

21. [Substitution]

Skill 21.1 Substituting one value into expressions involving + and -

MMBlue 1 1 2 2 3 3 4 4
MMGreen 1 1 2 2 3 3 4 4

- Substitute the letters with numbers.
- Use the order of operations rule: Add (+) and/or subtract (-) from left to right.

Q. If $a = 5$, find the value of $13 - a$

A. $13 - a$ ← substitute $a = 5$
 $= 13 - 5$
 $= 8$

a) If $p = 2$, find the value of $5 + p$

$= 5 + 2 = \boxed{7}$

b) If $f = 3$, find the value of $6 + f$

$= \dots = \boxed{}$

c) If $c = 4$, find the value of $4 + c$

$= \dots = \boxed{}$

d) If $m = 5$, find the value of $m + 3$

$= \dots = \boxed{}$

e) If $g = 7$, find the value of $g + 2$

$= \dots = \boxed{}$

f) If $z = 6$, find the value of $z + 1$

$= \dots = \boxed{}$

g) If $x = 3$, find the value of $x + x$

$= \dots = \boxed{}$

h) If $v = 4$, find the value of $v + v$

$= \dots = \boxed{}$

i) If $q = 7$, find the value of $q + q$

$= \dots = \boxed{}$

j) If $t = 5$, find the value of $t + t + t$

$= \dots = \boxed{}$

k) If $e = 6$, find the value of $e + e + e$

$= \dots = \boxed{}$

l) If $p = 8$, find the value of $p + p + p$

$= \dots = \boxed{}$

m) If $j = 9$, find the value of $j + j - 8$

$= \dots = \boxed{}$

n) If $k = 7$, find the value of $k + k + 6$

$= \dots = \boxed{}$

o) If $h = 8$, find the value of $4 + h + h$

$= \dots = \boxed{}$

p) If $m = 8$, find the value of $m + m - 9$

$= \dots = \boxed{}$

q) If $s = 6$, find the value of $9 + s + s$

$= \dots = \boxed{}$

r) If $n = 5$, find the value of $8 + n + n$

$= \dots = \boxed{}$

Skill 21.2 Substituting one value into expressions involving \cdot and \div

- Substitute the letters with numbers.
- Use the order of operations rule: Multiply (\cdot) and/or divide (\div) from left to right.

Q. If $m = 4$, find the value of $6m$

A. $6m$ \leftarrow substitute $m = 4$
 $= 6 \cdot 4$
 $= 24$

a) If $a = 6$, find the value of $9 \cdot a$

$= 9 \cdot 6$ $=$

b) If $n = 4$, find the value of $3 \cdot n$

$=$

c) If $y = 5$, find the value of $2 \cdot y$

$=$

d) If $w = 7$, find the value of $w \cdot 3$

$=$

e) If $p = 8$, find the value of $4 \cdot p$

$=$

f) If $z = 6$, find the value of $7 \cdot z$

$=$

g) If $a = 3$, find the value of $8a$

$=$

h) If $h = 2$, find the value of $9h$

$=$

i) If $n = 5$, find the value of $7n$

$=$

j) If $m = 32$, find the value of $m \div 4$

$=$

k) If $n = 7$, find the value of $42 \div n$

$=$

l) If $k = 3$, find the value of $36 \div k$

$=$

m) If $d = 9$, find the value of $81 \div d$

$=$

n) If $p = 8$, find the value of $64 \div p$

$=$

o) If $i = 6$, find the value of $42 \div i$

$=$

p) If $m = 7$, find the value of $56 \div m$

$=$

q) If $e = 20$, find the value of $\frac{e}{5}$

$=$

r) If $w = 9$, find the value of $\frac{108}{w}$

$=$

Skill 21.3 Substituting one value into expressions involving +, −, · and ÷

MMBlue 1 1 2 2 3 3 4 4
MMGreen 1 1 2 2 3 3 4 4

- Substitute the variable (letter) with the given value.
- Use the order of operations rules: First multiply (·) and/or divide (÷) from left to right. Finally add (+) and/or subtract (−) from left to right.

Q. If $q = 8$, find the value of $4q + 2$

A. $4q + 2$ substitute $q = 8$
 $= 4 \cdot 8 + 2$
 $= 32 + 2$
 $= 34$

a) If $w = 6$, find the value of $20 - 3w$

$= 20 - 3 \cdot 6$ Do × first
 $= 20 - 18 = \boxed{2}$

b) If $x = 2$, find the value of $5x + 1$

$=$
 $=$ $=$ $\boxed{}$

c) If $m = 3$, find the value of $2 + 3m$

$=$
 $=$ $=$ $\boxed{}$

d) If $x = 5$, find the value of $12 + 5x$

$=$
 $=$ $=$ $\boxed{}$

e) If $a = 10$, find the value of $15 + 3a$

$=$
 $=$ $=$ $\boxed{}$

f) If $b = 7$, find the value of $2b + 9$

$=$
 $=$ $=$ $\boxed{}$

g) If $s = 3$, find the value of $7 + 11s$

$=$
 $=$ $=$ $\boxed{}$

h) If $v = 4$, find the value of $9v - 8$

$=$
 $=$ $=$ $\boxed{}$

i) If $h = 4$, find the value of $3h - 7$

$=$
 $=$ $=$ $\boxed{}$

j) If $k = 7$, find the value of $35 - 4k$

$=$
 $=$ $=$ $\boxed{}$

k) If $w = 2$, find the value of $8w - 5$

$=$
 $=$ $=$ $\boxed{}$

l) If $u = 5$, find the value of $21 - 3u$

$=$
 $=$ $=$ $\boxed{}$

m) If $e = 9$, find the value of

$\frac{e + 15}{8}$
 $=$
 $=$ $=$ $\boxed{}$

n) If $s = 3$, find the value of

$\frac{s + 4}{7}$
 $=$
 $=$ $=$ $\boxed{}$

o) If $c = 3$, find the value of

$\frac{19 - c}{4}$
 $=$
 $=$ $=$ $\boxed{}$

Skill 21.4 Substituting negative values into expressions.

MMBlue 1 1 2 3 3 4 4
MMGreen 1 1 2 3 3 4 4

- Substitute the variable (letter) with the given value.
- Use the order of operations rules: First multiply (\cdot) and/or divide (\div) from left to right. Finally add ($+$) and/or subtract ($-$) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $z = -5$,
find the value of
 $z - 9$

A. $z - 9$ *substitute $z = -5$*
 $= -5 - 9$
 $= -14$

a) If $e = -12$, find the
value of $19 + e$

$$= 19 + (-12) = \boxed{7}$$

*19 has greatest absolute value
19 is positive $\Rightarrow +7$*

b) If $y = -3$, find the
value of $9y$

$$= \dots = \boxed{}$$

c) If $r = -2$, find the
value of $6r$

$$= \dots = \boxed{}$$

d) If $n = -7$, find the
value of $n + 8$

$$= \dots = \boxed{}$$

e) If $z = -9$, find the
value of $4 - z$

$$= \dots = \boxed{}$$

f) If $h = -6$, find the
value of $8 + h$

$$= \dots = \boxed{}$$

g) If $j = -2$, find the
value of $8 - j$

$$= \dots = \boxed{}$$

h) If $v = -8$, find the
value of $v - 5$

$$= \dots = \boxed{}$$

i) If $b = -5$, find the
value of $7 + b$

$$= \dots = \boxed{}$$

j) If $b = -9$, find the
value of $4b$

$$= \dots = \boxed{}$$

k) If $f = -3$, find the
value of $-7f$

$$= \dots = \boxed{}$$

l) If $i = -6$, find the
value of $-5i$

$$= \dots = \boxed{}$$

m) If $a = -12$, find the
value of $\frac{a}{4}$

$$= \dots = \boxed{}$$

n) If $e = -21$, find the
value of $\frac{e}{3}$

$$= \dots = \boxed{}$$

o) If $c = -32$, find the
value of $\frac{c}{8}$

$$= \dots = \boxed{}$$

p) If $s = -4$, find the
value of $2 + 3s$

$$= \dots = \boxed{}$$

q) If $q = -3$, find the
value of $7q - 5$

$$= \dots = \boxed{}$$

r) If $x = -9$, find the
value of $5 - 2x$

$$= \dots = \boxed{}$$

Skill 21.5 Substituting two values into expressions involving + and -

MMBlue 11 2 2 3 3 4 4
MMGreen 11 2 2 3 3 4 4

- Substitute the variables (letters) with the given values.
- Use the order of operations rule: Add (+) and/or subtract (-) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $h = 5$ and $i = -12$,
find the value of $h + i$

A. $h + i$ *substitute $h = 5$ and $i = -12$*
 $= 5 + (-12)$
 $= -7$

a) If $s = 9$ and $t = 8$,
find the value of $s + t$

$= 9 + 8$ $=$

b) If $m = 3$ and $n = 7$,
find the value of $m + n$

$=$ $=$

c) If $i = 10$ and $j = 4$,
find the value of $i + j$

$=$ $=$

d) If $y = 0$ and $z = 12$,
find the value of $y + z$

$=$ $=$

e) If $k = 14$ and $l = 6$,
find the value of $k - l$

$=$ $=$

f) If $g = 13$ and $h = 7$,
find the value of $g - h$

$=$ $=$

g) If $p = 13$ and $q = 11$,
find the value of $p + q$

$=$ $=$

h) If $n = 5$ and $o = 8$,
find the value of $n - o$

$=$ $=$

i) If $a = 6$ and $b = 14$,
find the value of $a - b$

$=$ $=$

j) If $h = 5$ and $i = -12$,
find the value of $h + i$

$=$ $=$

k) If $v = -8$ and $w = 9$,
find the value of $v - w$

$=$ $=$

l) If $f = -7$ and $g = 3$,
find the value of $f - g$

$=$ $=$

m) If $r = 2$ and $s = -11$,
find the value of $r - s$

$=$ $=$

n) If $a = -5$ and $b = 7$,
find the value of $a - b$

$=$ $=$

o) If $q = 6$ and $r = -16$,
find the value of $q + r$

$=$ $=$

p) If $t = 0$ and $u = 6$,
find the value of $t - u$

$=$ $=$

q) If $v = -14$ and $w = 8$,
find the value of $v + w$

$=$ $=$

r) If $w = 7$ and $x = -9$,
find the value of $w - x$

$=$ $=$

Skill 21.6 Substituting two values into expressions involving \cdot and \div

- Substitute the letters (variables) with the given values.
- Use the order of operations rules: Multiply (\cdot) and/or divide (\div) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $q = 6$ and $r = 8$,
find the value of qr

A. qr — substitute $q = 6$ and $r = 8$
 $= 6 \cdot 8$
 $= 48$

a) If $e = 3$ and $f = 7$,
find the value of $e \cdot f$

$= 3 \cdot 7$ =

b) If $n = 4$ and $o = 2$,
find the value of $n \cdot o$

$=$ =

c) If $b = 10$ and $c = 3$,
find the value of $b \cdot c$

$=$ =

d) If $y = 2$ and $z = 9$,
find the value of yz

$=$ =

e) If $g = 11$ and $h = 4$,
find the value of gh

$=$ =

f) If $l = 3$ and $m = 13$,
find the value of lm

$=$ =

g) If $s = 5$ and $t = 6$,
find the value of st

$=$ =

h) If $w = 5$ and $x = 8$,
find the value of wx

$=$ =

i) If $d = 7$ and $e = 0$,
find the value of de

$=$ =

j) If $w = 30$ and $x = 5$,
find the value of $w \div x$

$=$ =

k) If $v = 45$ and $w = 9$,
find the value of $v \div w$

$=$ =

l) If $u = 22$ and $v = -2$,
find the value of $u \div v$

$=$ =

m) If $a = 54$ and $b = 6$, find
the value of $\frac{a}{b}$

$=$ =

n) If $c = 72$ and $d = 9$, find
the value of $\frac{c}{d}$

$=$ =

o) If $k = 63$ and $l = 7$, find
the value of $\frac{k}{l}$

$=$ =

p) If $l = 0$ and $m = 14$,
find the value of $9lm$

$=$ =

q) If $k = 4$ and $l = -2$,
find the value of $8kl$

$=$ =

r) If $d = 5$ and $e = 3$,
find the value of $7de$

$=$ =

Skill 21.7 Substituting two values into expressions involving +, −, · and ÷

- Substitute the variables (letters) with the given values.
- Use the order of operations rules: First multiply (·) and/or divide (÷) from left to right. Finally add (+) and/or subtract (−) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $m = 8$ and $n = 9$,
find the value of
 $m - 5 - n$

A. $m - 5 - n$ *substitute $m = 8$ and $n = 9$*
 $= 8 - 5 - 9$
 $= 3 - 9$
 $= -6$

a) If $t = 6$ and $u = 7$,
find the value of
 $2t + u$

$= 2 \cdot 6 + 7$
 $= 12 + 7$ *Do × first* $= \boxed{19}$

b) If $d = 8$ and $e = 3$,
find the value of
 $16 - d + e$

$=$
 $=$ $= \boxed{}$

c) If $h = 3$ and $i = 7$,
find the value of
 $11 + h - i$

$=$
 $=$ $= \boxed{}$

d) If $i = 5$ and $j = 6$,
find the value of
 $3ij$

$=$
 $=$ $= \boxed{}$

e) If $a = 3$ and $b = 0$,
find the value of
 $8ab$

$=$
 $=$ $= \boxed{}$

f) If $m = 4$ and $n = 1$,
find the value of
 $3m - n$

$=$
 $=$ $= \boxed{}$

g) If $m = 3$ and $n = 2$,
find the value of
 $4m - 2n$

$=$
 $=$ $= \boxed{}$

h) If $b = 7$ and $c = -5$,
find the value of
 $2bc + 30$

$=$
 $=$ $= \boxed{}$

i) If $g = 2$ and $h = 9$,
find the value of
 $-2gh + 2h$

$=$
 $=$ $= \boxed{}$

j) If $a = 6$ and $b = 3$,
find the value of
 $-4a + 5b$

$=$
 $=$ $= \boxed{}$

k) If $y = 3$ and $z = 2$,
find the value of
 $\frac{9-y}{z}$

$=$
 $=$ $= \boxed{}$

l) If $g = -2$ and $h = 15$,
find the value of
 $\frac{h-7}{g}$

$=$
 $=$ $= \boxed{}$

Skill 21.8 Substituting into expressions involving powers.

MMBlue 11 22 33 44
MMGreen 11 22 33 44

- Substitute the variables (letters) with the given values.
- Use the order of operations rules: First evaluate all powers.
Then multiply (\cdot) and/or divide (\div) from left to right.
Finally add ($+$) and/or subtract ($-$) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $i = 4$,
find the value of
 $2i^2 - i$

A. $2i^2 - i$ *substitute $i = 4$*
 $= 2(4 \cdot 4) - 4$
 $= 2 \cdot 16 - 4$
 $= 32 - 4$
 $= 28$

a) If $x = 5$,
find the value of
 $40 - x^2$

$= 40 - 5 \cdot 5$ *multiply first*
 $= 40 - 25 = \boxed{15}$

b) If $j = 8$,
find the value of
 j^2

$= \dots = \boxed{}$

c) If $m = 3$,
find the value of
 $8 + m^2$

$= \dots = \boxed{}$

d) If $c = 5$,
find the value of
 $4c^2$

$= \dots = \boxed{}$

e) If $d = 7$,
find the value of
 $d^2 - 9$

$= \dots = \boxed{}$

f) If $k = 4$,
find the value of
 $23 - k^2$

$= \dots = \boxed{}$

g) If $z = 6$,
find the value of
 $2z^2 - 32$

$= \dots = \boxed{}$

h) If $y = 10$,
find the value of
 $2y^2 + y$

$= \dots = \boxed{}$

i) If $b = 4$,
find the value of
 $3b^2 + 7$

$= \dots = \boxed{}$

j) If $t = 3$,
find the value of
 $4t^2 + t$

$= \dots = \boxed{}$

k) If $e = 7$,
find the value of
 $-2e^2$

$= \dots = \boxed{}$

l) If $n = 6$,
find the value of
 $\frac{n^2 - 6}{5}$

$= \dots = \boxed{}$

Skill 21.9 Substituting into expressions with brackets.

- Substitute the variables (letters) with the given values.
- Use the order of operations rules: First evaluate inside the brackets.
Then multiply (\cdot) and/or divide (\div) from left to right.
Finally add ($+$) and/or subtract ($-$) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. If $r = 5$, find the value of $4(r - 2)$

A. $4(r - 2)$ *substitute $r = 5$*
 $= 4(5 - 2)$
 $= 4 \cdot 3$
 $= 12$

a) If $h = 2$, find the value of $3(5 + h)$

$= 3(5 + 2)$ *Do () first*
 $= 3 \cdot 7$ $= 21$

b) If $z = 6$, find the value of $4(12 - z)$

$=$ _____
 $=$ _____ $=$

c) If $s = 3$, find the value of $s(7 + s)$

$=$ _____
 $=$ _____ $=$

d) If $a = 7$, find the value of $5(a + 5)$

$=$ _____
 $=$ _____ $=$

e) If $r = 5$, find the value of $4(r - 2)$

$=$ _____
 $=$ _____ $=$

f) If $r = 9$, find the value of $r(2 + r)$

$=$ _____
 $=$ _____ $=$

g) If $q = 2$, find the value of $9(q + 8)$

$=$ _____
 $=$ _____ $=$

h) If $k = 4$, find the value of $k(k - 8)$

$=$ _____
 $=$ _____ $=$

i) If $h = -5$, find the value of $4(h - 2)$

$=$ _____
 $=$ _____ $=$

j) If $f = 9$, find the value of $6(f + 6)$

$=$ _____
 $=$ _____ $=$

k) If $p = 6$, find the value of $p(2 - p)$

$=$ _____
 $=$ _____ $=$

l) If $e = -2$, find the value of $e(e - 7)$

$=$ _____
 $=$ _____ $=$

Skill 21.10 Substituting into formulae.

MMBlue 11 22 33 44
MMGreen 11 22 33 44

- Substitute the variables (letters) with the given values.
- Use the order of operations rules: First evaluate all powers.
Then multiply (\cdot) and/or divide (\div) from left to right.
Finally add ($+$) and/or subtract ($-$) from left to right.
- Determine the sign of the result. (see skills 13.7 to 13.10, pages 98 to 101)

Q. Use $A = lw$ to find the area (A) of a rectangle where $l = 3$ and $w = 7$

A. $A = lw$ — substitute $l = 3$ and $w = 7$
 $= 3 \cdot 7$
 $= 21$

- a)** Use $F = ma$ to find the force (F) where $m = 5$ and $a = 11$

$$F = 5 \cdot 11 = \boxed{55}$$

- b)** Use $P = 5l$ to find the perimeter (P) of a regular pentagon where $l = 12$

$$P = 5 \cdot 12 = \boxed{}$$

- c)** Use $V = Bh$ to find the volume (V) of a prism where $B = 12$ and $h = 4$

$$V = 12 \cdot 4 = \boxed{}$$

- d)** Use $A = l^2$ to find the area (A) of a square where $l = 9$

$$A = 9^2 = \boxed{}$$

- e)** Use $A = \frac{ab}{2}$ to find the area (A) of a kite where $a = 8$ and $b = 7$

$$A = \frac{8 \cdot 7}{2} = \boxed{}$$

- f)** Use $D = rt$ to find the distance (D) where $r = 55$ and $t = 2$

$$D = 55 \cdot 2 = \boxed{}$$

- g)** Use $A = bh$ to find the area (A) of a parallelogram where $b = 4.5$ and $h = 4$

$$A = 4.5 \cdot 4 = \boxed{}$$

- h)** Use $P = 8l$ to find the perimeter (P) of an octagon where $l = 2.5$

$$P = 8 \cdot 2.5 = \boxed{}$$

- i)** Use $A = \frac{1}{2} h(a + b)$ to find the area (A) of a trapezoid where $h = 4$, $a = 7$ and $b = 3$

$$A = \frac{1}{2} \cdot 4 \cdot (7 + 3) = \boxed{}$$

- j)** Use $V = l^2h$ to find the volume (V) of a square prism where $l = 5$ and $h = 4$

$$V = 5^2 \cdot 4 = \boxed{}$$

- k)** Use $V = l^3$ to find the volume (V) of a cube where $l = 5$

$$V = 5^3 = \boxed{}$$

- l)** Use $A = \pi r^2$ to find the area (A) of a circle where $\pi \approx 3.14$ and $r = 10$

$$A = 3.14 \cdot 10^2 = \boxed{}$$