1a $2s - 1 = 6s - 5 \;\Rightarrow\; -4s = -4 \;\Rightarrow\; s = 1$

1b $5x - 12 = 2x - 6 \;\Rightarrow\; 3x = 6 \;\Rightarrow\; x = 2$

2 $S = 2\pi rh + 2\pi r^2 \;\Rightarrow\; 2\pi rh = S - 2\pi r^2 \;\Rightarrow\; h = \dfrac{S - 2\pi r^2}{2\pi r}.$

3 Let x be the length of the equal sides, so that $2x - 15$ is the length of the third side. The perimeter is the sum of the lengths of the sides, and it is given to be 53. Thus we have

$$x + x + (2x - 15) = 53,$$

or $4x - 15 = 53$. From this we get $4x = 68$, and finally $x = 17$. Therefore the equal sides are 17 cm long, and the third side is 19 cm.

4 Let x be the amount invested at 5.5%, so that $x - 4000$ is the amount invested at 4%. The interest from the 5.5% investment is $0.055x$, and the interest from the 4% investment is $0.04(x - 4000)$. Therefore

$$0.055x + 0.04(x - 4000) = 1900.$$

From this we have

$$0.095x - 160 = 1900 \;\Rightarrow\; 0.095x = 2060 \;\Rightarrow\; x = \dfrac{2060}{0.095} \;\Rightarrow\; x = 21,684.21$$

That is, \$21,684.21 was invested at 5.5%, and \$17,684.21 was invested at 4%.

5 Let x be the number of gallons of pure dye to be added. We equate gallons of pure dye:
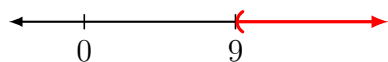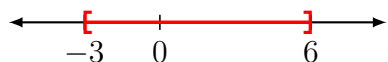
$$1.00x + 0.25(5) = 0.40(x + 5).$$

From this we obtain

$$0.60x = 0.75 \;\Rightarrow\; x = \dfrac{0.75}{0.60} = 1.25.$$

That is, 1.25 gallons of pure dye should be added.

6a $-3x < -27 \;\Rightarrow\; x > 9 \;\Rightarrow\; (9, \infty)$

6b $-6 \leq 2t \leq 12 \;\Rightarrow\; -3 \leq t \leq 6 \;\Rightarrow\; [-3, 6]$

7a $x \leq 15$ and $x \geq -7$ $\Rightarrow$ $-7 \leq x \leq 15$ $\Rightarrow$ $[-7, 15]$.

7b $3x < 24$ or $x > 10$ $\Rightarrow$ $x < 8$ or $x > 10$ $\Rightarrow$ $(-\infty, 8) \cup (10, \infty)$.
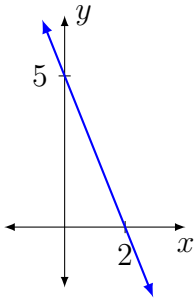
8 $7 - 3x = 16$ or $7 - 3x = -16$ $\Rightarrow$ $-3x = 9$ or $-3x = -23$ $\Rightarrow$ $x = -3$ or $x = \frac{23}{3}$ $\Rightarrow$ $\left\{ -3, \frac{23}{3} \right\}$

9a $3r - 1 > 11$ or $3r - 1 < -11$ $\Rightarrow$ $r > 4$ or $r < -\frac{10}{3}$ $\Rightarrow$ $\left(-\infty, -\frac{10}{3} \right) \cup (4, \infty)$

9b $|y + 5| \leq 5$ $\Rightarrow$ $-5 \leq y + 5 \leq 5$ $\Rightarrow$ $-10 \leq y \leq 0$ $\Rightarrow$ $[-10, 0]$

9c The solution set is $\varnothing$, which is to say there is no solution. An absolute value can never be less than 0.

10 x-intercept is $(2, 0)$, and y-intercept is $(0, 5)$.

11 Midpoint is at $\left(\dfrac{2 + 6}{2}, \dfrac{-3 - 8}{2} \right) = \left(4, -\dfrac{11}{2} \right)$

12 One line has equation $y = 2x - 3$ and thus slope 2, and the other line has equation $y = -\frac{1}{2}x + \frac{3}{2}$ and thus slope $-\frac{1}{2}$. Since the slopes are negative reciprocals, the lines are perpendicular.

13 Slope of the line is
$$m = \frac{10 - 6}{-8 - (-2)} = -\frac{4}{6} = -\frac{2}{3},$$
and so the equation is $y - 6 = -\frac{2}{3}(x + 2)$. Slope-intercept form:
$$y = -\frac{2}{3}x + \frac{14}{3}.$$
Standard form: $2x + 3y = 14$.

14 The line $4x - y = 7$, which can be written $y = 4x - 7$, has slope 4. Thus, the line whose equation we must find has point $(-2, -3)$ and slope 4 also, which gives us the equation $y + 3 = 4(x + 2)$ by the point-slope formula. Slope-intercept form: $y = 4x + 5$. Standard form: $4x - y = -5$.

15a $2p^{-3} = \dfrac{2}{p^3}$

15b $(v^5)^{-4}v^8 = v^{-20}v^8 = v^{-12} = \dfrac{1}{v^{12}}$

15c $\dfrac{(2k)^2 m^{-6}}{(km)^{-3}} = \dfrac{4k^2 m^{-6}}{k^{-3}m^{-3}} = \dfrac{4k^2 k^3}{m^6 m^{-3}} = \dfrac{4k^5}{m^3}$