Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
VARIABLE	A symbol, usually a letter, used to represent a number or quantity
Algebraic **EXPRESSION**	An expression that contains numbers, variables, and/or operations. **Example(s):** $2x$, $5p-1$, $9h+4$, $3y^2$
EVALUATING Expressions	**To evaluate an expression means to substitute the given replacement values for each variable, then simplify to find the numerical value of the expression.**

Directions: Evaluate each expression if $a = 9$, $b = 5$, and $c = 28$.

1. $a-3$ $9-3 = \boxed{6}$	**2.** $8b$ $8(5) = \boxed{40}$	**3.** $c-a$ $28-9 = \boxed{19}$
4. $c \div 4$ $28 \div 4 = \boxed{7}$	**5.** a^2 $9^2 = \boxed{81}$	**6.** $b+c$ $5+28 = \boxed{33}$

Directions: Evaluate each expression using the variable replacements.

7. $2x^3$ (if $x = 3$) $2(3)^3$ $2(27) = \boxed{54}$	**8.** $3v+17$ (if $v = 9$) $3(9)+17$ $27+17 = \boxed{44}$
9. s^2-18 (if $s = 5$) 5^2-18 $25-18 = \boxed{7}$	**10.** $5q+r$ (if $q = 9$ and $r = 4$) $5(9)+4$ $45+4 = \boxed{49}$
11. $4a-7b$ (if $a = 11$ and $b = 2$) $4(11)-7(2)$ $44-14 = \boxed{30}$	**12.** $35-mn$ (if $m = 4$ and $n = 6$) $35-4(6)$ $35-24 = \boxed{11}$

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13. $\frac{c}{d} - 1$ (if $c = 21$ and $d = 3$)

$\frac{21}{3} - 1$

$7 - 1 = \boxed{6}$

14. $2(f + g^2)$ (if $f = 1$ and $g = 6$)

$2(1 + 6^2)$

$2(1 + 36)$

$2(37) = \boxed{74}$

15. $x^3 + y^2$ (if $x = 4$ and $y = 7$)

$4^3 + 7^2$

$64 + 49 = \boxed{113}$

16. $24 - m \div n$ (if $m = 20$ and $n = 4$)

$24 - 20 \div 4$

$24 - 5 = \boxed{19}$

17. $\frac{5}{12}x$ $\left(\text{if } x = \frac{3}{4}\right)$

$\frac{5}{\cancel{12}_{4}}\left(\frac{\cancel{3}^{1}}{4}\right)$

$\frac{5}{4}\left(\frac{1}{4}\right) = \boxed{\frac{5}{16}}$

18. $y + \frac{3}{8}$ $\left(\text{if } y = \frac{7}{10}\right)$

$\frac{7}{10} + \frac{3}{8}$

$\frac{28}{40} + \frac{15}{40} = \frac{43}{40}$

$= \boxed{1\frac{3}{40}}$

19. $\frac{4}{9} \div m$ $\left(\text{if } m = \frac{5}{6}\right)$

$\frac{4}{9} \div \frac{5}{6} = \frac{4}{\cancel{9}_{3}} \cdot \frac{\cancel{6}^{2}}{5}$

$= \boxed{\frac{8}{15}}$

20. $\frac{7}{8}a - \frac{1}{4}$ $\left(\text{if } a = \frac{2}{3}\right)$

$\frac{7}{\cancel{48}}\left(\frac{\cancel{2}^{1}}{3}\right) - \frac{1}{4}$

$\frac{7}{12} - \frac{1}{4}$

$\frac{7}{12} - \frac{3}{12} = \frac{4}{12} = \boxed{\frac{1}{3}}$

APPLICATION

21. The football team sold pies and cakes at a bake sale. The expression **$7p + 12c$** represents the total amount of money they raised where p is the number of pies sold and c is the number of cakes sold. If they sold 32 pies and 15 cakes, how much money did they raise?

$7(32) + 12(15)$

$224 + 180 = 404$

$404 raised

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WHAT DID THE FOOTBALL COACH YELL AT THE VENDING MACHINE?

Directions: Evaluate each expression given the variable replacements. Show all work on a separate sheet of paper. After completing each set, find matching answers. One will have a letter and the other a number. Write the letter in the matching numbered box at the bottom of the page.

SET 1 (Evaluate if $x = 8$, $y = 14$, and $z = 3$)

W.	$y+z$	17	**10.**	$y-x$	6
E.	x^2-y	50	**6.**	z^3-4	23
M.	$x+2z+9$	23	**2.**	$2x+1$	17
N.	$\frac{y+42}{z-1}$	28	**18.**	$5x \div 4$	10
K.	$y-z^2+5$	10	**13.**	$3y+x$	50
A.	$3x-6z$	6	**4.**	$4x+y-6z$	28

SET 2 (Evaluate if $a = 6$, $b = 2$, and $c = 11$)

T.	$8a+7b-c$	51	**15.**	$a^2-4a-4b$	4
B.	$2b^3 \div 4$	4	**7.**	$\frac{3a+b}{c-1}$	2
A.	$5c-9b$	37	**12.**	$4c-2a+19$	51
U.	$\frac{a-2b+2c}{3}$	8	**3.**	$2b^4+5$	37
C.	$c^2-13a-1$	42	**17.**	$7(10-b^2)$	42
Y.	$ab-c+1$	2	**9.**	$c+3a-21$	8

SET 3 (Evaluate if $p = 8$, $q = \frac{1}{3}$, $r = 24$, and $s = 5$)

R.	$15s-5p$	35	**8.**	$q(r+s-2)$	9
T.	$r-\frac{3}{4}p$	18	**11.**	$p^2-2r+19$	35
A.	$\left(\frac{1}{4}p\right)^3+19$	27	**1.**	$\frac{7}{4}p-\frac{1}{8}r$	11
Q.	$s^2-\frac{p+r}{2}$	9	**16.**	$(r-4s-1)^3$	27
R.	$21q+7s$	42	**14.**	$rs-p^2-14$	42
I.	p^2-7p+3	11	**5.**	$6pq+2$	18

ANSWER:

1.		2.	3.	4.	5.		6.	7.		8.	9.	10.	11.	12.	13.	14.	15.	16.	17	18.	
I		W	A	N	T		M	Y		Q	U	A	R	T	E	R	B	A	C	K	!

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 1:** Evaluating Expressions

Directions: Evaluate each expression if $w = 2$, $x = 7$, $y = 24$, and $z = 5$.

1. $7w$

$7(2) = \boxed{14}$

2. $x + 16$

$7 + 16 = \boxed{23}$

3. $y \div 3$

$\frac{24}{3} = \boxed{8}$

4. $z^2 + w$

$5^2 + 2$

$25 + 2 = \boxed{27}$

5. $\frac{y - 2z}{x}$

$\frac{24 - 2(5)}{7} = \frac{24 - 10}{7}$

$= \frac{14}{7} = \boxed{2}$

6. $16w + 3z$

$16(2) + 3(5)$

$32 + 15$

$= \boxed{47}$

7. $x^2 + 2y$

$7^2 + 2(24)$

$49 + 48 = \boxed{97}$

8. $8(3 + w^2)$

$8(3 + 2^2)$

$8(3 + 4)$

$8(7) = \boxed{56}$

9. $y - 5w + 7x$

$24 - 5(2) + 7(7)$

$24 - 10 + 49$

$14 + 49 = \boxed{63}$

10. $\frac{1}{2}w^5$

$\frac{1}{2}(2)^5 = \frac{1}{2}(32)$

$= \boxed{16}$

11. $\frac{3}{4}y + 10$

$\frac{3}{4}(24) + 10$

$18 + 10 = \boxed{28}$

12. $20 - \frac{1}{3}(x + 2)$

$20 - \frac{1}{3}(7 + 2)$

$20 - \frac{1}{3}(9)$

$20 - 3 = \boxed{17}$

13. $\frac{8}{9}k^2 - 2k$ (if $k = 6$)

$\frac{8}{9}(6)^2 - 2(6)$

$\frac{8}{9}(36) - 12 = 32 - 12 = \boxed{20}$

14. $2a + b$ (if $a = \frac{5}{12}$ and $b = \frac{1}{8}$)

$2\left(\frac{5}{12}\right) + \frac{1}{8}$

$\frac{5}{6} + \frac{1}{8} = \frac{20}{24} + \frac{3}{24} = \boxed{\frac{23}{24}}$

15. Grant bought strawberries and bananas from the grocery store to make smoothies. The total amount he spent can be represented by the expression $1.8s + 0.65b$, where s is the number of pounds of strawberries and b is the number of pounds of bananas. If Grant bought 2.7 pounds of strawberries and 1.4 pounds of bananas, how much did he spend?

$1.8(2.7) + 0.65(1.4)$

$4.86 + 0.91$

$= 5.77$

Grant spent $5.77.

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

TRANSLATING Expressions

There are many ways to translate an expression into words.
The examples below give two different ways to write each expression.

OPERATION	EXPRESSION	WORDS
ADDITION	$n+5$	• "the sum of a number and 5" • "5 more than a number"
SUBTRACTION	$n-11$	• "a number minus 11" • "11 subtracted from a number"
MULTIPLICATION	$8n$	• "8 times a number" • "the product of a number and 8"
DIVISION	$\frac{n}{3}$	• "a number divided by 3" • "the quotient of a number and 3"

KEY WORDS & Phrases

ADDITION +	SUBTRACTION −
• sum	• difference
• more than	• less than
• increased by	• decreased by
• total	• subtracted from
• plus	• minus
• all together	•

MULTIPLICATION •	DIVISION /
• product	• divided by
• times	• quotient
• twice	• half / third
• double / triple	• separate
• of	•
• per	•

"TURN-AROUND" Phrases

Watch out for subtraction! The phrases below indicate a reversal in the order:

less than, subtracted from, and fewer than.

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WRITING EXPRESSIONS

Translate each expression.

	Words	Expression
1.	"twelve increased by a number"	$12+n$
2.	"the quotient of a number and seven"	$\frac{n}{7}$
3.	"a number decreased by four"	$n-4$
4.	"the product of a number and nine"	$n \cdot 9$
5.	"three less than a number"	$n-3$
6.	"four-fifths of a number"	$\frac{4}{5}n$
7.	"the sum of a number and twenty-five"	$n+25$
8.	"forty-two subtracted from a number"	$n-42$
9.	"twice a number"	$2n$
10.	"the difference of a number and seventeen"	$n-17$
11.	"one more than a number squared"	n^2+1
12.	"two fewer than three times a number"	$3n-2$

GOING BACKWARDS
(Writing Words)

Write each expression in TWO ways.

13. $x+13$	a) the sum of a number and 13
	b) a number increased by 13
14. $c-9$	a) 9 less than a number
	b) the difference of a number and 9
15. $10p$	a) the product of 10 and a number
	b) ten times a number
16. $r+7$	a) 7 more than a number
	b) the sum of a number and 7
17. $\frac{w}{4}$	a) the quotient of w and 4
	b) a number divided by 4
18. $26-k$	a) k less than 26
	b) 26 decreased by a number

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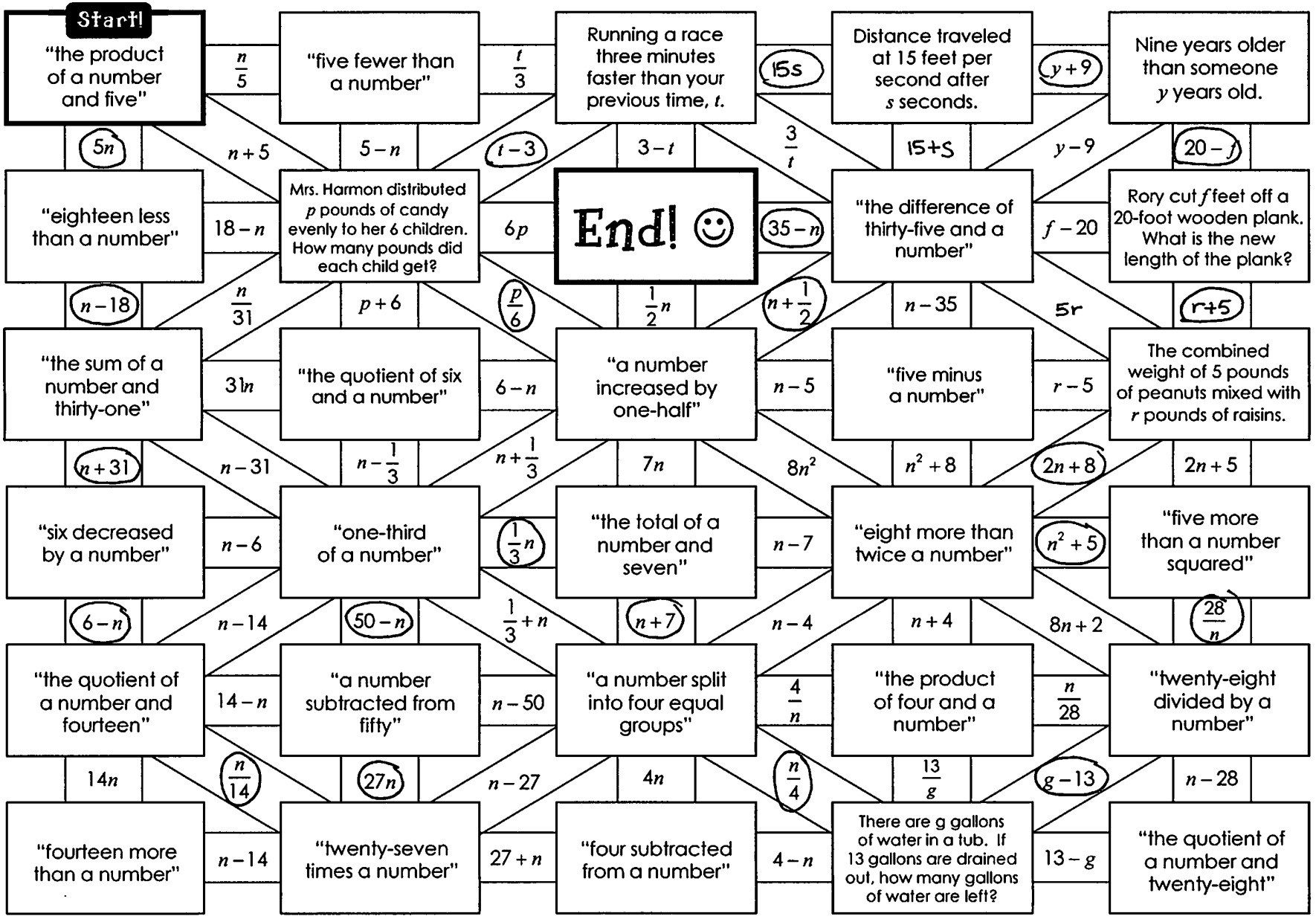
Translating Expressions Maze

Directions: Begin at the Start box. Read the expression and choose the pathway that contains a correctly translated algebraic expression. Mark your pathway as you move through the maze until you reach the end.



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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 2:** Translating Expressions

Directions: Translate each expression.	
1. "the quotient of a number and 3" $\frac{n}{3}$	**2.** "a number subtracted from 16" $16-n$
3. "seven increased by a number" $7+n$	**4.** "five times a number" $5n$
5. "ten less than a number" $n-10$	**6.** "twenty evenly split into n groups" $\frac{20}{n}$
7. "fourteen more than a number" $14+n$	**8.** "a number minus six" $n-6$
9. "a number divided by 8" $\frac{n}{8}$	**10.** "two-thirds of a number" $\frac{2}{3}n$
11. "the difference of 40 and a number" $40-n$	**12.** "the product of five and a number" $9n$
13. "a number decreased by 15" $n-15$	**14.** "the sum of 17 and twice a number" $17+2n$
15. "nine plus a number squared" $9+n^2$	**16.** "a number cubed" n^3

Directions: Give two different ways to write each expression in words.	
17. $a+7$	a) the total of a number and 7
	b) a number increased by 7
18. $m-12$	a) 12 subtracted from a number
	b) the difference of a number and 12
19. $9r$	a) the product of 9 and a number
	b) a number times 9
20. $\frac{60}{x}$	a) 60 split equally into x-groups
	b) the quotient of 60 and a number
21. $19-c$	a) a number fewer than 19
	b) 19 decreased by a number
22. $\frac{1}{4}k$	a) one quarter of a number
	b) the product of 1/4 and a number

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

WRITING & EVALUATING Expressions

Directions: Translate each verbal description into an algebraic expression, then evaluate for the given variable(s).

TRANSLATE IT	EVALUATE IT
1. "the sum of 16 and x" $16+x$	(when $x=12$) $16+12=\boxed{28}$
2. "the quotient of 48 and n" $\frac{48}{n}$	(when $n=8$) $\frac{48}{8}=\boxed{6}$
3. "seven subtracted from k" $k-7$	(when $k=18$) $18-7=\boxed{11}$
4. "four more than one-third a" $\frac{1}{3}a+4$	(when $a=15$) $\frac{1}{3}(15)+4=5+4=\boxed{9}$
5. "the difference of twice r and five" $2r-5$	(when $r=23$) $2(23)-5=46-5=\boxed{41}$
6. "the product of four and x, increased by y" $4x+y$	(when $x=9$ and $y=4$) $4(9)+4=36+4=\boxed{40}$
7. "v squared less than 42" $42-v^2$	(when $v=5$) $42-5^2=42-25=\boxed{17}$

REAL WORLD Examples

8. Jack weighs 13 more pounds than his brother Andy.

a) If a represents Andy's weight, write an expression to represent Jack's weight.	**a)** $a+13$
b) Find Jack's weight if Andy weighs 78 pounds.	**b)** $78+13=\boxed{91\text{ lb}}$

9. Ebony is selling wreaths for a holiday fundraiser for $9 each.

a) Write an expression to represent the total amount she will raise if she sells w wreaths.	**a)** $9w$
b) Find the total amount Ebony will raise if she sells 28 wreaths.	**b)** $9(28)=\boxed{\$252}$

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10. There are four students absent from Mrs. Malla's homeroom.

a) Write an expression to represent the number of students present if there are s students on Mrs. Malla's homeroom roster.	**a)** $s-4$
b) How many students are present if there are 23 students on Mrs. Malla's homeroom roster?	**b)** $23-4$ $= \boxed{19 \text{ students}}$

11. Carl ran 8 miles last Saturday as part of his marathon training plan.

a) Write an expression to represent the average number of minutes that it took Carl to run each mile if he completed the run in m minutes.	**a)** $\frac{m}{9}$
b) Find his average number of minutes per mile if he completed the run in 72 minutes.	**b)** $\frac{72}{8} = \boxed{9 \text{ min}}$

12. Two-thirds of the six-graders are going on an upcoming field trip.

a) Write an expression to represent the number of sixth graders attending the field trip there there are n students in sixth grade.	**a)** $\frac{2}{3}n$
b) If there are 291 sixth grade students, how many are going on the field trip?	**b)** $\frac{2}{3}(291)$ $= \boxed{194 \text{ students}}$

13. The sequel to a movie is 16 minutes longer than the first movie.

a) Write an expression to represent the number of minutes in the first movie if the sequel is m minutes long.	**a)** $m-16$
b) Find the length of the first movie if the sequel is 112 minutes long.	**b)** $112-16$ $= \boxed{96 \text{ min}}$

14. A group of five friends went out to dinner and evenly split the bill.

a) Write an expression for the amount each person paid if d represents the dinner bill.	**a)** $\frac{d}{5}$
b) If the bill came to \$78.10, how much did each person pay?	**b)** $\frac{78.10}{5}$ $= \boxed{\$15.62}$

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 3:** Writing & Evaluating Expressions

Directions: Translate into an algebraic expression, then evaluate for the given variable(s).

WORDS	EXPRESSION	EVALUATE
1. "seven subtracted from p"	$p-7$	(when $p = 22$) $22-7 = \boxed{15}$
2. "the product of three and x"	$3x$	(when $x = 8$) $3(8) = \boxed{24}$
3. "sixteen decreased by twice k"	$16-2k$	(when $k = 7$) $16-2(7) = 16-14 = \boxed{2}$
4. "the quotient of fifty-four and m"	$\frac{54}{m}$	(when $m = 6$) $\frac{54}{6} = \boxed{9}$
5. "the sum of fourteen and r squared"	$14+r^2$	(when $r = 3$) $14+3^2 = 14+9 = \boxed{23}$
6. "b subtracted five-sixths a"	$\frac{5}{6}a-b$	(when $a = 12$ and $b = 2$) $\frac{5}{6}(12)-2 = 10-2 = \boxed{8}$

7a. The toll to cross a bridge costs d dollars. If 95 vehicles crossed the bridge in one hour, write an expression to represent the amount of money collected.

$95d$

7b. If the bridge toll is \$3, how much money was collected?

$95(3) = \boxed{\$285}$

8a. Mitch and Zach went on a hike. Zach hiked f feet fewer than Mitch hiked. If Mitch hiked 3,000 feet, write an expression for how far Zach hiked.

$3000-f$

8b. If Zach hiked 280 feet fewer than Mitch, how far did Zach hike?

$3000 - 280$

$= \boxed{2,720 \text{ feet}}$

9a. The running back on a football team has ran for 572 yards so far this season. If he runs y yards in the next game, write an expression for his new season total.

$572+y$

9b. If he runs 85 yards in his next game, find his new season total.

$572 + 85$

$= \boxed{657 \text{ yd}}$

10a. A snowstorm brought 32 inches of snow over the course of h hours. Write an expression to represent the average hourly snowfall.

$\frac{32}{h}$

10b. If it snowed 32 inches in 10 hours, find the average hourly snowfall.

$\frac{32}{10} = \boxed{3.2 \text{ in}}$

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Name: _____ **Math 6**

Date: _____ **Per:** _____ **Unit 4:** Algebraic Expressions & Properties

Quiz 4-1: Evaluating & Translating Expressions

Evaluate each expression given the variable replacements.

1. $5x-12$ (if $x=9$)

$5(9)-12$

$45-12$

2. $b+a\div 4$ (if $a=8$ and $b=20$)

$20+8\div 4$

$20+2$

3. $\frac{n^2}{m-1}$ (if $m=6$ and $n=5$)

$\frac{5^2}{6-1} = \frac{25}{5}$

4. $pq+(11-p^2)$ (if $p=3$ and $q=7$)

$3(7)+(11-3^2)$

$21+(11-9)$

$21+2$

5. $s+\frac{5}{6}r$ (if $r=\frac{4}{15}$ and $s=\frac{2}{3}$)

$\frac{2}{3}+\frac{5}{6}\left(\frac{4}{15}\right)$

$\frac{2}{3}+\frac{2}{9}$

$\frac{6}{9}+\frac{2}{9}$

6. $7x-xy+y^3$ (if $x=9$ and $y=2$)

$7(9)-9(2)+2^3$

$63-18+8$

$45+8$

7. $2a^2+3ab$ (if $a=4$ and $b=7$)

$2(4)^2+3(4)(7)$

$2(16)+12(7)$

$32+84$

8. $\frac{2}{3}j^2-\frac{1}{4}k^2$ (if $j=12$ and $k=8$)

$\frac{2}{3}(12)^2-\frac{1}{4}(8)^2$

$\frac{2}{3}(144)-\frac{1}{4}(64)$

$96-16$

1.	33
2.	22
3.	5
4.	23
5.	$\frac{8}{9}$
6.	53
7.	116
8.	80

Translate the words into an algebraic expression.

9. "the difference of fourteen and a number"

10. "the product of a number and five"

9.	$14-n$
10.	$n\cdot 5$

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11. "the quotient of a number and nine"

12. "twenty-seven more than a number squared"

13. "three-fourths of a number"

14. "twenty subtracted from a number"

15. "the sum of twice a number and eleven"

16. "one less than three times a number"

17. Mr. Livingston drove 375 miles using g gallons of gas. Write an expression to find the number of miles he drove on average per gallon of gas.

18. Colin's bank account balance is d dollars. If he deposits a check for $50, write an expression to represent his new balance.

19. Jarrod pays $0.12 per text message as part of his cell phone plan.

a) If he sent m messages last month, write an expression to represent the total cost on his bill for text messaging.

b) If he sent 92 text messages, what was he charged for texts?

$0.12(92) = 11.04$

20. Alisa ran on the treadmill then lifted weights. She burned 85 fewer calories lifting weights than she did on the treadmill.

a) If she burned c calories on the treadmill, write an expression to represent the number of calories she burned while lifting weights.

b) If she burned 376 calories on the treadmill, how many calories did she burn from lifting weights?

$376 - 85 = 291$

11. $\frac{n}{9}$

12. n^2+27

13. $\frac{3}{4}n$

14. $n-27$

15. $2n+11$

16. $3n-1$

17. $\frac{375}{g}$

18. $d+50$

19. a) $0.12m$

b) \$11.04

20. a) $c-85$

b) 291 calories

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples
Parts of an **EXPRESSION**	**$8x + 1 + 5x + 12x + 23 + 7$** **Variable Terms** (Terms WITH a variable): $8x, 5x, 12x$ **Constant Terms** (Terms WITHOUT a variable): $1, 23, 7$ **Coefficients** (Number NEXT TO a variable): $8, 5, 12$

EXAMPLES

Directions: Identify the variable terms, constant terms, and coefficients.

	Expression	Variable Terms	Coefficients	Constant Terms
1.	$4x+9+7x$	$4x, 7x$	$4, 7$	9
2.	$7a+1+16$	$7a$	7	1
3.	$9+6k+8k+1$	$6k, 8k$	$6, 8$	$9, 1$
4.	$r+14+5+2r$	$r, 2r$	$1, 2$	$14, 5$
5.	$6+7w+w+13$	$7w, w$	$7, 1$	$6, 13$
6.	$\frac{1}{2}p+14+2+9p$	$\frac{1}{2}p, 9p$	$\frac{1}{2}, 9$	$14, 2$
7.	$8x+3y+15y$	$8x, 3y, 15y$	$8, 3, 15$	—
8.	$3m+7n+14+8m$	$3m, 7n, 8m$	$3, 7, 8$	14
9.	$7w+2v+11+4+6w$	$7w, 2v, 6w$	$7, 2, 6$	$11, 4$
10.	$\frac{2}{3}p+\frac{5}{6}q+\frac{1}{4}$	$\frac{2}{3}p, \frac{5}{6}q$	$\frac{2}{3}, \frac{5}{6}$	$\frac{1}{4}$

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Combining
LIKE TERMS

You can simplify an algebraic expression by **combining like terms.** This means to combine common variable terms and constant terms.

Example: Simplify the expression below:

$12x + 1 + 7x + 10 =$ 19x + 11

EXAMPLES

Directions: Simplify each expression.

11. $7x + 4 + 2x$

9x + 4

12. $n + 17 + 2n + 3$

3n + 20

13. $9r - 5r + 11$

4r + 11

14. $2k + 14 - 8 + k$

3k + 6

15. $1 + 8 + 2w + 6w$

8w + 9

16. $10 + 6p - 5p + 2$

p + 12

17. $11n + 5 - 1 - 2n + 4n$

13n + 4

18. $9c + 4 - c + 3 - 2c$

6c + 7

19. $\frac{3}{4}y + 7 + \frac{1}{2}y$

$\frac{3}{4}y + 7 + \frac{2}{4}y$

$\frac{5}{4}y + 7$

$1\frac{1}{4}y + 7$

20. $\frac{1}{8} + \frac{5}{6}w + \frac{7}{12}$

$\frac{3}{24} + \frac{5}{6}w + \frac{14}{24}$

$\frac{5}{6}w + \frac{17}{24}$

21. $9x + 7y - 3y + 2x$

11x + 4y

22. $3b + 8a + 11b - a$

7a + 14b

23. $2m - m + 8n + 14$

m + 8n + 14

24. $8r + 4s + s - 2r$

6r + 5s

25. $8p + 1 + 5q - 3q$

8p + 2q + 1

26. $c + 11d + 7c - 4d$

8c + 7d

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WHY DID THE TRAFFIC LIGHT SAY "Close your Eyes!" ?

Directions: Simplify each expression. After completing each set, find matching answers. One will have a letter and the other a number. Write the letter in the matching numbered box at the bottom of the page.

SET 1

N.	$9a+1-2a+2$	$7a+3$	7.	$3a+14-3-a$	$2a+11$
A.	$14+8a+2-7a$	$a+16$	16.	$1+10a+11-9-3a$	$7a+3$
U.	$15+2a+3a-6$	$5a+9$	2.	$14-1+9a-5a$	$4a+13$
B.	$a+16-6+a+1$	$2a+11$	9.	$a+11+4a+2-4$	$5a+9$
O.	$5a+16+7a-11$	$12a+5$	4.	$17+6a-5a-1$	$a+16$
T.	$9+a+3a+4$	$4a+13$	8.	$9a+10-7+3a+2$	$12a+5$

SET 2

W.	$k+20+3k-3$	$4k+17$	5.	$1+6k+5k+1$	$11k+2$
A.	$1+8k+10-7k-3$	$k+8$	18.	$10+7k-k-3k+4$	$3k+14$
T.	$3+9k+8k+3$	$17k+6$	3.	$9k+2k+12-7k+5$	$4k+17$
E.	$1+4k-2k+13+k$	$3k+14$	12.	$11k+16-9k+9$	$2k+25$
O.	$27+6k-2-4k$	$2k+25$	6.	$8k+13-6k-k-5$	$k+8$
S.	$10+3k-8+7k+k$	$11k+2$	10.	$4+12k+6k+2-k$	$17k+6$

SET 3

I.	$9+y+2x+x+y-1$	$3x+2y+8$	I.	$7x+2+3y+6-4x-y$	$3x+2y+8$
H.	$3x+7+y+6-2x$	$x+y+13$	13.	$10y+x+17-4y-12$	$x+6y+5$
G.	$4x+10y+6-6+4x-y$	$8x+9y$	11.	$1+6x+11y-x+3y$	$5x+14y+1$
T.	$3+7x-2+7y-2x+7y$	$5x+14y+1$	15.	$9y+16+x+x+4-2y$	$2x+7y+20$
A.	$17+10y+3+2x-3y$	$2x+7y+20$	14.	$16+2x-3+9y-8y-x$	$x+y+13$
C.	$8y+6x+7-2y-2-5x$	$x+6y+5$	17.	$5+10x+10y-2x-5-y$	$8x+9y$

ANSWER:

1.	2.		3.	4.	5.		6.	7.	8.	9.	10.		11.	12.		13.	14.	15.	16.	17.	18.	
I	T		W	A	S		A	B	O	U	T		T	O		C	H	A	N	G	E	!

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ Per: _____ **Homework 4:** Combining Like Terms

Directions: Identify the variable terms, constant terms, and coefficients for each expression.

	EXPRESSION	VARIABLE TERMS	COEFFICIENTS	CONSTANT TERMS
1.	$4x+15x$	$4x, 15x$	$4, 15$	—
2.	$8r+7+2r$	$8r, 2r$	$8, 2$	7
3.	$6n+25+7n+4$	$6n, 7n$	$6, 7$	$25, 4$
4.	$3a+4a+17+a+1$	$3a, 4a, a$	$3, 4, 1$	$17, 1$
5.	$11c+4d+c+9d+2c$	$11c, 4d, c, 9d, 2c$	$11, 4, 1, 9, 2$	—
6.	$5x+3+2y+y+8x+14$	$5x, 2y, y, 8x$	$5, 2, 1, 8$	$3, 14$

Directions: Simplify each expression by combining like terms.

7. $8w+4w$

$12w$

8. $6c-4c$

$2c$

9. $7x-4x+28$

$3x+28$

10. $20+9p-13$

$9p+7$

11. $7+\frac{4}{5}a-\frac{2}{3}a+2$

$7+\frac{12}{15}a-\frac{10}{15}a+2 = \frac{2}{15}a+9$

12. $12k+2-1+2k$

$14k+1$

13. $3n-2n+18+12n$

$13n+18$

14. $v+14+9v-5$

$10v+9$

15. $20+17z-16z-12$

$z+8$

16. $2+j+15+8j-11$

$9j+6$

17. $5r+16s-7s-2r+r$

$4r+9s$

18. $n+8n+7m-4n-m$

$6m+5n$

19. $5x+9-4+y+12x$

$17x+y+5$

20. $2a+9+4b-b+7a-1$

$9a+3b+8$

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples		
DISTRIBUTIVE Property	We can use the **distributive property** to multiply a sum or difference by a value. The distributive property is defined by the two rules below:		
	$a(b+c) = ab + ac$	$a(b-c) = ab - ac$	
NUMERICAL Examples	**Simplify each expression using the distributive property.**		
	1. $6(2+4)$ $12 + 24$ $= \boxed{36}$	**2.** $3(8+1)$ $24 + 3$ $= \boxed{27}$	**3.** $\frac{1}{2}(28+10)$ $14 + 5$ $= \boxed{19}$
	4. $7(8-2)$ $56 - 14$ $= \boxed{42}$	**5.** $12(5-3)$ $60 - 36$ $= \boxed{24}$	**6.** $4(9+2-8)$ $36 + 8 - 32$ $44 - 32$ $= \boxed{12}$
ALGEBRAIC Examples	**Simplify each expression using the distributive property.**		
	7. $2(x+5)$ $2x+10$	**8.** $10(k+1)$ $10k+10$	**9.** $7(a+b)$ $7a+7b$
	10. $9(w-4)$ $9w-36$	**11.** $2(7-p)$ $14-2p$	**12.** $3(r-s)$ $3r-3s$
	13. $2(2x+3)$ $4x+6$	**14.** $6(3y-7)$ $18y-42$	**15.** $8(9-5a)$ $72-40a$
	16. $5(3m+n)$ $15m+5n$	**17.** $7(2c-5d)$ $14c-35d$	**18.** $8(x-4y)$ $8x-32y$
	19. $9(w+4v-7)$ $9w+36v-63$	**20.** $2(5a-b+2c)$ $10a-2b+4c$	**21.** $\frac{1}{3}(6r+15s-12)$ $2r+5s-4$

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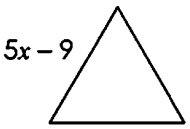
TRANSLATING

Translate each verbal expression into an algebraic expression, then simplify.

Words	Expression	Simplified Expression
22. "three times the sum of a number and eight"	$3(n+8)$	$3n+24$
23. "nine times the difference of a number and four"	$9(n-4)$	$9n-36$
24. "two less than a number, times four"	$4(n-2)$	$4n-8$
25. "six times the sum of twice a number and seven"	$6(2n+7)$	$12n+42$
26. "one-half the difference of four times a number and eighteen"	$\frac{1}{2}(4n-18)$	$2n-9$
27. "a number subtracted from twenty, multiplied by five"	$5(20-n)$	$100-5n$

APPLICATIONS

28. If the figure below is an equilateral triangle, use parentheses to write an expression to represent its perimeter, then simplify the expression.



$3(5x-9)$
$= \boxed{15x-27}$

29. A city averages r inches of rainfall each month. This January, they had two inches less rain than average. If they continue to have the same amount of rain each month as they did in January, write an expression to represent the amount of rain they will have for the year. Then, simplify the expression.

$12(r-2)$
$= \boxed{12r-24}$

Use for questions 30-31: A club is selling tubs of cookie dough for a fundraiser. The tubs cost the club c dollars each but they are selling them for $12 each. The difference in cost is their profit per tub.

30. Use parentheses to write an expression to represent the amount they profited if they sold 60 tubs. Then, simplify the expression.

$60(12-c)$
$= \boxed{720-60c}$

31. If the tubs cost the club $7 each, how much did they profit?

$720-60(7)$
$720-420$
$= \boxed{\$300}$

Use for questions 32-33: This past Sunday, the Giants scored seven more points than the Eagles. The Patriots scored twice as many points as the Giants.

32. Use parentheses to write an expression to represent the number of points scored by the Patriots, then simplify the expression.

$2(e+7)$
$= 2e+14$

33. If the Eagles scored 16 points, how many points did the Patriots score?

$2(16)+14$
$32+14$
$= 46$ pts

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SIMPLIFYING & EVALUATING EXPRESSIONS *Relay!*

Directions: Using the distributive property, simplify the expression in column 1. Pass your expression to the box in column 2. Simplify by combining like terms. Pass your simplified expression to the box in column 3. Evaluate for the given variable replacement(s). Write your answer in the circle. **Find the sum of your final answers in the column 3 and record at the bottom.**

	COLUMN 1 (DISTRIBUTE!)	**COLUMN 2** (COMBINE LIKE TERMS!)	**COLUMN 3** (EVALUATE!)	
❶	$2(x+8)$	$8x -$ [2x+16] -11	[6x+5]	(for $x = 8$) (53)
❷	$7(k-1)$	$k+8+$ [7k-7]	[8k+1]	(for $k = 2$) (17)
❸	$6(v-3)$	[6v-18] $-2v$	[4v-18]	(for $v = 7$) (10)
❹	$10(c+5)$	[10c+50] $-21+2c$	[12c+29]	(for $c = 5$) (89)
❺	$3(y-2)$	$15+$ [3y-6] $+2y$	[5y+9]	(for $y = 3$) (24)
❻	$\frac{1}{3}(6n+15)$	$15n+23-$ [2n+5]	[13n+28]	(for $n = 1$) (41)
❼	$5(2x+y)$	[10x+5y] $-2y-6x$	[4x+3y]	(for $x = 5$ and $y = 9$) (47)
❽	$9(r-3s)$	$40s+$ [9r-27s] $-7r$	[2r+13s]	(for $r = 7$ and $s = 3$) (53)
❾	$2(7a-4b)$	$12b+a+$ [14a-8b]	[15a+4b]	(for $a = 8$ and $b = 2$) (128)
❿	$4(m-3n+7)$	[4m-12n+28] $+2m-21$	[6m-12n+7]	(for $m = 4$ and $n = 1$) (19)

SUM OF THE NUMBERS IN COLUMN 3: 481

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 5:** The Distributive Property

Directions: Simplify each expression using the distributive property.

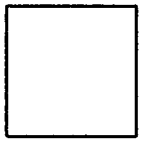
1. $4(9+3)$ $36+12$ $=\boxed{48}$	**2.** $8(7-2)$ $56-16$ $=\boxed{40}$	**3.** $6(11-1+4)$ $66-6+24$ $=\boxed{84}$

Directions: Simplify each expression using the distributive property.

4. $3(x+5)$ $3x+15$	**5.** $7(w-4)$ $7w-28$	**6.** $5(p+2)$ $5p+10$
7. $4(8-k)$ $32-4k$	**8.** $9(r+7)$ $9r+63$	**9.** $12(m-1)$ $12m-12$
10. $10(a+b)$ $10a+10b$	**11.** $3(x-2y)$ $3x-6y$	**12.** $2(4k+1)$ $8k+2$
13. $9(2a-5)$ $18a-45$	**14.** $5(3-2m)$ $15-10m$	**15.** $\frac{1}{5}(20m+5)$ $4m+1$
16. $\frac{4}{3}(6v-27)$ $8v-36$	**17.** $2(7m+2n+1)$ $14m+4n+2$	**18.** $5(2a-b+3)$ $10a-5b+15$

19. If the figure below is a square, write an expression using parentheses to represent its perimeter. Then, simplify the expression.

$7x-2$



$4(7x-2)$
$=\boxed{28x-8}$

20. Each day, Eliza runs and walks the same number of minutes. If she runs for m minutes and walks for 5 minutes, write an expression using parentheses for the total number of minutes she will spend running and walking for 14 days. Then, simplify the expression.

$14(m+5)$
$=\boxed{14m+70}$

Review: Simplify the expressions below by combining like terms.

21. $12a-3+5a$ $17a-3$	**22.** $6w+21-w+3$ $5w+24$
23. $1+16x-14x+14$ $2x+15$	**24.** $7r+r+23-16$ $8r+7$
25. $41+13c-2c-7$ $11c+34$	**26.** $28+11p-10p+2$ $p+30$
27. $9x-x+15y-23-4y$ $8x+11y-23$	**28.** $2+13m+4n-m+n+7$ $12m+5n+9$

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples	
WARM-UP	**Directions:** Simplify each expression by **combining like terms.**	
	1. $8x-2x$ $6x$	**2.** $10a-19-7a+a$ $4a-19$
	3. $15p+1-8p+2$ $7p+3$	**4.** $11r+14+5s-2r-s+2$ $9r+4s+16$
	Directions: Simplify each expression by **distributing.**	
	5. $4(x+2)$ $4x+8$	**6.** $9(2k-1)$ $18k-9$
	7. $\frac{1}{2}(24-10c)$ $12-5c$	**8.** $3(6m+2n-7)$ $18m+6n-21$
SIMPLIFYING EXPRESSIONS	An algebraic expression is in **simplest form** when it has no like terms and no parenthesis. **To simplify an algebraic expression completely:** 1 Distribute → 2 Combine Like Terms	
EXAMPLES	**Directions:** Simplify each expression.	
	9. $5(x+4)+9$ $5x+20+9$ $5x+29$	**10.** $7+9(2+k)$ $7+18+9k$ $9k+25$
	11. $4(w+9)-w$ $4w+36-w$ $3w+36$	**12.** $8a+2(a-7)$ $8a+2a-14$ $10a-14$

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13. $9(3c-4)+2c$

$27c-36+2c$

$\boxed{29c-36}$

14. $6(1+2n)-5$

$6+12n-5$

$\boxed{12n+1}$

15. $16+\frac{1}{3}(15r-9)$

$16+5r-3$

$\boxed{5r+13}$

16. $\frac{2}{5}y+\frac{1}{4}(y-8)$

$\frac{2}{5}y+\frac{1}{4}y-2$

$\frac{8}{20}y+\frac{5}{20}y-2 = \boxed{\frac{13}{20}y-2}$

17. $2v+5(3v+4)$

$2v+15v+20$

$\boxed{17v+20}$

18. $8(2m+3)-m+3$

$16m+24-m+3$

$\boxed{15m+27}$

19. $15p-2p+8(p+1)$

$15p-2p+8p+8$

$\boxed{21p+8}$

20. $25+9(z-2)+2z$

$25+9z-18+2z$

$11z+7$

21. $8(2a+b)-4a+9b$

$16a+8b-4a+9b$

$\boxed{12a+17b}$

22. $17x+12(y-x)-3y$

$17x+12y-12x-3y$

$\boxed{5x+9y}$

23. $3(d+5)+2(d+8)$

$3d+15+2d+16$

$\boxed{5d+31}$

24. $7(5k+2)+6(1-3k)$

$35k+14+6-18k$

$\boxed{17k+20}$

APPLICATION

25. Ariana, Ben, and Khloe played a video game. Ariana scored p points. Ben scored seven more points than Ariana scored. Khloe scored twice the number of points that Ben scored. Write an expression to represent the total number of points scored by Ariana, Ben, and Khloe in **simplest form.**

$p+p+7+2(p+7)$

$p+p+7+2p+14$

$\boxed{4p+21}$

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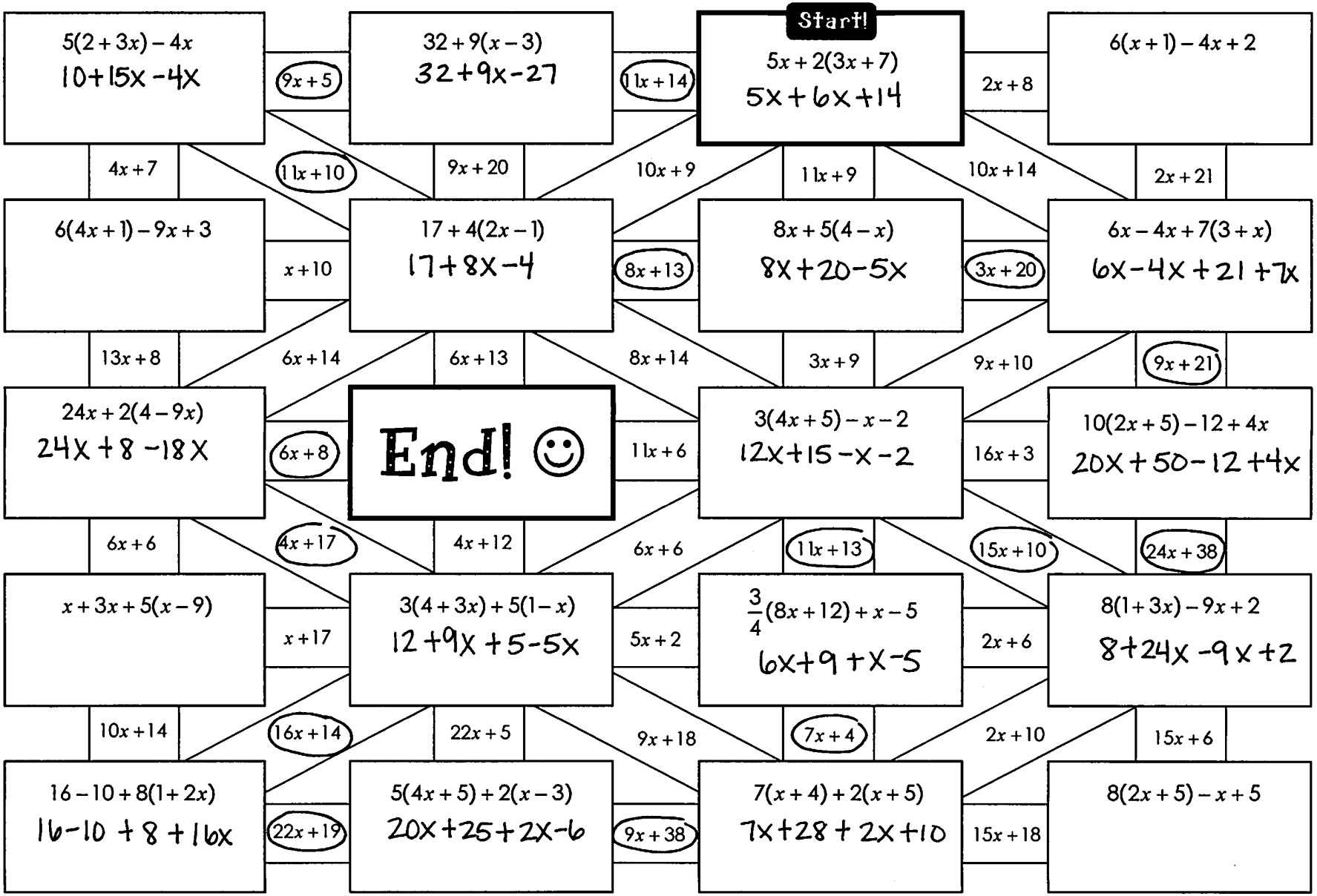
Simplifying Expressions Maze!

Directions: Begin at the **Start** box. Simplify each expression completely. Use your solutions to navigate through the maze until you reach the end. **SHOW ALL WORK- use a separate sheet of paper if necessary.**



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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ Per: _____ **Homework 6:** Simplifying Expressions

Directions: Simplify each expression by **combining like terms.**

1. $x+9+7x$

$8x+9$

2. $5k+14-1+11k$

$16k+13$

3. $10r-2r+4-7r+3$

$r+7$

4. $8m+20-6m-m+7$

$m+27$

5. $2b+4a-a-2+12b$

$3a+14b-2$

6. $\frac{1}{3}c+\frac{5}{6}c+c$

$\frac{2}{6}c+\frac{5}{6}c+\frac{6}{6}c=\frac{13}{6}c=2\frac{1}{6}c$

Directions: Simplify each expression using the **distributive property.**

7. $8(x+2)$

$8x+16$

8. $3(w-7)$

$3w-21$

9. $5(7-n)$

$35-5n$

10. $4(2r+9s-1)$

$8r+36s-4$

Directions: Simplify each expression completely.

11. $4(x-5)+2x$

$4x-20+2x$

$6x-20$

12. $5+4(3+p)$

$5+12+4p$

$4p+17$

13. $20+7(a-2)$

$20+7a-14$

$7a+6$

14. $2(k+4)+k+5$

$2k+8+k+5$

$3k+13$

15. $3(8+5y)-2$

$24+15y-2$

$15y+22$

16. $6(7m-1)-10m$

$42m-6-10m$

$32m-6$

17. $13c-11c+5(c-4)$

$13c-11c+5c-20$

$7c-20$

18. $18z+2(4-3z)+1$

$18z+8-6z+1$

$12z+9$

19. $20-4+4(3d+7)$

$20-4+12d+28$

$12d+44$

20. $\frac{2}{3}(24k-6)-2k$

$16k-4-2k$

$14k-4$

21. $7(2n+10)+2(4n-1)$

$14n+70+8n-2$

$22n+68$

22. $10+3(5a+2b-3)-4b$

$10+15a+6b-9-4b$

$15a+2b+1$

23. Laura bought y yards of fabric on Saturday. The next day, she went back and bought 3 more yards than she did on Saturday. If each yard of fabric costs $5, write an expression in simplest form for the total amount of money she spent on both days.

$5(y+y+3)$

$5y+5y+15=10y+15$

24. Jonas is a runner. He ran m miles last week. His goal this week was to run one mile more than twice the miles he ran last week. If he tripled his goal, write an expression in simplest form to show how many more miles he ran this week compared to last.

$3(2m+1)-m$

$6m+3-m=5m+3$

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

WARM-UP

Use the distributive property to simplify each expression.

1. $4(2+5)$ $8+20$ $\boxed{28}$	**2.** $10(7-3)$ $70-30$ $\boxed{40}$	**3.** $6(1+8)$ $6+48$ $\boxed{54}$
4. $2(p+3)$ $2p+6$	**5.** $8(3k-1)$ $24k-8$	**6.** $5(2x-9y)$ $10x-45y$

FACTORING Expressions

Separating an expression back into a product is called **factoring.**

$2x+8$ ➡ $2(x+4)$

(Simplest Form) **(Factored Form)**

Think of factoring like the distributive property in reverse!

How do you FACTOR?

❶	First find the **greatest common factor** (GCF) of each term.
❷	Draw a set of parentheses and place the GCF outside the parentheses.
❸	Divide each term by the GCF and drop down the factors inside the parentheses.
❹	Check your work by distributing!

Numerical EXAMPLES

Factor each expression using the GCF.

7. $8+16$ GCF: 8 $8(1+2)$	**8.** $15-27$ GCF: 3 $3(5-9)$
9. $36-4$ GCF: 4 $4(9-1)$	**10.** $24-18$ GCF: 6 $6(4-3)$
11. $32+80$ GCF: 16 $16(2+5)$	**12.** $54-28$ GCF: 2 $2(27-14)$

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Algebraic EXAMPLES

13. $2x+14$

$2(x+7)$

14. $8x-24$

$8(x-3)$

15. $6k+6$

$6(k+1)$

16. $9w-45$

$9(w-5)$

17. $10m+15$

$5(2m+3)$

18. $12a-6$

$6(2a-1)$

19. $6r+27s$

$3(2r+9s)$

20. $32a-24b$

$8(4a-3b)$

21. $4x+18y$

$2(2x+9y)$

22. $60a-48b$

$12(5a-4b)$

23. $6p-3q$

$3(2p-q)$

24. $36c-45d$

$9(4c-5d)$

EQUIVALENT Expressions

Algebraic expressions are **equivalent** if they simplify to the same expression. For example, the three expressions below are equivalent:

$2x+8$ **$2(x+4)$** **$3x+8-x$**

Write three expressions that are equivalent to the given expression. Give the factored form as one of the expressions.

25. $4m+20$

- $4(m+5)$
- $6m+12-2m+8$
- $3(m+6)+m+2$

26. $8k+36$

- $4(2k+9)$
- $15(k+2)-7k+6$
- $3k+9+5k+27$

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FACTORING
challenge!

Name: _____

Date: _____ **Per:** _____

Directions: Fill in the boxes below with the numbers **1-15** to correctly factor each expression. Each number is only used once!

1. $77x + 56$ ➡ $7(11x + 8)$
2. $45x - 15$ ➡ $15(3x - 1)$
3. $24x + 60$ ➡ $12(2x + 5)$
4. $40 - 52x$ ➡ $4(10 - 13x)$
5. $84x + 54y$ ➡ $6(14x + 9y)$

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FACTORING
challenge!

Name: _____

Date: _____ **Per:** _____

Directions: Fill in the boxes below with the numbers **1-15** to correctly factor each expression. Each number is only used once!

1. $77x + 56$ ➡ $\square(\square x + \square)$
2. $45x - 15$ ➡ $\square(\square x - \square)$
3. $24x + 60$ ➡ $\square(\square x + \square)$
4. $40 - 52x$ ➡ $\square(\square - \square x)$
5. $84x + 54y$ ➡ $\square(\square x + \square y)$

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 7:** Factoring Expressions; Equivalent Expressions

Directions: Factor each expression using the GCF. Check your answer by distributing.

1. $7+28$ $7(1+4)$	**2.** $16-2$ $2(8-1)$	**3.** $72-45$ $9(8-5)$
4. $3x+15$ $3(x+5)$	**5.** $9y-9$ $9(y-1)$	**6.** $5m+60$ $5(m+12)$
7. $35c-28$ $7(5c-4)$	**8.** $4r+22$ $2(2r+11)$	**9.** $20a+12b$ $4(5a+3b)$
10. $7w-63v$ $7(w-9v)$	**11.** $12-2k$ $2(6-k)$	**12.** $40+16n$ $8(5+2n)$
13. $30-54a$ $6(5-9a)$	**14.** $12p+18q$ $6(2p+3q)$	**15.** $28a-60b+20$ $4(7a-15b+5)$

Directions: Translate each expression, then write the expression in **factored form.**

16. "the sum of four times a number and twenty-four"

$4n+24 = \boxed{4(n+6)}$

17. "the difference between nine times a number and seventy-two"

$9n-72 = \boxed{9(n-8)}$

18. "ten times a number, subtracted from eighteen"

$18-10n = \boxed{2(9-5n)}$

19. "thirty more than the product of six and a number"

$6n+30 = \boxed{6(n+5)}$

Directions: Write three expressions that are equivalent to the given expression.

20. $7a+21$

- $7(a+3)$
- $4a+20+1+3a$
- $6(a+3)+a+3$

21. $24x+20y$

- $4(6x+5y)$
- $26x-2x+18y+2y$
- $5(5x+4y)-x$

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Name: _____ Math 6

Date: _____ Per: _____ **Unit 4:** Expressions & Properties

Quiz 4-2: Simplifying & Factoring Expressions; Equivalent Expressions

Identify the variable terms, coefficients, and constant terms of each expression.

1. $17m+8+3m+m+2$

Variable Terms:	17m, 3m, m
Coefficients:	17, 3, 1
Constant Terms:	8, 2

Simplify each expression by <u>combining like terms</u>.

2. $4r+9r$

3. $12a+7-8a$

4. $3+17p+2-p$

5. $13y+x+12y+6+x$

Simplify each expression using the <u>distributive property</u>.

6. $8(11+4)$

88+32

7. $3(12-5)$

36-15

8. $5(p+9)$

9. $2(5m-13)$

10. $\frac{1}{4}(24n-4)$

11. $7(5c+d)$

2. 13r

3. 4a+7

4. 16p+5

5. 2x+25y+6

6. 120

7. 21

8. 5p+45

9. 10m-26

10. 6n-1

11. 35c+7d

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Simplify each expression completely.

12. $10(2x+1)-13x$

$20x+10-13x$

13. $3+\frac{1}{2}(2+18k)$

$3+1+9k$

14. $16+2(7w-1)-11w$

$16+14w-2-11w$

15. $2(5p+6)+3(7-p)$

$10p+12+21-3p$

12. $7x+10$

13. $9k+4$

14. $3w+14$

15. $7p+33$

Factor each expression using a GCF.

16. $36+84$

17. $63-18$

18. $3a+27$

19. $54m-24n$

16. $12(3+7)$

17. $9(7-2)$

18. $3(a+9)$

19. $6(9m-4n)$

20. Give three expressions equivalent to the expression **$12x + 30$**.

20. $6(2x+5)$

$10(x+3)+2x$

$11x+40+x-10$

BONUS: It took Kate eight more minutes to complete her homework on Tuesday than it took her on Monday. It took her four times longer to complete her Wednesday homework than it took to complete her Tuesday homework. If m represents the number of minutes it took her to complete her Monday homework, **(a)** write an expression for the number of minutes she spent on the three days combined in simplest form, then **(b)** give the factored form of the expression.

Mon: m
Tues: $m+8$
Wed: $4(m+8)$

a) $m+m+8+4(m+8)$
$m+m+8+4m+32$

a) Simplest Form: $6m+40$

b) Factored Form: $2(3m+20)$

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Name:	Date:
Topic:	Class:

Main Ideas/Questions	Notes/Examples

COMMUTATIVE property

Recall that **equivalent expressions** are expressions with the same value. We can use certain properties to write equivalent expressions.

COMMUTATIVE PROPERTY OF ADDITION

ORDER of terms does not affect the sum

Numerical Example: $17+2=2+17$

Algebraic Example: $a+b=b+a$

COMMUTATIVE PROPERTY OF MULTIPLICATION

ORDER of factors does not affect the product

Numerical Example: $5\cdot4=4\cdot5$

Algebraic Example: $a\cdot b=b\cdot a$

Use the commutative property to write an equivalent expression.

1. $18+60$ — $60+18$
2. $15a+7b$ — $7b+15a$
3. $12\cdot7$ — $7\cdot12$
4. $4x\cdot9$ — $9\cdot4x$

ASSOCIATIVE property

ASSOCIATIVE PROPERTY OF ADDITION

GROUPING of terms does not affect the sum

Numerical Example: $(9+1)+6=9+(1+6)$

Algebraic Example: $(a+b)+c=a+(b+c)$

ASSOCIATIVE PROPERTY OF MULTIPLICATION

GROUPING of factors does not affect the product

Numerical Example: $8\cdot(7\cdot2)=(8\cdot7)\cdot2$

Algebraic Example: $a\cdot(b\cdot c)=(a\cdot b)\cdot c$

Use the associative property to write an equivalent expression.

5. $(16+9)+24$ — $16+(9+24)$
6. $2x+(1+4x)$ — $(2x+1)+4x$
7. $7\cdot(16\cdot5)$ — $(7\cdot16)\cdot5$
8. $\left(\frac{1}{3}p\right)q$ — $\frac{1}{3}(pq)$

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DISTRIBUTIVE property

DISTRIBUTIVE PROPERTY

Recall the distributive property rules:

- $a(b+c) = a \cdot b + a \cdot c$
- $a(b-c) = a \cdot b - a \cdot c$

Numerical Example: $7(x+2) = 7x+14$

Algebraic Example: $x(y-z) = xy-xz$

Use the distributive property to write an equivalent expression.

9. $6(8-5)$ $48-30$	**10.** $2(x+7)$ $2x+14$
11. $9(3k-1)$ $27k-9$	**12.** $27+45$ $9(3+5)$
13. $6y-30$ $6(y-5)$	**14.** $16c+72d$ $8(2c+9d)$

IDENTITY property

IDENTITY PROPERTY OF ADDITION

The sum of zero and a number is itself.

Numerical Example: $5+0=5$

Algebraic Example: $a+0=a$

IDENTITY PROPERTY OF MULTIPLICATION

The product of one and a number is itself.

Numerical Example: $6 \cdot 1 = 6$

Algebraic Example: $a \cdot 1 = a$

multiplication PROPERTY OF ZERO

MULTIPLICATION PROPERTY OF ZERO

Anything multiplied by zero is equal to zero.

Numerical Example: $7 \cdot 0 = 0$

Algebraic Example: $x \cdot 0 = 0$

INVERSE property

INVERSE PROPERTY OF ADDITION

The sum of a number and its opposite is zero.

Numerical Example: $5+(-5)=0$

Algebraic Example: $b+(-b)=0$

INVERSE PROPERTY OF MULTIPLICATION

The product of a number and its reciprocal is one.

Numerical Example: $\frac{3}{4} \cdot \frac{4}{3} = 1$

Algebraic Example: $\frac{a}{b} \cdot \frac{b}{a} = 1$

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NAME THAT MATH PROPERTY!

Name the property that justifies each statement. Properties can be used more than once.

1	$7 \cdot (4 \cdot 2) = (7 \cdot 4) \cdot 2$	Associative Property of Multiplication
2	$64 + 0 = 64$	Identity Property of Addition
3	$5(12 - 3) = 5 \cdot 12 - 5 \cdot 3$	Distributive Property
4	$(15w) \cdot 0 = 0$	Multiplication Property of Zero
5	$23 + 9 = 9 + 23$	Commutative Property of Addition
6	$3 \cdot \frac{1}{3} = 1$	Inverse Property of Multiplication
7	$8 + (3 + x) = (8 + 3) + x$	Associative Property of Addition
8	$11 + (-11) = 0$	Inverse Property of Addition
9	$6 \cdot y = y \cdot 6$	Commutative Property of Multiplication
10	$0 \cdot (7r - 4) = 0$	Multiplication Property of Zero
11	$9 + (2k \cdot 1) = 9 + 2k$	Identity Property of Multiplication
12	$\frac{4}{5} \cdot \frac{5}{4} = 1$	Inverse Property of Multiplication
13	$17 \cdot 3n = 3n \cdot 17$	Commutative Property of Multiplication
14	$(a + 8) + 0 = a + 8$	Identity Property of Addition
15	$3p + 6 = 3(p + 2)$	Distributive Property
16	$-48 + 48 = 0$	Inverse Property of Addition

Properties Bank:

Commutative Property of Addition	Identity Property of Addition
Commutative Property of Multiplication	Identity Property of Multiplication
Associative Property of Addition	Inverse Property of Addition
Associative Property of Multiplication	Inverse Property of Multiplication
Distributive Property	Multiplication Property of Zero

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Name: _____ **Unit 4:** Expressions & Properties

Date: _____ **Per:** _____ **Homework 8:** Properties

Directions: Use the commutative property to write an equivalent expression.

1. $43 \cdot 9$ $9 \cdot 43$	**2.** $2+15m$ $15m+2$	**3.** $8r \cdot \frac{1}{4}$ $\frac{1}{4} \cdot 8r$

Directions: Use the associative property to write an equivalent expression.

4. $(11+3)+17$ $11+(3+17)$	**5.** $(xy)z$ $x(yz)$	**6.** $14c+(2c+5)$ $(14c+2c)+5$

Directions: Use the distributive property to write an equivalent expression.

7. $4(5+19)$ $20+76$	**8.** $6(k-3)$ $6k-18$	**9.** $\frac{1}{2}(18v-8)$ $9v-4$
10. $81+63$ $9(9+7)$	**11.** $4a+28$ $4(a+7)$	**12.** $15r-12$ $3(5r-4)$

Directions: Name the property that justifies the statement.

13. $14x \cdot 0 = 0$ Multiplication Prop. of Zero	**14.** $7p+p=p+7p$ Commutative Prop. of Add.
15. $\frac{1}{6} \cdot 6 = 1$ Inverse Prop. of Mult.	**16.** $\left(\frac{1}{2} \cdot 5\right) \cdot 8 = \frac{1}{2} \cdot (5 \cdot 8)$ Associative Prop. of Mult.
17. $2k \cdot (3 \cdot 9) = 2k \cdot (9 \cdot 3)$ Commutative Prop. of Mult.	**18.** $5(2a+7) = 10a+35$ Distributive Property
19. $-9+9=0$ Inverse Prop. of Addition	**20.** $14(p+q) = 14(q+p)$ Commutative Prop. of Add.
21. $3(25-2) = 3(25) - 3(2)$ Distributive Property	**22.** $\left(\frac{2}{3}v\right) \cdot 1 = \frac{2}{3}v$ Identity Property of Mult.
23. $(17+2y)+y = 17+(2y+y)$ Associative Prop. of Add.	**24.** $4m-4 = 4(m-1)$ Distributive Property
25. $(0+12m) \cdot 4 = 12m \cdot 4$ Identity Prop. of Addition	**26.** $24+(-24)=0$ Inverse Property of Addition
27. $r(16-9) = 16r-9r$ Distributive Property	**28.** $8 \cdot (5p+1) = (5p+1) \cdot 8$ Commutative Property of Mult.

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Unit 4 Test Study Guide
(Expressions & Properties)

Name: _____

Date: _____ Per: _____

Topic 1: Evaluating Expressions

Directions: Evaluate each expression given the variable replacements.

1. $9r+5$ (if $r=7$)

$9(7)+5$

$=63+5$

$=\boxed{68}$

2. $2c-7+cd$ (if $c=4, d=9$)

$2(4)-7+4(9)$

$=8-7+36$

$=\boxed{37}$

3. $\frac{k^2}{k-2}$ (if $k=6$)

$\frac{6^2}{6-2} = \frac{36}{4}$

$=\boxed{9}$

4. $14-15m$ (if $m=\frac{2}{3}$)

$14-15\left(\frac{2}{3}\right)$

$=14-10$

$=\boxed{4}$

5. $(x+y^2)\cdot 4$ (if $x=1, y=3$)

$(1+3^2)\cdot 4$

$=(1+9)\cdot 4$

$=10\cdot 4 = \boxed{40}$

6. $\frac{1}{2}+\frac{4}{3}w$ (if $w=\frac{9}{10}$)

$\frac{1}{2}+\frac{4}{3}\left(\frac{9}{10}\right)$

$\frac{1}{2}+\frac{6}{5}$

$\frac{5}{10}+\frac{12}{10} = \frac{17}{10} = \boxed{1\frac{7}{10}}$

Topic 2: Translating & Writing Expressions

Directions: Translate each expression.

7. "the product of a number and seventeen"

$n\cdot 17$

8. "the sum of a number and nine"

$n+9$

9. "one-fourth of a number"

$\frac{1}{4}n$

10. "a number subtracted from thirty-two"

$32-n$

11. "the difference of twice a number and one"

$2n-1$

12. "three fewer than the quotient of a number and eight" $\frac{n}{8}-3$

13. Nate and Calvin went bowling. Nate scored 24 points less than Calvin. If c represents Calvin's score, write an expression to represent Nate's score.

$c-24$

14. The tire on a bicycle made 380 full rotations in m minutes. Write an expression to represent the average number of revolutions the tire made each minute.

$\frac{380}{m}$

15. Savannah's bank account balance was \$193.60. If her paycheck is deposited in the amount of p dollars, write an expression to represent her new balance.

$193.6+p$

16. Five-sixths of the workers at a company got a raise. If w represents the number workers, write an expression to represent how many workers got a raise.

$\frac{5}{6}w$

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Topic 3: Identify Parts of an Expression

Directions: Identify the variable terms, coefficients, and constant terms of each expression.			
Expression	**Variable Terms**	**Coefficients**	**Constant Terms**
17. $18r+5+16+2r$	$18r, 2r$	$18, 2$	$5, 16$
18. $7+3a+b+18+11b+2a$	$3a, 2a, b, 11b$	$3, 2, 1, 11$	$7, 18$

Topic 4: Simplifying Expressions

Directions: Simplify each expression by combining like terms.		
19. $5h+14+3h$ $8h + 14$	**20.** $20+18y-y+3$ $17y + 23$	**21.** $19n+10+m-3+5m-12n$ $6m + 7n + 7$
Directions: Simplify each expression using the distributive property.		
22. $7(4+9)$ $28 + 63 = \boxed{91}$	**23.** $3(17-3)$ $51 - 9 = \boxed{42}$	**24.** $6(x+3)$ $6x + 18$
25. $7(2n-1)$ $14n - 7$	**26.** $8(3a+5b)$ $24a + 40b$	**27.** $\frac{1}{3}(27y+6)$ $9y + 2$
Directions: Simplify each expression completely.		
28. $9(a+4)-2a$ $9a+36-2a$ $\boxed{7a+36}$	**29.** $17+5(4n-2)$ $17+20n-10$ $\boxed{20n+7}$	**30.** $8(2x+y)+4y-3x$ $16x+8y+4y-3x$ $\boxed{13x+12y}$
31. $8k+2(9-k)-1$ $8k+18-2k-1$ $\boxed{6k+17}$	**32.** $\frac{3}{4}(8w+28)-10+w$ $6w+21-10+w$ $\boxed{7w+11}$	**33.** $9(z+3)+4(1-2z)$ $9z+27+4-8z$ $\boxed{z+31}$

Topic 5: Factoring Expressions

Directions: Factor each expression using a GCF.		
34. $16+56$ $8(2+7)$	**35.** $60-24$ $12(5-2)$	**36.** $30+75$ $15(2+5)$

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37. $5k + 40$	**38.** $12x - 21$	**39.** $32a + 20b$
$5(k+8)$	$3(4x-7)$	$4(8a+5b)$

Topic 6: Simplifying & Factoring Expressions Applications

40. Levi played in a golf touranment with three rounds. His final score is the sum of his scores from each round. He scored seven more in the second round than he did in the first round. If his third round score was 77, write an expression to represent his total score if f represents his first round score. Give your answer in **simplest form.**

$f + f+7 +77$

$2f+84$

41. In his second year, a football player scored two less than twice the number of touchdowns he scored in his rookie year. If t represents the number of touchdowns he scored in his rookie year, write an expression for the number of touchdowns he scored in his second year in **factored form.**

$2t-2$

$2(t-1)$

42. Tickets to the aquarium cost \$6 each for children and \$16 each for adults. A large group purchased a combination of both tickets. If they purchased c child tickets and a adult tickets, write an expression for the total amount they paid in **factored form.**

$6c + 16a$

$2(3c+8a)$

43. The Smith family took three days to drive to Florida for a vacation. They drove m miles on the first day. On the second day, they drove five more miles than they did on the first day. If they drove three times as many miles on the third day as they did on the second day, write an expression to represent the total miles they drove in **simplest form.**

$m + m+5 +3(m+5)$

$m + m+5 +3m +15$

$5m+20$

Topic 7: Equivalent Expressions

Directions: Write three expressions that are equivalent to the given expression.

44. $24a + 10$

- $2(12a+5)$
- $5(5a+2) - a$
- $13a + 6 + 4 + 11a$

45. $6(2r + 3s)$

- $12r+18s$
- $10r + 10s + 2r + 8s$
- $15r + 18s - 3r$

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Topic 8: Properties

Directions: Use the indicated property to write an equivalent expression.

46. $(9k \cdot 7) \cdot 5$ **(Associative Property of Multiplication)**

$9k \cdot (7 \cdot 5)$

47. $17r + 11$ **(Commutative Property of Addition)**

$11 + 17r$

48. $8(1 - 3m)$ **(Distributive Property)**

$8 - 24m$

49. $2 + (15 + 7)$ **(Associative Property of Addition)**

$(2 + 15) + 7$

50. $6(2v + 1)$ **(Commutative Property of Multiplication)**

$(2v + 1) \cdot 6$

51. $7m - 63$ **(Distributive Property)**

$7(m - 9)$

Directions: Fill in the box with a value that makes the statement true. Justify with a property name.

Statement	Property Name
52. $27 + (-27) = \boxed{0}$	Inverse Prop. of Addition
53. $(p + q) \cdot \boxed{0} = 0$	Multiplication Prop. of Zero
54. $\boxed{18x} \cdot 1 = 18x$	Identity Prop. of Multiplication
55. $v^2 + 0 = \boxed{v^2}$	Identity Prop. of Addition
56. $\boxed{\frac{4}{9}} \cdot \frac{9}{4} = 1$	Inverse Prop. of Multiplication

Directions: Name the property that justifies each statement.

57. $6 \cdot 1 = 6$

Identity Prop. of Mult.

58. $12w + 9 = 9 + 12w$

Commutative Prop of Add.

59. $2 + 7 \cdot 0 = 2 + 0$

Mult. Prop. of Zero

60. $16(12) - 16(5) = 16(12 - 5)$

Distributive Property

61. $-20 + 20 = 0$

Inverse Prop. of Addition

62. $(3y \cdot 8) \cdot 2 = 3y \cdot (8 \cdot 2)$

Associative Prop. of Mult.

63. $6(p + 7) = 6p + 42$

Distributive Property

64. $\frac{1}{8} \cdot 8 = 1$

Inverse Prop of Multiplication

65. $(7 \cdot 4) \cdot 3r = (4 \cdot 7) \cdot 3r$

Commutative Prop. of Mult.

66. $12v + 0 = 12v$

Identity Prop. of Addition

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Name: _____

Date: _____ Per: _____

Unit 4 Test

Expressions & Properties

Evaluate each expression using the given variable replacements.

1. $7x-4$ (if $x = 9$)

$7(9)-4$

$63-4$

59

2. $(p+q^2)+pq$ (if $p = 7$ and $q = 5$)

$(7+5^2)+7(5)$

$(7+25)+35$

$32+35$

67

3. $\frac{ab}{a-b}$ (if $a = 12$ and $b = 4$)

$\frac{12(4)}{12-4} = \frac{48}{8}$

6

4. $\frac{3}{4}(c+d)$ (if $c = \frac{1}{4}$ and $d = \frac{3}{20}$)

$\frac{3}{4}\left(\frac{1}{4}+\frac{3}{20}\right)$

$\frac{3}{4}\left(\frac{5}{20}+\frac{3}{20}\right)$

$\frac{3}{4}\left(\frac{8}{20}\right) = \frac{3}{4}\left(\frac{2}{5}\right)$

$\frac{3}{10}$

Translate each expression.

5. "the quotient of 50 and a number w"

$\frac{50}{w}$

6. "nine more than twice a number r"

$2r+9$

7. "fourteen fewer than a number k"

$k-14$

8. "the product of four and a number a"

$4a$

9. "the difference between three times x and y"

$3x-4$

10. "the sum of one-third c and ten"

$\frac{1}{3}c+10$

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11. Jill is running a marathon, which is 26.2 miles. So far, she has completed m miles.

a) Write an expression for the number of miles she has left.

b) If she has completed 8.9 miles so far, how many miles does she have left?

$26.2 - 8.9$

a) $26.2 - m$

b) 17.3 miles

12. An airplane can hold at most p passengers on a flight. A certain flight has seven passengers less than four-fifths of its maximum capacity on board

a) Write an expression for the number of passengers on the flight.

b) If the plane can seat 440 passengers at most, how many passengers are on the flight?

$\frac{4}{5}(440) - 7 = 352 - 7$

a) $\frac{4}{5}p - 7$

b) 345 passengers

13. Which best describes the circled part of the following expression?

$$(14)x + 5$$

A. term
B. variable
C. constant
D. coefficient

D

14. Which list includes like terms in the expression below?

$$7x + 4 + 4x + 7y + 7$$

A. $7x, 4x$
B. $7x, 7y$
C. $4x, 4$
D. $7x, 4x, 7y$

A

Simplify each expression by combining like terms.

15. $2a + 16 + 5a$

$7a + 16$

16. $24 + 8w - 5w - 11 + w$

$4w + 13$

Simplify each expression using the distributive property.

17. $6(17 - 4)$

$102 - 24$

78

18. $7(m + 6)$

$7m + 42$

19. $\frac{1}{2}(8k - 18)$

$4k - 9$

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Simplify each expression completely.

20. $6(r+4)+5r$

$6r+24+5r$

$11r+24$

21. $17p+2(5-3p)$

$17p+10-6p$

$11p+10$

22. $2(8a+b)+3(b-a)$

$16a+2b+3b-3a$

$13a+5b$

Factor each expression using a GCF.

23. $72+40$

$8(9+5)$

24. $14n+14$

$14(n+1)$

25. $48r-18s$

$6(8r-3s)$

26. Noah, Mia, and Jay went fishing. Mia caught one more fish than Noah. Jay caught three times as many fish as Mia. If f represents the number of fish that Noah caught, which expression represents the total number of fish they caught?

$f+f+1+3(f+1)$

$f+f+1+3f+3$

A. $3f+5$

B. $4f+3$

C. $5f+4$

D. $4f+4$

C

27. Felix bought a baseball card twenty years ago that is now worth \$40 less than six times the original amount he paid. If x represents the original amount he paid, write an expression for the current value of the card in **factored form.**

$6x-40$

$2(3x-20)$

Use the following expression for 28-30: $32+\frac{2}{3}(21y-6)$

28. Write the expression in **simplest form.**

$32+14y-4$

$14y+28$

29. Write the expression in **factored form.**

$14(y+2)$

30. Write any other **equivalent expression.**

$6(2y+5)+2y-2$

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31. Use the **commutative property of addition** to write an equivalent expression.

$8 \cdot (p + q) =$ [8·(q+p)]

32. Which property is illustrated by the statement below?

$$(3x + 0) + 1 = 3x + (0 + 1)$$

A. Associative Property of Addition
B. Distributive Property
C. Identity Property of Addition
D. Commutative Property of Addition

[A]

33. Write values in the two boxes below to create a statement that illustrates the **inverse property of addition.**

$6 +$ [-6] $=$ [0]

34. Which property is illustrated by the statement below?

$$(x + 1) \cdot 0 = 0$$

A. Distributive Property
B. Multiplication Property of Zero
C. Inverse Property of Multiplication
D. Identity Property of Addition

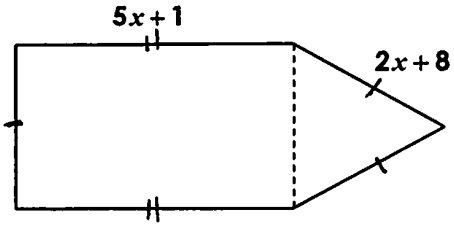
[B]

35. Which statement illustrates the inverse property of multiplication?

A. $\frac{1}{5} \cdot 1 = 1 \cdot \frac{1}{5}$
B. $\frac{1}{5} \cdot 1 = \frac{1}{5}$
C. $5 \cdot \frac{1}{5} = 1$
D. $\frac{1}{5} \cdot 0 = 0$

[C]

BONUS: The figure below is created with a rectangle and an equilateral triangle. Write an expression to represent the perimeter of the figure in **factored form.**



$3(2x+8) + 2(5x+1)$
$6x+24 + 10x+2$
$16x+26$

[2(8x+13)]

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