Number Machine Detectives

PLAYER SHEET - no solutions | A4 | v1.0.0

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

A number machine seems to reveal a secret starting number. Your family can work out how by recording its operations and reversing them. The puzzle uses arithmetic rather than mind reading, and every answer can be checked by running it through the same machine.

Set up and play

One player sheet per team, pencils and an eraser. Print in black and white at 100% / actual size. No cutting, folding, props or account required. Keep the host guide separate.

1. Choose a whole starting number from 1 to 20. Double it, add 6, halve the result, then multiply by 4.

2. Write down every intermediate value. Do operations in the stated order; do not combine different players' records.

3. To work backward, reverse the order and undo each operation: divide by 4, double, subtract 6, then halve.

Warm-up: travel forward

Start with 5. Double, add 6, halve, then multiply by 4. Record all four results.

Round 1: recover the start

A player reports a final output of 48. Which whole number did they start with?

Round 2: catch an impossible report

A player reports an output of 42, while claiming a whole starting number from 1 to 20. Can that be correct?

Final: repair the record

Two outputs are 64 and 88. Recover both starts, then run each one forward to verify all four intermediate values.

Finish together

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.

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.