Recognizing Proportional Relationships

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

A proportional relationship has $y = kx$: every nonzero row has the same y/x, and the graph includes $(0, 0)$. For $(2, 6), (4, 12)$ both ratios are 3; $(2, 7), (4, 13)$ have different ratios even though increases are steady.

Worked example

Practice table: does the table show a proportional relationship? Give two ratios as evidence.

1. First row: $y/x = 2/1 = 2$.
2. Second row: $y/x = 6/3 = 2$.
3. Third row gives 2; all ratios agree.
Answer: Yes; $k = 2$.

x	y
1	2
3	6
5	10

Practice Problems

Show your thinking.

1. Museum tickets: a student claims equal increases in y for equal increases in x prove proportionality. Is this general rule valid? Separately, is the given table proportional? Check its ratios and the origin.

x	y
1	3
2	6
4	12

2. Taxi fares: a student claims equal increases in y for equal increases in x prove proportionality. Is this general rule valid? Separately, is the given table proportional? Check its ratios and the origin.

x	y
2	8
3	11
5	17

3. A proportional table has $(x, y) = (1, 5)$ and $(2, 10)$. Is the second row consistent? If not, repair its y-value.

4. A proportional table has $(x, y) = (1, 7)$ and $(3, 21)$. Is the second row consistent? If not, repair its y-value. Write the repaired rule and predict the output at $x = 4$.

5. A proportional table has $(x, y) = (1, 3)$ and $(4, 12)$. Is the second row consistent? If not, repair its y-value. Explain why a rule with a nonzero joining fee cannot keep the same output/input ratio.

6. A proportional table has $(x, y) = (1, 4)$ and $(5, 20)$. Is the second row consistent? If not, repair its y-value. Test whether $(0, 0)$ agrees with that rule.

7. Refill station: a student claims equal increases in y for equal increases in x prove proportionality. Is this general rule valid? Separately, is the given table proportional? Check its ratios and the origin.

x	y
2	7
4	14
6	21

8. Delivery membership: a student claims equal increases in y for equal increases in x prove proportionality. Is this general rule valid? Separately, is the given table proportional? Check its ratios and the origin.

x	y
1	4
3	10
5	16

Answer Key

1. No: equal increments alone do not prove proportionality. Given table: yes, proportional with $k = 3$ and origin $(0, 0)$.
2. No: equal increments alone do not prove proportionality. Given table: no, because its output/input ratios differ.
3. The consistent output is 10; no repair.

4. The consistent output is 21; no repair. Rule $y = 7x$; next output 28.

5. The consistent output is 12; no repair. A fixed fee produces a nonzero output at zero input and changes the ratios.
6. The consistent output is 20; no repair. It does.

7. No: equal increments alone do not prove proportionality. Given table: yes, proportional with $k = \frac{7}{2}$ and origin $(0, 0)$.
8. No: equal increments alone do not prove proportionality. Given table: no, because its output/input ratios differ.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Counterexample: $y = 2x + 1$ gives outputs $3, 5, 7$ at inputs $1, 2, 3$. Equal input steps 1 give equal output steps 2, but ratios $3, 5/2, 7/3$ differ. Thus the general rule is false.
2. Given first row: $y/x = 3/1 = 3$.
3. Next ratios: $6/2 = 3$ and $12/4 = 3$. All agree.
4. The rule $y = 3x$ fits all three rows; at $x = 0$, $y = 3(0) = 0$. Constant ratios and the origin justify this table, not the invalid equal-increments claim.

Problem 2

1. Counterexample: $y = 2x + 1$ gives outputs $3, 5, 7$ at inputs $1, 2, 3$. Equal input steps 1 give equal output steps 2, but ratios $3, 5/2, 7/3$ differ. Thus the general rule is false.
2. Given first row: $y/x = 8/2 = 4$.
3. Next ratios: $11/3 = \frac{11}{3}$ and $17/5 = \frac{17}{5}$. They do not all agree.
4. The rows instead fit $y = 3x + 2$: at $x = 0$, $y = 2 \neq 0$. The nonzero intercept also rules out proportionality.

Problem 3

1. The first row sets $k = 5/1 = 5$.
2. At $x = 2$, $y = 5(2) = 10$.
3. Compare 10 with 10: equal.

Problem 4

1. The first row sets $k = 7/1 = 7$.
2. At $x = 3$, $y = 7(3) = 21$.
3. Compare 21 with 21: equal.
4. At $x = 4$, $y = 7(4) = 28$.

Problem 5

1. The first row sets $k = 3/1 = 3$.
2. At $x = 4$, $y = 3(4) = 12$.
3. Compare 12 with 12: equal.
4. A fee of 2 would make these outputs 5 at $x = 1$ and 14 at $x = 4$, with different ratios.

Problem 6

1. The first row sets $k = 4/1 = 4$.
2. At $x = 5$, $y = 4(5) = 20$.
3. Compare 20 with 20: equal.
4. $y = 4(0) = 0$.

Problem 7

1. Counterexample: $y = 2x + 1$ gives outputs $3, 5, 7$ at inputs $1, 2, 3$. Equal input steps 1 give equal output steps 2, but ratios $3, 5/2, 7/3$ differ. Thus the general rule is false.
2. Given first row: $y/x = 7/2 = \frac{7}{2}$.
3. Next ratios: $14/4 = \frac{7}{2}$ and $21/6 = \frac{7}{2}$. All agree.
4. The rule $y = \frac{7}{2}x$ fits all three rows; at $x = 0$, $y = \frac{7}{2}(0) = 0$. Constant ratios and the origin justify this table, not the invalid equal-increments claim.

Problem 8

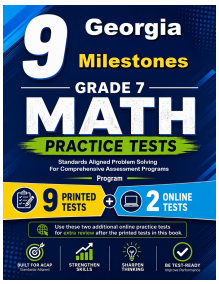
1. Counterexample: $y = 2x + 1$ gives outputs $3, 5, 7$ at inputs $1, 2, 3$. Equal input steps 1 give equal output steps 2, but ratios $3, 5/2, 7/3$ differ. Thus the general rule is false.
2. Given first row: $y/x = 4/1 = 4$.
3. Next ratios: $10/3 = \frac{10}{3}$ and $16/5 = \frac{16}{5}$. They do not all agree.
4. The rows instead fit $y = 3x + 1$: at $x = 0$, $y = 1 \neq 0$. The nonzero intercept also rules out proportionality.

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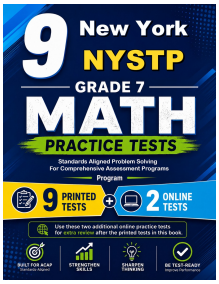
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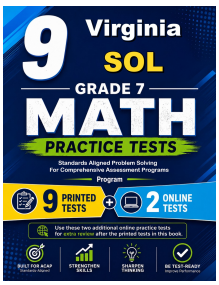
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