

# 22. [Algebra - Substitution]

Skill 22.1 Substituting into expressions involving + and -

MMBlue 11 22 3 44  
MMGreen 1 2 3 3 4 4

Substituting into an expression means replacing the letters (variables) with numbers and follow the order of operations.

<p><b>Q.</b> If <math>x = 3</math>, find the value of: <math>x + 4</math></p>	<p><b>A.</b> <math>x + 4</math> <math>= 3 + 4</math> <math>= 7</math></p>	<p>Substitute <math>x</math> with 3. Add 3 and 4.</p>
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<p><b>Q.</b> If <math>m = 6</math> and <math>n = -2</math>, find the value of: <math>m - n + m + 4</math></p>	<p><b>A.</b> <math>m - (-n) + m + 4</math> <math>= 6 - (-2) + 6 + 4</math> <math>= 6 + 2 + 6 + 4</math> <math>= 8 + 6 + 4</math> <math>= 18</math></p>	<p>Substitute <math>m</math> with 6 and <math>n</math> with <math>-2</math>. <math>-(-2) = +2</math> Minus negative 2 is the same as positive 2 or add 2. Working from left to right, add 6 to 2, then add 8 and 6 and 4.</p>
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<p><b>a)</b> If <math>t = 7</math>, find the value of: <math>t + 5</math>  <math>= 7 + 5</math>  <math>= 12</math></p>	<p><b>b)</b> If <math>r = 8</math>, find the value of: <math>r + 3</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>c)</b> If <math>p = -5</math>, find the value of: <math>p + 4</math>  <math>= \dots</math>  <math>= \dots</math></p>
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<p><b>d)</b> If <math>a = 6</math>, find the value of: <math>a + a + 4</math>  <math>= \dots</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>e)</b> If <math>h = 3</math>, find the value of: <math>h + h + h + 9</math>  <math>= \dots</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>f)</b> If <math>k = -6</math>, find the value of: <math>k + k + 9 - k</math>  <math>= -6 + (-6) + 9 - (-6)</math>  <math>= -6 - 6 + 9 + 6</math>  <math>= -12 + 15 = 3</math></p>
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<p><b>g)</b> If <math>f = 15</math> and <math>g = 4</math>, find the value of: <math>f - g</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>h)</b> If <math>l = -8</math> and <math>m = 5</math>, find the value of: <math>m + l</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>i)</b> If <math>q = 12</math> and <math>r = -7</math>, find the value of: <math>q - r</math>  <math>= \dots</math>  <math>= \dots</math></p>
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<p><b>j)</b> If <math>s = 9</math> and <math>t = 2</math>, find the value of: <math>s - t + s + 4</math>  <math>= \dots</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>k)</b> If <math>y = 8</math> and <math>z = 5</math>, find the value of: <math>12 - y + 7 - z</math>  <math>= \dots</math>  <math>= \dots</math>  <math>= \dots</math></p>	<p><b>l)</b> If <math>a = -6</math> and <math>b = 3</math>, find the value of: <math>9 + a + a - b</math>  <math>= \dots</math>  <math>= \dots</math>  <math>= \dots</math></p>
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**Q.** If  $y = 4$ ,  
find the value of:  
 $3 \times y$

**A.**  $3 \times y$   
 $= 3 \times 4$   
 $= 12$

Substitute  $y$  with 4.  
Multiply 3 by 4.

**Q.** If  $s = 2$  and  $t = 3$ ,  
find the value of:  
 $s \times t \times 4$

**A.**  $s \times t \times 4$   
 $= 2 \times 3 \times 4$   
 $= 6 \times 4$   
 $= 24$

Substitute  $s$  with 2 and  $t$  with 3.  
Working from left to right,  
multiply 2 by 3.  
Then multiply 6 by 4.

**Q.** If  $t = -6$ ,  
find the value of:  
 $4 \times t$

**A.**  $4 \times t$   
 $= 4 \times (-6)$   
 $= -24$

Substitute  $t$  with  $-6$ .  
Multiply 4 by 6 first and then  
multiply the signs:  $(+) \times (-) = -$

**a)** If  $t = 8$ ,  
find the value of:  
 $2 \times t$

$= 2 \times 8$   
.....  
 $= 16$   
.....

**b)** If  $h = 7$ ,  
find the value of:  
 $3 \times h$

$=$  .....  
 $=$  .....

**c)** If  $d = 6$ ,  
find the value of:  
 $d \times d$

$=$  .....  
 $=$  .....

**d)** If  $y = -10$ ,  
find the value of:  
 $y \times 4$

$=$  .....  
 $=$  .....  
 $=$  .....

**e)** If  $w = -3$ ,  
find the value of:  
 $2 \times w$

$=$  .....  
 $=$  .....  
 $=$  .....

**f)** If  $j = 3$  and  $k = 7$ ,  
find the value of:  
 $j \times k$

$=$  .....  
 $=$  .....  
 $=$  .....

**g)** If  $a = 5$  and  $x = 4$ ,  
find the value of:  
 $a \times x \times 3$

$=$  .....  
 $=$  .....  
 $=$  .....

**h)** If  $s = 2$  and  $t = 8$ ,  
find the value of:  
 $s \times t \times 1$

$=$  .....  
 $=$  .....  
 $=$  .....

**i)** If  $m = 4$  and  $n = 6$ ,  
find the value of:  
 $5 \times m \times n$

$=$  .....  
 $=$  .....  
 $=$  .....

**Q.** If  $c = 4$ ,  
find the value of:  
 $3c + 1$

**A.**  $3c + 1$   
 $= 3 \times c + 1$   
 $= 3 \times 4 + 1$   
 $= 12 + 1$   
 $= 13$

Expand  $3c$  to  $3 \times c$ .  
Substitute  $c$  with 4.  
Multiply 3 by 4.  
Add 12 and 1.

**Q.** If  $a = 4$  and  $b = 6$ ,  
find the value of:  
 $2ab$

**A.**  $2ab$   
 $= 2 \times a \times b$   
 $= 2 \times 4 \times 6$   
 $= 8 \times 6$   
 $= 48$

$2ab$  is the short expression for  
 $2 \times a \times b$ .  
Substitute  $a$  with 4 and  $b$  with 6.  
Working from left to right,  
multiply 2 by 4.  
Then multiply 8 by 6.

**a)** If  $a = 4$ ,  
find the value of:  
 $4a$

$= 4 \times a$   
 $= 4 \times 4$   
 $= 16$

**b)** If  $m = 3$ ,  
find the value of:  
 $2m$

$= \dots$   
 $= \dots$   
 $= \dots$

**c)** If  $j = -7$ ,  
find the value of:  
 $5j$

$= \dots$   
 $= \dots$   
 $= \dots$

**d)** If  $h = 3$ ,  
find the value of:  
 $4h - 10$

$= 4 \times h - 10$   
 $= 4 \times 3 - 10$   
 $= 12 - 10$   
 $= 2$

**e)** If  $k = 7$ ,  
find the value of:  
 $3k - 12$

$= \dots$   
 $= \dots$   
 $= \dots$   
 $= \dots$

**f)** If  $p = -4$ ,  
find the value of:  
 $2p + 5$

$= \dots$   
 $= \dots$   
 $= \dots$   
 $= \dots$

**g)** If  $t = 3$  and  $u = 2$ ,  
find the value of:  
 $2tu$

$= 2 \times t \times u$   
 $= 2 \times 3 \times 2$   
 $= 6 \times 2$   
 $= 12$

**h)** If  $y = 5$  and  $z = 4$ ,  
find the value of:  
 $2yz$

$= \dots$   
 $= \dots$   
 $= \dots$   
 $= \dots$

**i)** If  $q = 3$  and  $r = 7$ ,  
find the value of:  
 $3qr$

$= \dots$   
 $= \dots$   
 $= \dots$   
 $= \dots$

**Q.** If  $d = 8$ ,  
find the value of:  
 $\frac{1}{2}$  of  $d$

**A.**  $\frac{1}{2}$  of  $d$   
 $= \frac{1}{2} \times 8$   
 $= \frac{8}{2}$   
 $= 4$

Substitute  $d$  with 8.  
Replace "of" with " $\times$ ".  
Multiply 1 by 8.  
To simplify the fraction divide the  
numerator by the denominator:  
 $8 \div 2 = 4$

**Q.** If  $a = -6$ ,  
find the value of:  
 $\frac{18}{a}$

**A.**  $\frac{18}{a}$   
 $= \frac{18 \div 6}{-6 \div 6}$   
 $= \frac{3}{-1}$   
 $= -3$

Substitute  $a$  with 6.  
To simplify the fraction divide the  
numerator and the denominator by  
their GCF, which is 6.  
Then divide the signs, following the  
rule:  $(+) \div (-) = -$

**a)** If  $b = 6$ ,  
find the value of:  
 $\frac{1}{3}$  of  $b$   
 $= \frac{1}{3} \times 6$   
 $= \frac{6}{3}$   
 $= 2$

**b)** If  $c = 12$ ,  
find the value of:  
 $\frac{1}{4}$  of  $c$   
 $=$  .....  
 $=$  .....  
 $=$  .....

**c)** If  $p = 10$ ,  
find the value of:  
 $\frac{1}{2}$  of  $p$   
 $=$  .....  
 $=$  .....  
 $=$  .....

**d)** If  $r = -24$ ,  
find the value of:  
 $\frac{1}{6}$  of  $r$   
 $=$  .....  
 $=$  .....  
 $=$  .....

**e)** If  $h = -15$ ,  
find the value of:  
 $\frac{2}{3}$  of  $h$   
 $=$  .....  
 $=$  .....  
 $=$  .....

**f)** If  $m = -12$ ,  
find the value of:  
 $\frac{3}{4}$  of  $m$   
 $=$  .....  
 $=$  .....  
 $=$  .....

**g)** If  $g = 15$ ,  
find the value of:  
 $\frac{g}{5}$   
 $= \frac{15}{5}$   
 $= 3$

**h)** If  $x = 9$ ,  
find the value of:  
 $\frac{x}{3}$   
 $=$  .....  
 $=$  .....

**i)** If  $k = -8$ ,  
find the value of:  
 $\frac{24}{k}$   
 $=$  .....  
 $=$  .....

**Q.** If  $g = 2$  and  $h = 3$ ,  
find the value of:  
 $4g + 3h$

**A.**  $4g + 3h$   
 $= 4 \times 2 + 3 \times 3$   
 $= 8 + 9$   
 $= 17$

Substitute  $g$  with 2 and  $h$  with 3.  
Use the order of operations rules.  
First multiply 4 by 2, then 3 by 3.  
Finally add 8 and 9.

**Q.** If  $x = 2$ ,  
find the value of:  
 $4(x + 5)$

**A.**  $4(x + 5)$   
 $= 4 \times (2 + 5)$   
 $= 4 \times 7$   
 $= 28$

Substitute  $x$  with 2.  
Use the order of operations rules.  
First add 2 and 5 within the brackets.  
Then multiply 4 by 7.

**a)** If  $l = 4$  and  $m = 7$ ,  
find the value of:  
 $3l + 2m$

$= 3 \times l + 2 \times m$   
 $= \underbrace{3 \times 4}_{12} + \underbrace{2 \times 7}_{14}$   
 $= 12 + 14$   
 $= 26$

**b)** If  $s = 5$  and  $t = 3$ ,  
find the value of:  
 $4s - 2t$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**c)** If  $h = 2$  and  $i = 8$ ,  
find the value of:  
 $5h + 3i$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**d)** If  $w = 4$  and  $y = -3$ ,  
find the value of:  
 $2w + 3y$

$= 2 \times w + 3 \times y$   
 $= \underbrace{2 \times 4}_8 + \underbrace{3 \times (-3)}_{-9}$   
 $= 8 + (-9)$   
 $= -1$

**e)** If  $s = 9$  and  $t = 2$ ,  
find the value of:  
 $-s + 5t$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**f)** If  $j = 7$  and  $k = -5$ ,  
find the value of:  
 $j + 4k$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**g)** If  $a = 6$ ,  
find the value of:  
 $7(a + 8)$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**h)** If  $z = 10$ ,  
find the value of:  
 $4(z - 4)$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**i)** If  $d = 12$ ,  
find the value of:  
 $5(7 - d)$

$= \dots\dots\dots$   
 $= \dots\dots\dots$   
 $= \dots\dots\dots$

**Q.** If  $f = 3$ ,  
find the value of:  
 $4f^2$

**A.**  $4f^2$   
 $= 4 \times f \times f$   
 $= 4 \times 3 \times 3$   
 $= 12 \times 3$   
 $= 36$

Expand  $f^2$  to become  $f \times f$ .  
 Substitute  $f$  with 3.  
 Use the order of operations rules.  
 First multiply 4 by 3.  
 Then multiply 12 by 3.

**a)** If  $s = 9$ ,  
find the value of:  
 $s^2$

$= 9 \times 9$   
 $= 81$   
 $=$

**b)** If  $w = 2$ ,  
find the value of:  
 $5w^2$

$= 5 \times 2 \times 2$   
 $= 10 \times 2$   
 $= 20$

**c)** If  $a = 5$ ,  
find the value of:  
 $3a^2$

$=$   
 $=$   
 $=$

**d)** If  $b = 4$ ,  
find the value of:  
 $5b^2$

$=$   
 $=$   
 $=$

**e)** If  $z = 20$ ,  
find the value of:  
 $3z^2$

$=$   
 $=$   
 $=$

**f)** If  $t = 5$ ,  
find the value of:  
 $8t^2$

$=$   
 $=$   
 $=$

**g)** If  $g = -4$ ,  
find the value of:  
 $10g^2$

$= 10 \times (-4) \times (-4)$   
 $= 10 \times 16$   
 $= 160$

**h)** If  $v = -5$ ,  
find the value of:  
 $2v^2$

$=$   
 $=$   
 $=$

**i)** If  $m = -1$ ,  
find the value of:  
 $20m^2$

$=$   
 $=$   
 $=$

**j)** If  $x = -10$ ,  
find the value of:  
 $2x^2$

$=$   
 $=$   
 $=$

**k)** If  $t = -9$ ,  
find the value of:  
 $t^2$

$=$   
 $=$   
 $=$

**l)** If  $y = -6$ ,  
find the value of:  
 $2y^2$

$=$   
 $=$   
 $=$