Evaluating Expressions

Evaluating expressions: Applications and decisions

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Substitute the value for every occurrence of each variable, then follow the order of operations. At $x = 3, y = 2$, $4x + y^2 = 4(3) + 2^2 = 12 + 4 = 16$. Use parentheses for a negative input: if $x = -4$, then $x^2 = (-4)^2 = 16$.

Worked example

Substitute carefully. Evaluate $x^2 + 3x + 5$ at $x = 2$.

1. Substitute $x = 2$ to get $(2)^2 + 3(2) + 5$.
2. $(2)^2 = 4$ and $3(2) = 6$.
3. $4 + (6) + 5 = 15$.
Answer: 15.

Practice Problems

Show your thinking.

1. Plan A costs $3h + 8$ dollars and Plan B costs $4h + 3$ dollars for h hours. Which is cheaper for 3 hours? Does that choice stay cheaper for 6 hours?

2. A fruit stand prepares $4(x + 2)$ pieces using x apples and 2 pears on each of four trays. A group needs 30 pieces. Do 5 apples per tray suffice? What happens if each tray gets one more apple?

3. A tile design uses $x^2 + 2x + 10$ tiles, where x is the side length of a square center. Which of the two sizes $x = 2$ and $x = 3$ can be built with only 24 tiles? Give the spare tiles or shortage for both.

4. A deck with x cards gains 4 more, then is shared among 6 players. Compare $(x + 4)/6$ at $x = 20$ and $x = 22$. Which deck shares exactly without cutting a card? Give cards per player and leftovers.

5. A club starts with 40 dollars and spends 5 dollars per kit. It needs at least 10 dollars left. Use $40 - 5k$ to test buying 5, 6, or 7 kits. Which is the largest allowed purchase?

6. A receipt should charge $2n + 9$ dollars for n tickets. Lee types $2(n + 9)$ instead. Compare the two totals for 4 tickets and find the overcharge.

7. A project total is $5x + 2y$ dollars. Three add-ons are included, so $y = 3$. Is a 26-dollar receipt for $x = 4$ or $x = 5$ basic items? Test both.

8. A sensor test uses score $x^2 + y$, where x is a signed temperature difference and y is a calibration offset. Compare the scores for $(x, y) = (-3, 2)$ and $(3, -1)$. What causes the difference?

Answer Key

1. At 3 h, Plan B is 2 dollars cheaper. At 6 h, Plan A is 1 dollar cheaper.
2. 5 apples per tray gives 28 pieces, 2 short. With 6, there are 32 pieces, 2 extra.
3. Build size 2; 6 spare. Size 3 is short by 1.
4. Only the 20-card deck shares exactly: 4 each, none left. The other gives 4 each and 2 left.
5. 6 kits, leaving exactly 10 dollars.
6. Correct 17 dollars; typed 26 dollars; overcharge 9 dollars.
7. 4 basic items.
8. Scores 11 and 8; the 3-point difference comes from the offsets.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. At $h = 3$: A costs $3(3) + 8 = 17$ dollars and B costs $4(3) + 3 = 15$ dollars, so B saves 2.
2. At $h = 6$: A costs $3(6) + 8 = 26$ dollars and B costs $4(6) + 3 = 27$ dollars, so A saves 1.

Problem 2

1. For $x = 5$, each tray has $5 + 2 = 7$ pieces. Four trays have $4(7) = 28$, which is $30 - 28 = 2$ short.
2. For $x = 6$, each tray has $6 + 2 = 8$ pieces. Four trays have $4(8) = 32$, leaving $32 - 30 = 2$ extra.

Problem 3

1. At $x = 2$, the design uses $2^2 + 2(2) + 10 = 4 + 4 + 10 = 18$ tiles; $24 - 18 = 6$ spare.
2. At $x = 3$, it uses $3^2 + 2(3) + 10 = 9 + 6 + 10 = 25$ tiles; $25 - 24 = 1$ short.

Problem 4

1. At $x = 20$, total $20 + 4 = 24$. Then $24 \div 6 = 4$ with no remainder.
2. At $x = 22$, total $22 + 4 = 26$. Since $26 = 6(4) + 2$, each player gets 4 whole cards and 2 remain.

Problem 5

1. At $k = 5$, $40 - 5(5) = 15$ dollars; at $k = 6$, $40 - 5(6) = 10$ dollars. Both meet the minimum.
2. At $k = 7$, $40 - 5(7) = 5$ dollars, below the limit. So 6 is the greatest allowed choice.

Problem 6

1. Correct: $2(4) + 9 = 8 + 9 = 17$ dollars.
2. Typed: $2(4 + 9) = 2(13) = 26$ dollars. The 9-dollar fee was doubled.
3. Overcharge $= 26 - 17 = 9$ dollars.

Problem 7

1. Fix the add-on cost: $2(3) = 6$ dollars.
2. With 4 items, $5(4) + 6 = 26$ dollars. With 5, $5(5) + 6 = 31$ dollars.
3. Only the 4-item model matches the receipt.

Problem 8

1. Both square terms equal 9: $(-3)(-3) = 9$ and $3(3) = 9$.
2. Add the offsets: $9 + 2 = 11$, and $9 + (-1) = 8$. The square terms match; only the offsets differ by 3.

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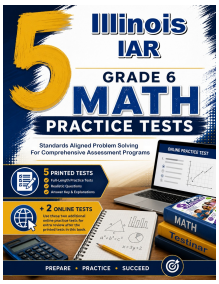

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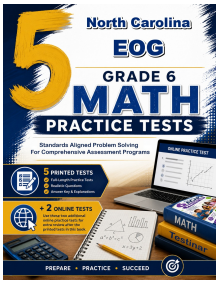

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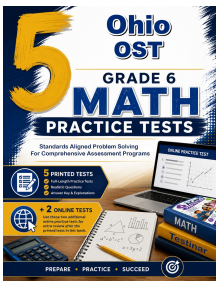

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