Grade 6 – Lesson 3

Math Practice Sheets

Introduction to Algebra

- Examples
- Practice Questions
- Extra Challenge Unit

Student Name

_____

Unit 3.1

Writing Variable Expressions

Example

A Variable is a quantity that can change or vary and is often represented with a letter.
Similarly, an Algebraic Expression is a mathematical phrase that has at least one variable and one operation.

Note that variables help you translate word phrases into algebraic expressions.

The given table shows several different ways to write math expressions with words.

Operation	+	-	×	÷
Algebraic Expression	m + 17	r - 33	7. k or 7(k)	x ÷ 5 or $\frac{x}{5}$
Words	17 added to m m plus 17 the sum of m and 17 17 more than m	33 subtracted from r r minus 33 the difference of r and 33 take away 33 from r	7 times k 7 multiplied by k the product of 7 and k 7 groups of k	x divided by 5 the quotient of x and 5

Exercise

1. Write each phrase as an algebraic expression.

a) Ten basketballs decreased by a number 'b' ☐

b) Seven dollars more than cost 'p' ☐

c) 'x' multiplied by 'y' ☐

d) One-ninth of a number 'n' ☐

e) Twice the sum of a number 'k' and 3 ☐

Unit 3.1

Writing Variable Expressions

Exercise

f) Sum of 'a' and 'b' is multiplied by 10

g) Difference between 'x' and 5 is divided by 3

h) Subtraction of 'z' from 'y'

i) One half of the sum of numbers 'x' and 'y'

j) The number 'r' multiplied by itself

k) Numbers 'p' and 'q' both squared and added

l) 6 is subtracted from the sum of 'k' and 'l'

m) The sum of fifty and the product of seven and a number 'z'

n) Difference of m and n added to 100

o) Sum of numbers 'x' and 'y' subtracted from their product

p) 'a', 'b', and 'c' are added and 'd' is subtracted from the sum

Unit 3.1

Writing Variable Expressions

Exercise

2. Write two word phrases for each algebraic expression.

a) e + 27

-
-

b) 100 - n

-
-

c) 14.r

-
-

d) k ÷ 11

-
-

e) 500 + x

-
-

f) $\frac{52}{n}$

-
-

g) p - 319

-
-

h) 125 (m)

-
-

Unit 3.1

Writing Variable Expressions

Exercise

Solve the problems below.

3. In 2005, Texas had 21 less seats in the U.S. Congress than California had. If 's' represents the number of seats California had, write an expression for the number of seats Texas had.

4. Let 'h' represent the number of times your heart beats in one minute. Write an expression for the total number of times it beats in hour.
(Hint: 1 hour = 60 minutes)

5. Let 's' represent the number of senators that each of the fifty states has in the U.S. Senate. Write an expression for the total number of senators.

a) 50 + s

b) 50 - s

c) 50 × s

d) $\frac{50}{s}$

6. The Rio Grande is one of the longest rivers in the United States. It forms the border between Texas and Mexico. The Red River forms a border between Texas and Oklahoma and is 1,290 miles long. Write an expression to express how much longer the Rio Grande is than the Red River.

Unit 3.2

Operations Properties

Example

There are certain rules or properties of math that are at ways true.

- The Commutative Properties of addition and multiplication states that the order in which numbers are added or multiplied does not change the result. i.e.

$a + b = b + a$
$7 + 12 = 12$
$12 + 7 = 12$

and

$a \times b = b \times a$
$7 \times 12 = 84$
$12 \times 7 = 84$

- The Associative Properties of addition and multiplication states that the way in which addends or factors are grouped does not change the result. i.e.

$(a + b) + c = a + (b + c)$
$(3 + 5) + 9 = 3 + (5 + 9)$
$8 + 9 = 3 + 14$
$17 = 17$

and

$(a \times b) \times c = a \times (b \times c)$
$(3 \times 5) \times 9 = 3 \times (5 \times 9)$
$15 \times 9 = 3 \times 45$
$135 = 135$

- The Identity Property of Addition states that the sum of an addend and 0 is the addend. i.e. $8 + 0 = 8$
- The Identify Property of Multiplication states that the product of a factor and 1 is that factor. i.e. $6 \times 1 = 6$
- The properties of zero state that the product of a factor and 0 is 0 and the quotient of zero and any none zero divisor is 0. i.e. $4 \times 0 = 0$, $0 \div 4 = 0$

Exercise

1. Name the property shown by each statement.

a) $28 + 0 = 28$

_____

b) $45 + 61 = 61 + 45$

_____

c) $10 + (29 + 6) = (10 + 29) + 6$

_____

d) $0 \times 83 = 0$

_____

e) $13 \times 75 = 75 \times 13$

_____

f) $342 \times 1 = 342$

_____

g) $0 \div 16 = 0$

_____

h) $17 \times 1 = 1 \times 17$

_____

Unit 3.2

Operations Properties

Exercise

2. Rewrite each expression using the property indicated.

a) Associative Property of Addition

$(15 + 3) + 26$ = _____

b) Commutative Property of Multiplication

291×870 = _____

c) Identity Property of Addition

$0 + 6{,}432$ = _____

d) Associative Property of Multiplication

$88 \times (30 \times 9)$ = _____

e) Commutative Property of Addition

$753 + 191$ = _____

f) Associative Property of Addition

$(200 + 55) + 49$ = _____

g) Identity Property of Multiplication

$6{,}420 \times 1$ = _____

h) Identity Property of Addition

$0 + 37{,}555$ = _____

i) Property of Zero

$9{,}751 \times 0$ = _____

j) Property of Zero

$0 \div 777$ = _____

Unit 3.2

Operations Properties

Exercise

3. Write each missing number. Then verify the properties of operations.

a) 4 × 12 = 12 × _____

_____ = _____

b) (6 + 9) + 5 = 6 + (____ + 5)

_____ + 5 = 6 + _____

_____ = _____

c) (2 × ____) × 4 = (2 × 5) × ____

_____ × 4 = _____× 4

_____ = _____

d) 632 × _____ = 632

_____ = _____

e) _____ ÷ 9 = 0

_____ = _____

f) 22 + 66 = _____ + 22

_____ = _____

4. Replace x with 6, y with 4, and z with 5. Then verify the properties of operations.

a) x + y = y + x

b) x × (y × z) = (x × y) × z

c) 0 + z = z

d) (x + y) + z = x + (y + z)

e) x × y = y × x

f) 0 ÷ y = 0

Unit 3.2

Operations Properties

Exercise

Solve the problems below.

5. Do 3 groups of 4 beach balls equal 4 groups of 3 beach balls? Use counters to solve.

6. Is 4 ÷ 2 = 2 ÷ 4? Solve and explain.

7. Owen ordered one turkey sandwich for $4.00 and two bottles of water for $1.00 each. Which expression would you use to find how much Owen paid?

   a) (2 × $1) × $4

   b) (2 + $1) + $4

   c) (2 × $1) + (1 × $4)

   d) 2 × (1 × $4)

8. Find (9 - 5) - 2 = 9 - (5 - 2). Is the equation true? What does this problem tell you about the associative property of subtraction?

Unit 3.3

Order of Operations

Example

The four operations of arithmetic addition (+), Subtraction (-), multiplication (×), and division (÷), can all be performed in a single problem but must be performed in a very specific order called order of operations. The order of operations is as follows:

- Perform operations in parentheses.
- Find the values of numbers with exponents.
- Multiply or divide from left to right as ordered in the problem.
- Add or subtract from left to right as ordered in the problem.

Evaluate: $16 + 12 \div 4 \times 5 - 2$

$16 + \boxed{12 \div 4} \times 5 - 2$

$= 16 + \boxed{3 \times 5} - 2$

$= \boxed{16 + 15} - 2$

$= 31 - 2$

$= 29$

Evaluate: $30 \div (1 + 5) \times 3^2 - 4$

$30 \div \boxed{(1 + 5)} \times 3^2 - 4$

$= 30 \div 6 \times \boxed{3^2} - 4$

$= \boxed{30 \div 6} \times 9 - 4$

$= \boxed{5 \times 9} - 4$

$= 45 - 4$

$= 41$

Exercise

1. Evaluate the following expressions.

a) $15 + 24 \div 3 - 1 \times 6$

b) $12 \times 7 - 13 \times 12 \div 3 + 10$

c) $70 \div 14 \times 6 - 4 + 2 \times 20$

d) $200 - 625 \div 5 \times 2 + 7^2$

Order of Operations

Exercise

2. Simplify the following.

a) $(25 \div 5 + 5) + 3 \times 4$

b) $50 \div (8 + 2) - 4 \times 3 + 8$

c)
$12 + 6 \div 3 - 2 \times 1 + (4 \times 3) \div 6$

d)
$15 + (15 - 6) \div 3 - 4 \times 3 + (3 \times 6) \div 9$

e) $(20 + 4) \div 6 + 2(11 - 2)$

f) $48 \div 3(12 \times 4 \div 2 - 20)$

g) $90 \div (5 + 10) \times 3^2 - 11$

h) $(3 \times 2)^2 - (21 \div 7 + 2) + 4^3$

Unit 3.3

Order of Operations

Exercise

3. Add parentheses so that each equation is correct. Also, show your simplification.

a) $6 \times 3 + 2 - 9 - 3 = 14$

b) $49 \div 7 - 2 \times 3 + 4 = 5$

c) $15 + 24 \div 6 - 3 \times 4 = 7$

d) $9 + 5 \div 2 \times 2 - 15 = -1$

e) $3 - 4 \times 3 - 6 + 7 = 4$

f) $13 \times 3 - 8 + 6 - 6 = 19$

g) $2^3 + 6 - 5 \times 4 = 12$

h) $4^2 \times 3 - 2 \div 4 = 4$

Unit 3.3

Order of Operations

Exercise

Solve the problems below.

4. 8 times the sum of 3 and 7 is divided by 20 is written as 8 × (3 + 7) ÷ 20. Simplify the expression.

5. Which one of the following equations is correct?

a) (3 + 18) + 12 ÷ 6 = 8

b) 3 + (18 + 12) ÷ 6 = 8

c) 3 + 18 + (12 ÷ 6) = 8

d) 3 + 18 + 12 ÷ 6 = 8

6. Put the correct sign in the box and verify.

a) (9 ☐ 6) × 4 = 12

b) (15 ☐ 7) ÷ 2 = 11

c) (18 ☐ 9) + 14 = 16

d) 8 - (26 ☐ 13) = 6

7. 110 is subtracted from the 5 times the sum of 23 and 37 is written as 5 × (23 + 37) - 110. Simplify the expression.

Unit 3.4

Distributive Property

Example

The Distributive Property states that multiplying a sum (or difference) by a number gives the same result as multiplying each number in the sum (or difference) by the number and adding (or subtracting) the product. i.e.

$a \times (b + c) = (a \times b) + (a \times c)$ and $a \times (b - c) = (a \times b) - (a \times c)$

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

$4 \times 7 = 20 + 8$

$28 = 28$

$4 \times (5 - 2) = (4 \times 5) - (4 \times 2)$

$4 \times 3 = 20 - 8$

$12 = 12$

You can use the distributive property to break apart a number to find the product for 3×47.

3×47 ← break 47 apart

$= 3 \times (40 + 7)$ ← 47 = 40 + 7

$= (3 \times 40) + (3 \times 7)$ ← multiply each addend

$= 120 + 21$ ← add

$= 141$

$\therefore 3 \times 47 = 141$

Similarly, you can use the distributive property to join numbers together to find $(5 \times 21) - (5 \times 11)$.

$(5 \times 21) - (5 \times 11)$

$= 5 \times (21 - 11)$ ← join factors

$= 5 \times 10$ ← subtract

$= 50$ ← multiply

$\therefore (5 \times 21) - (5 \times 11) = 50$

Exercise

1. Fill in the blanks for each of the following.

a) $(5 \times 7) + (\_\_\_ \times 4) = 5 (7 + 4)$

b) $12 \times (35 - 19) = (12 \times \_\_\_) - (12 \times 19)$

c) $6 \times 47 = (6 \times \_\_\_) + (6 \times 7)$

d) $(9 \times 86) - (9 \times 6) = 9 \times \_\_\_$

e) $14 \times (27 - 5) = (14 \times \_\_\_) - (14 \times 5)$

f) $5 \times 49 = (5 \times 50) - (5 \times \_\_\_)$

g) $(8 \times 46) - (8 \times 36) = 8 \times \_\_\_$

h) $4 \times 73 = (4 \times \_\_\_) + (4 \times 3)$

i) $3 \times 88 = (3 \times \_\_\_) - (3 \times 2)$

j) $(2 \times 61) + (2 \times 9) = 2 \times (\_\_\_ + \_\_\_)$

Unit 3.4

Distributive Property

Exercise

2. Indicate which operation is performed first.

a) (6 × 9) + (6 × 2)

_____

b) 4 × (7 + 8)

_____

c) (8 - 1) × 5

_____

d) (7 × 7) - (7 × 3)

_____

e) (4 + 10) × 9

_____

f) (8 × 0) + (8 × 1)

_____

3. Rewrite each expression using the distributive property.

a)
7 × (5 + 2) =

b)
(4 × 9) - (4 × 1) =

c)
(12 - 3) × 5 =

d)
9 × (8 - 2) =

e)
(6 × 0) + (6 × 1) =

f)
4 × (7 + 9) =

4. Replace p with 3, q with 2, and r with 5. Then, find the value of each expression.

a) p × (q + r)

b) (p × q) + (p × r)

c) (p - q) × r

d) q × (r - p)

Unit 3.4

Distributive Property

Exercise

5. Use the distributive property and mental math to evaluate each of the following.

a) 9 × 46

= 9 × (___ + 6)

= (9 × 40) + 9 × ___

= _____ + 54

= _____

b) 5 × 68

= 5 × (70 - ___)

= (5 × ___) - (5 × 2)

= 350 - ___

= _____

c) (7 × 61) + (7 × 21)

d) (8 × 54) - (8 × 4)

e) 4 × 87

f) 6 × 39

g) (3 × 52) + (3 × 8)

h) 7 × (48 - 3)

Unit 3.4

Distributive Property

Exercise

Solve the problems below.

6. Match the following.

a)	425×136=425×(6+30+100)	A)	Commutative under multiplication
b)	2 × 49 × 50 = 2 × 50 × 49	B)	Commutative under addition
c)	80+2,005+20=80+20+2,005	C)	Distributive of multiplication over addition

7. Jett simplifies 126 × 55 + 126 × 45 using the distributive property and found the result to be 12,600. Show how Jett simplified the expression to arrive at his answer.

8. The school canteen charges $12 for lunch and $3 for snacks each day. How much money do you spend in 5 days on these things if it can be expressed as 5 × (12 + 3)?

a) 63 b) 75

c) 27 d) 57

9. A taxi driver filled his car with 40 liters of gas on Monday. The next day he filled the tank with 50 liters of gas. If the gas costs $0.60 per liter it can be expressed as 0.60 × 40 + 0.60 × 50. How much did he spend in all on gas? Use distributive property to solve.

Unit 3.5

Math Challenges

Exercise

1. Using the algebraic expression 3n - 5, what is the smallest whole number value for n that will give you a result greater than 100?

2. Clark and Anna were asked to write an expression that will find the total number of sandals in a closet. They let s represent the number of pairs of sandals. Clark wrote s and Anna wrote 2s. Who is correct and why?

3. Write any two properties of operations. Explain with examples.

4. Coach Rodick fed the team after the game by buying 24 chicken deals for $5 each and 7 Burger Deals for $6 each. Find the cost of the food.

Unit 3.5

Math Challenges

Exercise

5. Add parentheses so that the equation below is correct. Show your work.

$8 \div 1 + 3 \times 5^2 - 2 = 48$

6. When the difference between 32 and 28 is added to 6 times the sum of 17 and 23, the sum is 244. Write the numerical expression and simplify.

7. A list of possible astronauts was narrowed down by two committees. The first committee selected 83 people to complete a written form. The second selected 71 of those people to come to an interview. If 695 were not asked to complete a form, how many were on the original list?

8. In India, A vendor supplies 32 liters of milk to a hotel in the morning and 68 liters of milk in the evening. If the milk costs $15 per liter, how much money is due the vender per day?

Congratulations!

You have finished a lesson. You should be very proud of yourself.
Now it is time to progress to the next lesson.
Your next assignment is notated by a green arrow.

Grade 6 Answer Key of Lesson 3

Unit 3.1

1. a) b-10 b) p+7 c) xy d) $\frac{n}{9}$ e) 2(k+3) f) 10(a+b)
   g) $\frac{x-5}{3}$ h) y-z i) $\frac{x+y}{2}$ j) r^2 k) p^2+q^2 l) (k+l)-6
   m) 50-7z n) (m-n)+100 o) xy-(x+y) p) (a+b+c)-d
3. s+21 4. 60h 5. c 6. 1,290+x

Unit 3.2

1. a) identity b) commutative c) associative d) zero
   e) commutative f) identity g) zero h) commutative
2. a) 15+(3+26) b) 870×291 c) 6,432 d) (88×30)×9
   e) 191+753 f) 200+(55+9) g) 6,420 h) 37,555
   i) 0 j) 0 3. a) 48 b) 20 c) 40 d) 632
   e) 0 f) 88 5. yes 6. no 7. c 8. no

Unit 3.3

1. a) 17 b) 42 c) 66 d) 99
2. a) 22 b) 1 c) 14 d) 8 e) 22 f) 64
   g) 43 h) 95
3. a) 6×3+2-(9-3) b) 49÷7-2×3+4 c) (15+24÷6)-3×4
   d) (9+5)÷2×2-15 e) 3-4×3+(6+7) f) 13×3-(8+6+6)
   g) 2^3+(6-5)×4 h) 4^2×(3-2)÷4 4. 4 5. b
6. a) - b) + c) ÷ d) ÷ 7. 190

Unit 3.4

1. a) 5 b) 35 c) 40 d) 80 e) 27 f) 1
   g) 10 h) 70 i) 90 j) 61+9
2. a) multiply b) add c) subtract d) multiply e) add f) multiply
3. a) (7×5)+(7×2) b) 7×(9-1) c) (12×5)-(3×5)
   d) (9×8)-(9×2) e) 6×1 f) (4×7)+(4×9)
4. a) 21 b) 21 c) 5 d) 4
5. a) 414 b) 340 c) 574 d) 400 e) 348 f) 234
   g) 180 h) 315
6. a) C b) A c) B
8. b 9. $54

Unit 3.5

1. 36
2. Clark
4. $162
5. 8÷(1+3)×5^2-2=48
6. (32-28)+6(17+23)
7. 849
8. $1,500