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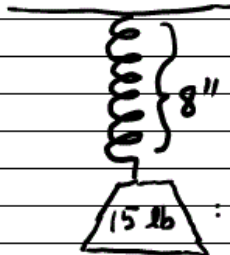
Direct Proportion Functions / Equations and Inequalities

Examples and Vocabulary	Notes/Comments/Questions
The quantity y is <u>directly proportional</u> (or <u>varies directly</u>) to the quantity x means $y = f(x) = mx$ But for historical reasons we usually write this formula as $y = kx$ The constant k (i.e. the slope) is called the <u>constant of proportionality</u> in this context.	

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Examples and Vocabulary	Notes/Comments/Questions
① The quantity y is directly proportional to the quantity x, and $y=20$ when $x=8$. a. Find the constant of proportionality. $y = mx = kx = \frac{5}{2}x$ $20 = k \cdot 8$ $\frac{5}{2} = \frac{20}{8} = k$ b. Find y when $x=25$. $y = \frac{5}{2}(25) = \frac{125}{2} = 62.5$	

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Examples and Vocabulary	Notes/Comments/Questions
c. Find x when $y = 32$. $\frac{2}{5} \cdot 32 = \frac{8}{2}x \cdot \frac{2}{8}$ $\frac{64}{5} = x$	
② The distance a spring stretches y is directly proportional to the weight x attached to the spring. Suppose a 15 lb weight stretches the spring 8 inches.	
a. Find the constant of proportionality. $y = kx = \frac{8}{15}x$ $8 = k \cdot 15$ $\frac{8}{15} = k$	

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Examples and Vocabulary	Notes/Comments/Questions
b. How far will a 25 lb weight stretch the Spring? $y = \frac{8}{15} (25) = \frac{8 \cdot 25}{15} = \frac{8 \cdot 5}{3} = \frac{40}{3} \approx 13.3$	
c. How heavy is a weight that stretches the spring 3.2 inches? $\frac{15}{8} \cdot 3.2 = \frac{8}{15} x \cdot \frac{15}{8}$ $6 = x$	

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Examples and Vocabulary	Notes/Comments/Questions
③ Solve each equation. a. $3(2x-5) = 10-(x+5)$ $6x-15 = 10-x-5$ $6x-15 = 5-x$ $\begin{array}{r} 6x-15 \\ +x \end{array} \quad \begin{array}{r} 5-x \\ +x \end{array}$ $7x-15 = 5$ $\begin{array}{r} 7x-15 \\ +15 \end{array} \quad \begin{array}{r} 5 \\ +15 \end{array}$ $\frac{7x}{7} = \frac{20}{7}$ $x = \frac{20}{7}$	
b. $3(2x-5) = 10-(5-6x)$ $6x-15 = 10-5+6x$ $\begin{array}{r} 6x-15 \\ -6x \end{array} \quad \begin{array}{r} 10-5+6x \\ -6x \end{array}$ $-15 = 10-5$ $-15 = 5, \text{ false}$	no solutions

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$c. \frac{t-2}{4} - \frac{t}{3} = 5 - \frac{3-t}{12}$ $12 \cdot \frac{t-2}{4} - 12 \cdot \frac{t}{3} = 12 \cdot 5 - 12 \cdot \frac{3-t}{12}$ $3(t-2) - 4t = 60 - (3-t)$ $3t - 6 - 4t = 60 - 3 + t$ $-6 - t = 57 + t$ $+t \quad +t$ $-6 = 57 + 2t$ $-57 \quad -57$ $-63 = 2t$ $\rightarrow \frac{-63}{2} = t$	
④ Find the zeros (x-intercepts) of the function $f(x) = \frac{4}{15} - \frac{2}{21}x$ $0 = \frac{4}{15} - \frac{2}{21}x$ $105 \cdot 0 = 105 \cdot \frac{4}{15} - 105 \cdot \frac{2}{21}x$ $0 = 28 - 10x$ $\frac{14}{5} = x$	$\left(\frac{7}{21}\right)\left(-\frac{4}{15}\right) = -\frac{2}{21}x\left(-\frac{21}{2}\right)$ $\frac{14}{5} = x$ $-28 = -10x$ $\frac{-28}{-10} = x$

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Examples and Vocabulary	Notes/Comments/Questions
⑤ The per capita (per person) income y from 1970 to 2000 can be modeled by $y = 604.8(x - 1970) + 2280$ where x is the calendar year. Determine when the per capita income was \$16190. $16190 = 604.8(x - 1970) + 2280$ $16190 = 604.8x - 1191456 + 2280$ $16190 = 604.8x - 1189176$ $+ 1189176 \quad + 1189176$ $\frac{1205366}{604.8} = \frac{604.8x}{604.8}$ $1993 \approx x$	

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Examples and Vocabulary	Notes/Comments/Questions
⑥ Solve each inequality. a. $3(2x-3) < \frac{x+2}{3}$ $\begin{array}{rcl} 6x - 9 & < & x + 2 \\ -x & & -x \\ \hline 5x - 9 & < & 2 \\ +9 & & +9 \\ \hline 5x & < & 11 \\ \frac{5x}{5} & < & \frac{11}{5} \end{array}$	$x < \frac{11}{5}$ $(-\infty, \frac{11}{5})$ 2.2
b. $-3(4z-4) \geq 4-(z-1)$ $\begin{array}{rcl} -12z + 12 & \geq & 4 - z + 1 \\ -12z + 12 & \geq & 5 - z \\ +z & & +z \\ \hline -11z + 12 & \geq & 5 \\ -12 & & -12 \\ \hline -11z & \geq & -7 \\ -11 & & -11 \\ \hline z & \leq & \frac{7}{11} \end{array}$	$-4 < -1$ $\overline{-1} \quad \overline{-1}$ $4 > 1$ $(-\infty, \frac{7}{11}]$

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Examples and Vocabulary	Notes/Comments/Questions
⑦ T = air temperature in Fahrenheit T_0 = air temperature at ground level x = altitude in miles $T = T_0 - 29x = 62 - 29x$ D = dew point temperature D_0 = dew point temperature at ground level = 50 $D = D_0 - 5.8x = 50 - 5.8x$ Determine the altitude where clouds may currently form. $T \leq D$ $ \begin{array}{rcl} 62 - 29x & \leq & 50 - 5.8x \\ +5.8x & & +5.8x \\ \hline 62 - 23.2x & \leq & 50 \\ -62 & & -62 \\ \hline -23.2x & \leq & -12 \end{array} $	$m = -29$ $m = -5.8$ $\begin{array}{rcl} -23.2x & \leq & -12 \\ \hline -23.2 & & -23.2 \\ \hline x & \geq & .52 \end{array}$

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Examples and Vocabulary	Notes/Comments/Questions
⑧ Solve each compound inequality. a. $-4 \leq 5x+1 < 21$ $\quad -1 \quad \quad -1 \quad -1$ $\frac{-5}{5} \leq \frac{5x}{5} < \frac{20}{5}$ $-1 \leq x < 4, [-1, 4)$ b. $4 \cdot \frac{1}{2} < 4 \cdot \frac{1-2t}{4} < 2 \cdot 4$ $2 < 1-2t < 8$ $\quad -1 \quad -1 \quad -1$ $\frac{1}{-2} < \frac{-2t}{-2} < \frac{7}{-2}$ $-\frac{1}{2} > t > -\frac{7}{2}, (-\frac{7}{2}, -\frac{1}{2})$	