Which expressions are equivalent to $3x + 12$?

A. $3(x+4)$

B. $x^3 + 12$

C. $12(x + x + x)$

D. $x + x + x + 4 + 4 + 4$

E. $6\left(\dfrac{1}{2}x + 2\right)$

Scoring

2 points: If selected only A, D, and E as equivalent responses.

1 point: If selected any two of A, D, and E as equivalent responses.

0 points: If selected only A or A with B and/or C as equivalent responses.

Key and Distractor Analysis

    A. Key: Students correctly factored the expression $3x + 12$.

    B. Students misunderstand that $3x$ and x^3 are not equivalent expressions. $x^3 = x \bullet x \bullet x$ and $3x = x + x + x$.

    C. Students understand that $3x$ is equal to $x + x + x$, but does not understand that 12 is a term and not a factor.

    D. Key: Students correctly decompose the expression.

    E. Key: Students correctly factored the expression $3x + 12$ using a fraction as one of the terms.

Expressions and Equations	**6.EE**

Apply and extend previous understandings of arithmetic to algebraic expressions.

    3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x+3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*

For answer choices A-E, bubble in "Yes" if the choice represents the expression $2(x+4)$ and "No" if it does not.

A) $(x+4)(x+4)$ ⭕Yes ⭕No

B) 2
$$\begin{array}{|c|c|}\hline x & 4 \\\hline \end{array}$$
⭕Yes ⭕No

C) $2x+4$ ⭕Yes ⭕No

D) $(\boxed{} + \square\square\square\square) + (\boxed{} + \square\square\square\square)$ ⭕Yes ⭕No

E) $2x+8$ ⭕Yes ⭕No

Scoring:

2 Pts = Student selects "Yes" for B, D, E **and** "No" for A,C
1 Pt. = Student selects "Yes" for B,D or B,E or D,E **and** "No" for A,C
0 Pts= Student selected "Yes" for A or C along with any other correct responses

Key and Distractor Analysis:
A. Student multiplied $(x+4)$ by itself instead of by 2.

B. **Key:** Student correctly modeled the product of 2 and $(x+4)$.

C. Student did not distribute the 2 to both terms of $(x+4)$.

D. **Key:** Student recognized multiplication as repeated addition of terms using algebra tiles.

E. **Key:** Student distributed 2 correctly to both terms within the quantity $(x+4)$.

Expressions and Equations   6.EE

Apply and extend previous understandings of arithmetic to algebraic expressions.

3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression $3(2+x)$ to produce the equivalent expression $6+3x$; apply the distributive property to the expression $24x+18y$ to produce the equivalent expression $6(4x+3y)$; apply properties of operations to $y+y+y$ to produce the equivalent expression $3y$.