

Domain and Range

Name: _____ Date: _____ Score: _____ / 26

Quick Review

Domain = all inputs (x -values) a function accepts. **Range** = all outputs (y -values) the function produces. For a list of ordered pairs or a table, just list the x 's (domain) and y 's (range), no repeats. From a graph, scan left to right for the domain, bottom to top for the range. **Discrete** data (separate points) uses set notation $\{1, 2, 3\}$; **continuous** data (connected curves) uses interval notation $[1, 3]$. Brackets $[]$ mean "included"; parentheses $()$ mean "not included." Watch for restrictions: denominators can't be zero, expressions under square roots can't be negative.

PRACTICE

Find the domain and range for each.

- | | | | |
|--|-------|--|-------|
| 1. $\{(1, 4), (2, 8), (3, 12)\}$ | _____ | 11. Line through $(-3, -2)$ and $(3, 2)$, closed ends | _____ |
| 2. $\{(0, 0), (1, 1), (2, 4), (3, 9)\}$ | _____ | 12. Horizontal line $y = 2$ | _____ |
| 3. $\{(-5, 3), (-2, 3), (4, 3)\}$ | _____ | 13. $f(x) = \sqrt{x}$ | _____ |
| 4. $y = 2x + 1$ for all real x | _____ | 14. $f(x) = \sqrt{x - 4}$ | _____ |
| 5. $y = x^2$ for all real x | _____ | 15. $y = 2^x$ | _____ |
| 6. $y = -3x$ for $0 \leq x \leq 5$ | _____ | 16. $y = 3$ for $x > 0$ | _____ |
| 7. Points $(-3, 1), (-1, 3), (2, 0), (3, 2)$ | _____ | 17. $f(x) = \frac{1}{x - 2}$ | _____ |
| 8. $y = x $ for $-4 \leq x \leq 4$ | _____ | 18. $y = x^2 + 5$ for all real x | _____ |
| 9. $f(x) = \frac{1}{x}$ | _____ | 19. Cost of n tickets at \$10, $n = 1$ to 5 | _____ |
| 10. $\{(2, 6), (2, 9), (3, 6)\}$ | _____ | 20. Time of a 100-mile drive at speed r , $r > 0$ | _____ |

VISUAL PRACTICE

Use the graph, table, chart, or diagram to answer the question.

21. Find the domain and range of the plotted points.

Answer: _____

22. Find the domain and range of the plotted points.

Answer: _____



◆ Word Problems

23. A movie theater charges $C(t) = 12t$ for t tickets. You can buy 1 to 10 tickets. State the domain and range.

Model: _____

Answer: _____

24. A ball is dropped from a 64-foot building. Its height is $h(t) = 64 - 16t^2$ for $t \geq 0$. State the domain and range in context.

Model: _____

Answer: _____

25. A car rental costs \$30 per day. You rent for d days, where d is a whole number from 1 to 7. State the domain and range.

Model: _____

Answer: _____

26. A water tank's volume is $V(t) = 500 - 20t$ liters, where t is time in minutes. The tank drains until empty. State the domain and range in context.

Model: _____

Answer: _____



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Answer Keys

- | | |
|---|---|
| 1. $D = \{1, 2, 3\}, R = \{4, 8, 12\}$ | 14. $D = [4, \infty), R = [0, \infty)$ |
| 2. $D = \{0, 1, 2, 3\}, R = \{0, 1, 4, 9\}$ | 15. $D = \mathbb{R}, R = (0, \infty)$ |
| 3. $D = \{-5, -2, 4\}, R = \{3\}$ | 16. $D = (0, \infty), R = \{3\}$ |
| 4. $D = \mathbb{R}, R = \mathbb{R}$ | 17. $D = x \neq 2, R = y \neq 0$ |
| 5. $D = \mathbb{R}, R = [0, \infty)$ | 18. $D = \mathbb{R}, R = [5, \infty)$ |
| 6. $D = [0, 5], R = [-15, 0]$ | 19. $D = \{1, 2, 3, 4, 5\}, R = \{10, 20, 30, 40, 50\}$ |
| 7. $D = \{-3, -1, 2, 3\}, R = \{0, 1, 2, 3\}$ | 20. $D = (0, \infty), R = (0, \infty)$ |
| 8. $D = [-4, 4], R = [0, 4]$ | 21. $D = \{-2, 0, 3\}, R = \{1, 4\}$ |
| 9. $D = x \neq 0, R = y \neq 0$ | 22. $D = \{-4, 1, 4\}, R = \{-2, 3\}$ |
| 10. $D = \{2, 3\}, R = \{6, 9\}$; not a function | 23. $D = \{1, 2, \dots, 10\}, R = \{12, 24, \dots, 120\}$ |
| 11. $D = [-3, 3], R = [-2, 2]$ | 24. $D = [0, 2], R = [0, 64]$ |
| 12. $D = \mathbb{R}, R = \{2\}$ | 25. $D = \{1, \dots, 7\}, R = \{30, 60, \dots, 210\}$ |
| 13. $D = [0, \infty), R = [0, \infty)$ | 26. $D = [0, 25], R = [0, 500]$ |

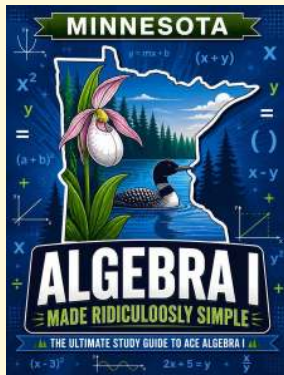
Step-by-Step Tutor Notes

- Think of slope as the amount the output changes for each 1-unit change in the input. Just list the x 's and y 's separately. So the requested value is $D = \{1, 2, 3\}, R = \{4, 8, 12\}$.
- Use the clue in the question first, then let the arithmetic finish the job. These are squares, but the domain/range just lists what appears. So the answer is $D = \{0, 1, 2, 3\}, R = \{0, 1, 4, 9\}$.
- Take it one clear step at a time and keep the original question in mind. All three outputs are 3, so the range is just one element. So the answer is $D = \{-5, -2, 4\}, R = \{3\}$.
- A non-horizontal line covers every real x and produces every real y . Both are all real numbers.
- Domain is all reals, but the parabola never dips below 0, so the range is $y \geq 0$.
- As x goes from 0 to 5, y goes from 0 down to -15 . (Negative slope flips the range orientation.)
- Focus on the main idea of the problem, then simplify carefully. List the x 's, then the y 's — sort each in order if you want. So the answer is $D = \{-3, -1, 2, 3\}, R = \{0, 1, 2, 3\}$.
- x runs from -4 to 4 ; $|x|$ runs from 0 (at $x = 0$) up to 4 (at the endpoints).
- Can't divide by zero, so $x \neq 0$. And $\frac{1}{x}$ is never exactly 0, so $y \neq 0$ either.
- The domain is $\{2, 3\}$ and the range is $\{6, 9\}$. Since $x = 2$ has two outputs, the relation is not a function.
- Focus on the main idea of the problem, then simplify carefully. Closed dots include the endpoints. x goes -3 to 3 ; y goes -2 to 2 . So the answer is $D = [-3, 3], R = [-2, 2]$.
- Start with the definition the problem is testing, then apply it directly. x takes all values; y is always 2. So the answer is $D = \mathbb{R}, R = \{2\}$.
- Focus on the main idea of the problem, then simplify carefully. Square roots need non-negative inputs, and they return non-negative outputs. So the answer is $D = [0, \infty), R = [0, \infty)$.
- Inside the radical must be ≥ 0 : $x - 4 \geq 0$, so $x \geq 4$. Output still starts at 0.
- Exponentials accept any x , and the output is always positive but approaches 0 without reaching it.
- This is a good place to slow down, check the notation, and simplify cleanly. Restricted constant function. Only the open right side of $x = 0$ is allowed. So the answer is $D = (0, \infty), R = \{3\}$.
- Denominator can't be zero: $x \neq 2$. Output never reaches 0 for the same reason as before.
- Use the structure of the expression to find the important point, then check that it fits the context. Domain is all reals. Range starts at 5 (the vertex) and goes up. That leads to $D = \mathbb{R}, R = [5, \infty)$.
- Start with the definition the problem is testing, then apply it directly. Tickets are discrete (whole numbers only). Domain and range are listed sets. So the answer is $D = \{1, 2, 3, 4, 5\}, R = \{10, 20, 30, 40, 50\}$.
- Speed must be positive (no division by zero, no driving backwards). Time can be any positive number depending on speed.
- The domain is the set of x -values. The range is the set of y -values.
- The domain is the set of x -values: $\{-4, 1, 4\}$. The range is the set of y -values: $\{-2, 3\}$.
- Tickets are whole numbers from 1 to 10, so the domain is the set $\{1, 2, \dots, 10\}$. The cost goes from $12(1) = 12$ up to $12(10) = 120$ in \$12 steps. Discrete points — don't connect them with a line.
- Time starts at 0. The ball hits the ground when $h(t) = 0$: $64 - 16t^2 = 0$, so $t^2 = 4$, $t = 2$ (positive root). Domain is $[0, 2]$. Height goes from 0 ft (ground) up to 64 ft (start). Range $[0, 64]$.
- Days are whole numbers 1 through 7. Cost is $30d$ in steps of 30: 30, 60, 90, \dots , 210. Discrete data.
- Time starts at 0; tank empties when $V = 0$: $500 - 20t = 0$, so $t = 25$ minutes. Domain $[0, 25]$. Volume runs 500 (start) down to 0 (empty). Range $[0, 500]$.



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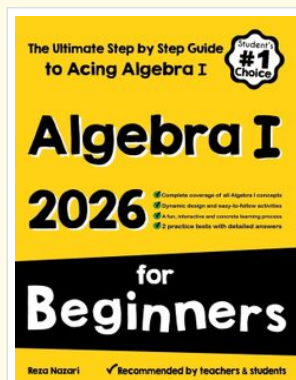
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