The Backlot Blackout

Whodunnit? · Quadratic Functions & Complex Numbers Name: _____

Starlight Studios was celebrating its hundredth birthday with a premiere on the old backlot. At nine o'clock a power surge plunged the whole lot into darkness for ninety seconds, and when the floodlights flickered back on, the glass case on Soundstage 4 was empty. The **Golden Reel**, the studio's very first film canister and its most treasured possession, was gone!

Six people had a backstage pass that night, each was seen working in a different corner of the lot, and there are six clever ways to smuggle a film can past the security gate. You are the lead detective. Find out **who** took it, **where** they were, and **how** they got it away.

How to crack the case

1. Your teacher will post **10 clue cards** around the room. Each card has a math problem and four answer choices. Every choice is paired with a clue.
2. Solve the problem on the **Show Your Work** page. Find your answer among the choices and read the clue next to it. If your answer is not there, check your work.
3. Use the clue to cross out suspects, places or methods on the case board below. Write the card number beside what it cleared.
4. After all 10 cards, exactly one suspect, one place and one method are left. Those three boxes name the culprit. If you end up with none, or more than one, a clue went wrong: recheck your math!

The Suspects	The Places	The Methods
☐ Marguerite Vance Film Director	☐ Editing Bay	☐ Hidden in a camera case
☐ Dashiell Cole Stunt Coordinator	☐ Prop Warehouse	☐ Swapped for an empty film can
☐ Winston Hale Studio Executive	☐ Costume Shop	☐ Rolled inside a costume trunk
☐ Ines Okafor Costume Designer	☐ Western Street Set	☐ Taped under a director's chair
☐ Bartholomew Pike Set Builder	☐ Commissary	☐ Packed in a prop treasure chest
☐ Lila Quintero Lead Actress	☐ Projection Booth	☐ Carried out in a popcorn tub

The culprit is _____ in _____ using _____

Show Your Work

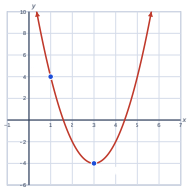
The Backlot Blackout · Show every step in the matching box. Name: _____

1. Choice _____	**2.** Choice _____
3. Choice _____	**4.** Choice _____
5. Choice _____	**6.** Choice _____
7. Choice _____	**8.** Choice _____
9. Choice _____	**10.** Choice _____

Clue #1

The Backlot Blackout

The graph shows a parabola. Its vertex and one other point are labeled. Write its equation in vertex form, $y = a(x - h)^2 + k$.



A. $y = 2(x - 3)^2 - 4$	Marguerite Vance was reviewing the day's footage in the Editing Bay. The editor's keycard log shows her inside for the entire hour.
B. $y = 2(x + 3)^2 - 4$	Winston Hale was watching a rough cut in the Editing Bay. The film editor says he never left his seat.
C. $y = 2(x - 3)^2 + 4$	Marguerite Vance was counting reels in the Prop Warehouse. The inventory clerk has her initials on the sheet at that minute.
D. $y = -4(x - 3)^2 - 4$	The prop treasure chest was pried open on the loading dock. It held only plastic doubloons and a rubber parrot.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

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Clue #2

The Backlot Blackout

Complete the square to find the vertex of the parabola. Write the vertex as an ordered pair.

$$y = 2x^2 + 6x + 1$$

A. $(\frac{3}{2}, -\frac{7}{2})$	Winston Hale was admiring a gown in the Costume Shop. The tailor chatted with him until the lights came back.
B. $(-3, 1)$	Security opened the treasure chest from the pirate set. It was lined with velvet and completely empty.
C. $(-\frac{3}{2}, -\frac{7}{2})$	The camera case was opened at the security gate. It held only lenses, a tripod plate and a crumpled lunch napkin.
D. $(-\frac{3}{2}, -\frac{5}{4})$	Dashiell Cole was checking out sword props in the Prop Warehouse. The sign-out sheet has his name in green ink.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

Clue #3

The Backlot Blackout

Solve with the quadratic formula. Give the exact solutions in simplest radical form.

$$3x^2 - 6x - 2 = 0$$

A. $x = 6 \pm \frac{\sqrt{15}}{3}$	Ines Okafor was returning a hat box to the Prop Warehouse. The librarian stamped her return slip at that moment.
B. $x = \frac{6 \pm 2\sqrt{15}}{3}$	Every prop treasure chest on the lot was tipped over and shaken. Only gold-painted rocks fell out.
C. $x = \frac{3 \pm \sqrt{3}}{3}$	Winston Hale was sitting in the grandstand on the Western Street Set. Three extras say he never moved.
D. $x = \frac{3 \pm \sqrt{15}}{3}$	Dashiell Cole was rehearsing a horse chase on the Western Street Set. Eight stunt riders and a wrangler saw him the whole time.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

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Clue #4

The Backlot Blackout

Use the discriminant to decide how many solutions the equation has and whether they are real or complex.

$$4x^2 - 12x + 9 = 0$$

A. two real solutions	Winston Hale was buying a sandwich at the Commissary. The cashier remembers him because he paid in coins.
B. no solutions	The treasure chest from the pirate set was weighed at the gate. It matched its listed weight exactly, so nothing was inside.
C. one real solution (a repeated root)	The empty film can sat on its archive shelf, still sealed with the vault's numbered tape. Nobody swapped it.
D. two complex solutions	Bartholomew Pike was nailing crates together in the Prop Warehouse. A forklift driver waved to him through the window.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

Clue #5

The Backlot Blackout

Write the expression in **a + bi** form.

$$(3 - 2i)(4 + 5i) + i^{27}$$

A. $2 + 6i$	A crew member x-rayed the prop treasure chest at the clinic. The scan showed wood and nails and nothing else.
B. $22 + 6i$	Ines Okafor was hemming a velvet cape in the Costume Shop. The seamstress next to her signed the work order at that minute.
C. $22 + 8i$	Winston Hale was watching dailies in the Projection Booth. The projectionist wrote his name in the visitor log.
D. $21 + 7i$	Lila Quintero was rehearsing a scene in the Prop Warehouse. The stage manager timed her through the whole blackout.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

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Clue #6

The Backlot Blackout

Divide. Write the quotient in **a + bi** form with real and imaginary parts as fractions.

$$\frac{7 + i}{2 - 3i}$$

A. $\frac{11}{13} + 23i$	Marguerite Vance was picking out a candlestick in the Prop Warehouse. The prop master saw her there the entire hour.
B. $-\frac{11}{5} - \frac{23}{5}i$	Winston Hale was giving notes to the editor in the Editing Bay. The editor typed every word into the project log.
C. $\frac{17}{13} - \frac{19}{13}i$	The big treasure chest from the pirate scene was unlocked and emptied. It contained only crumpled newspaper.
D. $\frac{11}{13} + \frac{23}{13}i$	Every costume trunk was unpacked on the lawn. Only capes, top hats and a feather boa came out.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

Clue #7

The Backlot Blackout

Solve over the complex numbers. Write both solutions in **a + bi** form.

$$2x^2 + 4x + 5 = 0$$

A. $x = 1 \pm \frac{\sqrt{6}}{2}i$	Police opened the treasure chest with a crowbar. Inside were sandbags and one very surprised mouse.
B. $x = -1 \pm \frac{\sqrt{6}}{2}i$	Bartholomew Pike was eating chili at the Commissary. The cashier's receipt is stamped with the exact time of the blackout.
C. $x = -1 \pm \frac{\sqrt{14}}{2}$	Dashiell Cole was loading a stunt wagon in the Prop Warehouse. The truck driver who helped him signed a receipt.
D. $x = -2 \pm i\sqrt{6}$	Winston Hale was trying on a top hat in the Costume Shop. A seamstress took two photos of him at that very minute.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

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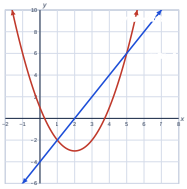
Clue #8

The Backlot Blackout

Find every point where the line meets the parabola. Write the points as ordered pairs.

$$y = x^2 - 4x + 1$$

$$y = 2x - 4$$



A. (1, −2) and (5, 6)	Each director's chair was flipped over and checked. Nothing was taped underneath any of them.
B. (−1, −6) and (−5, −14)	Winston Hale was shaking hands on the Western Street Set. The photographer has him in picture after picture.
C. (5, 6)	Ines Okafor was hanging a costume on a rack in the Prop Warehouse. The clerk logged her entry just before the blackout.
D. (−2, 1) and (6, 5)	The prop treasure chest was dusted for prints and searched by hand. Not a thing was hidden inside.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

Clue #9

The Backlot Blackout

Solve the inequality. Write your answer in interval notation.

$$2x^2 - 5x - 3 \leq 0$$

A. $[-\frac{1}{2}, 3]$	Lila Quintero was running her lines in the Projection Booth. The projectionist's logbook has her signature across the hour.
B. $(-\frac{1}{2}, 3)$	Bartholomew Pike was sanding a tabletop in the Prop Warehouse. Two apprentices worked beside him the entire time.
C. $(-\infty, -\frac{1}{2}] \cup [3, \infty)$	Winston Hale was sharing a booth with a reporter in the Commissary. The reporter's recording has his voice the whole hour.
D. $[-3, \frac{1}{2}]$	A crew member lifted the lid on the prop treasure chest. It was packed with foam peanuts and nothing else.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.

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Clue #10

The Backlot Blackout

A film crew fires a confetti canister straight up from a 64-foot soundstage roof. Its height in feet after t seconds is $h = -16t^2 + 48t + 64$. How many seconds after launch does the canister hit the ground?

Ground level is $h = 0$

A. -1 seconds	Lila Quintero was signing autographs in the Prop Warehouse. A line of fans waited in front of her for an hour.
B. 1.5 seconds	Winston Hale was sipping tea in the Projection Booth. The projectionist poured it and noted the time.
C. 100 seconds	The treasure chest was carried to the sound stage and opened for the cameras. It was empty except for a fake map.
D. 4 seconds	The giant premiere popcorn tubs were emptied onto a tarp. There was nothing in them but popcorn.

Solve the problem, find your answer, and read its clue. Cross it off on your case board.