SECURE MATERIAL - Reader Name: _____

Tennessee Comprehensive Assessment Program

TCAP/CRA

2014

6

Phase II

Expressions Task

Anchor Set

Part 1: Constructed Response Task Section

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

b. Evaluate the expression in part a, showing each calculation.

Part 1: Constructed Response Task Section

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

d. Why are both students correct?

Scoring Guide

The CCSS for Mathematical Content (2 points)

6.EE.A.1x Writes a numerical expression that is a correct translation of the verbal expression in part a: _____

- $(4 \times 5)^2 - (6 \div 3)$
- $4^2 \times 5^2 - 6 \div 3$
- or any other equivalent expression.

(1 Point)

6.EE.A.1z Provides an alternative accurate numerical expression for the verbal expression or for Emily's translation, such as $5^2 \times 4^2 + (6 - 2)$ or $(5 \times 4) \times (5 \times 4) + (6 - 2)$, for part c. _____

(1 Point)

The CCSS for Mathematical Practice (2 points)

MP3 Justifies using appropriate mathematical language that both students in part c are correct because both numerical expressions are equivalent to one another, or because both numerical expressions can be read as: *The product of five and four squared plus the difference of six and two.* _____

(1 Point)

(MP3: Construct viable arguments and critique the reasoning of others.)

MP6 Uses order of operations and precise calculations to correctly evaluate the expression given by the student in part a. _____

(1 Point)

(MP6: Attend to precision.)

TOTAL POINTS: 4

The CCSS for Mathematical Content Addressed In This Task

Apply and extend previous understandings of arithmetic to algebraic expressions.	
6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.

The CCSS for Mathematical Practice*
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
* Gray type indicates Mathematical Practices not addressed in this assessment.

A-1a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$(4 \times 5)^2 - (6 \div 3)$

b. Evaluate the expression in part a, showing each calculation.

$(4 \times 5)^2 - (6 \div 3)$

$(20)^2 - (6 \div 3)$

$20^2 - 2$

$400 - 2$

398

A-1b

Expressions Task

c Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(6-2)+(5\times4)\times(5\times4)$

Carla could have wrote this expression because $(5\times4)^2$ is the same as $(5\times4)\times(5\times4)$ and it doesn't matter where the 6-2 is so she could have moved it using commutative property.

d. Why are both students correct?

They mean the same thing but are written in a slightly different way, such as the $(5\times4)^2$ is the same as $(5\times4)\times(5\times4)$ and you can use propertys like commutative property to move the 6-2.

Anchor 1 Litho 00236200105

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 2 (MP3, MP6)

This response contains a numerical expression that is a correct translation of the verbal expression in Part A $((4 \times 5)^2 – (6 \div 3))$ (6.EE.A.1(x)). It also contains an alternative accurate numerical expression to the one given in Part C $((6 – 2) + (5 \times 4) \times (5 \times 4))$ (6.EE.A.1(z)). The student uses appropriate mathematical language in Part D to justify that both students in Part C are correct (“you can use propertys like commutative property to move the 6 – 2”) (MP3). In Part B, using order of operations and precise calculations, the student correctly evaluates the expression from Part A (MP6).

Total Awarded Points: 4 out of 4

A-2a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$(4 \times 5)^2 - (6 \div 3)$

b. Evaluate the expression in part a, showing each calculation.

$(4 \times 5)^2 - (6 \div 3)$

$20^2 - (6 \div 3)$

$20^2 - 2$

$400 - 2$

398

A-2b

Expressions Task

c. Two students wrote expressions for this verbal expression
the product of five and four squared plus the difference between six and two

Emily wrote $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$20^2 + 4$

d. Why are both students correct?

Because if you simplify the words in your head you get Clara's expression but if you write it as you hear it you get Emily's expression.

Anchor 2 Litho 00446200108

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 2 (MP3, MP6)

This response contains a numerical expression that is a correct translation of the verbal expression in Part A ($(4 \times 5)^2 – (6 \div 3)$) (6.EE.A.1(x)). It also contains an alternative accurate numerical expression to the one in Part C ($20^2 + 4$) (6.EE.A.1(z)). The student uses appropriate mathematical language in Part D to justify that both students in Part C are correct ("Because if you simplify the words in your head you get Clara's expression") (MP3). In Part B, the student uses order of operations and precise calculations to correctly evaluate the expression from Part A (MP6).

Total Awarded Points: 4 out of 4

A-3a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$(4 \times 5)^2 - 6 \div 3$

b. Evaluate the expression in part a, showing each calculation.

Parenthesis
Exponents
Multiply
Divide
Add
Subtract

$(4 \times 5)^2 - 6 \div 3$

$20^2 - 6 \div 3$

$400 - 6 \div 3$

$400 - 2 = 398$

A-3b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote. $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(6-2)+(5\times4)^2$

d. Why are both students correct?

Both students are correct because they get the same answer once they solve it. If you use order of operations correctly you will get the same answer. You get 404 for both equations.

$(6-2)+(5\times4)^2$
$4+(5\times4)^2$
$4+20^2$ $4+400=404$

$(5\times4)^2+(6-2)$
$20^2+(6-2)$
20^2+4
$400+4=404$

Anchor 3 Litho 00386200108

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 2 (MP3, MP6)

This response contains a numerical expression that is an acceptable translation of the verbal expression in Part A ($(4 \times 5)^2 – (6 \div 3)$) (6.EE.A.1(x)). The response also contains an alternative accurate numerical expression to the one in Part C ($(6 – 2) + (5 \times 4)^2$) (6.EE.A.1(z)). By correctly evaluating each expression and demonstrating that the expressions are equivalent, the student uses appropriate mathematical language in Part D to justify that both students in Part C are correct (MP3). In Part B, using the order of operations and precise calculations, the student correctly evaluates the expression from Part A (MP6).

Total Awarded Points: 4 out of 4

A-4a

Expressions Task

a. Translate the following verbal expression to a numerical expression.

the square of the product of four and five minus the quotient of six and three

$4 \cdot 5^2 - 6 \div 3$

4·25 - 6 ÷ 3

100 - 6 ÷ 3

100 - 2

98

b. Evaluate the expression in part a, showing each calculation.

$4 \cdot 5^2 - 6 \div 3 =$

$4 \cdot 25 - 6 \div 3 =$

$100 - 6 \div 3 =$

$100 - 2 =$

98

A-4b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(4 \times 5)^2 + (6 - 2)$

d. Why are both students correct?

Communative Property of Multipication says it doesn't matter which number goes first.

Anchor 4 Litho 00296200105

Total Content Points: 1 (6.EE.A.1(z))

Total Practice Points: 2 (MP3, MP6)

This response does not contain a numerical expression that is a correct translation of the verbal expression in Part A, as only the 5 and not the product of 4 and 5 is squared (no credit for 6.EE.A.1(x)). The student does provide an alternative accurate numerical expression to the one given in Part C ((6 – 2) + (5 × 4) × (5 × 4)) (6.EE.A.1(z)). The student uses appropriate mathematical language in Part D to justify that both students in Part C are correct ("Communative Property of Multipication says it doesn't matter which number goes first") (MP3). In Part B, the student correctly evaluates the incorrect expression from Part A (MP6).

Total Awarded Points: 3 out of 4

A-5a

Expressions Task

a. Translate the following verbal expression to a numerical expression.

the square of the product of four and five minus the quotient of six and three

$(5 \times 4)^2 - (6 \div 3)$

b. Evaluate the expression in part a, showing each calculation.

$(5 \times 4) - (6 \div 3)$

$20^2 - 2$

$400 - 4 = 396$

A-5b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(6-2)+(5\times4)^2=404$

d. Why are both students correct?

Because they just switche (6-2) and $(5\times4)^2$

Anchor 5 Litho 00196200108

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 1 (MP3)

This response contains a numerical expression that is a correct translation of the verbal expression in Part A ($(5 \times 4)^2 – (6 \div 3)$ (6.EE.A.1(x)). The student also provides an accurate alternative numerical expression to the one given in Part C ($(6 – 2) + (5 \times 4)^2 = 404$) (EE.A.1(z)). The student justifies the expression in Part C using appropriate mathematical language, showing in Part D that both students are correct because the commutative property indicates the difference of 6 and 2 can be placed before or after the square of the product of 5 and 4 ("Because they just switche $(6 – 2)$ and $(5 \times 4)^{2"}$) (MP3). In Part B, the student incorrectly solves the expression from Part A, resulting in an incorrect answer of 396, and in Part D, the language used ("they just switche") lacks precision (no credit for MP6).

Total Awarded Points: 3 out of 4

A-6a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$20^2 - 6 \div 3$

b. Evaluate the expression in part a, showing each calculation.

PEMDAS

$20^2 - 6 \div 3$

$20 \times 20 = 400$

$400 - 6 \div 3$

$3\overline{)6}$ → 2

$400 - 2$

$= 398$

$400 - 2 = 398$

A-6b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

400+(6-2)

d. Why are both students correct?

Because they're both showing numerical expressions for the verbal expression. They just wrote their expressions in different ways.

Anchor 6 Litho 01046200105

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 1 (MP6)

This response contains a numerical expression that is a correct translation of the verbal expression in Part A, with the student simplifying "the product of four and five" ($20^2 – 6 \div 3$) (6.EE.A.1(x)). The student provides an accurate alternative numerical expression to the one given in Part C (400 + (6 – 2)) (6.EE.A.1(z)). The student does not sufficiently explain why both Carla and Emily are correct in Part C, instead simply indicating in Part D that both students "just wrote their expressions in different ways" (no credit for MP3). In Part B, the student uses order of operations and precise calculations to correctly evaluate the expression from Part A (MP6).

Total Awarded Points: 3 out of 4

A-7a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$4^2 \cdot 5^2 - 6 \div 3$

b. Evaluate the expression in part a, showing each calculation.

$4^2 \cdot 5^2 - 6 \div 3$

$16 \cdot 25 - 6 \div 3$

$400 - 6 \div 3$

$400 - 2$

398

3
25
×16
150
+250
400

A-7b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(5 \times 4) \times 20 + (6 - 2)$

d. Why are both students correct?

Because it's the same equation just wri in different forms

Anchor 7 Litho 00796200114

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 1 (MP6)

This response contains a numerical expression that is an appropriate translation of the verbal expression in Part A ($4^2 \times 5^2 - 6 \div 3$) (6.EE.A.1(x)). The student also provides an accurate alternative numerical expression to the one given in Part C ($(5 \times 4) \times 20 + (6 - 2)$) (6.EE.A.1(z)). The explanation in Part D does not clearly explain why the two students are both correct in Part C (no credit for MP3). In Part B, the student uses order of operations and precise calculations to correctly evaluate the expression given in Part A (MP6).

Total Awarded Points: 3 out of 4

A-8a

Expressions Task

a Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$(4 \times 5)^2 - (6/3)$

b. Evaluate the expression in part a, showing each calculation.

$(4 \times 5)^2 - (6/3)$

$= (20)^2 - (6/3)$

$= (20^2) - (2)$

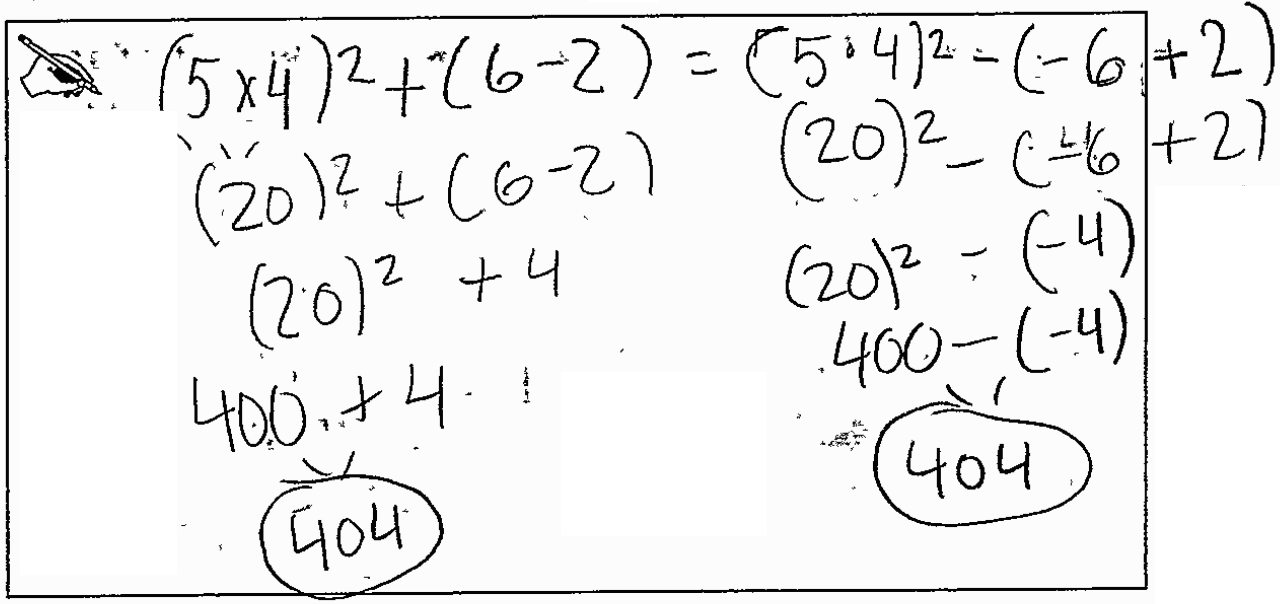
$= (400) - (2) = 398$

Expressions Task

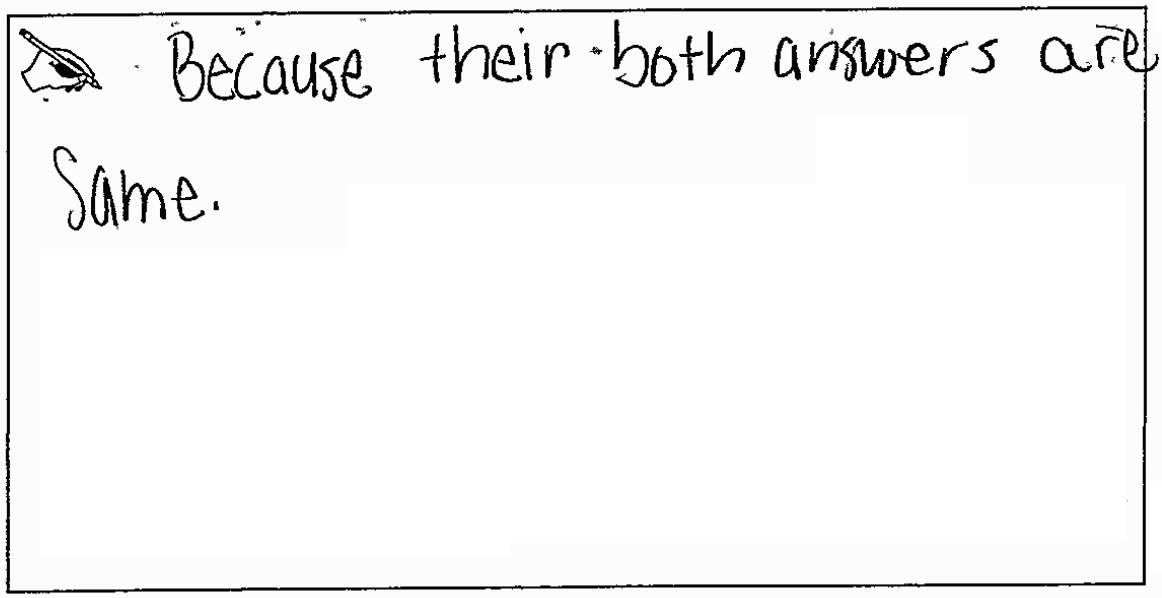
c Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?



d. Why are both students correct?



Anchor 8 Litho 00276200105

Total Content Points: 2 (6.EE.A.1(x), 6.EE.A.1(z))

Total Practice Points: 1 (MP6)

This response contains a numerical expression that is a correct translation of the verbal expression in Part A $\left((4\times5)^2-\frac{6}{3}\right)$ (6.EE.A.1(x)). The student provides an acceptable alternative numerical expression to Emily's expression given in Part C (6.EE.A.1(z)). The student does not use appropriate mathematical language in Part D to justify that both students in Part C are correct (no credit for MP3). In Part B, the student uses order of operations and precise calculations to correctly evaluate the expression from Part A (MP6).

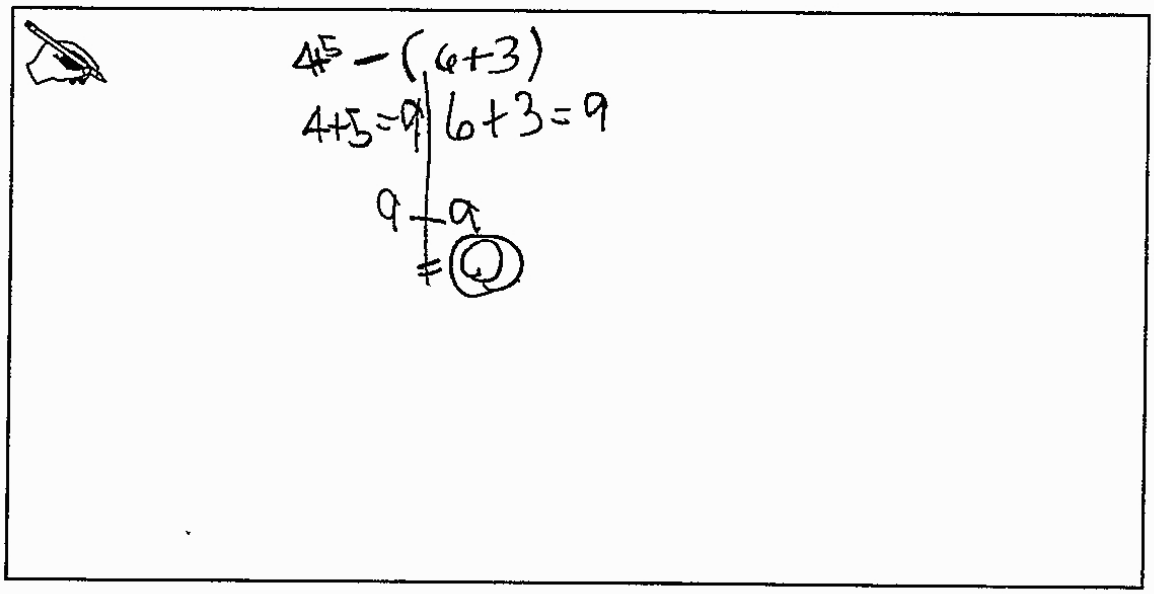
Total Awarded Points: 3 out of 4

A-9a

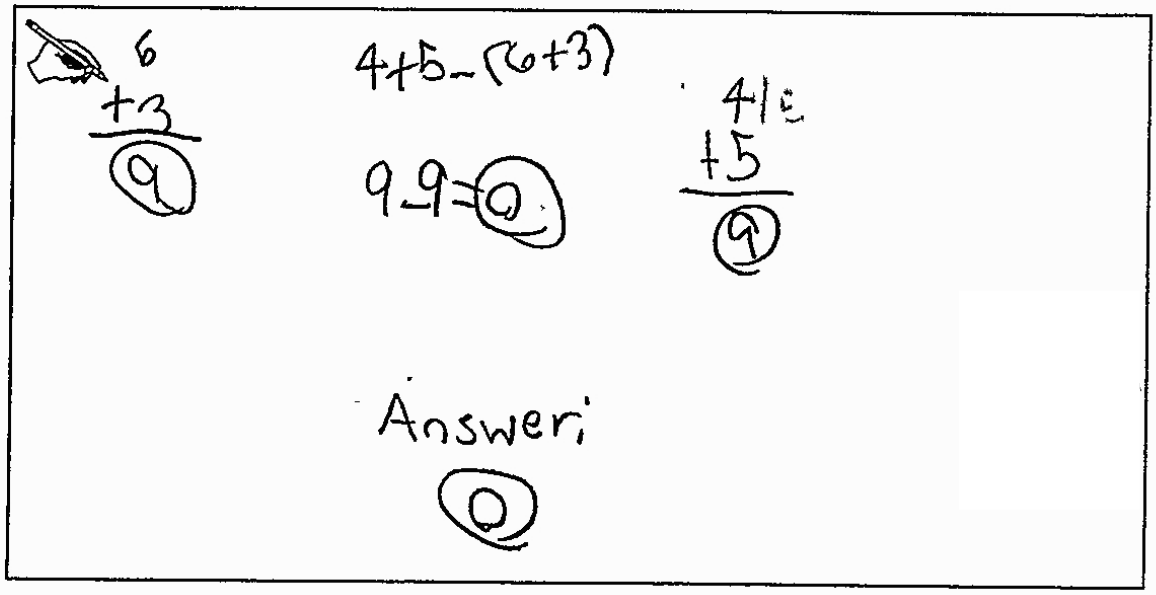
Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three



b. Evaluate the expression in part a, showing each calculation.



Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(5 \times 4^2) + 4$

d. Why are both students correct?

They didn't get the same equation but they got the right answer.

Anchor 9 Litho 00156200105

Total Content Points: 1 (6.EE.A.1(z))

Total Practice Points: 1 (MP6)

This response does not contain a numerical expression that is a correct translation of the verbal expression in Part A (no credit for 6.EE.A.1(x)). The student writes a correct alternative expression to the one given in Part C, indicating the product of 4 squared and 5, rather than the square of the product of 4 and 5, which is an acceptable translation of the verbal expression $((5 \times 4^2) + 4)$ (6.EE.A.1(z)). However, the student in Part D does not justify using appropriate mathematical language why both students in Part C are correct (no credit for MP3). In Part B, the student uses order of operations and precise calculations to accurately evaluate the (incorrect) expression from Part A, indicating sufficient attention to precision (MP6).

Total Awarded Points: 2 out of 4

A-10a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$(4 \times 5)^2 - (6 \div 3)$

b. Evaluate the expression in part a, showing each calculation.

$(4 \times 5)^2 - (6 \times 3)$

$20 \times 20 = 400$

-18

382

382

A-10b

Expressions Task

c. Two students wrote expressions for this verbal expression:
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

20 x 20 = 400
(5x4) x (5x4) + (6-2)
404

d. Why are both students correct?

They are both right because when you do the problem they both equal the same... 404

Anchor 10 Litho 00756200105

Total Content Points: 1 (6.EE.A.1(z))

Total Practice Points: 0

Since the student shows the difference of six and three rather than the quotient, this response does not contain a numerical expression that is a correct translation of the verbal expression in Part A (no credit for 6.EE.A.1(x)). The student provides an alternative accurate numerical expression to the one given in Part C ((5 × 4) × (5 × 4) + (6 – 2)) (6.EE.A.1(z)). The student's explanation in Part D showing that both students in Part C are correct is insufficient; two different expressions could also equal 404 (no credit for MP3). In Part B, the student finds the product of 6 and 3 rather than the difference indicated by the student's expression from Part A; therefore the student does not use order of operations or precise calculations to correctly evaluate the expression from Part A (no credit for MP6).

Total Awarded Points: 1 out of 4

A-11a

Expressions Task

a. Translate the following verbal expression to a numerical expression:

the square of the product of four and five minus the quotient of six and three

$4^4 \quad 5^4$

$256 + 3125$

$5 - 2 = 3$

$= 3384$

b. Evaluate the expression in part a, showing each calculation.

4^4

$4 \times 4 \times 4 \times 4 = 256$

5^4

$5 \times 5 \times 5 \times 5 = 3125$

$5 - 2 = 3$

$3 \overline{)6}$ $\quad 2$

$256 + 3125 + 3 = 3384$

A-11b

Expressions Task

c. Two students wrote expressions for this verbal expression.
the product of five and four squared plus the difference between six and two

Emily wrote: $(5 \times 4)^2 + (6 - 2)$.

Carla wrote a different numerical expression for the expression given. What correct expression could Carla have written?

$(4 \times 5) = x^2 + (6 - 2)$

d. Why are both students correct?

Because they both did it right just different ways they did it.

Anchor 11 Litho 00556200105

Total Content Points: 0

Total Practice Points: 0

This response does not contain a numerical expression that is a correct translation of the verbal expression in Part A (no credit for 6.EE.A.1(x)). The student does not provide an accurate alternative numerical expression to the one given in Part C (no credit for 6.EE.A.1(z)). The student does not use appropriate mathematical language in Part D to justify that both students in Part C are correct (no credit for MP3). No single expression is given by the student in Part A. The student shows calculations in Part B, but they do not match an expression in Part A (no credit for MP6).

Total Awarded Points: 0 out of 4