

The Discriminant

Name: _____

Date: _____

Score: _____ / 24

Q Quick Review

For a quadratic equation $ax^2 + bx + c = 0$, the **discriminant** is $D = b^2 - 4ac$. It tells you the number and type of solutions before you solve. If $D > 0$, there are two real solutions; if $D = 0$, there is one real solution; if $D < 0$, there are no real solutions. If D is a perfect square, the real solutions are rational; if D is positive but not a perfect square, the real solutions are irrational.

PRACTICE

Find the discriminant and describe the solutions.

- | | | | |
|-------------------------|-------|--------------------------------------|-------|
| 1. $x^2 - 5x + 6 = 0$ | _____ | 11. $6x^2 + x + 2 = 0$ | _____ |
| 2. $x^2 + 4x + 4 = 0$ | _____ | 12. $9x^2 - 12x + 4 = 0$ | _____ |
| 3. $x^2 + x + 1 = 0$ | _____ | 13. $x^2 + 6x + 5 = 0$ | _____ |
| 4. $2x^2 - 3x - 2 = 0$ | _____ | 14. $x^2 + 2x - 3 = 0$ | _____ |
| 5. $3x^2 + 2x + 5 = 0$ | _____ | 15. $2x^2 + 4x + 7 = 0$ | _____ |
| 6. $x^2 - 2x - 1 = 0$ | _____ | 16. $3x^2 - 10x + 2 = 0$ | _____ |
| 7. $4x^2 + 4x + 1 = 0$ | _____ | 17. $x^2 - 8x + 16 = 0$ | _____ |
| 8. $5x^2 - x + 2 = 0$ | _____ | 18. $7x^2 + 2x - 1 = 0$ | _____ |
| 9. $x^2 - 9 = 0$ | _____ | 19. $x^2 + 5x + 8 = 0$ | _____ |
| 10. $2x^2 + 7x + 3 = 0$ | _____ | 20. If $D = 49$, describe solutions | _____ |

◆ Word Problems

21. A quadratic model has equation $h(t) = -16t^2 + 32t + 4$. Use the discriminant to decide whether the object reaches ground level.

22. A profit equation is $P(x) = -x^2 + 6x - 12$. Use the discriminant to decide whether profit ever equals zero.

23. A parabola touches the x -axis at exactly one point. What must be true about its discriminant?

24. A quadratic equation has discriminant 18. How many real solutions does it have, and are they rational?



Scan Me

Answer Keys

- | | |
|--|---|
| <p>1. $D = 1$; two rational</p> <p>2. $D = 0$; one real</p> <p>3. $D = -3$; no real</p> <p>4. $D = 25$; two rational</p> <p>5. $D = -56$; no real</p> <p>6. $D = 8$; two irrational</p> <p>7. $D = 0$; one real</p> <p>8. $D = -39$; no real</p> <p>9. $D = 36$; two rational</p> <p>10. $D = 25$; two rational</p> <p>11. $D = -47$; no real</p> <p>12. $D = 0$; one real</p> | <p>13. $D = 16$; two rational</p> <p>14. $D = 16$; two rational</p> <p>15. $D = -40$; no real</p> <p>16. $D = 76$; two irrational</p> <p>17. $D = 0$; one real</p> <p>18. $D = 32$; two irrational</p> <p>19. $D = -7$; no real</p> <p>20. two rational</p> <p>21. $D = 1280$; yes, two real times</p> <p>22. $D = -12$; no real break-even point</p> <p>23. $D = 0$</p> <p>24. two real irrational solutions</p> |
|--|---|

Step-by-Step Tutor Notes

1. This is a good place to slow down, check the notation, and simplify cleanly. $D = (-5)^2 - 4(1)(6) = 25 - 24 = 1$. So the answer is $D = 1$; two rational.
2. Start with the definition the problem is testing, then apply it directly. $D = 16 - 16 = 0$. So the answer is $D = 0$; one real.
3. Start with the definition the problem is testing, then apply it directly. $D = 1 - 4 = -3$. So the answer is $D = -3$; no real.
4. Start with the definition the problem is testing, then apply it directly. $D = (-3)^2 - 4(2)(-2) = 9 + 16 = 25$. So the answer is $D = 25$; two rational.
5. Start with the definition the problem is testing, then apply it directly. $D = 4 - 60 = -56$. So the answer is $D = -56$; no real.
6. This is a good place to slow down, check the notation, and simplify cleanly. $D = 4 + 4 = 8$, positive but not a perfect square. So the answer is $D = 8$; two irrational.
7. Start with the definition the problem is testing, then apply it directly. $D = 16 - 16 = 0$. So the answer is $D = 0$; one real.
8. Focus on the main idea of the problem, then simplify carefully. $D = 1 - 40 = -39$. So the answer is $D = -39$; no real.
9. This is a good place to slow down, check the notation, and simplify cleanly. Here $a = 1, b = 0, c = -9$, so $D = 36$. So the answer is $D = 36$; two rational.
10. Focus on the main idea of the problem, then simplify carefully. $D = 49 - 24 = 25$. So the answer is $D = 25$; two rational.
11. Use the clue in the question first, then let the arithmetic finish the job. $D = 1 - 48 = -47$. So the answer is $D = -47$; no real.
12. Start with the definition the problem is testing, then apply it directly. $D = 144 - 144 = 0$. So the answer is $D = 0$; one real.
13. This is a good place to slow down, check the notation, and simplify cleanly. $D = 36 - 20 = 16$. So the answer is $D = 16$; two rational.
14. Start with the definition the problem is testing, then apply it directly. $D = 4 + 12 = 16$. So the answer is $D = 16$; two rational.
15. Focus on the main idea of the problem, then simplify carefully. $D = 16 - 56 = -40$. So the answer is $D = -40$; no real.
16. This is a good place to slow down, check the notation, and simplify cleanly. $D = 100 - 24 = 76$. So the answer is $D = 76$; two irrational.
17. Take it one clear step at a time and keep the original question in mind. $D = 64 - 64 = 0$. So the answer is $D = 0$; one real.
18. Focus on the main idea of the problem, then simplify carefully. $D = 4 + 28 = 32$. So the answer is $D = 32$; two irrational.
19. Take it one clear step at a time and keep the original question in mind. $D = 25 - 32 = -7$. So the answer is $D = -7$; no real.
20. Start with the definition the problem is testing, then apply it directly. Positive perfect square means two rational solutions. So the answer is two rational.
21. Set $h = 0$. With $a = -16, b = 32, c = 4$, $D = 32^2 - 4(-16)(4) = 1280 > 0$, so the graph crosses the ground level.
22. Here $a = -1, b = 6, c = -12$. The discriminant is $36 - 48 = -12$, so the model has no real zeros.
23. Touching once means the quadratic has one real solution, which happens exactly when the discriminant is 0.
24. 18 is positive, so there are two real solutions. It is not a perfect square, so the solutions are irrational.



Scan Me

Want a Full Algebra 1 Textbook? Try Our Alaska AK STAR Made Simple Book!



Alaska AK STAR Algebra I Made Ridiculously Simple

The friendly, step-by-step Algebra 1 textbook
Plain-English explanations, guided practice, and review support.



Scan Me

Full Lessons Inside

Concepts
Practice
Mastery

Important: All our test books contain **unique, completely different tests** from each other! Each book offers fresh practice questions—no repeats!

5 Practice Tests

- ✓ 5 complete practice tests with detailed explanations
- ✓ Perfect foundation for AK STAR test preparation
- ✓ Builds confidence and test-taking skills
- ✓ High-quality questions aligned with state standards

Start your practice journey!

6 Practice Tests

- ✓ 6 complete practice tests with detailed explanations
- ✓ **Unique tests**—different from the 5 tests book
- ✓ Perfect for more practice after mastering 5 tests
- ✓ Builds even more confidence and test-taking skills
- ✓ Same high-quality questions aligned with standards

Take your practice to the next level!

7 Practice Tests

- ✓ 7 complete practice tests for maximum preparation
- ✓ **Unique tests**—different from 5 and 6 tests books
- ✓ The most comprehensive practice for Algebra 1
- ✓ Ideal for students aiming for top scores
- ✓ Extensive practice builds mastery and confidence

Go all the way with comprehensive practice!

☐ STUDENT FAVORITE • Master Algebra I From the Ground Up ☐



Algebra I for Beginners

Written by a top math teacher & aligned with national and state Algebra I courses. From linear equations to graphing quadratics — explained the easy way.

- ✓ **Complete coverage** of every Algebra I concept — perfect companion to these worksheets
- ✓ **Step-by-step explanations** with worked examples on every topic
- ✓ **QR codes in every chapter** for free video lessons & bonus practice
- ✓ **2 full-length practice tests** with detailed answer keys

- ✓ 100% Guaranteed
- ✓ Lifetime Support
- ✓ Trusted by Teachers

Start Your Algebra Journey Today! →

★ STUDENT'S #1 CHOICE ★

Teacher-recommended • 12,000+ Happy Students

↓ PDF EDITION



Scan Me

Instant download • any device

☐ PAPERBACK



Scan Me

Paperback on Amazon

Hold it in your hands

Pair these free worksheets with *Algebra I for Beginners* and you have a complete self-paced course — concept lessons, daily practice, and full exam-style reviews, all in one path. →

EffortlessMath.com/product/algebra-i-for-beginners