



The Sky-Loom Heist

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

Detective: _____ **Date:** _____

The floating sky-islands of Aethelgard are in deep trouble! The legendary Golden Astrolabe has been stolen from the Chief Cartographer's sky-tower. The thief escaped by airship, leaving a trail of high-tech gear and debris in the clouds. We have a list of suspects from the Aero-Explorer Guild, but we must use our mathematical detective skills to find 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 Sky Bandit is _____

Possible suspects

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

NAME	SKY-GEAR	SECONDARY TOOL	GOGGLE CHOICE	HAIR TINT	VULNERABILITY
Bessie Coleman	steam jetpack	smoke bombs	leather visor	sunset orange hair	dazed by bright light
Roald Amundsen	steam jetpack	net launcher	leather visor	storm grey hair	shorted by salt water
Jacques Cousteau	glider wings	net launcher	leather visor	sunset orange hair	dazed by bright light
Harriet Quimby	magnetic gloves	decoy drones	brass goggles	sunset orange hair	dazed by bright light
Isabella Bird	gravity boots	smoke bombs	brass goggles	sunset orange hair	dazed by bright light
Amelia Earhart	glider wings	smoke bombs	brass goggles	storm grey hair	dazed by bright light
Nellie Bly	magnetic gloves	smoke bombs	leather visor	neon blue hair	shorted by salt water
Alexander Humboldt	grapple launcher	stealth cloak	brass goggles	sunset orange hair	dazed by bright light
Ibnu Battuta	gravity boots	stealth cloak	leather visor	neon blue hair	clogged by dust
Ranulph Fiennes	gravity boots	smoke bombs	leather visor	storm grey hair	shorted by salt water
Sally Ride	steam jetpack	net launcher	leather visor	neon blue hair	dazed by bright light
Robert Peary	magnetic gloves	smoke bombs	brass goggles	storm grey hair	clogged by dust
Ferdinand Magellan	gravity boots	flash flares	brass goggles	storm grey hair	shorted by salt water
Thor Heyerdahl	gravity boots	net launcher	leather visor	sunset orange hair	dazed by bright light
Matthew Henson	gravity boots	net launcher	brass goggles	sunset orange hair	dazed by bright light
Leif Erikson	grapple launcher	decoy drones	brass goggles	sunset orange hair	shorted by salt water
Charles Lindbergh	gravity boots	flash flares	brass goggles	neon blue hair	clogged by dust
Marco Polo	grapple launcher	decoy drones	leather visor	storm grey hair	dazed by bright light
Jeanne Baret	magnetic gloves	net launcher	brass goggles	sunset orange hair	dazed by bright light
Yuri Gagarin	glider wings	smoke bombs	leather visor	sunset orange hair	clogged by dust
Sacagawea	grapple launcher	flash flares	leather visor	sunset orange hair	clogged by dust

CLUE 1

Pythagorean theorem

To trace the escape path across the sky, we calculated the direct diagonal shortcut between the two floating docks using a right-triangle map.

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

T			T											T				
39	82	13	39	82	111	13	52	74	26	13	30	125	26	39	50	30	13	15
	T				T													
30	39	13	15	123	39	82	34	123	26	15	65							

legs 15 and 36, hypotenuse = → **T**

legs 20 and 48, hypotenuse = → **F**

legs 18 and 80, hypotenuse = → **H**

legs 27 and 120, hypotenuse = → **L**

legs 16 and 30, hypotenuse = → **C**

legs 36 and 105, hypotenuse = → **I**

legs 35 and 120, hypotenuse = → **N**

legs 10 and 24, hypotenuse = → **O**

legs 14 and 48, hypotenuse = → **U**

legs 5 and 12, hypotenuse = → **E**

legs 18 and 24, hypotenuse = → **S**

legs 9 and 12, hypotenuse = → **A**

legs 25 and 60, hypotenuse = → **K**

legs 24 and 70, hypotenuse = → **D**

Scratch space:

CLUE 2 Square roots

The bandit ran across a square landing grid, and we had to work backward from its total area to find the exact side length of their footprints.

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

T								T									
18	9	6	15	24	6	23	18	20	19	8	6	10	8	15	25	25	
									T	T							
24	19	24	24	16	6	25	15	18	18	9	6	25	21	6	23	6	

$$\sqrt{324} = \square \rightarrow \boxed{\text{T}}$$

$$\sqrt{81} = \square \rightarrow \boxed{\text{H}}$$

$$\sqrt{64} = \square \rightarrow \boxed{\text{R}}$$

$$\sqrt{576} = \square \rightarrow \boxed{\text{G}}$$

$$\sqrt{256} = \square \rightarrow \boxed{\text{L}}$$

$$\sqrt{529} = \square \rightarrow \boxed{\text{N}}$$

$$\sqrt{100} = \square \rightarrow \boxed{\text{B}}$$

$$\sqrt{36} = \square \rightarrow \boxed{\text{E}}$$

$$\sqrt{400} = \square \rightarrow \boxed{\text{W}}$$

$$\sqrt{625} = \square \rightarrow \boxed{\text{S}}$$

$$\sqrt{225} = \square \rightarrow \boxed{\text{A}}$$

$$\sqrt{361} = \square \rightarrow \boxed{\text{O}}$$

$$\sqrt{441} = \square \rightarrow \boxed{\text{C}}$$

Scratch space:

CLUE 3 Exponents

The rogue used a signal jammer that doubled its power with every extra antenna, forcing us to calculate the exponential strength of the signal.

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

T																	
16	4	128	216	625	256	361	128	25	32	324	100	32	49	128	100	196	27
					T										T		
196	216	125	256	4	16	225	81	32	324	4	81	125	256	4	16		

$4^2 = \square \rightarrow$ T	$14^2 = \square \rightarrow$ B	$2^8 = \square \rightarrow$ G	$3^4 = \square \rightarrow$ L
$18^2 = \square \rightarrow$ S	$2^2 = \square \rightarrow$ H	$5^2 = \square \rightarrow$ W	$2^5 = \square \rightarrow$ A
$10^2 = \square \rightarrow$ D	$5^4 = \square \rightarrow$ O	$15^2 = \square \rightarrow$ F	$2^7 = \square \rightarrow$ E
$19^2 = \square \rightarrow$ U	$7^2 = \square \rightarrow$ Z	$3^3 = \square \rightarrow$ Y	$6^3 = \square \rightarrow$ R
$5^3 = \square \rightarrow$ I			

Scratch space:

CLUE 4 Order of operations

We found a locked security terminal on the airship deck where we had to solve the nested formulas in the exact sequence to unlock the logbook.

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

S			S														
105	45	37	105	101	10	112	42	85	37	32	101	6	85	17	42		

S						S											
105	10	42	85	37	39	105	18	101	42	101	65	101	96	10			

79	101	6	17	37	39												

$93 + 6 \times 2 = \square \rightarrow$ S	$20 + 4 \times 3 = \square \rightarrow$ G	$7 \times 5 - 25 = \square \rightarrow$ T
$2 + 2 \times 2 = \square \rightarrow$ H	$6 \times 11 - 21 = \square \rightarrow$ U	$81 + 5 \times 3 = \square \rightarrow$ F
$9 \times 9 - 16 = \square \rightarrow$ L	$9 + 2 \times 4 = \square \rightarrow$ I	$18 + 4 \times 6 = \square \rightarrow$ R
$23 + 8 \times 2 = \square \rightarrow$ D	$50 + 7 \times 5 = \square \rightarrow$ A	$33 + 2 \times 2 = \square \rightarrow$ N
$10 \times 11 - 9 = \square \rightarrow$ E	$3 \times 8 - 6 = \square \rightarrow$ W	$77 + 5 \times 7 = \square \rightarrow$ O
$61 + 6 \times 3 = \square \rightarrow$ B		

Scratch space:

CLUE 5**Square roots - the last clue**

To measure the blast radius of the escape engine, we calculated the square root of the blackened zone to find the safe scanning boundary.

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:

$\text{sqrt}(36) = \boxed{}$

$\text{sqrt}(100) = \boxed{}$

$\text{sqrt}(121) = \boxed{}$

$\text{sqrt}(144) = \boxed{}$

$\text{sqrt}(1) = \boxed{}$

$\text{sqrt}(25) = \boxed{}$

$\text{sqrt}(81) = \boxed{}$

$\text{sqrt}(9) = \boxed{}$

$\text{sqrt}(64) = \boxed{}$

$\text{sqrt}(4) = \boxed{}$

$\text{sqrt}(49) = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain charged up their magnetic gloves, then tossed distracting flash flares.
2. The villain activated their gravity boots, then escaped under a stealth cloak.
3. The villain activated their gravity boots, then tossed distracting flash flares.
4. The villain activated their gravity boots, then dropped blinding smoke bombs.
5. The villain charged up their magnetic gloves, then escaped under a stealth cloak.
6. The villain charged up their magnetic gloves, then disabled the guards with a net launcher.
7. The villain unfurled their glider wings, then escaped under a stealth cloak.
8. The villain unfurled their glider wings, then deployed several decoy drones.
9. The villain fired up their steam jetpack, then dropped blinding smoke bombs.
10. The villain charged up their magnetic gloves, then deployed several decoy drones.
11. The villain activated their gravity boots, then disabled the guards with a net launcher.
12. The villain fired their grapple launcher, then tossed distracting flash flares.

Answer Key

The Sky-Loom Heist

Culprit: Isabella Bird

gravity boots · smoke bombs · brass goggles · sunset orange hair · dazed by bright light

Trail: Start 21 → Clue 1 19 → Clue 2 9 → Clue 3 5 → Clue 4 4 → Clue 5 1

Clue 1 (Pythagorean theorem): "THE THIEF DOES NOT USE A STEALTH CLOAK"

legs 15 and 36, hypotenuse = 39 (T) · legs 20 and 48, hypotenuse = 52 (F) · legs 18 and 80, hypotenuse = 82 (H) · legs 27 and 120, hypotenuse = 123 (L) · legs 16 and 30, hypotenuse = 34 (C) · legs 36 and 105, hypotenuse = 111 (I) · legs 35 and 120, hypotenuse = 125 (N) · legs 10 and 24, hypotenuse = 26 (O) · legs 14 and 48, hypotenuse = 50 (U) · legs 5 and 12, hypotenuse = 13 (E) · legs 18 and 24, hypotenuse = 30 (S) · legs 9 and 12, hypotenuse = 15 (A) · legs 25 and 60, hypotenuse = 65 (K) · legs 24 and 70, hypotenuse = 74 (D)

Clue 2 (Square roots): "THE AGENT WORE BRASS GOGGLES AT THE SCENE"

$\sqrt{324} = 18$ (T) · $\sqrt{81} = 9$ (H) · $\sqrt{64} = 8$ (R) · $\sqrt{576} = 24$ (G) · $\sqrt{256} = 16$ (L) · $\sqrt{529} = 23$ (N) · $\sqrt{100} = 10$ (B) · $\sqrt{36} = 6$ (E) · $\sqrt{400} = 20$ (W) · $\sqrt{625} = 25$ (S) · $\sqrt{225} = 15$ (A) · $\sqrt{361} = 19$ (O) · $\sqrt{441} = 21$ (C)

Clue 3 (Exponents): "THE ROGUE WAS DAZED BY BRIGHT FLASH LIGHT"

$4^2 = 16$ (T) · $14^2 = 196$ (B) · $2^8 = 256$ (G) · $3^4 = 81$ (L) · $18^2 = 324$ (S) · $2^2 = 4$ (H) · $5^2 = 25$ (W) · $2^5 = 32$ (A) · $10^2 = 100$ (D) · $5^4 = 625$ (O) · $15^2 = 225$ (F) · $2^7 = 128$ (E) · $19^2 = 361$ (U) · $7^2 = 49$ (Z) · $3^3 = 27$ (Y) · $6^3 = 216$ (R) · $5^3 = 125$ (I)

Clue 4 (Order of operations): "SUNSET ORANGE HAIR STRANDS WERE LEFT BEHIND"

$93 + 6 \times 2 = 105$ (S) · $20 + 4 \times 3 = 32$ (G) · $7 \times 5 - 25 = 10$ (T) · $2 + 2 \times 2 = 6$ (H) · $6 \times 11 - 21 = 45$ (U) · $81 + 5 \times 3 = 96$ (F) · $9 \times 9 - 16 = 65$ (L) · $9 + 2 \times 4 = 17$ (I) · $18 + 4 \times 6 = 42$ (R) · $23 + 8 \times 2 = 39$ (D) · $50 + 7 \times 5 = 85$ (A) · $33 + 2 \times 2 = 37$ (N) · $10 \times 11 - 9 = 101$ (E) · $3 \times 8 - 6 = 18$ (W) · $77 + 5 \times 7 = 112$ (O) · $61 + 6 \times 3 = 79$ (B)

Clue 5 (Square roots): surviving statement is box 4 → Isabella Bird

$\sqrt{36} = 6$ · $\sqrt{100} = 10$ · $\sqrt{121} = 11$ · $\sqrt{144} = 12$ · $\sqrt{1} = 1$ · $\sqrt{25} = 5$ · $\sqrt{81} = 9$ · $\sqrt{9} = 3$ · $\sqrt{64} = 8$ · $\sqrt{4} = 2$ · $\sqrt{49} = 7$