobody has to remember the whole sequence.

Warm-up: travel forward

Hint 1: Follow just one arrow at a time.

Hint 2: The third result is half of 16.

Answer: 10 -> 16 -> 8 -> 32

Doubling 5 gives 10; adding 6 gives 16; halving gives 8; multiplying by 4 gives 32.

Round 1: recover the start

Hint 1: Undo the last operation first.

Hint 2: Begin with 48/4.

Answer: 9

48/4=12; 12x2=24; 24-6=18; 18/2=9. Forward check: 9 -> 18 -> 24 -> 12 -> 48.

Round 2: catch an impossible report

Hint 1: Try the reverse route even if a fraction appears.

Hint 2: 42/4=10.5; continue from there.

Answer: No; reversing 42 gives 7.5, not a whole number.

The machine output is 4 times the starting number plus 12. Outputs from whole numbers are multiples of 4. 42 is not a multiple of 4; a calculation was recorded incorrectly.

Final: repair the record

Hint 1: Subtract 12 from each output, then divide by 4.

Hint 2: The two starts are 13 and 19; now prove them by going forward.

Answer: 64 comes from 13; 88 comes from 19.

For 13: 26 -> 32 -> 16 -> 64. For 19: 38 -> 44 -> 22 -> 88. The inverse rule gives the same starts: (output-12)/4.

How to close the session

Finish when the group can explain the reverse route and use it on both final outputs. Ask why an output of 42 cannot come from a whole starting number in this machine.

If a result differs, return to the stated rule and compare the written steps. An answer revealed by the host is help, not an independently solved puzzle.

Mechanism reference: Project Gutenberg 31186, To Guess Any Number Thought of. New session instructions and examples.

Age and time are planning estimates. No child playtest or physical print trial is claimed.