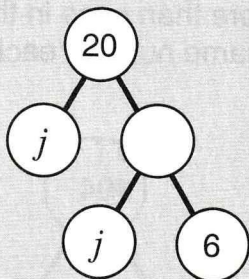


In the diagrams below, the number in each circle is the **sum** of the numbers in the connected circles below it.

EXAMPLE Find the value of j below.



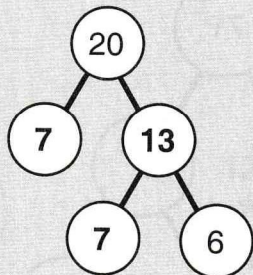
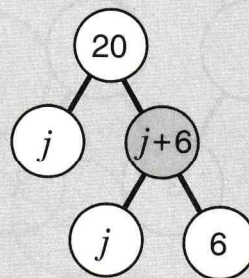
The blank circle is the sum of the two numbers connected below it, so we can label it $j+6$.

Now, we can use the top three circles to write an equation. 20 is the sum of j and $j+6$, so $20 = j + (j+6)$.

Subtracting 6 from both sides of the equation gives us

$$14 = j + j.$$

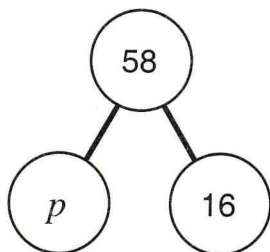
Since $7+7 = 14$, the value of j is 7.



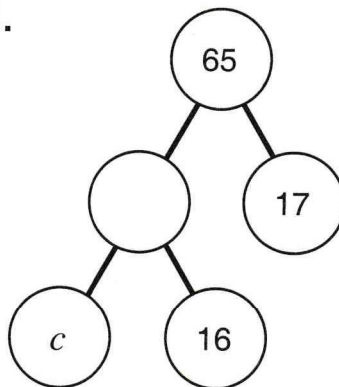
We replace j with 7 and check our work.

PRACTICE Find the value of the variable in each diagram below.

110.



111.



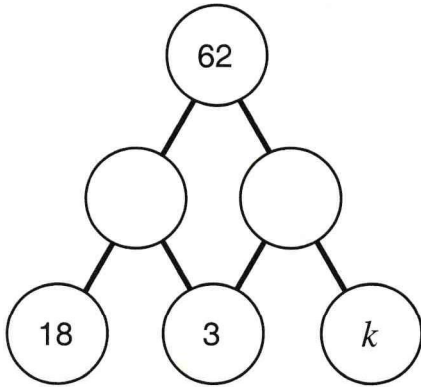
110. $p =$ _____

111. $c =$ _____

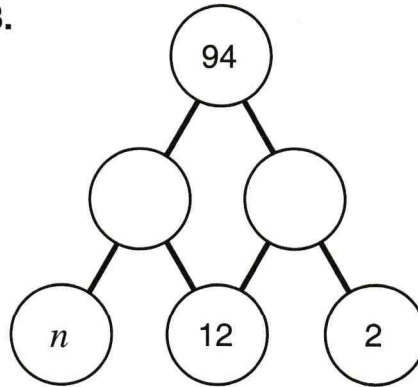
PRACTICE

Find the value of the variable in each diagram below. When a variable is used more than once in the same problem, it represents the same number each time it is used.

112.



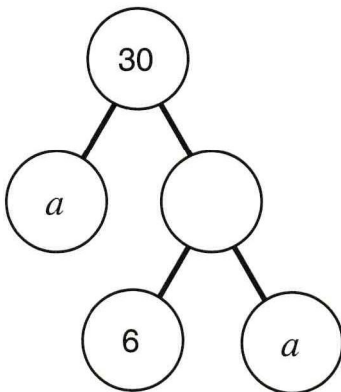
113.



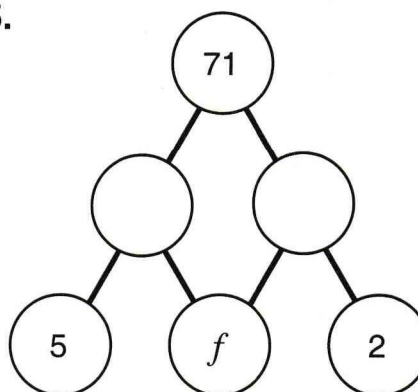
112. $k =$ _____

113. $n =$ _____

114.



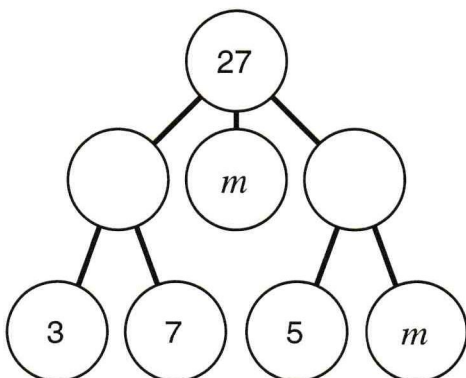
115.



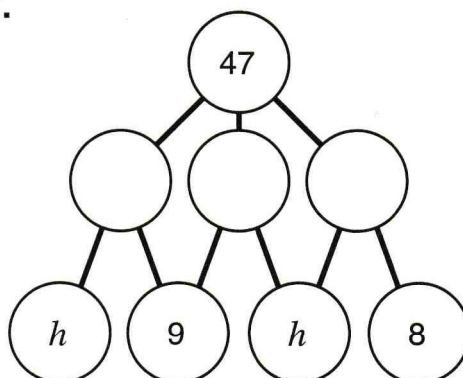
114. $a =$ _____

115. $f =$ _____

116.



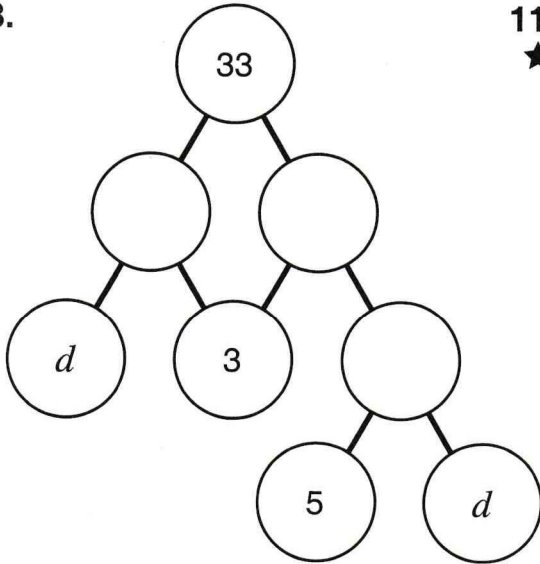
117. ★



116. $m =$ _____

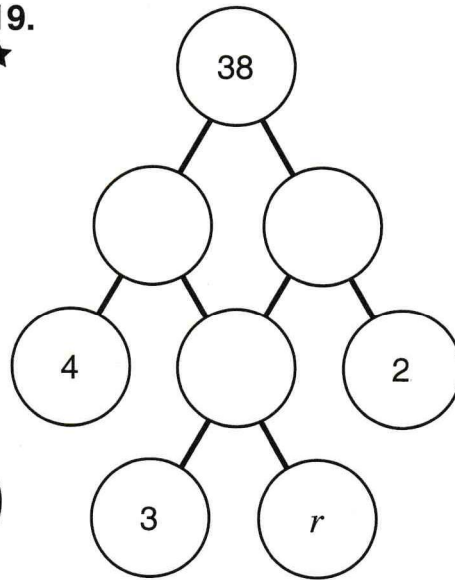
117. $h =$ _____

118.
★



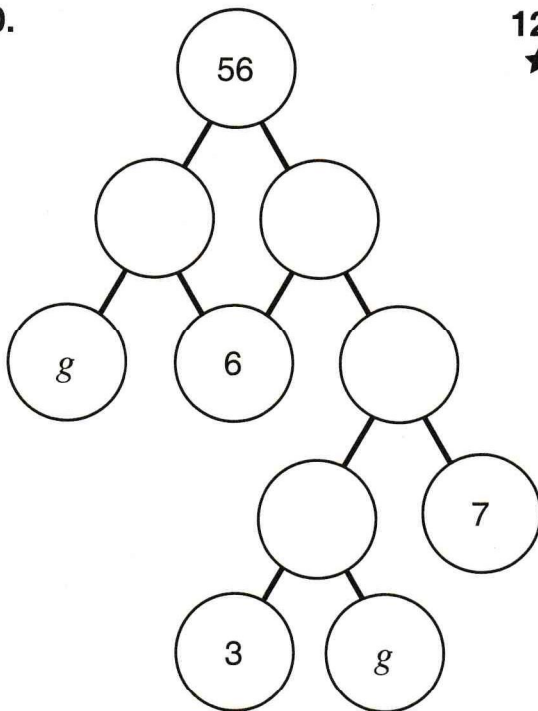
118. $d =$ _____

119.
★



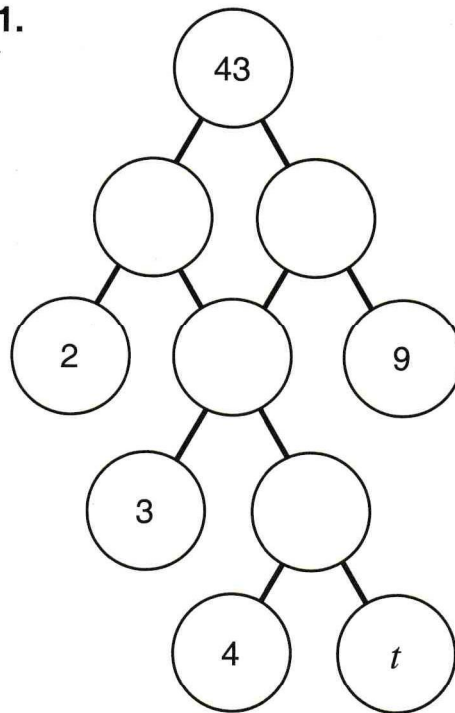
119. $r =$ _____

120.
★



120. $g =$ _____

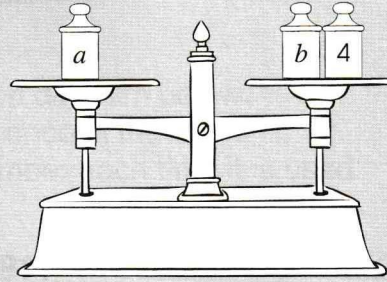
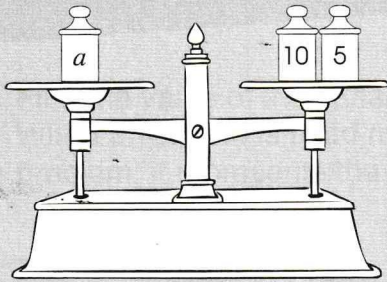
121.
★



121. $t =$ _____

EXAMPLE

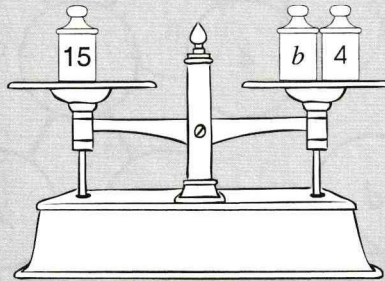
Weights that are labeled with the same variable have the same weight. Solve for both unknown weights.



We can write an equation for each balance scale:

$$a = 10 + 5 \quad \text{and} \quad a = b + 4.$$

From the left scale, we get $a = 10 + 5 = 15$, so $a = 15$.
 Since $a = 15$, we can replace the a -gram weight on the right scale with a 15-gram weight, giving us $15 = b + 4$.



We can remove 4 grams from each side of the balance. Similarly, we can subtract 4 from both sides of our equation. Subtracting 4 from both sides of $15 = b + 4$, we get $b = 11$.

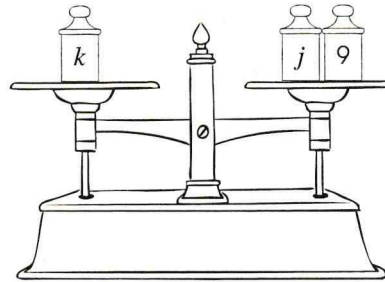
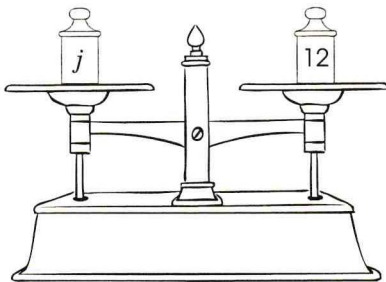
We replace a with 15 and b with 11 to check our answers:

$$15 = 10 + 5 \quad \checkmark \quad \text{and} \quad 15 = 11 + 4 \quad \checkmark$$

PRACTICE

Weights that are labeled with the same variable have the same weight. Solve for all variables.

122.



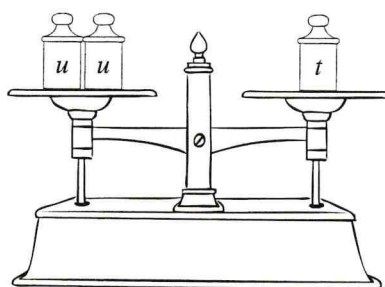
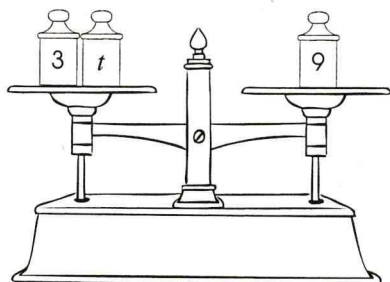
122. $j =$ _____

$k =$ _____

PRACTICE

Weights that are labeled with the same variable have the same weight. Solve for all variables.

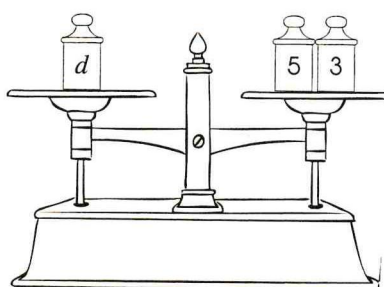
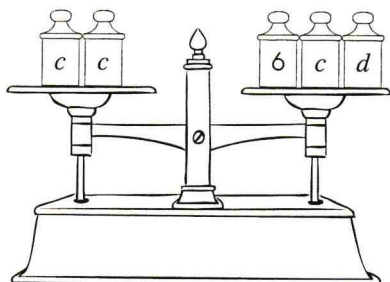
123.



123. $t =$ _____

$u =$ _____

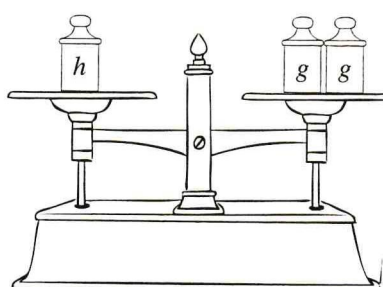
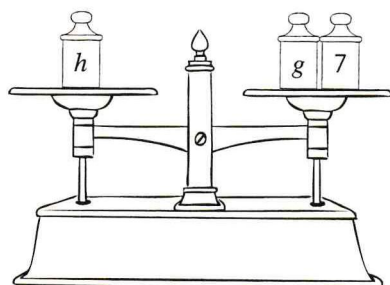
124.



124. $c =$ _____

$d =$ _____

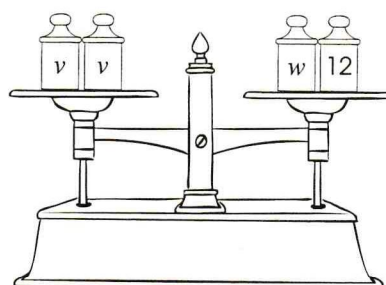
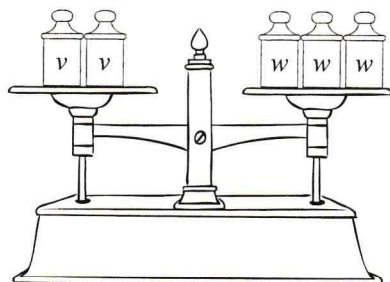
125.



125. $g =$ _____

$h =$ _____

126.



126. $v =$ _____

$w =$ _____

In each pair of equations below, a variable represents the same number each time it is used.

EXAMPLE

Solve for a and b .

$$a - 2 = 10$$

$$b + 6 = a$$

First, we solve the equation on top: $a - 2 = 10$.

Adding 2 to both sides, we get $a = 12$.

Then, since $a = 12$, we can replace the a in the second equation with 12:

$$b + 6 = 12.$$

Subtracting 6 from both sides gives us $b = 6$.

We replace a with 12 and b with 6 to check our answers:

$$12 - 2 = 10 \checkmark$$

$$6 + 6 = 12 \checkmark$$

PRACTICE

Each problem below has two equations and two variables. Solve for both variables in each problem.

127. $18 = x + 4$

$$x = y + 8$$

127. $x = \underline{\hspace{2cm}}$

$$y = \underline{\hspace{2cm}}$$

128. $j + 3 = k$

$$19 = 12 + j$$

128. $j = \underline{\hspace{2cm}}$

$$k = \underline{\hspace{2cm}}$$

129. $c + 9 = 15$

$$d = c + c$$

129. $c = \underline{\hspace{2cm}}$

$$d = \underline{\hspace{2cm}}$$

130. $q - 6 = 10$



$$q + r = 7 + r + r$$

130. $q = \underline{\hspace{2cm}}$

$$r = \underline{\hspace{2cm}}$$

131. $m + m = n + 4$



$$4 + n = 16 + m$$

131. $m = \underline{\hspace{2cm}}$

$$n = \underline{\hspace{2cm}}$$