Some of the weights on the balance scales below have been labeled with letters instead of numbers!
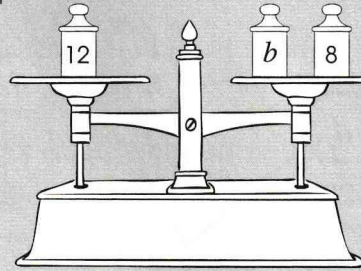
EXAMPLE

Write an equation to represent the balance scale below. Then, solve for the unknown weight.

The 12-gram weight is balanced by the b-gram weight and the 8-gram weight. We can write an equation for the scale: $12 = b + 8$.

If we remove 8 grams from each side of the scale, the b-gram weight will balance $12 - 8 = 4$ grams.

Similarly, we can solve our equation by subtracting 8 from both sides:

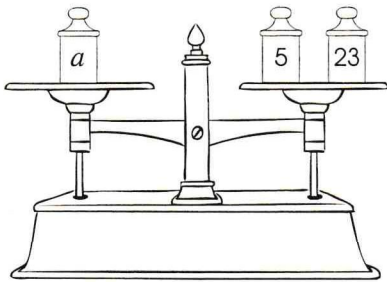$$12 = b + 8$$
$$\underline{-8 \qquad -8}$$
$$4 = b$$

So, $b = \mathbf{4}$.

We check our answer:
$12 = 4 + 8$. ✓

PRACTICE

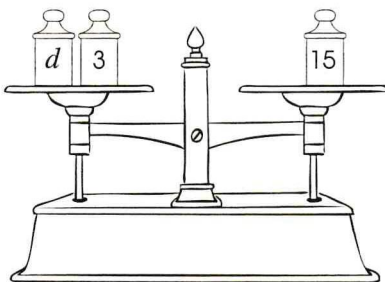Write an equation to represent each balance scale below. Then, solve for the unknown weight.
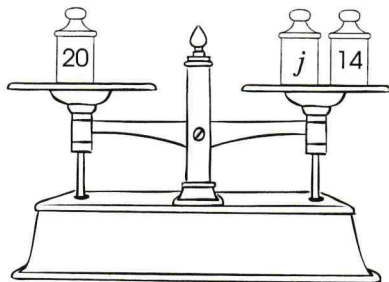
83.

83. equation: _____

$a =$ _____

84.

84. equation: _____

$d =$ _____

PRACTICE | Write an equation to represent each balance scale below.
Then, solve for the unknown weight.

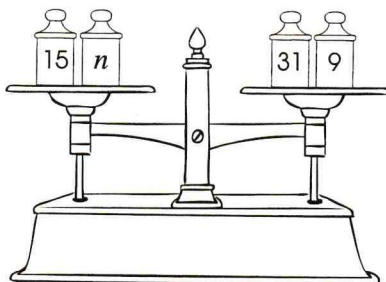**85.**
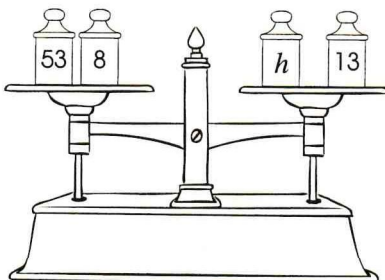

85. equation: _____

$j =$ _____

86.

86. equation: _____

$n =$ _____

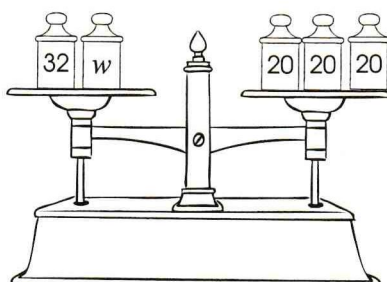**87.**

87. equation: _____

$h =$ _____

88.

88. equation: _____

$w =$ _____

EXAMPLE | Write an equation for the sentence below. Then solve the equation for n.

Three more than n is 17.

"Three more than n" is $n+3$ (or $3+n$), and "is" means "equals."

So, we write the equation $n+3=17$ (or $3+n=17$).

To solve the equation, we subtract 3 from both sides:

$$\begin{array}{r} n+3=17 \\ \underline{-3 \quad -3} \\ n=14 \end{array}$$

So, $\boldsymbol{n=14}$.

We replace n with 14 to check our answer:
Three more than 14 is 17. ✔

PRACTICE | Write an equation for each sentence below. Then, solve the equation for the variable.

89. The sum of six and a is thirty-six.

89. equation: _____

$a =$ _____

90. Twenty-six more than q is seventy.

90. equation: _____

$q =$ _____

91. Forty-three is the sum of w and fifteen.

91. equation: _____

$w =$ _____

92. Thirty less than t is eighty-seven.

92. equation: _____

$t =$ _____

93. Nineteen less than j is seventy-four.

93. equation: _____

$j =$ _____

PRACTICE | Write an equation for each sentence below. Then, solve the equation for the variable.

94. Seventy-three is the sum of a number and six. What is the number? Use n to represent the number.

94. equation: _____

$n =$ _____

95. Twelve less than a number is twenty-nine. What is the number? Use n to represent the number.

95. equation: _____

$n =$ _____

96. Seven inches more than Grogg's height is sixty-five inches. What is Grogg's height, in inches? Use g to represent the number of inches in Grogg's height.

96. equation: _____

$g =$ _____

97. Six less than the number of math books is fifteen. How many math books are there? Use m to represent the number of math books.

97. equation: _____

$m =$ _____

98. Ninety-seven is fifty-nine more than the number of pandakeets. How many pandakeets are there? Use p to represent the number of pandakeets.

98. equation: _____

$p =$ _____

99. ★ Fifteen years ago, Devin was thirty-three years old. How many years old is Devin today? Use d to represent Devin's current age in years.

99. equation: _____

$d =$ _____

EXAMPLE | Alex is h inches tall. If Alex grows three more inches, then he will be 32 inches tall. How many inches tall is Alex today?

If Alex grows three more inches, then he will be three inches taller than he is right now.

We write "three more than h" as $h+3$, so our equation is $h+3=32$. (We could also write $3+h=32$.)

Subtracting three from both sides, we get $h=29$.

So, Alex is **29** inches tall today.

PRACTICE | Write an equation for each word problem below. Then, solve the equation.

Many of the problems below can be solved without writing an equation. However, the problems provide good practice for writing and solving equations.

100. Ralph is r years old. In thirty-seven years, Ralph will be forty-four years old. How old is Ralph today?

100. equation: _____

$r =$ _____

101. Winnie made w cookies. Alex made 36 cookies. Winnie and Alex made a total of 84 cookies. How many cookies did Winnie make?

101. equation: _____

$w =$ _____

102. There are 65 adult hexatoads and h baby hexatoads in Professor Grok's office. All together, there are 122 hexatoads in his office. How many baby hexatoads are in Grok's office?

102. equation: _____

$h =$ _____

103. ★ Winnie enters an elevator on floor f. She goes up 6 floors, down 4 floors, and then up 2 more floors, where she exits the elevator on floor 9. On what floor did Winnie enter the elevator?

103. equation: _____

$f =$ _____

EXAMPLE | Sam is 3 years older than Tim. The sum of Sam's and Tim's ages, in years, is 17. How many years old is Tim?

We use t to represent Tim's age, in years.

Sam is 3 years older than Tim, so Sam is $t+3$ years old.

A "sum" is the result of addition, so Tim's age (t) added to Sam's age ($t+3$) is 17:

$$t+(t+3) = 17.$$

The associative property of addition lets us remove parentheses in a sum, so the equation above is equal to

$$t+t+3 = 17.$$

Subtracting 3 from both sides, we get $t+t = 14$.

Since $7+7 = 14$, the value of t is 7. Tim is **7** years old.

We check our answer: Tim is 7 years old. So, Sam is $7+3 = 10$ years old. The sum of Sam's and Tim's ages is $7+10 = 17$ years. ✓

PRACTICE | Solve each word problem below.

104. Together, Grogg and Alex have 32 gumballs. Grogg has twelve more gumballs than Alex. How many gumballs does Alex have?

104. _____

105. The sum of Olivia's and Ralph's heights is 64 inches. Olivia is 6 inches taller than Ralph. How many inches tall is Ralph?

105. _____

106. Together, a xylophone and case cost $100. The xylophone costs $80 more than the case. How much does the case cost?

106. _____

107. Alex earned a total of $42 working after school on Monday and Tuesday. On Tuesday, he earned six dollars more than he earned on Monday. How much did Alex earn on Monday?

107. _____

108. Fiona scored 33 points during two Beastball games. She scored nine fewer points during the first game than she scored during the second game. How many points did she score during the second game?

108. _____

109.
★ Lizzie read a total of 61 pages on Wednesday, Thursday, and Friday. She read 7 pages more on Friday than she read on Wednesday. On Thursday, she read 6 pages fewer than she read on Wednesday. How many pages did Lizzie read on Wednesday?

109. _____