1. Simplify. If an expression does not represent a real number, state so.

\[ \sqrt[4]{-1} \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

\( \text{OA. } \sqrt[4]{-1} = \) \[ \square \] (Type an integer.)

\( \text{OB. } \) The root is not a real number.

2. Simplify the radical.

\[ -\sqrt[5]{-7776} \]

Select the correct choice below and fill in any answer boxes in your choice.

\( \text{OA. } -\sqrt[5]{-7776} = \) \[ \square \] (Simplify your answer.)

\( \text{OB. } \) The root is not a real number.

3. Simplify the radical. Assume that all variables represent positive real numbers.

\[ \sqrt[3]{-8x^6y^{12}} \]

Select the correct choice below and, if necessary, fill in the answer box within your choice.

\( \text{OA. } \sqrt[3]{-8x^6y^{12}} = \) \[ \square \]

\( \text{OB. } \) The radical does not represent a real number.

4. Simplify. Assume variables represent any real number.

\[ \sqrt{(x - 1)^2} \]

\[ \sqrt{(x - 1)^2} = \] \[ \square \]

(Simplify your answer.)
5. The period, \( T \), of a pendulum in seconds can be found using the formula \( T = 2\pi \sqrt{\frac{L}{9.8}} \), where \( L \) represents the length of the pendulum in meters. Find the period of a pendulum that is 4 meters long.

The period of a pendulum is approximately \( \square \) seconds.
(Type an integer or decimal rounded to the nearest thousandth as needed. Round all intermediate values to four decimal places as needed.)

6. Three pieces of lumber are to be connected to form a right triangle that will be part of the frame for a roof. If the horizontal piece is 8 feet and the vertical piece is 6 feet, how long must the connecting piece be?

The length of the connecting piece is \( \square \) feet.

7. Use radical notation to rewrite the expression. Simplify, if possible.

\[
(-125)^{1/3}
\]

\[
(-125)^{1/3} = \square
\]

8. Evaluate the expression. \(-27^{4/3}\)

Which term represents the simplified form of \(-27^{4/3}\)?

\(\text{OA. } -\sqrt[3]{27^4}\)
\(\text{OB. } -\sqrt[3]{27^3}\)
\(\text{OC. } -(\sqrt[3]{27})^4\)
\(\text{OD. } -81\)

9. Use radical notation to write the expression. Simplify if possible.

\[
\left(\frac{9}{25}\right)^{3/2}
\]

\[
\left(\frac{9}{25}\right)^{3/2} = \square \text{ (Type an integer or a simplified fraction.)}
\]
10. Write with radicals. Assume that all variables represent nonnegative values.

\[(5y + x)^{4/5}\]

\[(5y + x)^{4/5} = \square\]

(Simplify your answer. Type an exact answer, using radicals as needed. Type your answer in factored form.)

11. Use the laws of exponents to simplify.

\[\frac{13}{a^{3/6}} \cdot \frac{1}{a^{6}} \]

\[\frac{13}{a^{3/6}} \cdot \frac{1}{a^{6}} = \square\]

(Simplify your answer. Type exponential notation with rational exponents.)

12. Use the rules of exponents to simplify the given expression.

\[\frac{x^{7/15}}{x^{2/5}}\]

\[\frac{x^{7/15}}{x^{2/5}} = \square\]

(Simplify your answer. Type exponential notation with positive exponents. Use integers or fractions for any numbers in the expression.)

13. Use the rules of exponents to simplify the given expression.

\[(-2b^{4/15})(-4b^{-1/5})\]

\[(-2b^{4/15})(-4b^{-1/5}) = \square\]

(Simplify your answer. Type exponential notation with positive exponents. Use integers or fractions for any numbers in the expression.)

14. Use the rules of exponents to simplify the given expression.

\[(-4y^{5/6})(-5y^{-1/2})\]

\[(-4y^{5/6})(-5y^{-1/2}) = \square\]

(Simplify your answer. Type exponential notation with positive exponents. Use integers or fractions for any numbers in the expression.)
15. Simplify the expression by first converting to rational exponents. Assume that all variables represent positive real numbers.

\[ \frac{\sqrt[5]{x^2}}{\sqrt[6]{x^2}} \]

The simplified form is \[ \square \].
(Type an exact answer, using radicals as needed.)

16. Multiply and simplify.

\[ \sqrt{7} \cdot \sqrt[3]{3} \]

\[ \sqrt{7} \cdot \sqrt[3]{3} = \square \]
(Simplify your answer. Type an exact answer, using radicals as needed.)

17. Multiply.

\[ \sqrt[3]{2} \cdot \sqrt[4]{4} \]

\[ \sqrt[3]{2} \cdot \sqrt[4]{4} = \square \]

18. Find the following product and simplify. Assume that the variables represent positive values.

\[ \sqrt[8]{2x^3y^3} \cdot \sqrt[8]{4x^2y^3} \]

\[ \sqrt[8]{2x^3y^3} \cdot \sqrt[8]{4x^2y^3} = \square \]
(Simplify your answer. Type an exact answer, using radicals as needed.)

19. Simplify the following.

\[ 5\sqrt[5]{8a^{19}} \]

\[ 5\sqrt[5]{8a^{19}} = \square \]
(Simplify your answer. Type an exact answer, using radicals as needed.)

20. Simplify.

\[ \sqrt[3]{x^{12}y^{10}} \]

\[ \sqrt[3]{x^{12}y^{10}} = \square \]
21. Simplify by factoring. Assume that all expressions under radicals represent nonnegative numbers.

\[ \sqrt[3]{56x^8} \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

- OA. \( \sqrt[3]{56x^8} = \) (Type an exact answer, using radicals as needed.)
- OB. The root is not a real number.

22. Multiply and simplify by factoring.

\[ \sqrt{10} \cdot \sqrt{6} = \]

(Type an exact answer, using radicals as needed.)

23. Simplify.

\[ \frac{\sqrt{280}}{\sqrt{7}} = \]

(Simplify your answer.)

24. Find the quotient and write the answer in simplest form. Assume that the variables represent positive values.

\[ \frac{16\sqrt{140x^6y^{10}}}{2\sqrt{5x^2y^3}} \]

\[ \frac{16\sqrt{140x^6y^{10}}}{2\sqrt{5x^2y^3}} = \]

(Simplify your answer. Type an exact answer, using radicals as needed.)

25. Add. Simplify by collecting like radical terms, if possible. Assume that all expressions under radicals represent non-negative numbers.

\[ 5\sqrt{y} + 3\sqrt{y} = \]

(Simplify your answer. Type an exact answer, using radicals as needed.)
26. Subtract. Simplify by collecting like radical terms, if possible.

\[ \sqrt{108} - \sqrt{75} \]

\[ \sqrt{108} - \sqrt{75} = \square \]

(Type an exact answer, using radicals as needed.)

27. Add or subtract. Simplify by collecting like radical terms if possible.

\[ \frac{7\sqrt{108} - \sqrt{75} + 2\sqrt{300}}{7\sqrt{108} - \sqrt{75} + 2\sqrt{300}} = \square \]

(Type an exact answer, using radicals as needed.)

28. Subtract. Simplify by collecting like radical terms if possible, assuming that all expressions under radicals represent non-negative numbers.

\[ \sqrt[3]{40x} - \sqrt[3]{5x^4} \]

\[ \sqrt[3]{40x} - \sqrt[3]{5x^4} = \square \]

(Simplify your answer. Type an exact answer, using radicals as needed.)

29. Multiply.

\[ \sqrt{3} (\sqrt{3} + \sqrt{10}) \]

\[ \sqrt{3} (\sqrt{3} + \sqrt{10}) = \square \]

(Simplify your answer. Type an exact answer, using radicals as needed.)

30. Assume that variables represent nonnegative values and use the distributive property for the following expression.

\[ 2\sqrt{3x} (3\sqrt{3x} - 4\sqrt{9x}) \]

\[ 2\sqrt{3x} (3\sqrt{3x} - 4\sqrt{9x}) = \square \] (Type an exact answer, using radicals as needed.)

31. Multiply, then simplify the product.

\[ (\sqrt{5} + 4)(\sqrt{15} - 5) \]

\[ (\sqrt{5} + 4)(\sqrt{15} - 5) = \square \]

(Simplify your answer. Type an exact answer, using radicals as needed.)
32. Multiply.

\[(6\sqrt{x} - 3)(4\sqrt{x} + 7)\]

\[(6\sqrt{x} - 3)(4\sqrt{x} + 7) = \square\]

(Simplify your answer. Type an exact answer, using radicals as needed.)

33. Multiply.

\[(7 + \sqrt{7})^2\]

\[(7 + \sqrt{7})^2 = \square\]

(Simplify your answer. Type an exact answer, using radicals as needed.)

34. Find the product.

\[(5 + 5\sqrt{3})^2\]

\[(5 + 5\sqrt{3})^2 = \square\]

(Simplify your answer. Type an exact answer, using radicals as needed.)

35. Multiply, then simplify the products.

\[(\sqrt{2x} + 7)(\sqrt{2x} - 7)\]

The answer is \[\square\].

(Simplify your answer. Type an exact answer, using radicals as needed.)

36. Multiply.

\[(2 + 3\sqrt{5})(2 - 3\sqrt{5})\]

\[(2 + 3\sqrt{5})(2 - 3\sqrt{5}) = \square\]

(Simplify your answer. Type an exact answer, using radicals as needed.)

37. Simplify by rationalizing the denominator. Assume that variables represent positive values.

\[\frac{\sqrt{11x^2}}{\sqrt{20}}\]

The answer is \[\square\].

(Simplify your answer: Type an exact answer, using radicals as needed.)
38. Rationalize the denominator.

\[ \frac{100}{\sqrt{10y}} = \square \]
(Type an exact answer, using radicals as needed. Simplify the answer.)

39. Rationalize the denominator of the following expression. Assume that the variables represent positive values.

\[ \frac{2}{\sqrt[3]{4}} = \square \] (Simplify your answer. Type an exact answer, using radicals as needed.)

40. Rationalize the denominator. Assume all variables are positive.

\[ \frac{3}{\sqrt[3]{7z^2}} = \square \]
(Simplify your answer. Type an exact answer using radicals as needed.)

41. Rationalize the denominator and simplify.

\[ \frac{8\sqrt{5}}{\sqrt{5} - 6} = \square \]
(Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression.)
42. Rationalize the denominator and simplify. Assume that variables represent positive values.

\[ \frac{5\sqrt{y}}{\sqrt{y} + 7} \]

\[ \frac{5\sqrt{y}}{\sqrt{y} + 7} = \square \] (Simplify your answer.)

43. Solve.

\[ 1 + \sqrt{x - 3} = 7 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your answer.

OA. The solution is \( x = \square \).
   (Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed.)

OB. The solution is not a real number.

44. Solve. Identify any extraneous solutions.

\[ \sqrt{2y - 8} = \sqrt{4y + 8} \]

Select the correct choice below and, if necessary, fill in the answer box to complete your answer.

OA. The solution is \( y = \square \). There are no extraneous solutions.
   (Simplify your answer. Use a comma to separate answers as needed.)

OB. The solution is \( y = \square \). The extraneous solution is \( y = \square \).
   (Simplify your answer. Use a comma to separate answers as needed.)

OC. There are no real number solutions. The extraneous solution is \( y = \square \).
   (Simplify your answer. Use a comma to separate answers as needed.)
45. Solve the following equation and identify any extraneous solutions.

\[ y - 3 = \sqrt{y - 3} \]

Select the correct choice below and fill in the answer box within your choice if necessary.

(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed.)

- **A.** The real solutions are \( \underline{2} \).
- **B.** The real solutions are \( \underline{2} \) and the extraneous solutions are \( \underline{3} \).
- **C.** There is no real solution, but the extraneous solutions are \( \underline{3} \).
- **D.** There is no solution to the equation.

46. Solve the following equation and identify any extraneous solutions.

\[ 4 + \sqrt{x} = \sqrt{5x + 16} \]

Select the correct choice below and fill in the answer box within your choice if necessary.

(Simplify your answer. Type an integer or a fraction. Use a comma to separate answers as needed.)

- **A.** The real solutions are \( \underline{2} \).
- **B.** The real solutions are \( \underline{2} \) and the extraneous solutions are \( \underline{3} \).
- **C.** There is no real solution, but the extraneous solutions are \( \underline{3} \).
- **D.** There is no solution to the equation.

47. Express in terms of \( i \).

\[ \sqrt{-45} \]

\[ \sqrt{-45} = \underline{3i} \]

(Simplify your answer. Type your answer in the form \( a + bi \).)

48. Write the number as a product of a real number and \( i \). Simplify all radical expressions.

\[ \sqrt{-8} \]

\[ \sqrt{-8} = \underline{2i} \]

(Simplify your answer. Type your answer in the form \( a + bi \). Type an exact answer, using radicals as needed.)
49. Add and simplify. 
\[(2 + 4i) + (6 - 3i) = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)

50. Subtract and simplify. 
\[(5 + 7i) - (-8 - i) = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)

51. Multiply and simplify your answer. 
\[(7i)(7i) = \square \] 
(Simplify your answer. Express complex numbers in terms of \(i\).)

52. Multiply. 
\[4i(-5 + 5i) = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)

53. Multiply. 
\[-4i(5 + 8i) = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)

54. Multiply. 
\[(6 + i)(8 - i) = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)

55. Write in standard form. 
\[\frac{4}{i} = \square \] 
(Simplify your answer. Type your answer in the form \(a + bi\).)
56. Divide.

\[ \frac{8 + 28i}{4i} = \square \]

(Simplify your answer. Type your answer in the form \(a + bi\). Use integers or fractions for any numbers in the expression.)

57. Write the complex number in standard form.

\[ \frac{4}{5 + i} = \square \]

(Simplify your answer. Use integers or fractions for any numbers in the expression. Type your answer in the form \(a + bi\).)

58. Write the complex number in standard form.

\[ \frac{3 + 4i}{4 + i} = \square \]

(Simplify your answer. Use integers or fractions for any numbers in the expression. Type your answer in the form \(a + bi\).)

59. Evaluate.

\[ i^{12} = \square \]

(Simplify your answer. Type an exact answer, using \(i\) as needed.)

60. Evaluate.

\[ i^{37} = \square \]

(Simplify your answer. Type an exact answer, using \(i\) as needed.)
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<td>A, $-2x^2y^4$</td>
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<td>8.</td>
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<td>9.</td>
<td>$\frac{27}{125}$</td>
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<td>10.</td>
<td>$\sqrt[5]{(5y + x)^4}$</td>
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<td>11.</td>
<td>$\frac{9}{a^2}$</td>
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<td>$x^{1/15}$</td>
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<td>$20y^{1/3}$</td>
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<td>$\sqrt[15]{x}$</td>
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16. $\sqrt[6]{3087}$

17. 2

18. $\sqrt[8]{8x^5y^6}$

19. $10a^9\sqrt{2a}$

20. $x^4y^{3\sqrt{3}}y$

21. $A, 2x^{\frac{3}{2}}\sqrt{7x^2}$

22. $2\sqrt{15}$

23. $2\sqrt{10}$

24. $16x^2y^{3\sqrt{7y}}$

25. $8\sqrt{y}$

26. $\sqrt{3}$

27. $57\sqrt{3}$

28. $(2 - x)^{\frac{3}{2}}\sqrt{5x}$

29. $3 + \sqrt{30}$

30. $18x - 24x\sqrt{3}$
31. \(5\sqrt{3} - 5\sqrt{5} + 4\sqrt{15} - 20\)

32. \(24x + 30\sqrt{x} - 21\)

33. \(56 + 14\sqrt{7}\)

34. \(100 + 50\sqrt{3}\)

35. \(2x - 49\)

36. \(-41\)

37. \(\frac{x\sqrt{55}}{10}\)

38. \(\frac{10\sqrt{10y}}{y}\)

39. \(\sqrt[3]{2}\)

40. \(\frac{3\sqrt[3]{49z}}{7z}\)

41. \(-40 - 48\sqrt{5}\)

42. \(\frac{5y - 35\sqrt{y}}{y - 49}\)

43. A, 39

44. C, -8
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<tbody>
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<td>45.</td>
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<td>56.</td>
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<td>57.</td>
<td>$\frac{10}{13} - \frac{2}{13}i$</td>
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<td>58.</td>
<td>$\frac{16}{17} + \frac{13}{17}i$</td>
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60. \( i \)