Quantitative comparison and number reasoning

Original classroom teaching; not an official form or score predictor

GRE Quantitative Comparison and Number Reasoning

- Compare Quantity A and Quantity B, using every **constraint** 约束条件 given.
- Choose from four fixed answers: A greater, B greater, equal, or cannot be determined.
- Recognise when the relationship is **indeterminate** 不能确定的.
- Use arithmetic, powers, ratios and divisibility to simplify.

The four answers

- (A) Quantity A is always greater; (B) Quantity B is always greater; (C) they are always equal; (D) the relationship cannot be determined.
- "Always" means for every value the conditions allow.
- If you find one case where A is greater and another where B is greater, the answer is (D).

Test the allowed values

- Unless the question says otherwise, a variable can be positive, negative, zero, a fraction or not an integer.
- Try a few kinds of value: 2, -2, 0, $\frac{1}{2}$, a large number.
- Examples can prove (D), but a few examples never prove (A), (B) or (C); for those, you need a reason that covers all cases.

Simplify safely

- You may add or subtract the same amount from both quantities.
- You may multiply or divide both by the same positive number.
- Never divide by a quantity that could be zero or negative without considering those cases.
- Figures are not necessarily drawn to scale: use the given facts.

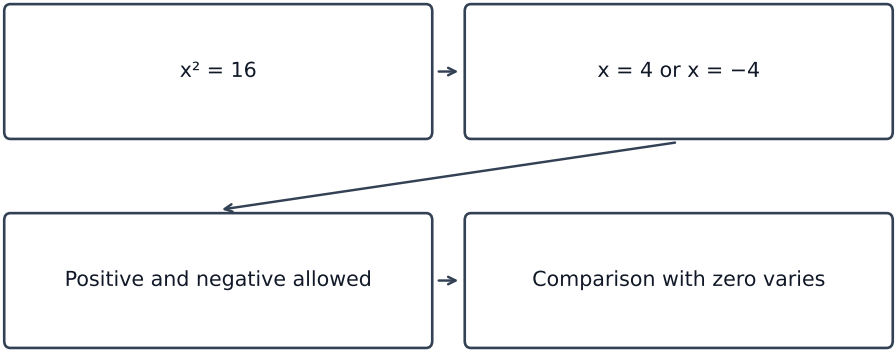
Figure: Simplify safely



both allowed, so the relationship cannot be determined

- Two allowed values on opposite sides of zero.
- Match each part of the diagram to the text.

Figure: Simplify safely ·



- $x^2 = 16$ allows $x = 4$ or $x = -4$, so the comparison with zero is not fixed

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Worked example: powers of a fraction

- Try $x = \frac{1}{2}$: $\frac{1}{4} > \frac{1}{8}$, so A is greater.
- Reason for every allowed x: $x^2 - x^3 = x^2(1 - x)$. Both factors are positive when $0 < x < 1$, so A is always greater: answer (A).
- Without the condition, $x = 2$ gives $4 < 8$, so the answer would be (D).

Worked example: an original application

- Quantitative Comparison uses these relationships: A.
- Quantity A is greater.
- B.
- Quantity B is greater.

Independent transfer

- With the same four answer categories, let $a > 0$ and $b < 0$.
- Compare Quantity A: a/b, Quantity B: b/a.
- Give admissible examples if the relationship can vary, and identify when equality occurs.
- **D.** For a=2,b=-1, A=-2 and B=-1/2, so B is greater.

Common errors

- Assuming a variable is a positive integer.
- Concluding (A), (B) or (C) from one or two examples.
- Dividing both sides by an expression that could be negative.

Common errors (2)

- Trusting a figure's appearance.
- Writing $\sqrt{16} = \pm 4$ (the root is 4; the equation $x^2 = 16$ has two solutions).

Key terms

- **constraint**: A condition that limits the allowed values.
- **indeterminate**: Not fixed by the information given.

Check yourself

- $x \neq 0$. Quantity A: x. Quantity B: $\frac{1}{x}$. What is the answer?
- n is a positive integer. Quantity A: $(-1)^{2n}$. Quantity B: 1. What is the answer?
- Why can examples prove (D) but not (A)?