# Graphing Proportional Relationships

Explore ideas and representations

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

## QUICK REVIEW

A proportional graph is a straight line through $(0,0)$. Find $k = y/x$ from any nonzero input, or use rise divided by run in axis units. For example, $(4,6)$ gives $k = 6/4 = 3/2$, so the unit-input point is $(1, 3/2)$. Use the numbered scales, not just the number of squares.

**Worked example**

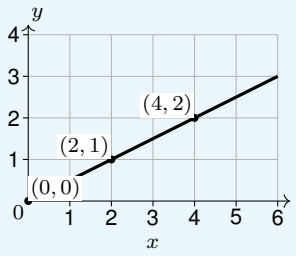
Graph $y = x/2$ from $x = 0$ to $x = 6$ using $(0,0), (2,1), (4,2)$.

**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.

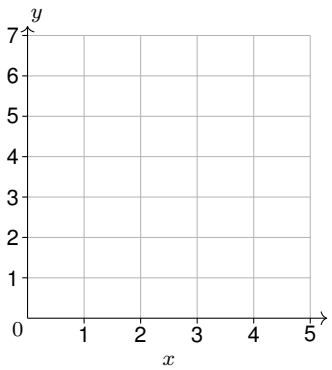
**Answer:** The straight segment goes through $(0,0), (2,1), (4,2)$ and ends at $(6,3)$.




## Practice Problems

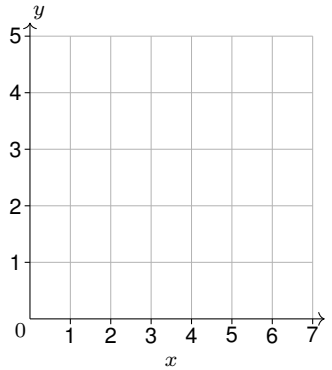
Show your thinking.

**1.** Graph $y = \frac{3}{2}x$ for $0 \le x \le 4$. Plot the points for $x = 0, 2, 4$, then state what $k$ tells you at $x = 1$.



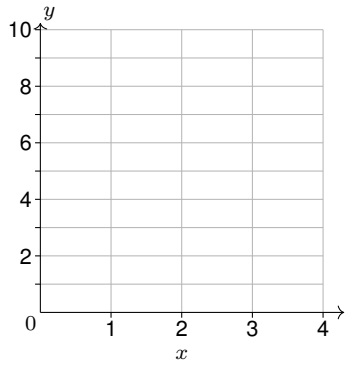

**2.** A straight proportional graph contains $(0,0)$ and $(4,5)$. Find its point with $x = 1$ and explain why its output is the constant.

**3.** A proportional table gives $(x, y) = (0,0), (3,2), (6,?)$. Complete the last row and graph the relationship from $x = 0$ to $x = 6$.




**4.** A proportional graph contains $(2,7)$ and $(6,21)$. Find the constant from rise/run. How much does output increase when input increases by $2$?

**5.** A proportional line passes through $(3,9)$. Find its point with output $6$, then graph the line from $x = 0$ to $x = 3$ using both points and the origin.




**6.** On the same axes, proportional line A contains $(4,3)$ and line B contains $(4,7)$. Which is steeper? Find the difference in their outputs at $x = 8$.

# Answer Key

**1.** Segment through $(0,0), (2,3), (4,6)$. At input $1$, output is $k = 3/2$.
**2.** $(1, 5/4)$; $k = 5/4$ output units per input unit.
**3.** Missing output $4$; segment through $(0,0), (3,2), (6,4)$.
**4.** $k = 7/2$; the output increases by $7$ units.
**5.** The missing point is $(2,6)$; draw the segment through $(0,0), (2,6), (3,9)$.
**6.** B is steeper. At $x = 8$, B gives $14$ and A gives $6$, a difference of $8$.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

**1.** At zero input, $y = (3/2)(0) = 0$.
**2.** At $x = 2$, $y = (3/2)(2) = 3$; at $x = 4$, $y = (3/2)(4) = 6$.
**3.** Join the three points. The rate $k = 3/2$ gives $y = (3/2)(1) = 3/2$ at one input unit.

### Problem 2

**1.** From the origin to $(4,5)$ the rise/run is $5/4$.
**2.** At one input unit the rule gives $y = (5/4)(1) = 5/4$.
**3.** At $(1, 5/4)$ the ratio is $(5/4)/1 = 5/4$, so the output itself gives the constant.

### Problem 3

**1.** The second row gives $k = 2/3$ output units per input unit.
**2.** Input $6$ is twice $3$, so the corresponding output is $2(2) = 4$.
**3.** Check $4/6 = 2/3$, then join $(0,0), (3,2), (6,4)$ with one segment.

### Problem 4

**1.** Rise $= 21 - 7 = 14$ and run $= 6 - 2 = 4$.
**2.** Rise/run $= 14/4 = 7/2$; it matches $y/x = 7/2$ at $(2,7)$.
**3.** Two more input units give an output increase of $2(7/2) = 7$.

### Problem 5

**1.** From $(3,9)$, the constant is $9/3 = 3$, so $y = 3x$.
**2.** When $y = 6$, solve $3x = 6$: $x = 6/3 = 2$.
**3.** Plot $(2,6)$ and $(3,9)$ with $(0,0)$, since $3(0) = 0$. Join them.

### Problem 6

**1.** From the origin to input $4$, A rises $3$ and B rises $7$. The rates are $3/4$ and $7/4$.
**2.** Because $7/4 > 3/4$ on these same axes, B is steeper.
**3.** At input $8 = 2(4)$, the outputs are $2(3) = 6$ and $2(7) = 14$. Difference: $14 - 6 = 8$.

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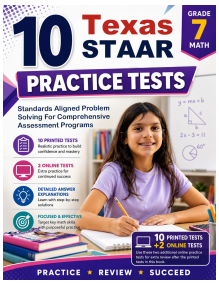


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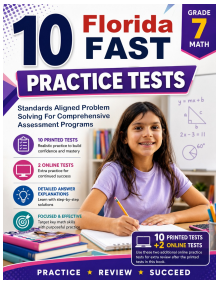


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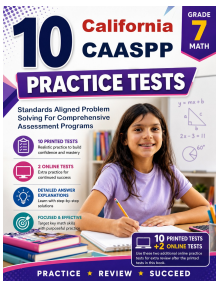


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