Name _____
Class _____

In these activities you will identify solution-preserving mathematical moves related to equations and moves that do not preserve solutions. After completing the activities, discuss and/or present your findings to the rest of the class.

Activity 1 [Page 1.3]

1. Adjust the length of the blue and green segments to create the equation $x + 17 = 32$. Answer each of the following. Explain your reasoning in each case.

   a. If you make the green segment larger, what happens to the equation?

   b. What happens to the pink segments and to the solution to the equation?

   c. If you make the green segment smaller, what happens to the equation? To the solution to the equation?

2. Reset the page. Create the equation $x + 17 = 32$ again.

   a. If you make the blue segment larger, what happens to the equation?

   b. What happens to the pink segments and to the solution to the equation?

   c. If you make the blue segment smaller, what happens to the equation? To the solution to the equation?

3. Students are discussing equations of the form $x + a = b$ where *a* and *b* are given numbers. Decide whether you agree or disagree with the statements some of them made. Give a reason for your answer.

   a. Sandra said that adding 2 to the left side of the equation and 3 to the right side of the equation will make a new equation whose solution is 1 more than the solution to the original equation.

   b. Mark said that the solution to the equation will be $x = b - a$.

   c. Patou said that if you subtract 11 from both sides of an equation, the value of *x* for the new equation will be 11 less than the value of *x* in the original equation.

   d. Mabel said that adding the same number to both sides of an equation will not change the solution.

4. Solve each problem using arithmetic. Then show how you could set up an equation and use the file to solve the same problem.

   a. Sondra received 18 text messages before noon on Monday. At the end of the day she had received a total of 37 text messages. How many text messages did she get the rest of the day?

b. Sondra received 13 text messages after noon on Tuesday, and at the end of the day she had a total of 31 messages. How many text messages did Sondra get in the morning?

c. After Sondra deleted 13 of the text messages she received on Wednesday, she had 25 messages left for that day. How many did she have to start?

Activity 2 [Page 1.3]

1. Reset the page so the equation is $x+\frac{2}{3}=\frac{7}{3}$. Drag the green segment to $\frac{0}{3}$.

   a. Describe the equation.

   b. What value was subtracted from both sides of the original equation to obtain the new equation?

   c. Tami said that the new equation has the same solution as $x=\frac{5}{3}$. Do you agree with her? Why or why not.

2. Reset the page. Create the equation $x-\frac{3}{2}=\frac{7}{4}$ by dragging the green segment first and then the blue segment.

   a. What is the solution to the equation?

b. Explain how you could find the solution by dragging the green segment.

c. What number was added to both sides of the original equation to make the new equation?

3. Reset the page. Use the arrow to select decimals.

a. Give at least two ways you could find the solution to the equation.

b. Change the constant on the left side of the equation to 2. Predict what you think the solution will be. Explain your reasoning. Use the file to check your answer.

c. Reset the page. Change the constant on the right side of the equation to 3.4. Predict what you think the solution will be. Explain your reasoning. Use the file to check your answer.

Activity 3 [Page 2.2]

1. Create the equation $6x = 24$. Use the file to decide whether the new equations will have the same solution as $6x = 24$.
   a. $12x = 48$
   b. $10x = 28$
   c. $\frac{1}{2}x = 8$
   d. $3x = 12$
   e. $1x = 4$

2. a. Describe how the equations in question 1 could be made from the original equation $6x = 24$.

   b. Which of the strategies you described in part 2a preserved the solution from the original equation?

3. Do you agree or disagree with the following students. Explain why or why not.
   a. Teena says that you can multiply both sides of an equation by any number, and the new equation will have the same solution as the original equation. Do you agree with her? Why or why not?

   b. Kurt says that every equation with a variable has some number that will be a solution.

Activity 4 [Page 2.2]

1. Reset the page. Change the equation to $\left(\frac{1}{2}\right)(y+12)=18$.

   a. Explain how the values associated with the lengths of the pink, green and blue segments are related.

   b. What is the solution?

   c. Predict the new equation and the solution to the new equation if the multiplier is changed to $\frac{1}{3}$. Check your prediction using the file.

2. Decide whether the following statements are true or false. Use an example from the file to support your thinking.

   a. Multiplying both sides of an equation by the same number will preserve the solution to the original equation.

   b. The equation $3(x+4)=72$ will have the same solution as $3x+4=72$.

c. The equation $x + 27 = 39$ will have the same solution as $2x + 27 = 78$.

d. Multiplying both sides of an equation by a unit fraction is the same as dividing both sides of the equation by the denominator of the fraction.

e. An equation can never have 0 as a solution.