Graphing Proportional Relationships

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Check both conditions: a proportional graph is straight and goes through $(0,0)$. A line through $(0,3)$ and $(2,7)$ has rise/run $4/2=2$, but its nonzero starting value makes it nonproportional. A bent graph through the origin also fails the test.

Worked example

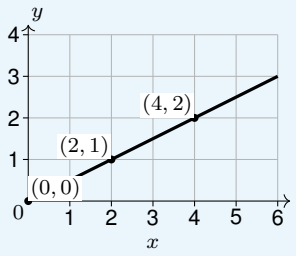
Graph $y=x/2$ from $x=0$ to $x=6$ using $(0,0),(2,1),(4,2)$.

1. At $x=0$, $y=0/2=0$; at $x=2$, $y=2/2=1$.

2. At $x=4$, $y=4/2=2$, and the right endpoint has $y=6/2=3$.

3. From $(2,1)$ to $(4,2)$ the rise/run is $(2-1)/(4-2)=1/2$. Draw the straight segment shown through all three marked points.

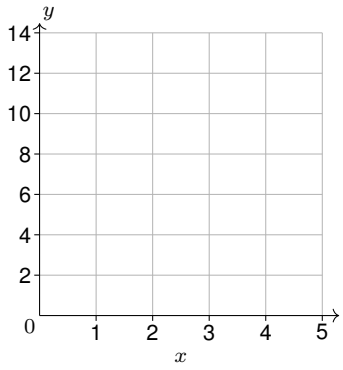
Answer: The straight segment goes through $(0,0),(2,1),(4,2)$ and ends at $(6,3)$.



Practice Problems

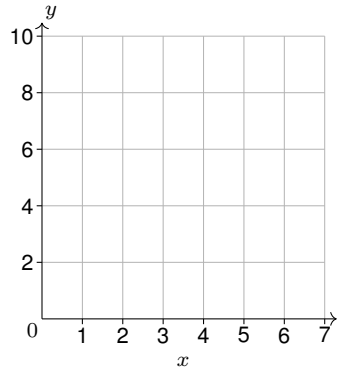
Show your thinking.

1. A student draws only the segment from $(2,6)$ to $(4,12)$ for a proportional rule on $0\le x\le 4$. Repair the graph and state the y-intercept.



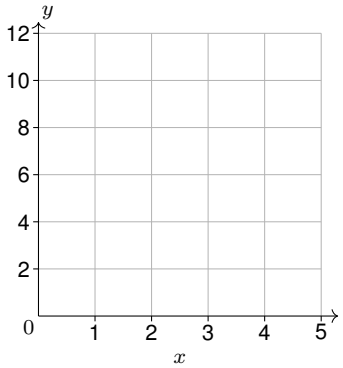
2. A broken-line graph connects $(0,0)$ to $(2,2)$ to $(4,8)$. It passes through the origin. Is it proportional? Compare the two segments.

3. For a proportional rule, input 3 gives output 4. Lee plots $(4,3)$. Correct the coordinate order, find k, and graph the rule from $x=0$ to $x=6$.



4. On a proportional graph, each horizontal square is 2 input units and each vertical square is 3 output units. The line rises 2 squares for 3 squares right. Find k and explain why counting squares gives the wrong rate.

5. A straight line through $(1,4)$ and $(3,8)$ is labeled proportional. Test the label, and graph the actual line on $0\le x\le 4$ including its intercept.



6. Sketch A is straight through $(0,0)$ and $(5,7)$. Sketch B is curved through those points and $(10,20)$. Classify each as proportional or not, and give numerical evidence.

Answer Key

1. $y = 3x$; the intercept is $(0, 0)$. Draw the segment from $(0, 0)$ to $(4, 12)$ through $(2, 6)$.
2. No. The segment rates are 1 and 3, so the graph is not one straight line.
3. The point is $(3, 4)$, not $(4, 3)$. $k = 4/3$; draw through $(0, 0), (3, 4), (6, 8)$.
4. $k = 1$ output unit per input unit, not $2/3$.
5. Not proportional: $y = 2x + 2$ has intercept $(0, 2)$. Draw the segment ending at $(4, 10)$.
6. A is proportional with $k = 7/5$. B is not proportional.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The given points agree: $6/2 = 12/4 = 3$.
2. The required interval includes $x = 0$, where $y = 3(0) = 0$. The original segment left out inputs from 0 up to 2.
3. Join $(0, 0), (2, 6), (4, 12)$, stopping at the stated right endpoint $x = 4$.

Problem 2

1. From $(0, 0)$ to $(2, 2)$ the rate is $(2 - 0)/(2 - 0) = 1$.
2. From $(2, 2)$ to $(4, 8)$ the rate is $(8 - 2)/(4 - 2) = 3$.
3. A single rate of 1 would give $y = 1(4) = 4$, not 8. Passing through the origin is not enough.

Problem 3

1. Input is the horizontal coordinate: the given pair is $(3, 4)$, so $k = 4/3$.
2. At input 4, the correct output is $(4/3)(4) = 16/3$, not 3. The swapped point does not fit.
3. At input 6, $y = (4/3)(6) = 8$. Plot $(0, 0), (3, 4), (6, 8)$ and connect them.

Problem 4

1. The horizontal run is $3(2) = 6$ input units.
2. The vertical rise is $2(3) = 6$ output units.
3. Use the axis units: $k = 6/6 = 1$. The ratio $2/3$ uses square counts, not the different axis scales.

Problem 5

1. The rise/run is $(8 - 4)/(3 - 1) = 2$.
2. From $(1, 4)$, move one input unit left: the output falls to $4 - 2 = 2$. Thus the intercept is $(0, 2)$, not $(0, 0)$.
3. The line is $y = 2x + 2$; at $x = 4$ it gives $2(4) + 2 = 10$. Join $(0, 2), (1, 4), (3, 8), (4, 10)$.

Problem 6

1. A is straight through the origin, and its given nonzero point yields $k = 7/5$.
2. That rate predicts $(7/5)(10) = 14$ at input 10.
3. B gives 20 there, with ratio $20/10 = 2$ instead of $7/5$. Sharing the first two points does not make B proportional.

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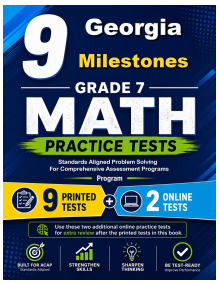

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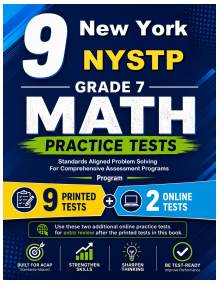

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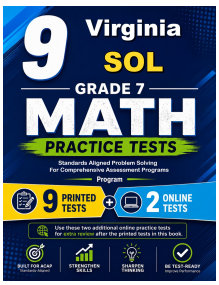

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