

by Lisa Chen.

a) $|x+3|=11$
 $x+3=11 \quad |8+3|=11$
 $x=8 \quad |11|=11$
 $x+3=-11 \quad |-14+3|=11$
 $x=-14 \quad |-11|=11$

b) $|x-7|=12$
 $x-7=12 \quad |19-7|=12$
 $x=19 \quad |12|=12$
 $x-7=-12 \quad |-5-7|=12$
 $x=-5 \quad |-12|=12$

c) $|x-5|=2$
 $x-5=2 \quad |26-5|=21$
 $x=26 \quad |21|=21$
 $x-5=-2 \quad |1-5-2|=2$
 $x=-16 \quad |-21|=21$

d) $|x+9|=17$
 $-x+9=17 \quad |-(8)+9|=17$
 $-x=8 \quad |8+9|=17$
 $x=-8 \quad |17|=17$
 $-x+9=-17 \quad |26+9|=17$
 $-x=-26 \quad |-17|=17$
 $x=26$

e) $|2x-4|=7$
 $2x-4=7 \quad |2(5)-4|=7$
 $2x=11 \quad |11-4|=7$
 $x=5.5 \quad |7|=7$
 $2x-4=-7 \quad |2(-1.5)-4|=7$
 $2x=-3 \quad |-3-4|=7$
 $x=-1.5 \quad |-7|=7$

f) Same as e)

g) $|5x-11|=17$
 $5x-11=17 \quad |5(\frac{28}{5})-11|=17$
 $5x=28 \quad |28-11|=17$
 $x=\frac{28}{5} \quad |17|=17$
 $5x-11=-17 \quad |5(\frac{-6}{5})-11|=17$
 $5x=-6 \quad |-6-11|=17$
 $x=-\frac{6}{5} \quad |-17|=17$

h) $-|2x-4|+18=2$
 $-2x-4=7 \quad -2(10)-4+18=2$
 $-2x=11 \quad |-20-4+18=2$
 $x=10 \quad |-16+18=2$
 $2x-4=16 \quad -2(10)-4+18=2$
 $2x=20 \quad |-20-4+18=2$
 $x=10 \quad |-16+18=2$
 $2x-4=-16 \quad -2(-6)-4+18=2$
 $2x=-12 \quad |-12-4+18=2$
 $x=-6 \quad |-16+18=2$

i.) $3|9+2x|-14=18$
 $3|9+2x|=32$
 $|9+2x|=\frac{32}{3}$
 $9+2x=\frac{32}{3}$
 $2x=\frac{5}{3}$
 $x=\frac{5}{6}$
 $3|9+\frac{5}{2}|-14=18$
 $3|\frac{19}{2}|-14=18$
 $3|\frac{19}{2}|=32$
 $|\frac{19}{2}|=\frac{32}{3}$
 $19=6.4$
 $19 \neq 6.4$
 $18 \neq 18$ (wrong)

j) $|5-3x|+12=3$
 $5-3x=19 \quad |5-3(\frac{-14}{3})+12=3$
 $-3x=14 \quad |5-(-14)+12=3$
 $x=-\frac{14}{3} \quad |19+12=31$
 $5-3x=-19 \quad |5-3(8)+12=3$
 $-3x=-24 \quad |5-24+12=3$
 $x=8 \quad |-19+12=3$

k) $|x^2+9|=6x$
 $x^2+9=6x \quad x^2+9-6x=0$
 $x^2-6x+9=0 \quad (x-3)^2=0$
 $x=3$

l) $|2x^2-x-6|=2x+1$
 $2x^2-x-6=2x+1 \quad 2x^2-3x-7=0$
 $2x^2-3x-7=0$
 $x=\frac{3 \pm \sqrt{9+56}}{4}$
 $x=\frac{3 \pm \sqrt{65}}{4}$

m) $|x^2+3|=12$
 $x^2+3=12 \quad x^2=9 \quad x=3$
 $x^2+3=-12 \quad x^2=-15$
 $x^2=-15$ cannot square root negative

n) $|x^2-10x|=24$
 $x^2-10x=24 \quad x^2-10x-24=0$
 $(x-12)(x+2)=0$
 $x=12 \quad x=-2$
 $|12^2-10(12)|=24$
 $|144-120|=24$
 $|120-144|=24$
 $|120-144|=24$
 $|144-120|=24$
 $0 \neq 24$ EXTRAN.

o) $|13x-x^2|=30$
 $13x-x^2=30 \quad x^2-13x+30=0$
 $(x-10)(x-3)=0$
 $x=10 \quad x=3$
 $|13(10)-10^2|=30$
 $|130-100|=30$
 $|13(3)-3^2|=30$
 $|39-9|=30$

p) $|x^2-3x|=4$
 $x^2-3x=4 \quad x^2-3x-4=0$
 $(x-4)(x+1)=0$
 $x=4 \quad x=-1$
 $|4^2-3(4)|=4$
 $|16-12|=4$
 $|16-12|=4$
 $|4-3|=1$

q) $|x^2-3x|=4$
 $x^2-3x=4 \quad x^2-3x-4=0$
 $(x-4)(x+1)=0$
 $x=4 \quad x=-1$
 $|4^2-3(4)|=4$
 $|16-12|=4$
 $|16-12|=4$
 $|4-3|=1$

r) $|x+4|=|-12|$
 $x+4=12 \quad x+4=-12$
 $x=8 \quad x=-16$
 $|8+4|=|-12|$
 $|12+4|=|-12|$
 $|16+4|=|-12|$

1. a) $|x+3|=11$
 $x+3=11 \quad x+3=-11$
 $x=8 \quad x=-14$
 $|8+3|=11$
 $|11|=11 \checkmark$
 $|-14+3|=11$
 $|-11|=11 \checkmark$

b) $|x-7|=12$
 $x-7=12 \quad x-7=-12$
 $x=19 \quad x=-5$
 $|19-7|=12$
 $|12|=12 \checkmark$
 $|-5-7|=12$
 $|-12|=12 \checkmark$

c) $|x-5|=2$
 $x-5=2 \quad x-5=-2$
 $x=7 \quad x=3$
 $|7-5|=2$
 $|2|=2 \checkmark$
 $|3-5|=2$
 $|-2|=2 \checkmark$

d) $|x+9|=17$
 $-x+9=17 \quad -x+9=-17$
 $-x=8 \quad -x=-26$
 $x=-8 \quad x=26$
 $|(-8)+9|=17$
 $|8+9|=17$
 $|17|=17 \checkmark$
 $|-26+9|=17$
 $|-17|=17 \checkmark$

e) $|2x-4|=7$
 $2x-4=7 \quad 2x-4=-7$
 $2x=11 \quad 2x=-3$
 $x=\frac{11}{2} \quad x=-\frac{3}{2}$
 $|2(\frac{11}{2})-4|=7$
 $|11-4|=7$
 $|7|=7 \checkmark$
 $|2(-\frac{3}{2})-4|=7$
 $|-3-4|=7$
 $|-7|=7 \checkmark$

f) same as e.

g) $|5x-11|=17$
 $5x-11=17 \quad 5x-11=-17$
 $5x=28 \quad 5x=6$
 $x=\frac{28}{5} \quad x=\frac{6}{5}$
 $|5(\frac{28}{5})-11|=17$
 $|28-11|=17$
 $|17|=17 \checkmark$
 $|5(\frac{6}{5})-11|=17$
 $|6-11|=17$
 $|-5|=17 \checkmark$

h) $-|2x-4|+18=2$
 $-(2x-4)+18=2 \quad -(2x-4)+18=2$
 $-2x+22=2 \quad -2x+22=2$
 $-2x=-20 \quad -2x=-24$
 $x=10 \quad x=12$
 $|-2(10)-4|+18=2$
 $|-20-4|+18=2$
 $|-24+18|=2$
 $|-6|=2$
 $2=2 \checkmark$

#3) $|x|=|x+1|$
 $x=3 \quad x=3$
 $x=-3 \quad x=-3$

1) $x=x+1$
 $0=1$
 $x=-x+1$
 $2x=1$
 $x=\frac{1}{2}$

4) $|x-1|+|x|+|x+1|=\frac{5}{2}$

0 $+$ $+$ $+$
 1 $+$ $+$ $+$
 2 $+$ $+$ $+$
 3 $+$ $+$ $+$
 4 $+$ $+$ $+$
 5 $+$ $+$ $+$
 6 $+$ $+$ $+$
 7 $+$ $+$ $+$
 8 $+$ $+$ $+$

6) $|a-2| \times |b-3|=2$

$|1| \times |2|=2$
 $|2| \times |1|=2$
 $|-1| \times |-2|=2$
 $|-2| \times |-1|=2$

8 possibilities

$|1| \times |2|$
 $|-1| \times |2|$
 $|-2| \times |1|$
 $|-2| \times |-1|$

good job
1.2.1

By Kyle Dawson

1. a) $|x+3|=11$

$$\begin{aligned} x+3 &= 11 & x+3 &= -11 \\ \boxed{x=8} & & \boxed{x=-14} & \\ |8+3| &= 11 & & \\ |11| &= 11 \checkmark & & \\ |-14+3| &= 11 & & \\ |-11| &= 11 \checkmark & & \end{aligned}$$

b) $|x-7|=12$

$$\begin{aligned} x-7 &= 12 & x-7 &= -12 \\ \boxed{x=19} & & \boxed{x=-5} & \\ |19-7| &= 12 & & \\ |12| &= 12 \checkmark & & \\ |-5-7| &= 12 & & \\ |-12| &= 12 \checkmark & & \end{aligned}$$

c) $|x-5|=2$

$$\begin{aligned} x-5 &= 2 & x-5 &= -2 \\ \boxed{x=7} & & \boxed{x=3} & \\ |7-5| &= 2 & & \\ |2| &= 2 \checkmark & & \\ |3-5| &= 2 & & \\ |-2| &= 2 \checkmark & & \end{aligned}$$

d) $|-x+9|=17$

$$\begin{aligned} -x+9 &= 17 & -x+9 &= -17 \\ \boxed{x=-8} & & \boxed{x=26} & \\ |(-8)+9| &= 17 & & \\ |1| &= 17 \checkmark & & \\ |26+9| &= 17 & & \\ |35| &= 17 \checkmark & & \end{aligned}$$

e) $|2x-4|=7$

$$\begin{aligned} 2x-4 &= 7 & 2x-4 &= -7 \\ \boxed{x=\frac{11}{2}} & & \boxed{x=-\frac{3}{2}} & \\ |2(\frac{11}{2})-4| &= 7 & & \\ |11-4| &= 7 & & \\ |7| &= 7 \checkmark & & \\ |2(-\frac{3}{2})-4| &= 7 & & \\ |-3-4| &= 7 & & \\ |-7| &= 7 \checkmark & & \end{aligned}$$

f) same as e.

g) $|5x-11|=17$

$$\begin{aligned} 5x-11 &= 17 & 5x-11 &= -17 \\ \boxed{x=\frac{28}{5}} & & \boxed{x=-\frac{6}{5}} & \\ |5(\frac{28}{5})-11| &= 17 & & \\ |28-11| &= 17 & & \\ |17| &= 17 \checkmark & & \\ |5(-\frac{6}{5})-11| &= 17 & & \\ |-6-11| &= 17 & & \\ |-17| &= 17 \checkmark & & \end{aligned}$$

h) $-|2x-4|+18=2$

$$\begin{aligned} -(2x-4)+18 &= 2 & -(2x-4)+18 &= -2 \\ -2x+22 &= 2 & -2x+22 &= -2 \\ -2x &= -20 & -2x &= -24 \\ \boxed{x=10} & & \boxed{x=12} & \\ -|2(10)-4|+18 &= 2 & & \\ -|16|+18 &= 2 & & \\ -16+18 &= 2 & & \\ 2 &= 2 \checkmark & & \end{aligned}$$

k) $|x^2+9|=6x$

$$\begin{aligned} x^2+9 &= 6x & x^2+9 &= -6x \\ x^2-6x+9 &= 0 & x^2+6x+9 &= 0 \\ (x-3)(x-3) &= 0 & (x+3)(x+3) &= 0 \\ \boxed{x=3} & & \boxed{x=-3} & \\ |(3)^2+9| &= 6(3) & & \\ |18| &= 18 & & \\ |18| &= 18 & & \\ |18| &= 18 \checkmark & & \\ |(-3)^2+9| &= 6(-3) & & \\ |18| &= -18 & & \\ |18| &= -18 & & \\ 18 &= -18 \times & & \end{aligned}$$

l) $|2x^2-x-6|=2x+1$

$$\begin{aligned} 2x^2-x-6 &= 2x+1 & 2x^2-x-6 &= -(2x+1) \\ 2x^2-3x-7 &= 0 & 2x^2-x-6 &= -2x-1 \\ x &= \frac{-(-3) \pm \sqrt{9-4(-7)(2)}}{4} & x &= \frac{-(-1) \pm \sqrt{1-4(-1)(2)}}{4} \\ x &= \frac{3 \pm \sqrt{65}}{4} & x &= \frac{-1 \pm \sqrt{9}}{4} \\ x &= \frac{3 \pm \sqrt{65}}{4} & x &= \frac{-1 \pm 3}{4} \\ \boxed{\frac{3+\sqrt{65}}{4}} & & \boxed{\frac{-1+3}{4}} & \\ \boxed{\frac{3-\sqrt{65}}{4}} & & \boxed{\frac{-1-3}{4}} & \end{aligned}$$

m) $|x^2+3|=12$

$$\begin{aligned} -12 &= x^2+3 & 12 &= x^2+3 \\ -15 &= x^2 & 9 &= x^2 \\ \sqrt{-15} &= x & \sqrt{9} &= x \\ \text{no sol.} & & \boxed{3} &= x \\ |12| &= |3^2+3| & & \\ |12| &= |12| & & \\ |12| &= 12 \checkmark & & \end{aligned}$$

n) $|x^2-10x|=24$

$$\begin{aligned} x^2-10x &= 24 & x^2-10x &= -24 \\ x^2-10x-24 &= 0 & x^2-10x+24 &= 0 \\ (x-12)(x+2) &= 0 & (x-6)(x-4) &= 0 \\ \boxed{x=12} & & \boxed{x=6} & \\ |12^2-10(12)| &= 24 & |6^2-10(6)| &= 24 \\ |144-120| &= 24 & |36-60| &= 24 \\ |24| &= 24 & |24| &= 24 \\ 24 &= 24 \checkmark & 24 &= 24 \checkmark \\ |(6)^2-10(-3)| &= 24 & |4^2-10(4)| &= 24 \\ |36-40| &= 24 & |16-40| &= 24 \\ |-4| &= 24 & |-24| &= 24 \\ 4 &= 24 \times & 24 &= 24 \checkmark \end{aligned}$$

$$\begin{array}{l} x+y=12 \\ x=3 \end{array} \quad \begin{array}{l} x+y=-12 \\ x=-16 \end{array}$$

$$\begin{array}{l} 18+y = |-16| \\ 12 = |-16| \end{array} \quad \begin{array}{l} |-16+y| = |-12| \\ |-16| = |-12| \end{array}$$

$$\begin{array}{l} 12 = 12 \\ 16 = 12 \end{array}$$

$$3) |x| = |x+1|$$

$$\begin{array}{l} x = x+1 \\ -x = -x \end{array} \quad \begin{array}{l} -x = x+1 \\ -x = -x \end{array} \quad \begin{array}{l} x = -x-1 \\ +x = +x \end{array} \quad \begin{array}{l} -x = -x+1 \\ +x = +x \end{array}$$

$$\lambda = -\frac{1}{2} \quad \left| -\frac{1}{2} \right| = \left| -\frac{1}{2} + 1 \right|$$

$$\left| -\frac{1}{2} \right| = \left| \frac{1}{2} \right|$$

$$\frac{1}{2} = \frac{1}{2}$$

$$\boxed{x = -\frac{1}{2}}$$

$$4) |x-1| + |x| + |x+1| = \frac{5}{2}$$

$$1) x-x+1+x+x+1 = \frac{5}{2}$$

$$3x = \frac{5}{2}$$

$$x = \frac{5}{6}$$

$$3) x-x-x+x+x+1 = \frac{5}{2}$$

$$x = \frac{5}{2}$$

$$2) -x-x-x-x-x+1 = \frac{5}{2}$$

$$-3x = \frac{5}{2}$$

$$x = -\frac{5}{6}$$

$$1) x+1+x+x+1 = \frac{5}{2}$$

$$x+2 = \frac{5}{2}$$

$$x = \frac{1}{2}$$

$$2) -x+1-x-x+1 = \frac{5}{2}$$

$$-x+2 = \frac{5}{2}$$

$$-x = \frac{1}{2}$$

$$x = -\frac{1}{2}$$

$$3) x+1+x-x-1 = \frac{5}{2}$$

$$x-2 = \frac{5}{2}$$

$$x = \frac{9}{2}$$

$$4) x-1-x-x-1 = \frac{5}{2}$$

$$-x-2 = \frac{5}{2}$$

$$-x = \frac{9}{2}$$

$$x = -\frac{9}{2}$$

$$8) -x+x+x-x-x = \frac{5}{2}$$

$$-x = \frac{5}{2}$$

$$x = -\frac{5}{2}$$

$$\boxed{\text{Solution } x = -\frac{1}{2}, \frac{1}{2}}$$

$$5) |x^2 - 9x + 20| = |16 - x^2|$$

$$x^2 - 9x + 20 = 16 - x^2$$

$$2x^2 - 9x + 4 = 0$$

$$x^2 - 9x + 8 = 0$$

$$(x-8)(x-1) = 0$$

$$(2x-8)(2x-1) = 0$$

$$(x-4)(2x-1) = 0$$

$$x=4 \quad x=\frac{1}{2}$$

$$|4^2 - 9(4) + 20| = |16 - 4^2|$$

$$|16 - 36 + 20| = |16 - 16|$$

$$|0| = |0|$$

$$\left| \left(\frac{1}{2}\right)^2 - 9\left(\frac{1}{2}\right) + 20 \right| = \left| 16 - \left(\frac{1}{2}\right)^2 \right|$$

$$\left| \frac{1}{4} - \frac{9}{2} + 20 \right| = \left| 16 - \frac{1}{4} \right|$$

$$\left| \frac{1}{4} - \frac{18}{4} + 20 \right| = \left| 16 - \frac{1}{4} \right|$$

$$\left| \frac{63}{4} \right| = \left| \frac{63}{4} \right|$$

$$-|2(10) - 4| + 18 = 2$$

$$-|16| + 18 = 2$$

$$-16 + 18 = 2$$

$$2 = 2 \checkmark$$

$$-|2(12) - 4| + 18 = 2$$

$$-|20| + 18 = 2$$

$$-20 + 18 = 2$$

$$-2 \neq 2 \quad x$$

$$\text{no solutions}$$

good job
kije! :)

$$i) 3|9+2x| - 14 = 18$$

$$3(9+2x) - 14 = 18$$

$$27+6x - 14 = 18$$

$$6x + 13 = 18$$

$$6x = 5$$

$$\boxed{x = \frac{5}{6}}$$

$$3(9+2x) - 14 = -18$$

$$27+6x - 14 = -18$$

$$6x + 13 = -18$$

$$6x = -31$$

$$x = -\frac{31}{6} \text{ extraneous}$$

$$3 \left| \frac{9+2\left(\frac{5}{6}\right)}{3} \right| - 14 = 18$$

$$3 \left| \frac{9+\frac{5}{3}}{3} \right| - 14 = 18$$

$$3 \left| \frac{32}{9} \right| - 14 = 18$$

$$2 \left(\frac{32}{3} \right) - 14 = 18$$

$$\frac{64}{3} - 14 = 18$$

$$22 - 14 = 18$$

$$8 = 18 \checkmark$$

$$3|9+2\left(-\frac{31}{6}\right)| - 14 = 18$$

$$3|9-\frac{31}{3}| - 14 = 18$$

$$3|\frac{27-31}{3}| - 14 = 18$$

$$j) |5-3x| + 12 = 31$$

$$(5-3x) + 12 = 31$$

$$5-3x = 19$$

$$-3x = 14$$

$$x = -\frac{14}{3}$$

$$(5-3x) + 12 = -31$$

$$5$$

$$-|2(10)-4|+18=2$$

$$-|16|+18=2$$

$$-16+18=2$$

$$2=2 \checkmark$$

$$-|2(12)-4|+18=2$$

$$-|20|+18=2$$

$$-20+18=2$$

$$-2 \neq 2 \text{ X}$$

no solutions

$$i) 3|9+2x|-14=18$$

$$3(9+2x)-14=18$$

$$27+6x-14=18$$

$$6x+13=18$$

$$6x=5$$

$$x=\frac{5}{6}$$

$$3(9+2x)-14=-18$$

$$27+6x-14=-18$$

$$6x+13=-18$$

$$6x=-31$$

$$x=-\frac{31}{6} \text{ extraneous}$$

$$3\left|9+2\left(\frac{5}{6}\right)\right|-14=18$$

$$3\left|9+\frac{5}{3}\right|-14=18$$

$$3\left|\frac{32}{3}\right|-14=18$$

$$2\left(\frac{32}{3}\right)-14=18$$

$$2x-14=18$$

$$2x=32$$

$$x=16 \checkmark$$

$$3\left|9+2\left(-\frac{31}{6}\right)\right|-14=18$$

$$3\left|9-\frac{31}{3}\right|-14=18$$

$$3\left|\frac{27}{3}-\frac{31}{3}\right|-14=18$$

$$3\left|-\frac{4}{3}\right|-14=18$$

$$3\left(\frac{4}{3}\right)-14=18$$

$$4-14=18$$

$$-10 \neq 18 \text{ X}$$

$$j) |5-3x|+12=31$$

$$(5-3x)+12=31$$

$$5-3x=19$$

$$-3x=14$$

$$x=-\frac{14}{3}$$

$$(5-3x)+12=-31$$

$$5-3x=-43$$

$$-3x=-48$$

$$x=\frac{48}{3}$$

$$x=16 \text{ extraneous}$$

$$|5-3\left(-\frac{14}{3}\right)|+12=31$$

$$|5+14|+12=31$$

$$|19|+12=31$$

$$19+12=31$$

$$31=31 \checkmark$$

$$|5-3(16)|+12=31$$

$$|5-48|+12=31$$

$$|-43|+12=31$$

$$43+12=31$$

$$55 \neq 31 \text{ X}$$