

NAME: _____

A2.A.25: Solve quadratic equations, using the quadratic formula

1. 080718b, P.I. A2.A.25
Which equation has the complex number $4 - 3i$ as a root?

[A] $x^2 + 8x - 25 = 0$ [B] $x^2 - 6x + 25 = 0$
[C] $x^2 + 6x - 25 = 0$ [D] $x^2 - 8x + 25 = 0$
2. 010714b, P.I. A2.A.25
Which quadratic equation has the roots $3 + i$ and $3 - i$?

[A] $x^2 + 6x + 8 = 0$ [B] $x^2 - 6x + 10 = 0$
[C] $x^2 + 6x - 10 = 0$ [D] $x^2 - 6x - 8 = 0$
3. 010222b, P.I. A2.A.25
Solve for x in simplest $a + bi$ form:
 $x^2 + 8x + 25 = 0$
4. 080328b, P.I. A2.A.25
Express, in simplest $a + bi$ form, the roots of the equation $x^2 + 5 = 4x$.
5. 010931b, P.I. A2.A.25
Find the roots of the equation $x^2 + 7 = 2x$ and express your answer in simplest $a + bi$ form.
6. fall9928b, P.I. A2.A.25
Solve the equation $x^2 = 6x - 12$ and express the roots in simplest $a + bi$ form.
7. 010627b, P.I. A2.A.25
In physics class, Taras discovers that the behavior of electrical power, x , in a particular circuit can be represented by the function $f(x) = x^2 + 2x + 7$. If $f(x) = 0$, solve the equation and express your answer in simplest $a + bi$ form.
8. 080634b, P.I. A2.A.25
Barb pulled the plug in her bathtub and it started to drain. The amount of water in the bathtub as it drains is represented by the equation $L = -5t^2 - 8t + 120$, where L represents the number of liters of water in the bathtub and t represents the amount of time, in minutes, since the plug was pulled. How many liters of water were in the bathtub when Barb pulled the plug? Show your reasoning. Determine, to the *nearest tenth of a minute*, the amount of time it takes for all the water in the bathtub to drain.
9. 010729b, P.I. A2.A.25
Matt's rectangular patio measures 9 feet by 12 feet. He wants to increase the patio's dimensions so its area will be twice the area it is now. He plans to increase both the length and the width by the same amount, x . Find x , to the *nearest hundredth of a foot*.
10. 060128b, P.I. A2.A.25
A homeowner wants to increase the size of a rectangular deck that now measures 15 feet by 20 feet, but building code laws state that a homeowner cannot have a deck larger than 900 square feet. If the length and the width are to be increased by the same amount, find, to the *nearest tenth*, the maximum number of feet that the length of the deck may be increased in size legally.
11. 080727b, P.I. A2.A.25
A rectangular patio measuring 6 meters by 8 meters is to be increased in size to an area measuring 150 square meters. If both the width and the length are to be increased by the same amount, what is the number of meters, to the *nearest tenth*, that the dimensions will be increased?

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[1] D

[2] B

[2] $-4 \pm 3i$, and appropriate work is shown.

[1] The quadratic formula is used correctly, but one computational error is made.

or [1] $\frac{-8 \pm 6i}{2}$, but appropriate work is shown.

or [1] $-4 \pm 3i$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[3] incorrect procedure.

[4] $2 \pm i$, and appropriate work is shown.

[3] Appropriate work is shown, but one computational error is made, but the result is expressed as a complex number in simplest $a + bi$ form.

or [3] Appropriate work is shown, but the roots are not expressed in simplest $a + bi$ form.

or [3] Appropriate work is shown, but only one complex root, in simplest $a + bi$ form, is found.

[2] Appropriate work is shown, but one computational error is made, resulting in a solution that is not a complex number.

or [2] Appropriate work is shown, but two or more computational errors are made, but the result is expressed as a complex number in simplest $a + bi$ form.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] An incorrect quadratic formula is used, but the result is expressed as a complex number in simplest $a + bi$ form.

[1] Incorrect substitution is made into the quadratic formula, such as $a = 1$, $b = 5$, and $c = -4$, but the resulting equation is solved appropriately.

or [1] $2 \pm i$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[4] incorrect procedure.

- [4] $1 \pm i\sqrt{6}$, and appropriate work is shown.
 [3] Appropriate work is shown, but one computational error is made.
 or [3] Appropriate work is shown, but the solution is expressed as $\frac{2 \pm 2i\sqrt{6}}{2}$.
 [2] Appropriate work is shown, but two or more computational errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made.
 or [2] Appropriate work is shown, but the solution is expressed as $\frac{2 \pm \sqrt{-24}}{2}$.
 [1] Appropriate work is shown, but one conceptual error and one computational error are made.
 or [1] A correct substitution is made in the quadratic formula, but no further correct work is shown.
 or [1] $1 \pm i\sqrt{6}$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [5] _____

- [4] Finds $3 + i\sqrt{3}$ and $3 - i\sqrt{3}$, or $3 + 1.73i$ and $3 - 1.73i$ by using the quadratic formula or some other valid method.
 [3] Finds a correct answer, but does not simplify.
 or [3] Uses a correct procedure, but makes an arithmetic mistake or simplifies improperly.
 or [3] Finds incorrect roots based upon a mistake in the quadratic formula which keeps the discriminant negative.
 [2] Writes a correct equation:
 $x^2 - 6x + 12 = 0$, and a correct discriminant of $i\sqrt{12}$ or $2i\sqrt{3}$, but incorrect roots.
 or [2] Uses a correct procedure, but makes more than one error.
 [1] Writes the correct equation only.
 or [1] Obtains correct answer, but no work is shown.
 [0] Response is completely incorrect, irrelevant, or incoherent; or is a correct response that was obtained by an obviously incorrect procedure.
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- [6] _____
- [4] $-1 \pm i\sqrt{6}$, and appropriate work is shown, such as appropriately substituting for a , b , and c in the quadratic formula, solving the equation, and simplifying the answer correctly.
 [3] Appropriate work is shown, but one computational or simplification error is made.
 [2] Appropriate work is shown, but two or more computational or simplification errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made, such as writing the quadratic formula incorrectly.
 [1] Appropriate work is shown, but one conceptual error and one computational or simplification error are made.
 or [1] $-1 \pm i\sqrt{6}$, but no work is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [7] _____

[6] 120 and 4.2, and appropriate work is shown, such as substituting $t = 0$ into the equation and solving the equation

$$-5t^2 - 8t + 120 = 0.$$

[5] Appropriate work is shown, but one computational or rounding error is made.

or [5] 120 and 4.2, but no work is shown to find the amount of water, but appropriate work is shown to find the amount of time.

[4] Appropriate work is shown, but two or more computational or rounding errors are made.

or [4] Appropriate work is shown, and the amount of water is found correctly, but one conceptual error is made in finding the amount of time.

or [4] The amount of time is found correctly, and appropriate work is shown, but the amount of water is not found.

or [4] The amount of water is found correctly, and appropriate work is shown, and a correct substitution into the quadratic formula is made, but the amount of time is not found.

[3] Appropriate work is shown, but one conceptual error is made in finding the amount of time, and one computational error is made in finding the amount of water.

[2] The amount of water is found correctly, and appropriate work is shown, but no further correct work is shown.

or [2] 120 and 4.2, but no work is shown.

[1] 120 or 4.2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[8] incorrect procedure.

[4] 4.27, and appropriate work is shown, such as solving the equation $(9 + x)(12 + x) = 216$.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] Appropriate work is shown, but the negative root is not rejected.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] A correct equation is written in standard form, but no further correct work is shown.

or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] An incorrect quadratic equation of a lesser degree of difficulty is solved appropriately.

or [1] 4.27, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

[4] 12.6, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] Appropriate work is shown, but the quadratic formula is incorrect.

[2] An appropriate equation is shown and put in standard form, but the quadratic formula is not used correctly.

or [2] An appropriate equation is shown and put in standard form, but no further work is shown.

or [2] Appropriate work is shown, but more than one computational error or one computational and one rounding error are made.

[1] An appropriate equation is shown, but all other work is missing or is incorrect.

or [1] 12.6, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[10] incorrect procedure.

[4] 5.3, and appropriate work is shown, such as solving the equation $(x + 6)(x + 8) = 150$ by using a table or the quadratic formula.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] Appropriate solutions are found, but the negative root is not rejected.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

[1] The correct quadratic equation in standard form, $x^2 + 14x - 102 = 0$, is written, but no further correct work is shown.

or [1] An incorrect quadratic equation is solved appropriately.

or [1] 5.3, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[11] incorrect procedure.