



The Theft of the Heart Pearl

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

Detective: _____ Date: _____

The shimmering Coral Vault has been looted, and the precious Great Heart Pearl is gone. A rogue mer-scout was seen escaping into the deep kelp forest, leaving behind traces of unique ocean magic and distinct physical clues. We must track them down before they cross the open ocean.

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 mer-scout is _____

Possible suspects

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

NAME	PRIMARY MAGIC	SPECIALIZED GEAR	SWIMMING STYLE	TAIL FIN COLOR	MAGIC ALLERGY
Ariel	whale-whispering	conch horn	right-finned stroke	crimson coral	silver-kelp
Thalassa	bioluminescence	sea-glass dagger	right-finned stroke	seafoam green	silver-kelp
Rikki	bioluminescence	prism shell	left-finned stroke	crimson coral	silver-kelp
Madison	coral-shaping	conch horn	right-finned stroke	shimmering violet	sunlight-magic
Lyla	coral-shaping	sea-glass dagger	right-finned stroke	seafoam green	silver-kelp
Syrena	tide-calling	kelp lasso	left-finned stroke	crimson coral	sunlight-magic
Undine	tide-calling	kelp lasso	right-finned stroke	crimson coral	sunlight-magic
Cleo	current-weaving	prism shell	left-finned stroke	crimson coral	deep-salt
Melusine	whale-whispering	conch horn	right-finned stroke	shimmering violet	sunlight-magic
Coralia	bioluminescence	kelp lasso	left-finned stroke	shimmering violet	silver-kelp
Muriel	current-weaving	sea-glass dagger	left-finned stroke	crimson coral	silver-kelp
Emma	current-weaving	sea-glass dagger	left-finned stroke	crimson coral	sunlight-magic
Delphine	coral-shaping	pearl compass	left-finned stroke	shimmering violet	sunlight-magic
Marina	current-weaving	sea-glass dagger	left-finned stroke	seafoam green	sunlight-magic
Mako	bioluminescence	conch horn	left-finned stroke	seafoam green	sunlight-magic
Oceanus	bioluminescence	pearl compass	right-finned stroke	crimson coral	sunlight-magic
Nerida	coral-shaping	prism shell	right-finned stroke	crimson coral	deep-salt
Nereus	tide-calling	prism shell	right-finned stroke	crimson coral	sunlight-magic
Caspian	coral-shaping	conch horn	right-finned stroke	crimson coral	sunlight-magic
Kai	current-weaving	sea-glass dagger	right-finned stroke	seafoam green	sunlight-magic
Triton	tide-calling	pearl compass	right-finned stroke	crimson coral	sunlight-magic

CLUE 1

Pythagorean theorem

To map the suspect's escape route across the reef, we must calculate the diagonal distance between the ancient shipwreck and the blue hole using our coordinate trackers.

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

T			T											T				
50	17	65	50	17	52	65	123	15	74	65	26	30	74	50	17	13	37	65
13	40	116	52	26	68	26	17	65	29	29								

legs 14 and 48, hypotenuse = → **T**

legs 8 and 15, hypotenuse = → **H**

legs 9 and 12, hypotenuse = → **D**

legs 5 and 12, hypotenuse = → **A**

legs 25 and 60, hypotenuse = → **E**

legs 12 and 35, hypotenuse = → **V**

legs 10 and 24, hypotenuse = → **S**

legs 32 and 60, hypotenuse = → **M**

legs 27 and 120, hypotenuse = → **F**

legs 80 and 84, hypotenuse = → **R**

legs 20 and 48, hypotenuse = → **I**

legs 24 and 32, hypotenuse = → **P**

legs 20 and 21, hypotenuse = → **L**

legs 24 and 70, hypotenuse = → **O**

legs 18 and 24, hypotenuse = → **N**

Scratch space:

CLUE 2 Square roots

The guards found a square formation of glowing jellyfish blocking the eastern trench. Finding the side length of this square array reveals the thief's next clue.

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

T									T									T	
22	4	15	6	11	6	16	15	24	22	6	13	18	19	6	13	18	22	4	
					T								T						
5	20	18	14	4	22	17	18	10	10	15	7	6	22	20	9	3	15		

$\text{sqrt}(484) = \square \rightarrow \text{T}$	$\text{sqrt}(16) = \square \rightarrow \text{H}$	$\text{sqrt}(100) = \square \rightarrow \text{N}$
$\text{sqrt}(36) = \square \rightarrow \text{S}$	$\text{sqrt}(49) = \square \rightarrow \text{D}$	$\text{sqrt}(289) = \square \rightarrow \text{F}$
$\text{sqrt}(361) = \square \rightarrow \text{M}$	$\text{sqrt}(169) = \square \rightarrow \text{W}$	$\text{sqrt}(196) = \square \rightarrow \text{G}$
$\text{sqrt}(9) = \square \rightarrow \text{K}$	$\text{sqrt}(400) = \square \rightarrow \text{R}$	$\text{sqrt}(324) = \square \rightarrow \text{I}$
$\text{sqrt}(576) = \square \rightarrow \text{C}$	$\text{sqrt}(81) = \square \rightarrow \text{O}$	$\text{sqrt}(256) = \square \rightarrow \text{P}$
$\text{sqrt}(25) = \square \rightarrow \text{A}$	$\text{sqrt}(121) = \square \rightarrow \text{U}$	$\text{sqrt}(225) = \square \rightarrow \text{E}$

Scratch space:

CLUE 3

Exponents

The magical energy ripples outward, doubling in power with every league it travels. Calculating the exponential growth of these waves helps us pinpoint the source.

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

V																		
256	125	243	243	169	125	8	361	243	144	144	16	361	625	484	216			
27	625	125	512	289	32	16	343	8	243	125	512	289	32	216	169	512	125	441

$16^2 = \square \rightarrow \text{V}$

$5^3 = \square \rightarrow \text{I}$

$2^3 = \square \rightarrow \text{N}$

$13^2 = \square \rightarrow \text{A}$

$19^2 = \square \rightarrow \text{F}$

$3^5 = \square \rightarrow \text{L}$

$21^2 = \square \rightarrow \text{C}$

$2^9 = \square \rightarrow \text{G}$

$7^3 = \square \rightarrow \text{U}$

$3^3 = \square \rightarrow \text{B}$

$6^3 = \square \rightarrow \text{M}$

$4^2 = \square \rightarrow \text{S}$

$17^2 = \square \rightarrow \text{H}$

$5^4 = \square \rightarrow \text{R}$

$22^2 = \square \rightarrow \text{O}$

$2^5 = \square \rightarrow \text{T}$

$12^2 = \square \rightarrow \text{E}$

Scratch space:

CLUE 4

Order of operations

We discovered a locked sea-chest belonging to the suspect. The key combination requires us to solve the tidal equations in the exact, ancient order of the seas.

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

C							C										
19	77	50	31	83	115	94	19	115	77	68	33	72	33	68	77	67	83
57	67	77	67	33	67	72	37	50	94	37	101	67	83	68	94	84	

$4 \times 9 - 17 = \square \rightarrow \boxed{\text{C}}$

$86 + 3 \times 5 = \square \rightarrow \boxed{\text{H}}$

$9 \times 10 - 13 = \square \rightarrow \boxed{\text{R}}$

$9 \times 10 - 6 = \square \rightarrow \boxed{\text{D}}$

$10 \times 9 - 18 = \square \rightarrow \boxed{\text{F}}$

$3 \times 12 - 5 = \square \rightarrow \boxed{\text{M}}$

$19 + 6 \times 8 = \square \rightarrow \boxed{\text{E}}$

$53 + 5 \times 6 = \square \rightarrow \boxed{\text{S}}$

$42 + 3 \times 5 = \square \rightarrow \boxed{\text{W}}$

$21 + 2 \times 6 = \square \rightarrow \boxed{\text{L}}$

$9 \times 7 - 13 = \square \rightarrow \boxed{\text{I}}$

$59 + 7 \times 5 = \square \rightarrow \boxed{\text{N}}$

$12 \times 11 - 17 = \square \rightarrow \boxed{\text{O}}$

$36 + 8 \times 4 = \square \rightarrow \boxed{\text{A}}$

$29 + 4 \times 2 = \square \rightarrow \boxed{\text{T}}$

Scratch space:

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

A square patch of ocean floor has been swept clean of sand. Determining the root dimensions of this cleared zone gives us the final coordinate of the suspect's hideout.

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:

$\sqrt{4} = \boxed{}$

$\sqrt{81} = \boxed{}$

$\sqrt{100} = \boxed{}$

$\sqrt{25} = \boxed{}$

$\sqrt{121} = \boxed{}$

$\sqrt{64} = \boxed{}$

$\sqrt{144} = \boxed{}$

$\sqrt{16} = \boxed{}$

$\sqrt{49} = \boxed{}$

$\sqrt{9} = \boxed{}$

$\sqrt{1} = \boxed{}$

Step 2 - cross out the sentence with each answer:

1. The villain summons a massive undercurrent, then cuts through nets with a sea-glass dagger.
2. The villain shapes a barrier of sharp coral, then signals allies with a conch horn.
3. The villain whispers to a pod of blue whales, then cuts through nets with a sea-glass dagger.
4. The villain shapes a barrier of sharp coral, then cuts through nets with a sea-glass dagger.
5. The villain summons a massive undercurrent, then blinds pursuers with a prism shell.
6. The villain calls down a rushing high tide, then navigates home using a pearl compass.
7. The villain calls down a rushing high tide, then signals allies with a conch horn.
8. The villain summons a massive undercurrent, then escapes using a kelp lasso.
9. The villain lights up the dark water with bioluminescence, then navigates home using a pearl compass.
10. The villain calls down a rushing high tide, then escapes using a kelp lasso.
11. The villain shapes a barrier of sharp coral, then blinds pursuers with a prism shell.
12. The villain shapes a barrier of sharp coral, then escapes using a kelp lasso.

Answer Key

The Theft of the Heart Pearl

Culprit: Triton

tide-calling · pearl compass · right-finned stroke · crimson coral · sunlight-magic

Trail: Start 21 → Clue 1 17 → Clue 2 10 → Clue 3 7 → Clue 4 4 → Clue 5 1

Clue 1 (Pythagorean theorem): "THE THIEF DOES NOT HAVE A PRISM SHELL"

legs 14 and 48, hypotenuse = 50 (T) · legs 8 and 15, hypotenuse = 17 (H) · legs 9 and 12, hypotenuse = 15 (D) · legs 5 and 12, hypotenuse = 13 (A) · legs 25 and 60, hypotenuse = 65 (E) · legs 12 and 35, hypotenuse = 37 (V) · legs 10 and 24, hypotenuse = 26 (S) · legs 32 and 60, hypotenuse = 68 (M) · legs 27 and 120, hypotenuse = 123 (F) · legs 80 and 84, hypotenuse = 116 (R) · legs 20 and 48, hypotenuse = 52 (I) · legs 24 and 32, hypotenuse = 40 (P) · legs 20 and 21, hypotenuse = 29 (L) · legs 24 and 70, hypotenuse = 74 (O) · legs 18 and 24, hypotenuse = 30 (N)

Clue 2 (Square roots): "THE SUSPECT SWIMS WITH A RIGHT FINNED STROKE"

$\sqrt{484} = 22$ (T) · $\sqrt{16} = 4$ (H) · $\sqrt{100} = 10$ (N) · $\sqrt{36} = 6$ (S) · $\sqrt{49} = 7$ (D) · $\sqrt{289} = 17$ (F) · $\sqrt{361} = 19$ (M) · $\sqrt{169} = 13$ (W) · $\sqrt{196} = 14$ (G) · $\sqrt{9} = 3$ (K) · $\sqrt{400} = 20$ (R) · $\sqrt{324} = 18$ (I) · $\sqrt{576} = 24$ (C) · $\sqrt{81} = 9$ (O) · $\sqrt{256} = 16$ (P) · $\sqrt{25} = 5$ (A) · $\sqrt{121} = 11$ (U) · $\sqrt{225} = 15$ (E)

Clue 3 (Exponents): "VILLAIN FLEES FROM BRIGHT SUNLIGHT MAGIC"

$16^2 = 256$ (V) · $5^3 = 125$ (I) · $2^3 = 8$ (N) · $13^2 = 169$ (A) · $19^2 = 361$ (F) · $3^5 = 243$ (L) · $21^2 = 441$ (C) · $2^9 = 512$ (G) · $7^3 = 343$ (U) · $3^3 = 27$ (B) · $6^3 = 216$ (M) · $4^2 = 16$ (S) · $17^2 = 289$ (H) · $5^4 = 625$ (R) · $22^2 = 484$ (O) · $2^5 = 32$ (T) · $12^2 = 144$ (E)

Clue 4 (Order of operations): "CRIMSON CORAL FLARES WERE LEFT IN THE SAND"

$4 \times 9 - 17 = 19$ (C) · $86 + 3 \times 5 = 101$ (H) · $9 \times 10 - 13 = 77$ (R) · $9 \times 10 - 6 = 84$ (D) · $10 \times 9 - 18 = 72$ (F) · $3 \times 12 - 5 = 31$ (M) · $19 + 6 \times 8 = 67$ (E) · $53 + 5 \times 6 = 83$ (S) · $42 + 3 \times 5 = 57$ (W) · $21 + 2 \times 6 = 33$ (L) · $9 \times 7 - 13 = 50$ (I) · $59 + 7 \times 5 = 94$ (N) · $12 \times 11 - 17 = 115$ (O) · $36 + 8 \times 4 = 68$ (A) · $29 + 4 \times 2 = 37$ (T)

Clue 5 (Square roots): surviving statement is box 6 → Triton

$\sqrt{4} = 2$ · $\sqrt{81} = 9$ · $\sqrt{100} = 10$ · $\sqrt{25} = 5$ · $\sqrt{121} = 11$ · $\sqrt{64} = 8$ · $\sqrt{144} = 12$ · $\sqrt{16} = 4$ · $\sqrt{49} = 7$ · $\sqrt{9} = 3$ · $\sqrt{1} = 1$