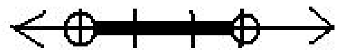
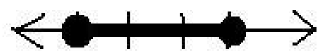
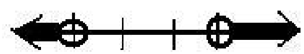
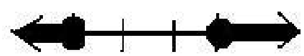
M^2=Math Mediator Lesson 7: Absolute Value Inequalities

Total Recall (Warm-up) (5 minutes approx.)	Total Recall: Exercise from yesterday's lesson on inequalities. Solve for x and graph the solution for this inequality: $200 \le 2000 - 0.5x \le 500$ (A: $3600 \ge x \ge 3000$)
Direct Instruction (10 minutes approx.)	The inequality in today's Total Recall is a formula for caloric intake with a desire for a weight gain. 2000 is the amount of calories taken in (what you eat). This varies. 0.5x represents a half hour of some exercise 'x' burning off calories. Brisk jogging (running) burns off 800 calories per hour Walking burns off 500 calories per hour What exercise would burn 3000 to 3600 calories per hour? (None; maximum healthy exercise is around 800 to 1000 calories per hour.) 200 to 500 is the range of the final daily caloric outcome, and since it is positive, it represents a weight gain. Q: What would have to change for this to become a weight loss situation? Q: What different types of workouts could you add to the list? Q: What if you performed two different workouts during the day, one for ½ hour and one for ¾ hour? How would you express that in an inequality?
Direct Instruction (10 minutes approx.)	Another way to describe a calorie gain between 200 to 500 calories would be 350 ± 150 calories. The ideal is the middle of the range, and the tolerance is the variation. Here the ideal is 350 and the tolerance is 150. Using absolute value, there is an inequality to describe our initial compound inequality: $\lvert (2000 - 0.5x) - 350 \rvert \le 150$ Let's break this down and see if it is the same as our initial compound inequality. The difference of the ACTUAL and IDEAL can be a positive or a negative value, because of the absolute value symbol. Therefore we have two cases: 1. $\{(2000 - 0.5x) - 350\}$ is a negative value: (the absolute value will change it to a positive value, but taking away the absolute value its going to be a negative value): $-\{(2000 - 0.5x) - 350\} \le 150$ and if we multiply both sides by -1, the inequality direction changes and we have: $\{(2000 - 0.5x) - 350\} \ge -150$ 2. $\{(2000 - 0.5x) - 350\}$ is a positive value and the absolute value doesn't change it, so we end up with $\{(2000 - 0.5x) - 350\} \le 150$ Putting these both together in a compound inequality: $-150 \le \{(2000 - 0.5x) - 350\} \le 150$ and if we add 350 to both sides of the inequality, we get; $200 \le (2000 - 0.5x) \le 500$ which is what we started with!

M^2=Math Mediator Lesson 7: Absolute Value Inequalities

Practice (5 minutes approx.)	The Format: { |ACTUAL – IDEAL| ≤ TOLERANCE} is used extensively in quality control for production manufacturing. In a bolt making factory, the size of the bolt ideally is 1/4" and each bolt is measured for accuracy to be up to plus or minus 0.005" or it is rejected. Write an absolute value inequality for the testing of these bolts: $\|x - 0.25\| \le .005$ where x is the measure of each bolt.
Direct Instruction: (5 minutes approx.)	Here is a summary of the various absolute value inequalities: (Copy in notebooks). <u>Abs. Value Ineq</u>. <u>Compound Form</u> <u>Graph of Solution</u> $\|ax + b\| < c$ — $-c < ax + b < c$ —  Example $\|3x + 5\| < 10$ — $-10 < 3x + 5 < 10$ $\|ax + b\| \le c$ — $-c \le ax + b \le c$ —  Example $\|3x + 5\| \le 10$ — $-10 \le 3x + 5 \le 10$ $\|ax + b\| > c$ — $-c > ax + b > c$ —  Example $\|3x + 5\| > 10$ — $-10 > 3x + 5 > 10$ $\|ax + b\| \ge c$ — $-c \ge ax + b \ge c$ —  Example $\|3x + 5\| \ge 10$ — $-10 \ge 3x + 5 \ge 10$
Exercise: (15 minutes approx.)	U-DO: Solve for x and graph each 1. $\|x\| = 4$ A: x = 4, -4; 2. $\|x + 2\| = 12$ A: x = 10, -14; 2. $\|5x - 2\| = 2x + 7$ A: x = 3,-5/7; 4. $\|x + 4\| \ge 5$ A: $-9 \ge x \ge 1$ 5. $\|3x - 7\| > 2$ A: $5/3 > x > 3$; 6. $\|24 - x\| \le 11$ A: $13 \le x \le 35$ 7. $\|(1/2)x - 10\| < 4$ A: $12 < x < 28$
Wrap-up (5 minutes approx.)	Wrap up closing comments and housekeeping. This is a good point to review all the subjects that the students have gone over up to now and have a test.