

Lesson 1

- 1 $3x + 2$, y^2 , $\frac{a+bc}{2}$, $(-2a+1)^3$ are examples of algebraic expressions. Ψ x, y, a, b, c are examples of variables but also examples of algebraic expressions. Variables represent unknown numbers. If we know the value of x , we can evaluate $3x + 2$, and as a result we get a number.
- 2 a) "a squared" or "a raised to the second power." b) "a cubed" or "a raised to the third power." c) "a raised to the twelfth power." d) "2 to the m" or "2 raised to the m-th power." e) "minus y" or "the opposite of y" f) "the product of c and d" or "c times d" g) "a minus b" h) "two-fifth times x" or "two-fifth x"
- 3 a) $7 \times n$ b) $-5 \times k \times m$ c) "there is no multiplication performed"
d) $-x \times (-y)$ e) $\frac{3 \times x}{2}$ f) $2 \times x - y \times z + w \times (-t)$
- 4 a) multiplication b) division c) exponentiation d) division e) subtraction f) multiplication
- 5 a) Any time two operation signs are next to each other, parentheses are needed. b) If parentheses are removed, only m would be raised to the fourth power. c) Any time two operation signs are next to each other, parentheses are needed, even if the multiplication sign is not explicitly displayed d) If parentheses are removed, only a would be raised to the fourth power. e) Any time two operation signs are next to each other, parentheses are needed, even if the multiplication sign is not explicitly displayed f) Any time two operation signs are next to each other, parentheses are needed
- 6 a) $-s$ b) s c) st d) t e) x f) $\frac{x}{y}$ g) st h) s i) $y - s$
- 7 a) x b) $-x$ c) multiplication
- 8 a) $1 \cdot x = x$; b) $-1 \cdot x = -x$ c) $0 \cdot x = 0$
- 9 a) $-(-x)$ b) $-\frac{x^3}{y}$ c) $-\left(-\frac{x^3}{y}\right)$ d) $-\left(\frac{-x^3}{-y}\right)$
- 10 a) $\frac{1}{2}y$ b) $\frac{3}{4}y$ c) $y+5$ d) $v-y$ e) y^2 f) $y+3$ g) $y-x$ h) xy i) $2y$
- 11 a) $a+(-b)$ b) $a-(-b)$ c) $a(-b)$ d) $-C$ f) $-(-C)$ g) $-\frac{-a}{-b}$
h) $v(-t)(-p)$ i) $\frac{c}{-B}$ j) $(-x)^m$ k) $\left(\frac{x}{y}\right)^m$
- 12 a) $x+10$ b) $\frac{2}{3}x$ c) $\frac{x}{3}$ d) $\frac{100}{x}$ e) $30x$ f) $x-3$
- 13 $\frac{d}{t}$
- 14 ma
- 15 $\frac{1}{2}(bh)$ or $\frac{1}{2}bh$
- 16 a) $3+5=8$ b) $3-2=1$ c) $\frac{3}{3}=1$ d) $4 \times 3=12$ e) $3^2=9$ f) $\frac{6}{3}=2$
- 17 $\frac{1}{x}$ can not be evaluated with $x=0$, because the denominator of a fraction can not be 0.

If $x = 0$, $\frac{1}{x-5}$ can be evaluated: $\frac{1}{x-5} = \frac{1}{0-5} = -\frac{1}{5}$, but if $x = 5$ then $\frac{1}{x-5} = \frac{1}{5-5} = -\frac{1}{0}$ is not possible. Another example could be: $\frac{3}{y+4}$ cannot be evaluated with $y = -4$. (answers vary)

18 a) $3 \cdot 0 = 0$ b) $0 - 2 = -2$ c) cannot be evaluated d) $\frac{0}{7} = 0$ e) $\frac{2}{0-3} = -\frac{2}{3}$ f)

cannot be evaluated

19 a) $3^2 = 9$ b) $2^3 = 8$ c) $2^2 = 4$

20 a) $-A = -2$ b) $-A = 2$

21 a) $6 - 8 = -2$ b) $-10 - 6 = -16$ c) $-4 + 6 = 2$ d) $6 - 6 = 0$ e) $-2 + 6 - 6 = -2$

22 a) $2 + (-2) = 0$ b) $2 - (-2) = 4$ c) $-2 - (-2) = 0$ d) $-5 - (-2) + 4 = 1$ e)

$6 + (-2) - 10 - (-2) = -4$

23 a) $3(10) = 30$ b) $-5(10) = -50$ c) $\frac{-200}{10} = -20$ d) $-\frac{10}{2} = -5$

e) $-5 \div 10 = -0.5$ or $-\frac{1}{2}$ f) $10^4 = 10,000$

24 a) $-1000(-12) = 12,000$ b) $\frac{-12}{6} = -2$ c) $-5(-12) = 60$

d) $\frac{6}{-12+12}$ "not possible" e) $-24 \div (-12) = 2$ f) $(-12)^2 = 144$

25 a) $\frac{7}{3}$ or $2\frac{1}{3}$ b) $\frac{13}{15}$ c) $-\frac{8}{21}$ d) $-\frac{13}{12}$ e) $\frac{8}{3}$ or $2\frac{2}{3}$ f) $-\frac{11}{3}$ or $-3\frac{2}{3}$

26 a) $\frac{9}{10}$ b) $\frac{16}{35}$ c) $\frac{8}{5}$ or $1\frac{3}{5}$ d) $-\frac{13}{20}$ e) $-\frac{29}{10}$ or $-2\frac{9}{10}$

27 a) $\frac{4}{7}$ b) -2 c) $-\frac{4}{3}$ d) $\frac{5}{8}$ e) $\frac{35}{2}$ or $17\frac{1}{2}$ f) $-\frac{1}{7}$

28 a) $\frac{9}{16}$ b) -1 c) $\frac{9}{20}$ d) $\frac{3}{2}$ e) $\frac{1}{4}$ f) 0

29 a) 3.41 b) 34.81 c) 0.05 d) -8 e) 0.06 f) -5

30 a) -3.9 b) -2.1 c) 2 d) 360 e) -0.0006 f) -0.216

31 a) -1.58 b) -1.1 c) -10 d) 0.3 e) 20

32 a) $\frac{19}{15}$ or $1\frac{4}{15}$ b) $-\frac{5}{14}$ c) -1.28

33 a) $-\frac{1}{15}$ b) $\frac{13}{14}$ c) 0.88

34 a) $\frac{4}{9}$ b) $\frac{18}{5}$ or $3\frac{3}{5}$ c) -0.002

35 a) $\frac{9}{121}$ b) $\frac{40}{9}$ c) -20

36 a) $-10,000,000$ b) 16 c) $-\frac{1}{8}$ d) 0.00001 or $\frac{1}{100,000}$

37 a) $2x = 2\left(-\frac{1}{2}\right) = -1$ b) $\frac{3}{4}x = \frac{3}{4}\left(-\frac{1}{2}\right) = -\frac{3}{8}$ c) $\left(-\frac{1}{2}\right)^2 = \frac{1}{4}$

38 $-t = -1$ if $t = 1$, $-t = -(-1) = 1$ if $t = -1$; $-t$ may be positive or negative depending on the value of t