



# The Neo-City Scrap Yard Mystery

Grade 8 math · Exponents, Square roots, Pythagorean theorem, Order of operations, Two-step equations · Reading level grades 5-6

Detective: \_\_\_\_\_ Date: \_\_\_\_\_

The golden Core Processor has been stolen from the central laboratory! A rogue automaton is sneaking through the scrap yards trying to escape. Decode the sensor logs to catch the robot thief before they upload the stolen plans!

1. Solve each math problem. The answer is a number, and the letter beside it is what that number stands for.
2. In the clue boxes, write that letter in every box showing the same number, then read the secret clue.
3. Use each clue to cross suspects off the list. The one suspect left at the end is the culprit!

**My answer: the rogue automaton is** \_\_\_\_\_

# Possible suspects

Cross off a row as each clue rules it out. The one left at the end is the culprit.

| NAME              | MAIN POWER    | EXTRA TOOL         | ARM GRIP       | HEAD ANTENNA      | SYSTEM WEAKNESS |
|-------------------|---------------|--------------------|----------------|-------------------|-----------------|
| Ada Lovelace      | Jet Thrusters | Nano-Repair        | Right-arm grip | Glass Sensor Dome | Rust Spray      |
| Katherine Johnson | Sonic Screech | Rocket Fist        | Left-arm grip  | Glass Sensor Dome | Magnet Wand     |
| Alan Turing       | Laser Cutting | Stealth Camouflage | Left-arm grip  | Steel Mohawk      | Rust Spray      |
| Victor Scheinman  | EMP Blasts    | Nano-Repair        | Left-arm grip  | Steel Mohawk      | Magnet Wand     |
| Linus Torvalds    | Magnetism     | Rocket Fist        | Right-arm grip | Steel Mohawk      | Water Splash    |
| Isaac Asimov      | Laser Cutting | Plasma Shield      | Right-arm grip | Steel Mohawk      | Magnet Wand     |
| George Devol      | Magnetism     | Stealth Camouflage | Right-arm grip | Glass Sensor Dome | Magnet Wand     |
| Arthur Clarke     | Laser Cutting | Plasma Shield      | Right-arm grip | Glass Sensor Dome | Rust Spray      |
| Charles Babbage   | Magnetism     | Plasma Shield      | Right-arm grip | Copper Antenna    | Magnet Wand     |
| Marie Curie       | Sonic Screech | Plasma Shield      | Left-arm grip  | Glass Sensor Dome | Rust Spray      |
| Tim Berners Lee   | EMP Blasts    | Rocket Fist        | Right-arm grip | Copper Antenna    | Magnet Wand     |
| Richard Feynman   | Magnetism     | Hologram Mimic     | Right-arm grip | Copper Antenna    | Magnet Wand     |
| Rachel Carson     | Laser Cutting | Nano-Repair        | Right-arm grip | Copper Antenna    | Water Splash    |
| Margaret Hamilton | Laser Cutting | Hologram Mimic     | Right-arm grip | Copper Antenna    | Magnet Wand     |
| Nikola Tesla      | EMP Blasts    | Hologram Mimic     | Left-arm grip  | Copper Antenna    | Magnet Wand     |
| Anita Borg        | Sonic Screech | Rocket Fist        | Right-arm grip | Steel Mohawk      | Magnet Wand     |
| Stephen Hawking   | Sonic Screech | Hologram Mimic     | Right-arm grip | Copper Antenna    | Magnet Wand     |
| Albert Einstein   | Laser Cutting | Hologram Mimic     | Right-arm grip | Steel Mohawk      | Rust Spray      |
| Hedy Lamarr       | Laser Cutting | Nano-Repair        | Left-arm grip  | Glass Sensor Dome | Magnet Wand     |
| Steve Wozniak     | Jet Thrusters | Nano-Repair        | Right-arm grip | Steel Mohawk      | Water Splash    |
| Sally Ride        | Sonic Screech | Hologram Mimic     | Left-arm grip  | Steel Mohawk      | Rust Spray      |

## CLUE 1 Exponents

The lab computer shows the virus is multiplying fast. Every second, the rogue data doubles as an exponent. Solve the power level to unlock the first clue.

Solve each problem, then write its letter in every clue box that shows the same number.

|     |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|
| T   |     |     |     |     |     |     |     |     |     |     |     |     |    |     |     | T   |
| 100 | 27  | 216 | 121 | 441 | 125 | 125 | 169 | 441 | 225 | 25  | 400 | 216 | 81 | 225 | 400 | 100 |
|     |     |     |     | T   |     |     |     |     |     |     |     | T   |    |     |     | T   |
| 27  | 169 | 121 | 216 | 100 | 27  | 216 | 49  | 400 | 512 | 196 | 216 | 100 | 36 | 441 | 81  | 100 |

|                                |                                |                                |                                |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| $10^2 = \square \rightarrow$ T | $15^2 = \square \rightarrow$ N | $20^2 = \square \rightarrow$ O | $5^3 = \square \rightarrow$ L  |
| $9^2 = \square \rightarrow$ S  | $6^3 = \square \rightarrow$ E  | $3^3 = \square \rightarrow$ H  | $14^2 = \square \rightarrow$ K |
| $7^2 = \square \rightarrow$ R  | $2^9 = \square \rightarrow$ C  | $21^2 = \square \rightarrow$ I | $13^2 = \square \rightarrow$ A |
| $11^2 = \square \rightarrow$ V | $6^2 = \square \rightarrow$ F  | $5^2 = \square \rightarrow$ D  |                                |

Scratch space:

## CLUE 2 Square roots

We found the rogue bot's square microchip burned onto the workbench. If you find the square root of the total area, you can bypass the chip lock.

Solve each problem, then write its letter in every clue box that shows the same number.

|    |    |    |    |    |    |    |    |    |    |    |    |   |    |    |   |    |
|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|---|----|
| T  |    |    |    |    |    |    |    | T  |    |    |    |   |    |    |   |    |
| 24 | 10 | 8  | 12 | 19 | 3  | 10 | 24 | 14 | 12 | 23 | 9  | 8 | 14 | 25 | 8 | 21 |
|    |    |    |    |    |    |    | T  |    |    |    |    |   |    |    |   |    |
| 10 | 8  | 14 | 25 | 13 | 21 | 24 | 12 | 19 | 5  | 8  | 21 |   |    |    |   |    |

$$\text{sqrt}(576) = \square \rightarrow \boxed{\text{T}}$$

$$\text{sqrt}(100) = \square \rightarrow \boxed{\text{H}}$$

$$\text{sqrt}(625) = \square \rightarrow \boxed{\text{V}}$$

$$\text{sqrt}(25) = \square \rightarrow \boxed{\text{P}}$$

$$\text{sqrt}(64) = \square \rightarrow \boxed{\text{E}}$$

$$\text{sqrt}(169) = \square \rightarrow \boxed{\text{Y}}$$

$$\text{sqrt}(361) = \square \rightarrow \boxed{\text{I}}$$

$$\text{sqrt}(441) = \square \rightarrow \boxed{\text{S}}$$

$$\text{sqrt}(9) = \square \rightarrow \boxed{\text{G}}$$

$$\text{sqrt}(196) = \square \rightarrow \boxed{\text{A}}$$

$$\text{sqrt}(144) = \square \rightarrow \boxed{\text{R}}$$

$$\text{sqrt}(529) = \square \rightarrow \boxed{\text{M}}$$

$$\text{sqrt}(81) = \square \rightarrow \boxed{\text{L}}$$

Scratch space:

**CLUE 3**

# Pythagorean theorem

The thief ran diagonally across the square testing pad. Use the side measurements of the right triangle to calculate the shortest cable path.

Solve each problem, then write its letter in every clue box that shows the same number.

|          |    |          |    |    |    |    |    |          |          |    |    |          |    |    |    |
|----------|----|----------|----|----|----|----|----|----------|----------|----|----|----------|----|----|----|
| <b>A</b> |    | <b>A</b> |    |    |    |    |    |          | <b>A</b> |    |    |          |    |    |    |
| 87       | 29 | 87       | 5  | 51 | 26 | 52 | 74 | 87       | 51       | 58 | 13 | 52       | 68 | 30 | 13 |
|          |    |          |    |    |    |    |    | <b>A</b> |          |    |    | <b>A</b> |    |    |    |
| 52       | 40 | 26       | 34 | 20 | 5  | 26 | 87 | 20       | 13       | 58 | 26 | 87       | 58 |    |    |

legs 60 and 63, hypotenuse =  → **A**

legs 32 and 60, hypotenuse =  → **O**

legs 3 and 4, hypotenuse =  → **G**

legs 20 and 21, hypotenuse =  → **M**

legs 5 and 12, hypotenuse =  → **S**

legs 10 and 24, hypotenuse =  → **E**

legs 18 and 24, hypotenuse =  → **P**

legs 12 and 16, hypotenuse =  → **R**

legs 16 and 30, hypotenuse =  → **I**

legs 24 and 70, hypotenuse =  → **W**

legs 20 and 48, hypotenuse =  → **T**

legs 40 and 42, hypotenuse =  → **D**

legs 24 and 45, hypotenuse =  → **N**

legs 24 and 32, hypotenuse =  → **H**

Scratch space:

## CLUE 4

## Order of operations

The security lock requires a precise code. Follow the strict order of operations to solve the equation and crack open the secure drawer.

Solve each problem, then write its letter in every clue box that shows the same number.

|    |    |    |    |    |    |    |    |     |    |    |     |     |    |    |    |    |  |
|----|----|----|----|----|----|----|----|-----|----|----|-----|-----|----|----|----|----|--|
| A  |    |    |    |    |    |    | A  |     |    |    |     |     | A  |    |    | A  |  |
| 99 | 95 | 85 | 44 | 44 | 68 | 54 | 99 | 109 | 59 | 68 | 109 | 109 | 99 | 50 | 99 | 26 |  |

  

|    |    |    |     |    |    |    |    |     |   |     |    |  |
|----|----|----|-----|----|----|----|----|-----|---|-----|----|--|
|    |    |    |     |    |    | A  |    |     |   |     |    |  |
| 26 | 68 | 68 | 109 | 26 | 44 | 99 | 54 | 115 | 8 | 109 | 23 |  |

$9 \times 12 - 9 = \square \rightarrow \boxed{\text{A}}$

$9 \times 4 - 13 = \square \rightarrow \boxed{\text{G}}$

$9 \times 10 - 5 = \square \rightarrow \boxed{\text{O}}$

$12 \times 10 - 25 = \square \rightarrow \boxed{\text{C}}$

$47 + 3 \times 7 = \square \rightarrow \boxed{\text{E}}$

$11 \times 10 - 1 = \square \rightarrow \boxed{\text{N}}$

$12 \times 10 - 5 = \square \rightarrow \boxed{\text{K}}$

$38 + 2 \times 3 = \square \rightarrow \boxed{\text{P}}$

$5 \times 12 - 1 = \square \rightarrow \boxed{\text{T}}$

$10 \times 5 - 24 = \square \rightarrow \boxed{\text{S}}$

$2 + 3 \times 2 = \square \rightarrow \boxed{\text{I}}$

$24 + 5 \times 6 = \square \rightarrow \boxed{\text{R}}$

$40 + 5 \times 2 = \square \rightarrow \boxed{\text{W}}$

Scratch space:

**CLUE 5****Two-step equations - the last clue**

We need to find out how many battery packs the bot stole. Set up a two-step equation with the total weight and solve for the unknown variable.

First solve each problem. Then find each answer in the numbered list below and cross that sentence out. One sentence will be left - that is exactly what the villain did!

**Step 1 - solve these:**

$5x + 8 = 53, x = \boxed{\phantom{00}}$

$3x + 9 = 15, x = \boxed{\phantom{00}}$

$3x + 3 = 15, x = \boxed{\phantom{00}}$

$5x + 5 = 35, x = \boxed{\phantom{00}}$

$5x + 9 = 34, x = \boxed{\phantom{00}}$

$3x + 8 = 11, x = \boxed{\phantom{00}}$

$4x + 11 = 39, x = \boxed{\phantom{00}}$

$6x + 11 = 77, x = \boxed{\phantom{00}}$

$2x + 12 = 18, x = \boxed{\phantom{00}}$

$4x + 8 = 40, x = \boxed{\phantom{00}}$

$6x + 8 = 80, x = \boxed{\phantom{00}}$

**Step 2 - cross out the sentence with each answer:**

1. The villain fires up their booster rocket engines, then blends into the shadows using stealth camouflage.
2. The villain activates their high-voltage magnet, then fools the security guards using a hologram mimic.
3. The villain triggers a massive electric emp blast, then blends into the shadows using stealth camouflage.
4. The villain carves a hole with a laser cutter, then fools the security guards using a hologram mimic.
5. The villain emits a deafening sonic alarm screech, then blocks the exit with a glowing plasma shield.
6. The villain activates their high-voltage magnet, then smashes the main laboratory door with a rocket fist.
7. The villain carves a hole with a laser cutter, then blocks the exit with a glowing plasma shield.
8. The villain fires up their booster rocket engines, then fixes their own broken circuits with nano-repair.
9. The villain emits a deafening sonic alarm screech, then fools the security guards using a hologram mimic.
10. The villain activates their high-voltage magnet, then blocks the exit with a glowing plasma shield.
11. The villain fires up their booster rocket engines, then smashes the main laboratory door with a rocket fist.
12. The villain activates their high-voltage magnet, then fixes their own broken circuits with nano-repair.

# Answer Key

## The Neo-City Scrap Yard Mystery

### Culprit: Charles Babbage

Magnetism · Plasma Shield · Right-arm grip · Copper Antenna · Magnet Wand

Trail: Start 21 → Clue 1 17 → Clue 2 11 → Clue 3 6 → Clue 4 4 → Clue 5 1

#### Clue 1 (Exponents): "THE VILLAIN DOES NOT HAVE THE ROCKET FIST"

$10^2 = 100$  (T) ·  $15^2 = 225$  (N) ·  $20^2 = 400$  (O) ·  $5^3 = 125$  (L) ·  $9^2 = 81$  (S) ·  $6^3 = 216$  (E) ·  $3^3 = 27$  (H) ·  $14^2 = 196$  (K) ·  $7^2 = 49$  (R) ·  $2^9 = 512$  (C) ·  $21^2 = 441$  (I) ·  $13^2 = 169$  (A) ·  $11^2 = 121$  (V) ·  $6^2 = 36$  (F) ·  $5^2 = 25$  (D)

#### Clue 2 (Square roots): "THE RIGHT ARM LEAVES HEAVY STRIPES"

$\sqrt{576} = 24$  (T) ·  $\sqrt{100} = 10$  (H) ·  $\sqrt{625} = 25$  (V) ·  $\sqrt{25} = 5$  (P) ·  $\sqrt{64} = 8$  (E) ·  $\sqrt{169} = 13$  (Y) ·  $\sqrt{361} = 19$  (I) ·  $\sqrt{441} = 21$  (S) ·  $\sqrt{9} = 3$  (G) ·  $\sqrt{196} = 14$  (A) ·  $\sqrt{144} = 12$  (R) ·  $\sqrt{529} = 23$  (M) ·  $\sqrt{81} = 9$  (L)

#### Clue 3 (Pythagorean theorem): "A MAGNET WAND STOPS THEIR GEARS DEAD"

legs 60 and 63, hypotenuse = 87 (A) · legs 32 and 60, hypotenuse = 68 (O) · legs 3 and 4, hypotenuse = 5 (G) · legs 20 and 21, hypotenuse = 29 (M) · legs 5 and 12, hypotenuse = 13 (S) · legs 10 and 24, hypotenuse = 26 (E) · legs 18 and 24, hypotenuse = 30 (P) · legs 12 and 16, hypotenuse = 20 (R) · legs 16 and 30, hypotenuse = 34 (I) · legs 24 and 70, hypotenuse = 74 (W) · legs 20 and 48, hypotenuse = 52 (T) · legs 40 and 42, hypotenuse = 58 (D) · legs 24 and 45, hypotenuse = 51 (N) · legs 24 and 32, hypotenuse = 40 (H)

#### Clue 4 (Order of operations): "A COPPER ANTENNA WAS SEEN SPARKING"

$9 \times 12 - 9 = 99$  (A) ·  $9 \times 4 - 13 = 23$  (G) ·  $9 \times 10 - 5 = 85$  (O) ·  $12 \times 10 - 25 = 95$  (C) ·  $47 + 3 \times 7 = 68$  (E) ·  $11 \times 10 - 1 = 109$  (N) ·  $12 \times 10 - 5 = 115$  (K) ·  $38 + 2 \times 3 = 44$  (P) ·  $5 \times 12 - 1 = 59$  (T) ·  $10 \times 5 - 24 = 26$  (S) ·  $2 + 3 \times 2 = 8$  (I) ·  $24 + 5 \times 6 = 54$  (R) ·  $40 + 5 \times 2 = 50$  (W)

#### Clue 5 (Two-step equations): surviving statement is box 10 → Charles Babbage

$5x + 8 = 53, x = 9$  ·  $3x + 9 = 15, x = 2$  ·  $3x + 3 = 15, x = 4$  ·  $5x + 5 = 35, x = 6$  ·  $5x + 9 = 34, x = 5$  ·  $3x + 8 = 11, x = 1$  ·  $4x + 11 = 39, x = 7$  ·  $6x + 11 = 77, x = 11$  ·  $2x + 12 = 18, x = 3$  ·  $4x + 8 = 40, x = 8$  ·  $6x + 8 = 80, x = 12$