Writing and Evaluating Algebraic Expressions

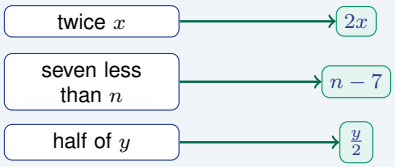
Name: _____	Date: _____	Score: _____ / 17

This is where algebra begins! An **algebraic expression** lets you describe a quantity even when you do not know its exact value yet—so words like "five more than a number" become math symbols like $x + 5$. When you *evaluate* an expression, you swap the variable for a real number and simplify using order of operations. Master these two skills and you have the keys to equations, formulas, and every algebra topic that comes next!

Key Concepts & Quick Review

Key words: sum $(+)$, difference $(-)$, product $(\times)$, quotient $(\div)$, more than, less than, twice, half of, increased/decreased by.

Evaluating: replace the variable with the given value and follow order of operations (PEMDAS). Example: evaluate $3x^2 - 4$ for $x = 2$: $3(2)^2 - 4 = 12 - 4 = 8$.



Translate the words first, then substitute values.

Examples

① Write an expression for each: (a) seven less than twice a number n; (b) the product of five and x, increased by three.

Think It Through: Turn the words into math one phrase at a time. In part (a), "twice a number" means $2n$. Then "seven less than" tells you to subtract 7 from that amount, giving $2n - 7$. In part (b), "the product of five and x" means $5x$. The phrase "increased by three" means add 3, so the final expression is $5x + 3$. The key is to translate each word clue carefully instead of trying to do the whole sentence at once.

Answer: *(a)* $2n - 7$; *(b)* $5x + 3$

② Evaluate $4a^2 - 3b + 1$ for $a = 3$ and $b = -2$.

Think It Through: Substitute the given values first: $4(3)^2 - 3(-2) + 1$. Then follow the order of operations. Compute the exponent: $(3)^2 = 9$. Multiply: $4 \cdot 9 = 36$. Be careful with the negative in the middle term: $-3(-2) = +6$ because a negative times a negative is positive. Now add the pieces: $36 + 6 + 1 = 43$.

Answer: 43

Practice Problems

Evaluate each expression for the given values.

1. Evaluate $3x + 5$ when $x = 4$. _____
2. Evaluate $2n - 7$ when $n = 6$. _____
3. Evaluate $4a + 2b$ when $a = 3$ and $b = 1$. _____
4. Evaluate $x^2 - 1$ when $x = 5$. _____
5. Evaluate $\frac{m}{4} + 3$ when $m = 12$. _____
6. Evaluate $5y - 2z$ when $y = 3$ and $z = 4$. _____
7. Evaluate $3k^2$ when $k = 2$. _____
8. Evaluate $2(p + 4)$ when $p = 7$. _____
9. Evaluate $\dfrac{3c}{2} - 1$ when $c = 8$. _____
10. Evaluate $a^2 + b^2$ when $a = 3$ and $b = 4$. _____
11. Evaluate $6 - 2t$ when $t = -3$. _____
12. Evaluate $n^2 - 3n + 2$ when $n = 5$. _____
13. Evaluate $4x + \frac{y}{3}$ when $x = 2$ and $y = 9$. _____
14. Evaluate $(r + s)^2$ when $r = 1$ and $s = 4$. _____
15. Evaluate $7m - 4$ when $m = \frac{1}{2}$. _____

Study Tips

- **"Less than" flips the order!** "Seven less than n" is $n - 7$, not $7 - n$. Read carefully.
- When substituting a **negative value**, wrap it in parentheses: $3(-2)^2$ not $3-2^2$ — the parentheses prevent sign errors.
- Always follow **PEMDAS** when evaluating: exponents before multiplication, multiplication before addition.

Word Problems

16. A food truck charges $\$3.50$ per taco plus a one-time $\$1.25$ guacamole fee for any order. Write an expression for the total cost C of ordering t tacos. How much does a group of friends pay if they order 8 tacos? If another group paid exactly $\$18.75$, how many tacos did they order? _____

17. A drone descends from a height of $120\,m$. Its height in meters after t seconds is given by $h = 120 - 4t^2$. Find the drone's height after $3\,s$ and after $5\,s$. Between which two whole-number seconds does the drone first reach a height below $30\,m$? _____

Answer Keys

1) 17
2) 5
3) 14
4) 24
5) 6
6) 7
7) 12
8) 22
9) 11
10) 25
11) 12
12) 12
13) 11
14) 25
15) $-\frac{1}{2}$
16) $C = 3.50t + 1.25$; 8 tacos: \$29.25; 5 tacos
17) After $3\ s$: $84\ m$; after $5\ s$: $20\ m$; below $30\ m$ between $t = 4$ and $t = 5$

Step-by-Step Explanations

Strategy: For Percents Greater Than 100% and Less Than 1%, remember that very large percents mean more than one whole, while tiny percents mean only a small fraction of one whole. The answer should feel reasonable: over 100% grows past the whole, while less than 1% stays very small.

Practice 1: Convert 150% to a decimal. **Answer:** 1.5
At the beginning of the practice, move the decimal two places left; a percent over 100% becomes a number greater than 1.

Practice 15: Convert the fraction $\frac{7}{4}$ to a percent. **Answer:** 175%
For the later model problem, first rewrite $\frac{7}{4}$ as 1.75, then multiply by 100%. The answer is greater than 100% because the fraction is greater than 1.

Word-problem notes:

16. **Answer:** $0.8\% = 0.008 = \frac{1}{125}$; $5{,}000 \times 0.008 = 40$ people.
To change 0.8% into a decimal, divide by 100: $0.8 \div 100 = 0.008$. As a fraction, that is $\frac{0.8}{100} = \frac{8}{1000} = \frac{1}{125}$. Now find 0.8% of $5{,}000$ by multiplying the decimal form: $5{,}000 \times 0.008 = 40$. Percent problems are often easier once you convert the percent to a decimal first.

17. **Answer:** This month: $\frac{900}{600} = 150\%$; increase: $\frac{300}{600} = 50\%$. The first is $> 100\%$.
First compare this month's production to last month's: $\frac{900}{600} = 1.5 = 150\%$. That means this month's production is 150% of last month's amount. Now find the increase itself: $900 - 600 = 300$ parts. As a percent of last month's production, that is $\frac{300}{600} = 0.5 = 50\%$. The 150% value is greater than 100% because the factory made more this month than it did last month.

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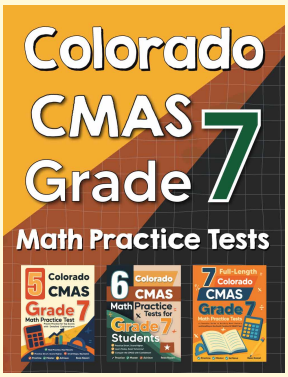

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