Practice 3-2

Balancing Equations

1. a) Find the number to add that makes the scale balance.
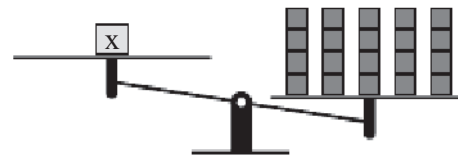
$9+3+17$

12
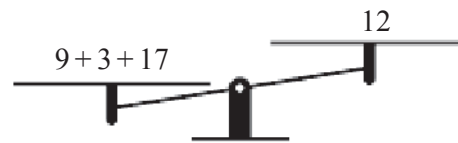
b) Complete the equation 9 + 3 + 17 = 12 + _____.

2. a) Find the number to add that makes the scale balance.

$2+5$

5

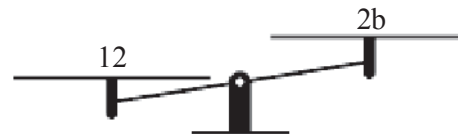**b)** Complete the equation 2 + 5 = 5 + _____.

3. This scale balanced with x on one side and 4 blocks on the other side. Your friend changed the scale, but had to leave before restoring the balance.

x

a) Find the number to multiply by on the left that makes the scale balance.

b) Complete the equation _____ • x = 20.

4. This scale balanced with 12 on the left side and 6b on the right side. Your teacher changed the scale, but did not have time to restore the balance.

12

$2b$

a) Find the number to divide by on the left that makes the scale balance.

b) Complete the equation 12 ÷ _____ = 2b.

**5.** This scale balanced when n + 30 = 70. Suppose the left side becomes n + 13.

$n+13$

70

a) How can you change the right side so that n + 13 = ___ is equivalent to n + 30 = 70? Fill in the answer line to complete your choice.

◯ A. Multiply the right side by _____.

◯ B. Add _____ to the right side.

◯ C. Divide the right side by _____.

◯ D. Subtract _____ from the right side.

b) Complete the equation n + 13 = _____.

6. This scale balanced when 13 + t = 25.
Suppose the left side becomes 20 + t.
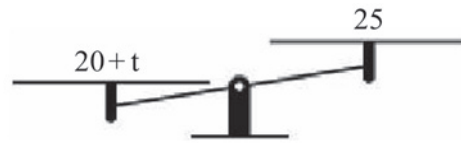
a) How can you change the right side
so that 20 + t = ___ is equivalent to
13 + t + 25? Fill in the answer line
to complete your choice.

   ○ A. Multiply the right side by _____.

   ○ B. Add _____ to the right side.

   ○ C. Divide the right side by _____.

   ○ D. Subtract _____ from the right side.

b) Complete the equation 20 + t = _____.

7. **Error Analysis** In math class, you are checking your friend's work. This is how
he balanced an equation.

Unbalanced equation: 16 ÷ 8 = 16 ÷ 8 − 1

Balanced equation: 16 ÷ 8 + 1 = 16 ÷ 8 − 1

a) Find the correct balanced equation.

   ○ A. 16 ÷ 8 + 1 = 16 ÷ 8 + 1

   ○ B. 16 ÷ 8 − 1 = 16 ÷ 8 + 1

   ○ C. 16 ÷ 8 − 1 = 16 ÷ 8 − 1

b) What error did your friend make?

   ○ A. He added 1 to the left side.

   ○ B. He subtracted 1 from the left side.

   ○ C. He subtracted 1 from the right side.

   ○ D. He added 1 to the right side.

8. **Reasoning** A scale presenting the equation x = 9 balances with x on one side
and 9 on the other side. A second scale representing the equation y = 18
balances with y on one side and 18 on the other side. What must be true
about x and y? Explain your reasoning.

   ○ A. x = y   ○ D. 9x = y

   ○ B. 2x = y   ○ E. x = 9y

   ○ C. x = 2y

9. a) **Multiple Representation** Draw scales to show that if 4x = 8, then x = 2.

b) What operation must be used to show this?

   ○ A. Division   ○ C. Addition

   ○ B. Multiplication   ○ D. Subtraction

10. **Writing** If you are given a true equation and you add the same number to
each side, the resulting equation is also a true equation. If you are given a
false equation and you add the same number to each side, will the resulting
equation be a true equation or a false equation? Give an example to explain
your answer.

11. **Coloring Tools** Suppose that a crayon weighs the same as a marker. You have a box of crayons, 3 extra crayons, and 19 markers. Let b be the number of crayons in the box. A scale balances with all the crayons on one side and all the markers on the other. You remove markers from the scale so that you can color a picture.

    a) How many crayons must you remove to keep the scale balanced?

    b) Complete the equation b + 3 – _____ = 17.

12. Complete the following equation to make it true.

    4(9 + __) = 36 + 28

13. In math class, your equation-balancing team is given a starting equation. The team captain changes the equation, as shown. What do you have to change on the right side of the equation to balance it after the team captain's change?

    Starting equation: $4x = 12$
    Team captain's change: $8x = 12$

    Fill in the blank to balance the equation.

    $8x = $ _____

14. **Think About the Process** You start with the equation $12b = 24$. What step should you take to find the quantity that equals $4b$?

    ○ A. Divide 24 by b.   ○ C. Multiply 24 by b.
    ○ B. Divide 24 by 3.   ○ D. Multiply 24 by 3.

15. **Think About the Process** You start with the equation $4z = 12$. Your friend changes the equation as follows.

    $4z + 6 = 12$

    What should you do to the right side to make the equation equivalent to the starting equation?

    ○ A. Subtract 6 from 12.   ○ C. Add 6 to 12.
    ○ B. Add 4z to 12.   ○ D. Subtract 4z from 12.