Multi-Step Equations Involving $x^{2}$

Determine the value of *x*. Simplify, where possible.

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| **EXAMPLE:** $0=7x+21$$$0=7x+21$$$$-21=7x$$$$-21=7 x$$$$-3=x$$$$x=-3$$ | **EXAMPLE:** $0=3x-8$$$0=3x-8$$$$8=3x$$$$8=3 x$$$\frac{8}{3}=x$ $$x=\frac{8}{3}$$ | **EXAMPLE:** $0=-5x+20$$$0=-5x+20$$$$-20=-5x$$$$-20=-5 x$$$$4=x$$$$x=4$$ |
| 1. $0=-8x-32$ | 2. $0=5x-7$ | 3. $0=-2x-22$ |
| 4. $0=-3x+6$ | 5. $0=8x+12$ | 6. $0=4x-2$ |

*Answers:* $1. x=-4, 2. \frac{7}{5}, 3. -11, 4. 2, 5. -\frac{3}{2}, 6. \frac{1}{2}$

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| **EXAMPLE:** $x=\sqrt{-25}$$$x=i\sqrt{25}$$$$x=5i$$ | **EXAMPLE:** $x=\sqrt{45}$$$x=\sqrt{5}\sqrt{9}$$$$x=\sqrt{5}∙(3)$$$$x=3\sqrt{5}$$ | **EXAMPLE:** $x=-\sqrt{44}$$$x=-\sqrt{4}\sqrt{11}$$$$x=-\left(2\right)∙\sqrt{11}$$$$x=-2\sqrt{11}$$ |
| 7. $x=\sqrt{16}$ | 8. $x=\sqrt{250}$ | 9. $x=-\sqrt{72}$ |
| 10. $x=\sqrt{-48}$ | 11. $x=\sqrt{-49}$ | 12. $x=-\sqrt{100}$ |

*Answers:* $7. 4, 8. 5\sqrt{10}, 9. -6\sqrt{2}, 10. 4i\sqrt{3}, 11. 7i, 12. -10$

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| **EXAMPLE:** $x^{2}=-25$$$\pm \sqrt{x^{2}}=\pm \sqrt{-25}$$$$x=\pm i\sqrt{25}$$$$x=\pm 5i$$ | **EXAMPLE:** $x^{2}=45$$$\pm \sqrt{x^{2}}=\pm \sqrt{45}$$$$x=\pm \sqrt{5}\sqrt{9}$$$$x=\pm \sqrt{5}∙(3)$$$$x=\pm 3\sqrt{5}$$ | **EXAMPLE:** $x^{2}=44$$$x=\sqrt{4}\sqrt{11}$$$$x=\left(2\right)∙\sqrt{11}$$$$x=2\sqrt{11}$$ |
| 13. $x^{2}=16$ | 14. $x^{2}=250$ | 15. $x^{2}=72$ |
| 16. $x^{2}=-48$ | 17. $x^{2}=-49$ | 18. $x^{2}=100$ |

*Answers:* $13. \pm 4, 14. \pm 5\sqrt{10}, 15. \pm 6\sqrt{2}, 16. \pm 4i\sqrt{3}, 17. \pm 7i, 18. \pm 10$

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| **EXAMPLE:** $0=x^{2}+25$$$0=x^{2}+25$$$$-25=x^{2}$$$$\pm \sqrt{-25}=\pm \sqrt{x^{2}}$$$$\pm i\sqrt{25}=x$$$$\pm 5i=x$$$$x=\pm 5i$$ | **EXAMPLE:** $0=x^{2}-45$$$0=x^{2}-45$$$$45=x^{2}$$$$\pm \sqrt{45}=\pm \sqrt{x^{2}}$$$$\pm \sqrt{5}\sqrt{9}=x$$$$\pm \sqrt{5}∙\left(3\right)=x$$$$\pm 3\sqrt{5}=x$$$$x=\pm 3\sqrt{5}$$ | **EXAMPLE:** $0=x^{2}-44$$$0=x^{2}-45$$$$44=x^{2}$$$$\pm \sqrt{44}=\pm \sqrt{x^{2}}$$$$\pm \sqrt{4}\sqrt{11}=x$$$$\pm \left(2\right)∙\sqrt{11}=x$$$$\pm 2\sqrt{11}=x$$$$x=\pm 2\sqrt{11}$$ |
| 19. $0=x^{2}-16$ | 20. $0=x^{2}-250$ | 21. $0=x^{2}-72$ |
| 22. $0=x^{2}+48$ | 23. $0=x^{2}+49$ | 24. $0=x^{2}-100$ |

*Answers:* $19. \pm 4, 20. \pm 5\sqrt{10}, 21. \pm 6\sqrt{2}, 22. \pm 4i\sqrt{3}, 23. \pm 7i, 24. \pm 10$

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| **EXAMPLE:** $0=5x^{2}+125$$$0=5x^{2}+125$$$$-125=5x^{2}$$$$-125=5x^{2}$$$$-25=x^{2}$$$$\pm \sqrt{-25}=\pm \sqrt{x^{2}}$$$$\pm i\sqrt{25}=x$$$$\pm 5i=x$$$$x=\pm 5i$$ | **EXAMPLE:** $0=-3x^{2}+135$$$0=-3x^{2}+135$$$$-135=-3x^{2}$$$$-135=-3x^{2}$$$$45=x^{2}$$$$\pm \sqrt{45}=\pm \sqrt{x^{2}}$$$$\pm \sqrt{5}\sqrt{9}=x$$$$\pm \sqrt{5}∙\left(3\right)=x$$$$\pm 3\sqrt{5}=x$$$$x=\pm 3\sqrt{5}$$ | **EXAMPLE:** $0=-x^{2}+44$$$0=-x^{2}+44$$$$-44=-x^{2}$$$$-44=-1x^{2}$$$$44=x^{2}$$$$\pm \sqrt{44}=\pm \sqrt{x^{2}}$$$$\pm \sqrt{4}\sqrt{11}=x$$$$\pm \left(2\right)∙\sqrt{11}=x$$$$\pm 2\sqrt{11}=x$$$$x=\pm 2\sqrt{11}$$ |
| 25. $0=2x^{2}-32$ | 26. $0=-x^{2}+250$ | 27. $0=3x^{2}-216$ |
| 28. $0=-5x^{2}-240$ | 29. $0=-2x^{2}-98$ | 30. $0=8x^{2}-800$ |

*Answers:* $25. \pm 4, 26. \pm 5\sqrt{10}, 27. \pm 6\sqrt{2}, 28. \pm 4i\sqrt{3}, 29. \pm 7i, 30. \pm 10$

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| **EXAMPLE:** $0=5(x-3)^{2}+125$$$0=5(x-3)^{2}+125$$$$-125=5(x-3)^{2}$$$$-125=5(x-3)^{2}$$$$-25=(x-3)^{2}$$$$\pm \sqrt{-25}=\pm \sqrt{(x-3)^{2}}$$$$\pm i\sqrt{25}=(x-3)$$$$\pm 5i=x-3$$$$\pm 5i=x-3$$$$3\pm 5i=x$$$$x=3\pm 5i$$ | **EXAMPLE:** $0=-3\left(x+2\right)^{2}+135$$$0=-3\left(x+2\right)^{2}+135$$$$-135=-3\left(x+2\right)^{2}$$$$-135=-3\left(x+2\right)^{2}$$$$45=\left(x+2\right)^{2}$$$$\pm \sqrt{45}=\pm \sqrt{\left(x+2\right)^{2}}$$$$\pm \sqrt{5}\sqrt{9}=\left(x+2\right)$$$$\pm \sqrt{5}∙\left(3\right)=x+2$$$$\pm 3\sqrt{5}=x+2$$$$\pm 3\sqrt{5}=x+2$$$$-2\pm 3\sqrt{5}=x$$$$x=-2\pm 3\sqrt{5}$$ | **EXAMPLE:** $0=-(x-7)^{2}+44$$$0=-(x-7)^{2}+44$$$$-44=-(x-7)^{2}$$$$-44=-1(x-7)^{2}$$$$44=(x-7)^{2}$$$$\pm \sqrt{44}=\pm \sqrt{(x-7)^{2}}$$$$\pm \sqrt{4}\sqrt{11}=(x-7)$$$$\pm \left(2\right)∙\sqrt{11}=x-7$$$$\pm 2\sqrt{11}=x-7$$$$\pm 2\sqrt{11}=x-7$$$$7\pm 2\sqrt{11}=x$$$$x=7\pm 2\sqrt{11}$$ |
| 31. $0=2(x+3)^{2}-32$ | 32. $0=-(x+8)^{2}+250$ | 33. $0=3(x-4)^{2}-216$ |
| 34. $0=-5(x-2)^{2}-240$ | 35. $0=-2(x+6)^{2}-98$ | 36. $0=8(x-5)^{2}-800$ |

*Answers:* $31. -3\pm 4, 32. -8\pm 5\sqrt{10}, 33. 4\pm 6\sqrt{2}, 34. 2\pm 4i\sqrt{3}, 35. -6\pm 7i, 36. 5\pm 10$