The Great Astrolabe Heist

Grade 8 math · Exponents, Square roots, Pythagorean theorem, Order of operations, Two-step equations · Reading level grades 7-9

Detective: _____ **Date:** _____

An emergency alert echoes across the floating docks of Aethelgard! The legendary Golden Astrolabe has been stolen from the Chief Navigator's private observatory, throwing the fleet into complete chaos. A mysterious rogue slipped past the guards, leaving only a trail of strange energy readings and sky-ship residue behind. As the lead detective of the Aethelgard Rangers, it is up to you to track down the thief, crack the mathematical security codes left at the crime scene, and restore order to the skies.

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 Sky-Thief is _____

Possible suspects

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

NAME	PRIMARY GEAR	SECONDARY GEAR	DOMINANT HAND	HAIR COLOR	VULNERABILITY
Jonas Squall	Gale-Force Engine	Compass Jammer	Right-handed grip	Spiky copper hair	Dazzled by bright flash
Sienna Stratos	Lightning Harpoon	Spyglass Lens	Left-handed grip	Wind-swept blue hair	Fears heights
Lyra Featherstone	Cloud Cannon	Wind Whistle	Right-handed grip	Spiky copper hair	Fears heights
Aria Gale	Gale-Force Engine	Signal Flare	Right-handed grip	Braided silver hair	Allergic to pine-pollen
Ember Stratos	Gale-Force Engine	Compass Jammer	Right-handed grip	Wind-swept blue hair	Dazzled by bright flash
Cyrus Sterling	Gravity Boots	Rope Launcher	Left-handed grip	Wind-swept blue hair	Fears heights
Finn Tempest	Gravity Boots	Signal Flare	Left-handed grip	Braided silver hair	Dazzled by bright flash
Iris Cloudchaser	Lightning Harpoon	Wind Whistle	Left-handed grip	Spiky copper hair	Fears heights
Navigator Orion	Shadow Sail	Spyglass Lens	Right-handed grip	Spiky copper hair	Dazzled by bright flash
Kaelen Aeros	Lightning Harpoon	Compass Jammer	Right-handed grip	Spiky copper hair	Dazzled by bright flash
Maeve Sirocco	Gale-Force Engine	Compass Jammer	Right-handed grip	Spiky copper hair	Fears heights
Rowan Altus	Shadow Sail	Rope Launcher	Right-handed grip	Spiky copper hair	Dazzled by bright flash
Pilot Celeste	Lightning Harpoon	Wind Whistle	Right-handed grip	Spiky copper hair	Dazzled by bright flash
Nadia Breeze	Cloud Cannon	Compass Jammer	Left-handed grip	Braided silver hair	Fears heights
Leo Cloudcrest	Lightning Harpoon	Rope Launcher	Right-handed grip	Wind-swept blue hair	Dazzled by bright flash
Gale Sterling	Cloud Cannon	Signal Flare	Right-handed grip	Spiky copper hair	Allergic to pine-pollen
Vesper Wind	Shadow Sail	Spyglass Lens	Right-handed grip	Braided silver hair	Allergic to pine-pollen
Skyler Windrunner	Gravity Boots	Rope Launcher	Right-handed grip	Wind-swept blue hair	Fears heights
Stormy Vance	Cloud Cannon	Signal Flare	Left-handed grip	Spiky copper hair	Dazzled by bright flash
Breeze Vance	Shadow Sail	Spyglass Lens	Right-handed grip	Wind-swept blue hair	Fears heights
Jax Hurricane	Gale-Force Engine	Signal Flare	Left-handed grip	Spiky copper hair	Dazzled by bright flash

CLUE 1 Exponents

> To crack the sky-thief's encrypted logbook, we must calculate the rapid growth of cloud-spores. Each hour, the spore population multiplies exponentially. Solve the exponent equation to unlock the first clue.

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

14^2 = ☐ → T

3^6 = ☐ → S

6^3 = ☐ → N

2^7 = ☐ → U

21^2 = ☐ → O

13^2 = ☐ → R

3^5 = ☐ → L

22^2 = ☐ → F

7^3 = ☐ → D

7^2 = ☐ → K

19^2 = ☐ → I

20^2 = ☐ → A

9^2 = ☐ → P

2^5 = ☐ → H

2^9 = ☐ → Y

11^2 = ☐ → C

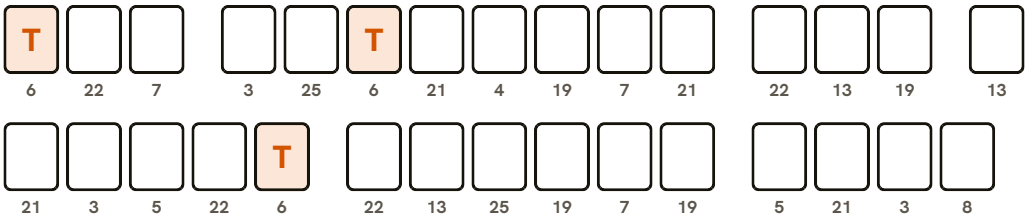
3^3 = ☐ → E

Scratch space:

CLUE 2 Square roots

> The navigator's map is divided into a perfect square grid of floating islands. By calculating the square root of the total grid area, we find the coordinate of the thief's escape route.

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



sqrt(36) = ☐ → T

sqrt(25) = ☐ → G

sqrt(16) = ☐ → U

sqrt(441) = ☐ → R

sqrt(9) = ☐ → I

sqrt(484) = ☐ → H

sqrt(361) = ☐ → D

sqrt(49) = ☐ → E

sqrt(625) = ☐ → N

sqrt(64) = ☐ → P

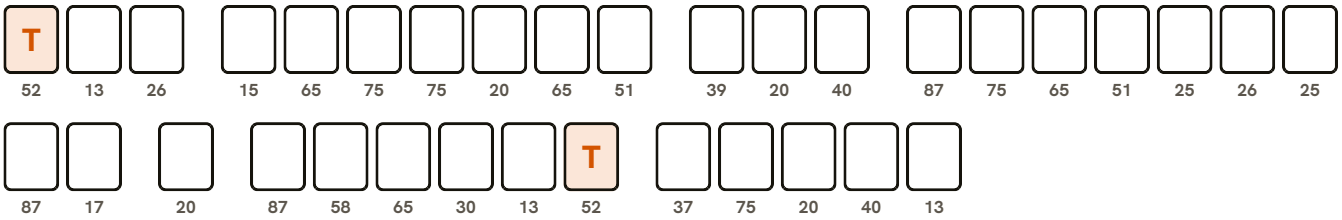
sqrt(169) = ☐ → A

Scratch space:

CLUE 3 Pythagorean theorem

> We need to calculate the direct flight distance between the floating dock and the high watchtower. Use the Pythagorean theorem to find the length of this diagonal zipline path and uncover the thief's trail.

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



legs 20 and 48, hypotenuse = ☐ → T

legs 24 and 32, hypotenuse = ☐ → S

legs 7 and 24, hypotenuse = ☐ → D

legs 18 and 24, hypotenuse = ☐ → G

legs 24 and 45, hypotenuse = ☐ → N

legs 8 and 15, hypotenuse = ☐ → Y

legs 60 and 63, hypotenuse = ☐ → B

legs 25 and 60, hypotenuse = ☐ → I

legs 5 and 12, hypotenuse = ☐ → H

legs 21 and 72, hypotenuse = ☐ → L

legs 10 and 24, hypotenuse = ☐ → E

legs 40 and 42, hypotenuse = ☐ → R

legs 9 and 12, hypotenuse = ☐ → V

legs 12 and 35, hypotenuse = ☐ → F

legs 15 and 36, hypotenuse = ☐ → W

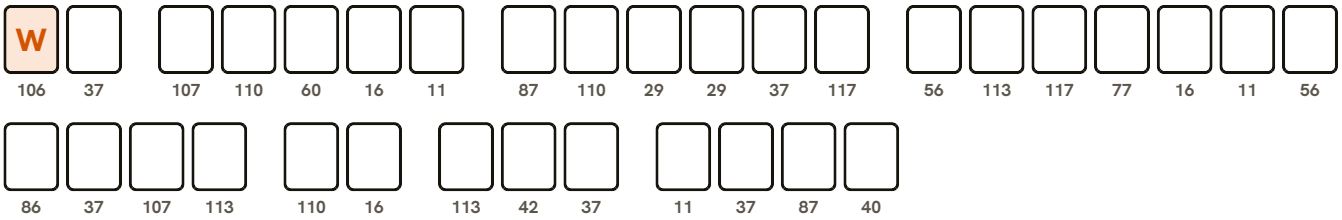
legs 12 and 16, hypotenuse = ☐ → A

Scratch space:

CLUE 4 Order of operations

> The thief left a coded message on the ship's pressure dial. Follow the strict order of operations to solve the complex mathematical formula and decode the dial's secret reading.

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



94 + 6 × 2 = ☐ → W

6 × 8 - 11 = ☐ → E

65 + 7 × 6 = ☐ → F

9 × 11 - 22 = ☐ → A

12 + 7 × 4 = ☐ → K

2 + 3 × 3 = ☐ → D

7 × 8 - 14 = ☐ → H

12 × 10 - 7 = ☐ → T

8 × 8 - 8 = ☐ → S

8 + 3 × 7 = ☐ → P

11 × 12 - 22 = ☐ → O

12 × 12 - 27 = ☐ → R

8 × 8 - 4 = ☐ → U

2 × 11 - 6 = ☐ → N

9 × 11 - 13 = ☐ → L

55 + 8 × 4 = ☐ → C

Scratch space:

CLUE 5 Two-step equations - the last clue

> Our fuel level is dropping steadily, but we can work backward to find the original amount. Use a two-step equation to solve for our starting reserves and reveal the final clue.

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:

$5x + 10 = 45$, x = ☐	$6x + 1 = 19$, x = ☐	$3x + 6 = 42$, x = ☐	$4x + 6 = 10$, x = ☐
$6x + 7 = 37$, x = ☐	$3x + 8 = 20$, x = ☐	$5x + 11 = 41$, x = ☐	$5x + 6 = 16$, x = ☐
$5x + 7 = 57$, x = ☐	$2x + 9 = 31$, x = ☐	$4x + 5 = 41$, x = ☐	

Step 2 - cross out the sentence with each answer:

1. The villain powered up the gravity boots, then broke the spyglass lens.
2. The villain activated the gale-force engine, then swung away on the rope launcher.
3. The villain unfurled the shadow sail, then broke the spyglass lens.
4. The villain activated the gale-force engine, then blew the wind whistle.
5. The villain powered up the gravity boots, then jammed the ship compass.
6. The villain fired the cloud cannon, then swung away on the rope launcher.
7. The villain shot the lightning harpoon, then blew the wind whistle.
8. The villain activated the gale-force engine, then jammed the ship compass.
9. The villain unfurled the shadow sail, then jammed the ship compass.
10. The villain powered up the gravity boots, then fired the signal flare.
11. The villain shot the lightning harpoon, then fired the signal flare.
12. The villain shot the lightning harpoon, then jammed the ship compass.

TEACHER / PARENT

Answer Key

The Great Astrolabe Heist

Culprit: Jonas Squall

Gale-Force Engine · Compass Jammer · Right-handed grip · Spiky copper hair · Dazzled by bright flash

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

Clue 1 (Exponents): "THE SKY THIEF DOES NOT USE A ROPE LAUNCHER"

14^2 = 196 (T) · 3^6 = 729 (S) · 6^3 = 216 (N) · 2^7 = 128 (U) · 21^2 = 441 (O) · 13^2 = 169 (R) · 3^5 = 243 (L) · 22^2 = 484 (F) · 7^3 = 343 (D) · 7^2 = 49 (K) · 19^2 = 361 (I) · 20^2 = 400 (A) · 9^2 = 81 (P) · 2^5 = 32 (H) · 2^9 = 512 (Y) · 11^2 = 121 (C) · 3^3 = 27 (E)

Clue 2 (Square roots): "THE INTRUDER HAD A RIGHT HANDED GRIP"

sqrt(36) = 6 (T) · sqrt(25) = 5 (G) · sqrt(16) = 4 (U) · sqrt(441) = 21 (R) · sqrt(9) = 3 (I) · sqrt(484) = 22 (H) · sqrt(361) = 19 (D) · sqrt(49) = 7 (E) · sqrt(625) = 25 (N) · sqrt(64) = 8 (P) · sqrt(169) = 13 (A)

Clue 3 (Pythagorean theorem): "THE VILLAIN WAS BLINDED BY A BRIGHT FLASH"

legs 20 and 48, hypotenuse = 52 (T) · legs 24 and 32, hypotenuse = 40 (S) · legs 7 and 24, hypotenuse = 25 (D) · legs 18 and 24, hypotenuse = 30 (G) · legs 24 and 45, hypotenuse = 51 (N) · legs 8 and 15, hypotenuse = 17 (Y) · legs 60 and 63, hypotenuse = 87 (B) · legs 25 and 60, hypotenuse = 65 (I) · legs 5 and 12, hypotenuse = 13 (H) · legs 21 and 72, hypotenuse = 75 (L) · legs 10 and 24, hypotenuse = 26 (E) · legs 40 and 42, hypotenuse = 58 (R) · legs 9 and 12, hypotenuse = 15 (V) · legs 12 and 35, hypotenuse = 37 (F) · legs 15 and 36, hypotenuse = 39 (W) · legs 12 and 16, hypotenuse = 20 (A)

Clue 4 (Order of operations): "WE FOUND COPPER STRANDS LEFT ON THE DECK"

94 + 6 × 2 = 106 (W) · 6 × 8 - 11 = 37 (E) · 65 + 7 × 6 = 107 (F) · 9 × 11 - 22 = 77 (A) · 12 + 7 × 4 = 40 (K) · 2 + 3 × 3 = 11 (D) · 7 × 8 - 14 = 42 (H) · 12 × 10 - 7 = 113 (T) · 8 × 8 - 8 = 56 (S) · 8 + 3 × 7 = 29 (P) · 11 × 12 - 22 = 110 (O) · 12 × 12 - 27 = 117 (R) · 8 × 8 - 4 = 60 (U) · 2 × 11 - 6 = 16 (N) · 9 × 11 - 13 = 86 (L) · 55 + 8 × 4 = 87 (C)

Clue 5 (Two-step equations): surviving statement is box 8 → Jonas Squall

5x + 10 = 45, x = 7 · 6x + 1 = 19, x = 3 · 3x + 6 = 42, x = 12 · 4x + 6 = 10, x = 1 · 6x + 7 = 37, x = 5 · 3x + 8 = 20, x = 4 · 5x + 11 = 41, x = 6 · 5x + 6 = 16, x = 2 · 5x + 7 = 57, x = 10 · 2x + 9 = 31, x = 11 · 4x + 5 = 41, x = 9