1. Express the following without the absolute value.

(a) $|86|$ (b) $|-78|$ (c) $\Big||-2|-|-5|\Big|$ (d) $\dfrac{-6}{|-6|}$

(e) $\left|\dfrac{-4}{16}\right|$ (f) $\left|\dfrac{8-13}{13-8}\right|$ (g) $-2-\Big|2-|-2|\Big|$ (h) $|\pi|$

(i) $|\pi-3|$ (j) $|3-\pi|$ (k) $|\pi-4|$ (l) $|1-\sqrt{2}|$

(m) $|\sqrt{2}-1|$ (n) $|y|$ (o) $|x-y|$, where $x<y$

2. Solve for x in the given equations.

(a) $|x|=15$ (b) $|x|=7$ (c) $|x|=-6$ (d) $|2x+5|=1$

(e) $|3x-6|=4$ (f) $|6-4x|=10$ (g) $\left|\dfrac{x-2}{3}\right|=9$ (h) $\left|\dfrac{1}{2}x-7\right|=4$

3. Solve for x in the given equations.

(a) $|x|=3$ (b) $7+|x+3|=1$ (c) $4+|2x-1|=6$ (d) $-|x+1|+8=5$

(e) $4-3|x-4|=2$ (f) $|x+7|-5=-8$ (g) $-2+|3x+1|=7$ (h) $-|7x+2|+1=3$

(i) $-|5x+2|+4=-4$ (j) $3+|2x+3|=6$ (k) $|3x+6|=2$ (l) $6-|x+4|=11$

(m) $8-7|x|=2$ (n) $5|x+1|-8=9$ (o) $|2x+5|+2=-3$ (p) $5|x+2|+2=5$

4. Solve for z in the given equations.

(a) $2|5z+1|-3=0$ (b) $\dfrac{5-|z|}{2}=1$ (c) $\dfrac{|2z+1|-3}{4}=\dfrac{1}{2}-|2z+1|$

(d) $\dfrac{|3-2z|+4}{2}=2-|3-2z|$ (e) $|3z-2|=|2z+7|$ (f) $|3z+1|=|4z|$

(g) $|4-z|-|z+2|=0$ (h) $|2-5z|=5|z+1|$

5. Express the following without the absolute value.

(a) $|x+3|$ (b) $|x-3|$ (c) $|3-x|$

(d) $|2x+5|$ (e) $|3x-4|$ (f) $|6-3x|$

(g) $|x-\pi|$ (h) $|\sqrt{3}-x|$ (i) $|x|$

Answers

1. (a) 86 (b) 78 (c) 3 (d) -1

   (e) $\frac{1}{4}$ (f) 1 (g) -2 (h) π

   (i) $\pi - 3$ (j) $\pi - 3$ (k) $4 - \pi$ (l) $\sqrt{2} - 1$

   (m) $\sqrt{2} - 1$ (n) $y = \begin{cases} y & \text{if } y \geq 0 \\ -y & \text{if } y < 0 \end{cases}$ (o) $y - x$

2. (a) $x = 15, \quad x = -15$ (b) $x = 7, \quad x = -7$ (c) No solution (d) $x = -3, \quad x = -2$

   (e) $x = \frac{2}{3}, \quad x = \frac{10}{3}$ (f) $x = -1, \quad x = 4$ (g) $x = -25, \quad x = 29$ (h) $x = 6, \quad x = 22$

3. (a) $x = 3, x = -3$ (b) No solution. (c) $x = -\frac{1}{2}, x = \frac{3}{2}$ (d) $x = -4, x = 2$

   (e) $x = \frac{10}{3}, x = \frac{14}{3}$ (f) No solution. (g) $x = -\frac{10}{3}, x = \frac{8}{3}$ (h) No solution.

   (i) $x = -2, x = \frac{6}{5}$ (j) $x = -3, x = 0$ (k) $x = -\frac{8}{3}, x = -\frac{4}{3}$ (l) No solution.

   (m) $x = -\frac{6}{7}, x = \frac{6}{7}$ (n) $x = -\frac{22}{5}, x = \frac{12}{5}$ (o) No solution. (p) $x = -\frac{13}{5}, x = -\frac{7}{5}$

4. (a) $z = -\frac{1}{2}, z = \frac{1}{10}$ (b) $z = -3, z = 3$ (c) $z = 0, z = -1$ (d) $z = \frac{3}{2}$

   (e) $z = -1, z = 9$ (f) $z = -\frac{1}{7}, z = 1$ (g) $z = 1$ (h) $z = -\frac{3}{10}$

5. (a) $|x + 3| = \begin{cases} x + 3 & \text{if } x \geq -3 \\ -x - 3 & \text{if } x < -3 \end{cases}$ (b) $|x - 3| = \begin{cases} x - 3 & \text{if } x \geq 3 \\ -x + 3 & \text{if } x < 3 \end{cases}$

   (c) $|3 - x| = \begin{cases} 3 - x & \text{if } x \leq 3 \\ x - 3 & \text{if } x > 3 \end{cases}$ (d) $|2x + 5| = \begin{cases} 2x + 5 & \text{if } x \geq \frac{-5}{2} \\ -2x - 5 & \text{if } x < \frac{-5}{2} \end{cases}$

(e) $|3x-4| = \begin{cases} 3x-4 & \text{if } x \geq \frac{4}{3} \\ 4-3x & \text{if } x < \frac{4}{3} \end{cases}$

(f) $|6-3x| = \begin{cases} 6-3x & \text{if } x \leq 2 \\ 3x-6 & \text{if } x > 2 \end{cases}$

(g) $|x-\pi| = \begin{cases} x-\pi & \text{if } x \geq \pi \\ \pi-x & \text{if } x < \pi \end{cases}$

(h) $|\sqrt{3}-x| = \begin{cases} \sqrt{3}-x & \text{if } x \leq \sqrt{3} \\ x-\sqrt{3} & \text{if } x > \sqrt{3} \end{cases}$

(i) $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$