



# The Sonata Sabotage

Grade 9 math · Two-step equations, Exponents, Square roots, Integers · Reading level grades 7-9

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

The prestigious Steinway Tuning Key has vanished hours before the final round of the International Chopin Competition. Without it, the grand piano will fall out of tune, ruining the performance of a lifetime. The culprit has left behind a trail of coded musical scores.

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 virtuoso is** \_\_\_\_\_

# Possible suspects

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

| NAME     | SIGNATURE PIECE      | PERFORMANCE FLAIR | PAGE TURNING STYLE   | PERFORMANCE HAIRSTYLE | PERFORMANCE DISTRACTION |
|----------|----------------------|-------------------|----------------------|-----------------------|-------------------------|
| Yuja     | Rachmaninoff Prelude | Double Octaves    | Left Hand Page Turn  | Beethoven Shag        | Coughing Audience       |
| Arthur   | Chopin Nocturne      | Heavy Pedaling    | Right Hand Page Turn | Beethoven Shag        | Coughing Audience       |
| Robert   | Bach Prelude         | Heavy Pedaling    | Left Hand Page Turn  | Sleek Chignon         | Squeaky Bench           |
| Anton    | Liszt Etude          | Double Octaves    | Right Hand Page Turn | Sleek Chignon         | Sticky Keys             |
| Igor     | Rachmaninoff Prelude | Heavy Pedaling    | Right Hand Page Turn | Sleek Chignon         | Sticky Keys             |
| Johann   | Beethoven Sonata     | Double Octaves    | Left Hand Page Turn  | Sleek Chignon         | Sticky Keys             |
| Felix    | Beethoven Sonata     | Heavy Pedaling    | Left Hand Page Turn  | Beethoven Shag        | Coughing Audience       |
| Erik     | Chopin Nocturne      | Cross Hand Play   | Left Hand Page Turn  | Beethoven Shag        | Squeaky Bench           |
| Wolfgang | Beethoven Sonata     | Blindfolded Jumps | Right Hand Page Turn | Sleek Chignon         | Coughing Audience       |
| Franz    | Rachmaninoff Prelude | Rapid Arpeggios   | Right Hand Page Turn | Beethoven Shag        | Coughing Audience       |
| Mitsuko  | Beethoven Sonata     | Heavy Pedaling    | Right Hand Page Turn | Sleek Chignon         | Coughing Audience       |
| Claude   | Beethoven Sonata     | Double Octaves    | Right Hand Page Turn | Sleek Chignon         | Coughing Audience       |
| Lang     | Bach Prelude         | Blindfolded Jumps | Right Hand Page Turn | Beethoven Shag        | Coughing Audience       |
| Maurice  | Rachmaninoff Prelude | Cross Hand Play   | Right Hand Page Turn | Sleek Chignon         | Coughing Audience       |
| Frederic | Beethoven Sonata     | Heavy Pedaling    | Left Hand Page Turn  | Classical Part        | Sticky Keys             |
| Martha   | Bach Prelude         | Rapid Arpeggios   | Right Hand Page Turn | Beethoven Shag        | Sticky Keys             |
| Ludwig   | Rachmaninoff Prelude | Rapid Arpeggios   | Right Hand Page Turn | Beethoven Shag        | Sticky Keys             |
| Clara    | Rachmaninoff Prelude | Blindfolded Jumps | Left Hand Page Turn  | Beethoven Shag        | Squeaky Bench           |
| Sergei   | Liszt Etude          | Blindfolded Jumps | Right Hand Page Turn | Beethoven Shag        | Squeaky Bench           |
| Hector   | Liszt Etude          | Rapid Arpeggios   | Right Hand Page Turn | Beethoven Shag        | Coughing Audience       |
| Pyotr    | Beethoven Sonata     | Heavy Pedaling    | Right Hand Page Turn | Beethoven Shag        | Coughing Audience       |

### CLUE 1

## Two-step equations

To unlock the backstage double-doors, you must solve for the unknown variables on the twin-dial combination lock.

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

A 2x10 grid of boxes. The top row contains the following values from left to right: 'T' (orange), 5, 14, 11, 10, 17, 7, 7, 8, 17, 16, 22, 6, 11, 20, 16, 6, 'T' (orange), 5. The bottom row contains the following values from left to right: 9, 20, 11, 3, 7, 17, 16, 22, 18, 6, 7, 22, 11, 22, 2, 9, 4, 19, 20.

$$6x + 9 = 39, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{T}}$$

$9x + 6 = 33, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{B}}$

$$5x + 12 = 42, x = \boxed{\phantom{00}} \rightarrow \boxed{0}$$

$$6x + 7 = 73, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{E}}$$

$$4x + 10 = 38, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{L}}$$

$9x + 7 = 97, x = \boxed{\phantom{00}} \rightarrow \mathbf{V}$

$$3x + 1 = 61, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{S}}$$

$$4x + 9 = 73, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{N}}$$

$8x + 2 = 18, x = \boxed{\phantom{00}} \rightarrow \boxed{\mathbf{J}}$

$$9x + 4 = 175, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{P}}$$

$$9x + 11 = 137, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{H}}$$

$$6x + 6 = 108, x = \boxed{\phantom{00}} \rightarrow \boxed{1}$$

$$8x + 6 = 150, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{F}}$$

$$4x + 12 = 28, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{M}}$$

$$7x + 10 = 66, x = \boxed{\phantom{00}} \rightarrow \boxed{\mathbf{A}}$$

$$4x + 3 = 39, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{U}}$$

$$3x + 5 = 71, x = \boxed{\phantom{00}} \rightarrow \boxed{\text{D}}$$

Scratch space:

## CLUE 2 Exponents

The soundboard decibel readings multiply exponentially with each octave. Calculate the power of the amplifier to find the clue.

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

|     |     |     |     |     |     |    |     |     |     |     |     |     |    |     |     |     |  |
|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|--|
| T   |     |     |     |     |     |    |     |     |     | T   | T   |     |    |     |     |     |  |
| 324 | 216 | 625 | 361 | 400 | 361 | 64 | 625 | 169 | 324 | 324 | 400 | 441 | 8  | 625 | 32  |     |  |
|     |     |     |     |     |     |    | T   |     | T   |     |     |     |    |     |     | T   |  |
| 64  | 225 | 256 | 625 | 361 | 512 | 49 | 324 | 216 | 324 | 216 | 625 | 441 | 49 | 256 | 216 | 324 |  |
|     |     |     |     |     |     |    |     |     |     |     |     |     |    |     |     |     |  |
| 216 | 225 | 8   | 32  |     |     |    |     |     |     |     |     |     |    |     |     |     |  |

|                                       |                                       |                                       |                                       |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| $18^2 = \square \rightarrow \text{T}$ | $20^2 = \square \rightarrow \text{U}$ | $2^5 = \square \rightarrow \text{D}$  | $5^4 = \square \rightarrow \text{E}$  |
| $7^2 = \square \rightarrow \text{I}$  | $2^3 = \square \rightarrow \text{N}$  | $13^2 = \square \rightarrow \text{C}$ | $19^2 = \square \rightarrow \text{S}$ |
| $15^2 = \square \rightarrow \text{A}$ | $8^2 = \square \rightarrow \text{P}$  | $21^2 = \square \rightarrow \text{R}$ | $6^3 = \square \rightarrow \text{H}$  |
| $8^3 = \square \rightarrow \text{W}$  | $16^2 = \square \rightarrow \text{G}$ |                                       |                                       |

Scratch space:

## CLUE 3 Square roots

The grand piano string lengths are calculated using a square root function. Find the base length to uncover the hidden note.

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

|    |    |    |    |    |    |   |    |    |    |    |    |   |    |    |    |    |    |
|----|----|----|----|----|----|---|----|----|----|----|----|---|----|----|----|----|----|
| A  |    |    |    |    |    |   |    |    | A  |    |    |   |    |    |    |    |    |
| 16 | 14 | 6  | 19 | 25 | 20 | 3 | 11 | 25 | 16 | 19 | 15 | 3 | 7  | 11 | 14 | 7  |    |
|    |    |    |    |    |    |   |    |    |    |    |    |   |    |    |    |    |    |
| 23 | 3  | 21 | 21 | 12 | 19 | 3 | 11 | 10 | 20 | 7  | 14 | 6 | 11 | 14 | 7  | 12 | 10 |

|                                                   |                                                   |                                                   |
|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|
| $\text{sqrt}(256) = \square \rightarrow \text{A}$ | $\text{sqrt}(100) = \square \rightarrow \text{T}$ | $\text{sqrt}(9) = \square \rightarrow \text{I}$   |
| $\text{sqrt}(121) = \square \rightarrow \text{N}$ | $\text{sqrt}(144) = \square \rightarrow \text{R}$ | $\text{sqrt}(529) = \square \rightarrow \text{W}$ |
| $\text{sqrt}(196) = \square \rightarrow \text{C}$ | $\text{sqrt}(225) = \square \rightarrow \text{D}$ | $\text{sqrt}(49) = \square \rightarrow \text{E}$  |
| $\text{sqrt}(625) = \square \rightarrow \text{G}$ | $\text{sqrt}(400) = \square \rightarrow \text{H}$ | $\text{sqrt}(441) = \square \rightarrow \text{L}$ |
| $\text{sqrt}(361) = \square \rightarrow \text{U}$ | $\text{sqrt}(36) = \square \rightarrow \text{O}$  |                                                   |

Scratch space:

## CLUE 4 Integers

The pitch pipe can tune notes both above and below absolute pitch. Balance the positive and negative frequencies to hear the clue.

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

|    |    |    |    |    |   |    |    |    |    |    |    |    |  |
|----|----|----|----|----|---|----|----|----|----|----|----|----|--|
| T  |    |    |    |    |   |    |    |    |    |    |    |    |  |
| 38 | 26 | 14 | 25 | 27 | 8 | 10 | 27 | 33 | 26 | 27 | 10 | 27 |  |

  

|    |    |    |    |    |    |    |    |   |    |    |    |    |  |
|----|----|----|----|----|----|----|----|---|----|----|----|----|--|
|    |    |    | T  |    |    |    |    |   |    |    |    |    |  |
| 13 | 14 | 14 | 38 | 26 | 22 | 25 | 14 | 8 | 30 | 26 | 27 | 16 |  |

$$34 - (-4) = \boxed{\phantom{00}} \rightarrow \boxed{\text{T}}$$

$$12 - (-2) = \boxed{\phantom{00}} \rightarrow \boxed{\text{E}}$$

$$12 - (-13) = \boxed{\phantom{00}} \rightarrow \boxed{\text{V}}$$

$$22 - (-4) = \boxed{\phantom{00}} \rightarrow \boxed{\text{H}}$$

$$5 - (-5) = \boxed{\phantom{00}} \rightarrow \boxed{\text{D}}$$

$$(-7) + 20 = \boxed{\phantom{00}} \rightarrow \boxed{\text{B}}$$

$$(-14) + 30 = \boxed{\phantom{00}} \rightarrow \boxed{\text{G}}$$

$$(-9) + 36 = \boxed{\phantom{00}} \rightarrow \boxed{\text{A}}$$

$$23 - (-7) = \boxed{\phantom{00}} \rightarrow \boxed{\text{S}}$$

$$13 - (-9) = \boxed{\phantom{00}} \rightarrow \boxed{\text{O}}$$

$$(-9) + 17 = \boxed{\phantom{00}} \rightarrow \boxed{\text{N}}$$

$$(-15) + 48 = \boxed{\phantom{00}} \rightarrow \boxed{\text{L}}$$

Scratch space:

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

The stage lighting rig requires a two-step equation to balance the wattage of the spotlights against the main house lights.

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:**

$3x + 5 = 35, x = \boxed{\phantom{00}}$

$5x + 8 = 23, x = \boxed{\phantom{00}}$

$5x + 3 = 28, x = \boxed{\phantom{00}}$

$9x + 3 = 12, x = \boxed{\phantom{00}}$

$5x + 1 = 46, x = \boxed{\phantom{00}}$

$9x + 10 = 118, x = \boxed{\phantom{00}}$

$2x + 1 = 13, x = \boxed{\phantom{00}}$

$8x + 12 = 68, x = \boxed{\phantom{00}}$

$6x + 4 = 28, x = \boxed{\phantom{00}}$

$5x + 6 = 16, x = \boxed{\phantom{00}}$

$3x + 3 = 36, x = \boxed{\phantom{00}}$

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

1. The villain plays a Chopin Nocturne at high speed, then leaps blindly with blindfolded jumps.
2. The villain blasts a Bach Prelude on the grand piano, then drowns the room out with heavy pedaling.
3. The villain blares a Rachmaninoff Prelude, then sweeps into rapid arpeggios.
4. The villain blasts a Bach Prelude on the grand piano, then executes a flurry of double octaves.
5. The villain plays a Chopin Nocturne at high speed, then drowns the room out with heavy pedaling.
6. The villain blasts a Bach Prelude on the grand piano, then sweeps into rapid arpeggios.
7. The villain plays a Chopin Nocturne at high speed, then executes a flurry of double octaves.
8. The villain performs a Beethoven Sonata with passion, then drowns the room out with heavy pedaling.
9. The villain blares a Rachmaninoff Prelude, then crosses their hands in a cross-hand play.
10. The villain tears through a Liszt Etude, then sweeps into rapid arpeggios.
11. The villain plays a Chopin Nocturne at high speed, then sweeps into rapid arpeggios.
12. The villain performs a Beethoven Sonata with passion, then leaps blindly with blindfolded jumps.

# Answer Key

## The Sonata Sabotage

### Culprit: Pyotr

Beethoven Sonata · Heavy Pedaling · Right Hand Page Turn · Beethoven Shag · Coughing Audience

Trail: Start 21 → Clue 1 17 → Clue 2 11 → Clue 3 7 → Clue 4 4 → Clue 5 1

#### Clue 1 (Two-step equations): "THE VILLAIN DOES NOT USE BLINDFOLDED JUMPS"

$6x + 9 = 39, x = 5$  (T) ·  $9x + 6 = 33, x = 3$  (B) ·  $5x + 12 = 42, x = 6$  (O) ·  $6x + 7 = 73, x = 11$  (E) ·  $4x + 10 = 38, x = 7$  (L) ·  $9x + 7 = 97, x = 10$  (V) ·  $3x + 1 = 61, x = 20$  (S) ·  $4x + 9 = 73, x = 16$  (N) ·  $8x + 2 = 18, x = 2$  (J) ·  $9x + 4 = 175, x = 19$  (P) ·  $9x + 11 = 137, x = 14$  (H) ·  $6x + 6 = 108, x = 17$  (I) ·  $8x + 6 = 150, x = 18$  (F) ·  $4x + 12 = 28, x = 4$  (M) ·  $7x + 10 = 66, x = 8$  (A) ·  $4x + 3 = 39, x = 9$  (U) ·  $3x + 5 = 71, x = 22$  (D)

#### Clue 2 (Exponents): "THE SUSPECT TURNED PAGES WITH THE RIGHT HAND"

$18^2 = 324$  (T) ·  $20^2 = 400$  (U) ·  $2^5 = 32$  (D) ·  $5^4 = 625$  (E) ·  $7^2 = 49$  (I) ·  $2^3 = 8$  (N) ·  $13^2 = 169$  (C) ·  $19^2 = 361$  (S) ·  $15^2 = 225$  (A) ·  $8^2 = 64$  (P) ·  $21^2 = 441$  (R) ·  $6^3 = 216$  (H) ·  $8^3 = 512$  (W) ·  $16^2 = 256$  (G)

#### Clue 3 (Square roots): "A COUGHING AUDIENCE WILL RUIN THE CONCERT"

$\sqrt{256} = 16$  (A) ·  $\sqrt{100} = 10$  (T) ·  $\sqrt{9} = 3$  (I) ·  $\sqrt{121} = 11$  (N) ·  $\sqrt{144} = 12$  (R) ·  $\sqrt{529} = 23$  (W) ·  $\sqrt{196} = 14$  (C) ·  $\sqrt{225} = 15$  (D) ·  $\sqrt{49} = 7$  (E) ·  $\sqrt{625} = 25$  (G) ·  $\sqrt{400} = 20$  (H) ·  $\sqrt{441} = 21$  (L) ·  $\sqrt{361} = 19$  (U) ·  $\sqrt{36} = 6$  (O)

#### Clue 4 (Integers): "THE VANDAL HAD A BEETHOVEN SHAG"

$34 - (-4) = 38$  (T) ·  $12 - (-2) = 14$  (E) ·  $12 - (-13) = 25$  (V) ·  $22 - (-4) = 26$  (H) ·  $5 - (-5) = 10$  (D) ·  $(-7) + 20 = 13$  (B) ·  $(-14) + 30 = 16$  (G) ·  $(-9) + 36 = 27$  (A) ·  $23 - (-7) = 30$  (S) ·  $13 - (-9) = 22$  (O) ·  $(-9) + 17 = 8$  (N) ·  $(-15) + 48 = 33$  (L)

#### Clue 5 (Two-step equations): surviving statement is box 8 → Pyotr

$3x + 5 = 35, x = 10$  ·  $5x + 8 = 23, x = 3$  ·  $5x + 3 = 28, x = 5$  ·  $9x + 3 = 12, x = 1$  ·  $5x + 1 = 46, x = 9$  ·  $9x + 10 = 118, x = 12$  ·  $2x + 1 = 13, x = 6$  ·  $8x + 12 = 68, x = 7$  ·  $6x + 4 = 28, x = 4$  ·  $5x + 6 = 16, x = 2$  ·  $3x + 3 = 36, x = 11$