The Case of the Missing Star Crystal

Grade 10 math · Pythagorean theorem, Square roots, Exponents, Order of operations · Reading level grades 7-9

Detective: _____ **Date:** _____

Someone ambushed the Chief Explorer aboard the flagship Zephyr and swiped the ancient Star Crystal. Trace the flight path, analyze the evidence, and unmask the culprit.

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 Airship Captain is _____

Possible suspects

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

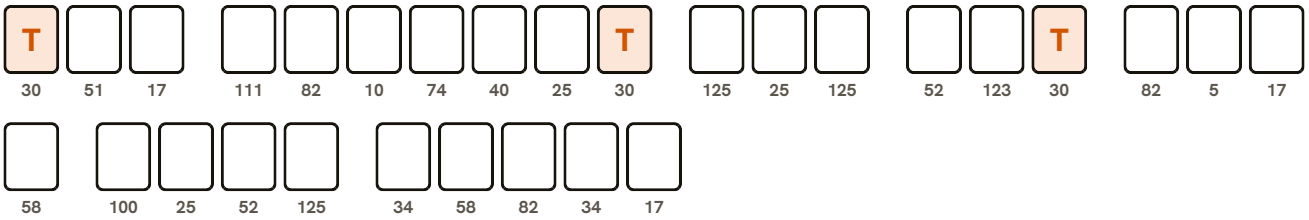
NAME	PRIMARY GADGET	NAVIGATION TOOL	WATCH HAND	BANDANA COLOR	WEAKNESS
Mechanic Brody	Lightning Rod	Brass Spyglass	Wears Watch On Left Wrist	Sapphire Bandana	Strong Gusts
Navigator Gemma	Sound Wave Cannon	Brass Spyglass	Wears Watch On Left Wrist	Sapphire Bandana	Bright Lanterns
Scout Tali	Glider Wings	Star Chart	Wears Watch On Left Wrist	Sapphire Bandana	Loud Whistles
Ranger Dax	Sound Wave Cannon	Solar Compass	Wears Watch On Left Wrist	Crimson Bandana	Strong Gusts
Aviator Nora	Sound Wave Cannon	Wind Gauge	Wears Watch On Left Wrist	Emerald Bandana	Bright Lanterns
Officer Milo	Glider Wings	Brass Spyglass	Wears Watch On Left Wrist	Crimson Bandana	Bright Lanterns
Commander Roy	Smoke Bomb	Star Chart	Wears Watch On Left Wrist	Sapphire Bandana	Strong Gusts
Deckhand Otis	Lightning Rod	Altimeter	Wears Watch On Left Wrist	Emerald Bandana	Loud Whistles
Tech Hugo	Lightning Rod	Brass Spyglass	Wears Watch On Left Wrist	Crimson Bandana	Strong Gusts
Specialist Eva	Smoke Bomb	Solar Compass	Wears Watch On Right Wrist	Sapphire Bandana	Loud Whistles
Engineer Jax	Grapple Hook	Wind Gauge	Wears Watch On Left Wrist	Sapphire Bandana	Strong Gusts
Aviator Nina	Lightning Rod	Altimeter	Wears Watch On Right Wrist	Emerald Bandana	Loud Whistles
Helmsman Cruz	Sound Wave Cannon	Solar Compass	Wears Watch On Left Wrist	Sapphire Bandana	Strong Gusts
Gunner Flint	Smoke Bomb	Brass Spyglass	Wears Watch On Right Wrist	Sapphire Bandana	Strong Gusts
Pilot Maya	Grapple Hook	Altimeter	Wears Watch On Left Wrist	Sapphire Bandana	Bright Lanterns
Explorer Seth	Glider Wings	Altimeter	Wears Watch On Right Wrist	Crimson Bandana	Strong Gusts
Scout Kael	Smoke Bomb	Star Chart	Wears Watch On Left Wrist	Emerald Bandana	Bright Lanterns
Navigator Leo	Sound Wave Cannon	Solar Compass	Wears Watch On Right Wrist	Sapphire Bandana	Bright Lanterns
Sailor Iris	Grapple Hook	Star Chart	Wears Watch On Left Wrist	Sapphire Bandana	Strong Gusts
Captain Vance	Lightning Rod	Wind Gauge	Wears Watch On Right Wrist	Crimson Bandana	Loud Whistles
Deckhand Zane	Sound Wave Cannon	Solar Compass	Wears Watch On Left Wrist	Sapphire Bandana	Loud Whistles

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CLUE 1 Pythagorean theorem

> To calculate the exact diagonal distance the thief leapt across the airship deck, you map the right triangle of the rigging.

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



legs 18 and 24, hypotenuse = ☐ → T

legs 20 and 48, hypotenuse = ☐ → N

legs 16 and 30, hypotenuse = ☐ → G

legs 8 and 15, hypotenuse = ☐ → E

legs 36 and 105, hypotenuse = ☐ → C

legs 24 and 32, hypotenuse = ☐ → R

legs 18 and 80, hypotenuse = ☐ → U

legs 27 and 120, hypotenuse = ☐ → O

legs 28 and 96, hypotenuse = ☐ → W

legs 35 and 120, hypotenuse = ☐ → D

legs 40 and 42, hypotenuse = ☐ → A

legs 7 and 24, hypotenuse = ☐ → I

legs 24 and 45, hypotenuse = ☐ → H

legs 24 and 70, hypotenuse = ☐ → P

legs 6 and 8, hypotenuse = ☐ → L

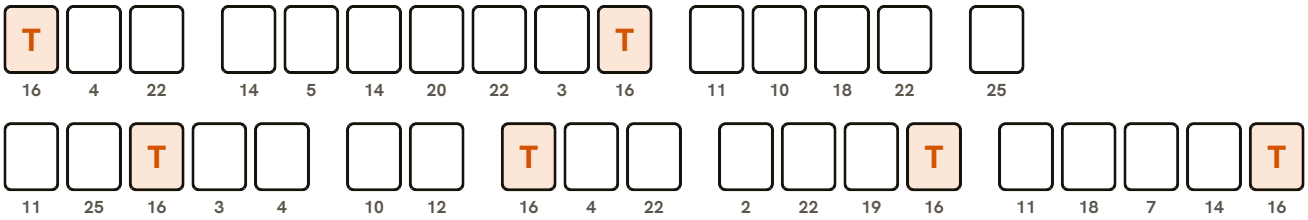
legs 3 and 4, hypotenuse = ☐ → S

Scratch space:

CLUE 2 Square roots

> The central power grid is arranged in a square array, so finding the side length reveals which control junction was tampered with.

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



sqrt(256) = ☐ → T

sqrt(324) = ☐ → R

sqrt(49) = ☐ → I

sqrt(100) = ☐ → O

sqrt(16) = ☐ → H

sqrt(361) = ☐ → F

sqrt(196) = ☐ → S

sqrt(4) = ☐ → L

sqrt(25) = ☐ → U

sqrt(625) = ☐ → A

sqrt(400) = ☐ → P

sqrt(121) = ☐ → W

sqrt(9) = ☐ → C

sqrt(144) = ☐ → N

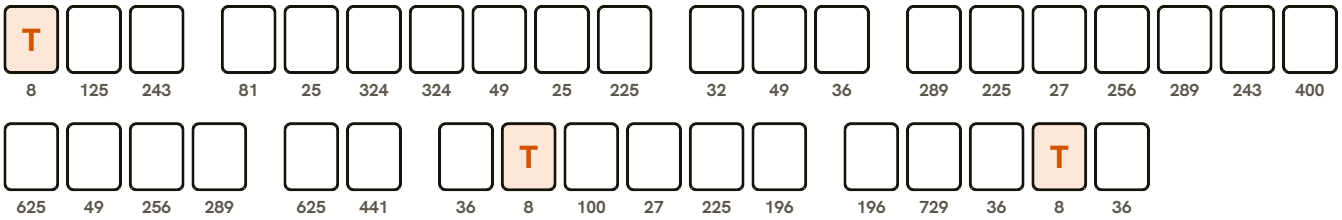
sqrt(484) = ☐ → E

Scratch space:

CLUE 3 Exponents

> Signals from the stolen crystal double in intensity with each cloud layer crossed, letting you calculate its total broadcast range.

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



2^3 = ☐ → T | 2^5 = ☐ → W | 6^2 = ☐ → S | 5^3 = ☐ → H

21^2 = ☐ → Y | 14^2 = ☐ → G | 10^2 = ☐ → R | 5^4 = ☐ → B

5^2 = ☐ → I | 17^2 = ☐ → K | 4^4 = ☐ → C | 3^3 = ☐ → O

15^2 = ☐ → N | 20^2 = ☐ → D | 7^2 = ☐ → A | 3^4 = ☐ → V

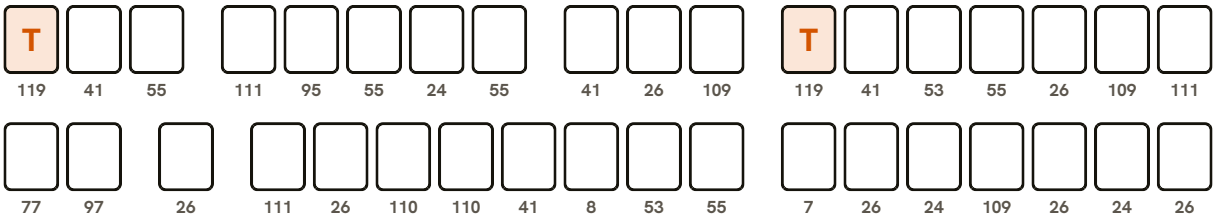
18^2 = ☐ → L | 9^3 = ☐ → U | 3^5 = ☐ → E

Scratch space:

CLUE 4 Order of operations

> Deciphering the airship captain's locked logbook requires solving the priority sequence of security bypass codes.

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



92 + 9 × 3 = ☐ → T

79 + 6 × 5 = ☐ → D

87 + 6 × 4 = ☐ → S

83 + 2 × 7 = ☐ → F

9 × 9 - 4 = ☐ → O

9 × 6 - 30 = ☐ → N

10 × 4 - 14 = ☐ → A

10 × 5 - 9 = ☐ → H

11 × 11 - 26 = ☐ → C

47 + 9 × 7 = ☐ → P

2 × 12 - 17 = ☐ → B

4 + 2 × 2 = ☐ → I

39 + 2 × 7 = ☐ → R

15 + 5 × 8 = ☐ → E

Scratch space:

CLUE 5 Square roots - the last clue

> Measuring the area of the storm field surrounding the vault gives the exact root radius needed to track the escape vessel.

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:

sqrt(121) = ☐ sqrt(16) = ☐ sqrt(64) = ☐ sqrt(81) = ☐ sqrt(100) = ☐

sqrt(144) = ☐ sqrt(1) = ☐ sqrt(4) = ☐ sqrt(9) = ☐ sqrt(25) = ☐

sqrt(36) = ☐

Step 2 - cross out the sentence with each answer:

1. The villain vanished into thin air using a smoke bomb, then checked coordinates on a solar compass.
2. The villain disrupted the sensors with a sound wave cannon, then monitored elevation using an altimeter.
3. The villain channeled power using a lightning rod, then monitored elevation using an altimeter.
4. The villain disrupted the sensors with a sound wave cannon, then checked coordinates on a solar compass.
5. The villain disrupted the sensors with a sound wave cannon, then plotted a course across a star chart.
6. The villain soared over the railings with glider wings, then measured airflow with a wind gauge.
7. The villain channeled power using a lightning rod, then scouted the horizon with a brass spyglass.
8. The villain vanished into thin air using a smoke bomb, then plotted a course across a star chart.
9. The villain soared over the railings with glider wings, then scouted the horizon with a brass spyglass.
10. The villain swung across the deck with a grapple hook, then checked coordinates on a solar compass.
11. The villain swung across the deck with a grapple hook, then plotted a course across a star chart.
12. The villain disrupted the sensors with a sound wave cannon, then scouted the horizon with a brass spyglass.

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TEACHER / PARENT

Answer Key

The Case of the Missing Star Crystal

Culprit: Mechanic Brody

Lightning Rod · Brass Spyglass · Wears Watch On Left Wrist · Sapphire Bandana · Strong Gusts

Trail: Start 21 → Clue 1 18 → Clue 2 13 → Clue 3 6 → Clue 4 4 → Clue 5 1

Clue 1 (Pythagorean theorem): "THE CULPRIT DID NOT USE A WIND GAUGE"

legs 18 and 24, hypotenuse = 30 (T) · legs 20 and 48, hypotenuse = 52 (N) · legs 16 and 30, hypotenuse = 34 (G) · legs 8 and 15, hypotenuse = 17 (E) · legs 36 and 105, hypotenuse = 111 (C) · legs 24 and 32, hypotenuse = 40 (R) · legs 18 and 80, hypotenuse = 82 (U) · legs 27 and 120, hypotenuse = 123 (O) · legs 28 and 96, hypotenuse = 100 (W) · legs 35 and 120, hypotenuse = 125 (D) · legs 40 and 42, hypotenuse = 58 (A) · legs 7 and 24, hypotenuse = 25 (I) · legs 24 and 45, hypotenuse = 51 (H) · legs 24 and 70, hypotenuse = 74 (P) · legs 6 and 8, hypotenuse = 10 (L) · legs 3 and 4, hypotenuse = 5 (S)

Clue 2 (Square roots): "THE SUSPECT WORE A WATCH ON THE LEFT WRIST"

sqrt(256) = 16 (T) · sqrt(324) = 18 (R) · sqrt(49) = 7 (I) · sqrt(100) = 10 (O) · sqrt(16) = 4 (H) · sqrt(361) = 19 (F) · sqrt(196) = 14 (S) · sqrt(4) = 2 (L) · sqrt(25) = 5 (U) · sqrt(625) = 25 (A) · sqrt(400) = 20 (P) · sqrt(121) = 11 (W) · sqrt(9) = 3 (C) · sqrt(144) = 12 (N) · sqrt(484) = 22 (E)

Clue 3 (Exponents): "THE VILLAIN WAS KNOCKED BACK BY STRONG GUSTS"

2^3 = 8 (T) · 2^5 = 32 (W) · 6^2 = 36 (S) · 5^3 = 125 (H) · 21^2 = 441 (Y) · 14^2 = 196 (G) · 10^2 = 100 (R) · 5^4 = 625 (B) · 5^2 = 25 (I) · 17^2 = 289 (K) · 4^4 = 256 (C) · 3^3 = 27 (O) · 15^2 = 225 (N) · 20^2 = 400 (D) · 7^2 = 49 (A) · 3^4 = 81 (V) · 18^2 = 324 (L) · 9^3 = 729 (U) · 3^5 = 243 (E)

Clue 4 (Order of operations): "THE SCENE HAD THREADS OF A SAPPHIRE BANDANA"

92 + 9 × 3 = 119 (T) · 79 + 6 × 5 = 109 (D) · 87 + 6 × 4 = 111 (S) · 83 + 2 × 7 = 97 (F) · 9 × 9 - 4 = 77 (O) · 9 × 6 - 30 = 24 (N) · 10 × 4 - 14 = 26 (A) · 10 × 5 - 9 = 41 (H) · 11 × 11 - 26 = 95 (C) · 47 + 9 × 7 = 110 (P) · 2 × 12 - 17 = 7 (B) · 4 + 2 × 2 = 8 (I) · 39 + 2 × 7 = 53 (R) · 15 + 5 × 8 = 55 (E)

Clue 5 (Square roots): surviving statement is box 7 → Mechanic Brody

sqrt(121) = 11 · sqrt(16) = 4 · sqrt(64) = 8 · sqrt(81) = 9 · sqrt(100) = 10 · sqrt(144) = 12 · sqrt(1) = 1 · sqrt(4) = 2 · sqrt(9) = 3 · sqrt(25) = 5 · sqrt(36) = 6