Agenda:

"I know what we're going to do today."

1)   Warm up- p. 22

2)   Go over homework lesson 2

2)   Module 3:
          Lesson 3: How do you multiply and divide expressions?

3)   Homework: page 18 (3, 4) And page 34

#3(a,b) #4(a-f)

Jan 6-8:14 AM

Homework

1. Write each expression in standard form.

a. $3x + (2 - 4x)$	b. $3x + (-2 + 4x)$	c. $-3x + (2 + 4x)$
$-1x + 2$	$7x - 2$	$1x + 2$
d. $3x + (-2 - 4x)$	e. $3x - (2 + 4x)$	f. $3x + (-2 - 4x)$
$-1x - 2$	$-1x - 2$	$-1x + 2$
(g.) $3x + (+2 + 4x)$	h. $3x - (2 + 4x)$	i. $-3x + (-2 + 4x)$
$7x + 2$	$7x - 2$	$1x + 2$

g) $3x + (+2 + 4x)$ $3x - 2 - 4x$ f) $3x + (+2 - 4x)$

$3x + 4x + 2$

$7x + 2$ $3x - 4x + 2$

$-1x + 2$

Jan 8-11:04 AM

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2. Write each expression in standard form.

a. $4y - (3 + y)$ $+(-3-y)$ $3y - 3$	b. $(2b + 1) - b$ $1b + 1$	c. $(6c - 4) - (c - 3)$ $5c - 1$
d. $(d + 3d) - (-d + 2)$ $+(d-2)$ $5d - 2$	e. $(-5x - 4) - (-2 - 5x)$ -2	f. $11f + (-2f + 2)$ $+ +$ $13f - 2$
g. $-5g + (6g - 4)$ $1g - 4$	h. $(8h - 1) - (h + 3)$ $-(-h-3)$ $7h - 4$	i. $(7 + w) - (w + 7)$ 0
j. $(2g + 9h - 5) - (6g - 4h + 2)$ $+(-6g+4h-3)$ $-4g + 13h - 7$		

$$2g + 9h - 5$$
$$+(-6g + 4h - 2)$$
$$\overline{}$$
$$-4g + 13h - 7$$

- - - - -
- - -

(C) $(6c - 4) - (c - 3)$
$(6c - 4) + (-c + 3)$

$$6c \;\boxed{-4} \;\; + + -$$
$$\underline{-c \; + 3}$$
$$5c - 1$$

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3. Write each expression in standard form.

a. $-3(8x)$ $-24x$	b. $5 \cdot k \cdot (-7)$ $-35k$	c. $2(-6x) \cdot 2$ $-24x$
d. $-3(8x) + 6(4x)$ $-24x + 24x$ 0	e. $8(5m) + 2(3m)$ $40m + 6m$ $46m$	f. $-6(2v) + 3a(3)$ $-12v + 9a$

4. Write each expression in standard form.

|		
a. $8x \div 2$ $\dfrac{8x}{2} = 4x$	b. $18w \div 6$ $3w$	c. $25r \div 5r$ $\dfrac{25r}{5r} = 5$
d. $33y \div 11y$ 3	e. $56k \div 2k$ 28	f. $24xy \div 6y$ $\dfrac{24xy}{6y} = 4x$

5. For each problem (a)–(e), write an expression in standard form.

a. Find the sum of $-3x$ and $8x$.

$-3x + 8x \ = \ 5x$

b. Find the sum of $-7g$ and $4g + 2$.

$-7g + 4g + 2 = -3g + 2$

c. Find the difference when $6h$ is subtracted from $2h - 4$.

d. Find the difference when $-3n - 7$ is subtracted from $n + 4$.

e. Find the result when $13v + 2$ is subtracted from $11 + 5v$.

f. Find the result when $-18m - 4$ is added to $4m - 14$.

g. What is the result when $-2x + 9$ is taken away from $-7x + 2$?

6. Marty and Stewart are stuffing envelopes with index cards. They are putting x index cards in each envelope. When they are finished, Marty has 15 stuffed envelopes and 4 extra index cards, and Stewart has 12 stuffed envelopes and 6 extra index cards. Write an expression in standard form that represents the number of index cards the boys started with. Explain what your expression means.

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7. The area of the pictured rectangle below is $24b$ ft^2. Its width is $2b$ ft. Find the height of the rectangle and name any properties used with the appropriate step.

2b ft.

___ ft.   24b ft^2
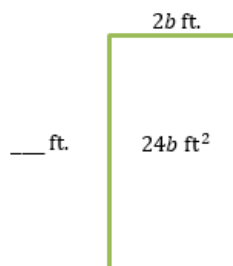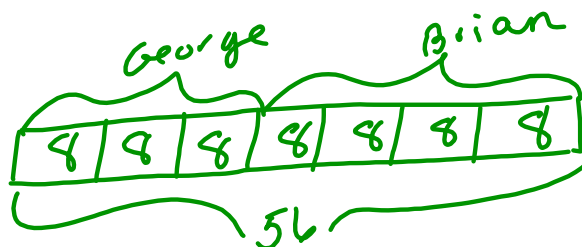
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Lesson 3: Writing Products as Sums and Sums as Products

Classwork

Opening Exercise

Solve the problem using a tape diagram. A sum of money was shared between George and Brian in a ratio of 3:4. If the sum of money was $56.00, how much did George get?

$G \quad B$
$3x, 4x$

George
Brian
8 | 8 | 8 | 8 | 8 | 8 | 8
56

George = 24
Brian = 32

a) $\underline{3+2}$

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Example 1

Represent $x + 2$ using a tape diagram.

x | 1 1 1

or

x | 2
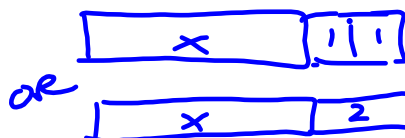
Draw a rectangular array for $3(x + 2)$.

$3x + 6$
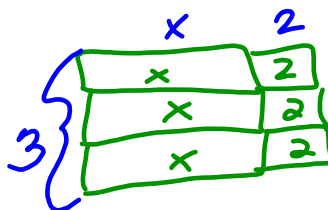
Distribute

x	2
x	2
x	2

3

$= 3x + 6$

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4

Key Terms

Distributive Property: The distributive property can be written as the identity
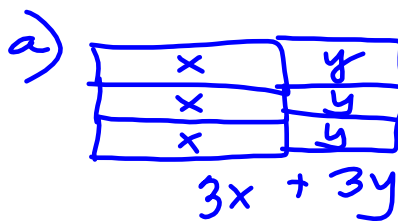
$$a(b + c) = ab + ac \text{ for all numbers } a, b, \text{ and } c.$$

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Example 2

Draw a tape diagram to represent each expression.

a. $(x + y) + (x + y) + (x + y)$

a)

x	y
x	y
x	y

$3x + 3y$

b. $(x + x + x) + (y + y + y)$

$3x + 3y$

c. $3(x + y)$

$3x + 3y$

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Example 3

Find an equivalent expression by applying the distributive property to the expression:

$$5(8x + 3).$$

$$40x + 15$$

$8x$	3
$8x$	3
$8x$	3
$8x$	3
$8x$	3

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Exercise 1

Apply the distributive property to expand each expression.

a. $2(x + 1)$

$$2x + 2$$

b. $10(2c + 5)$

$$20c + 50$$

c. $3(4f - 1)$

$$12f - 3$$

d. $9(-3r - 11)$

$$-27r - 99$$

	x	$+1$
2	$2x$	$+2$

	$4f$	-1
3	$12f$	-3

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Expand

$$4(x + y + z) = 4x + 4y + 4z$$

Jan 3-10:10 AM

Example 4

Rewrite the expression $(6x + 15) \div 3$ in standard form using the distributive property.

$$\frac{6x}{3} + \frac{15}{3}$$

$$2x + 5$$

$$(6x + 15) \cdot \frac{1}{3}$$

$$\frac{1}{3}(6x + 15)$$

$$2x + 5$$

$$\frac{3}{1} \qquad \text{flip} \qquad \frac{1}{3}$$

1

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Exercise 3

Rewrite the expressions as a sum.

e. $(2b + 12) \div 2$

$$\frac{2b}{2} \quad \frac{12}{2}$$

$$\frac{2b}{2} + \frac{12}{2}$$

$$6 + 6$$

f. $(20r - 8) \div 4$

$$\frac{20r}{4} - \frac{8}{4}$$

$$5r - 2$$

g. $(49g - 7) \div 7$

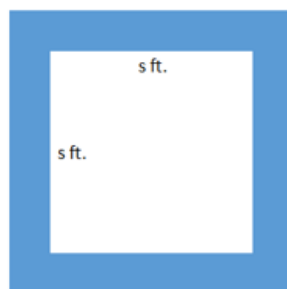$$\frac{49g}{7} - \frac{7}{7}$$

$$7g - 1$$

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Example 5

A square fountain area with side length s ft. is bordered by a single row of square tiles as shown. Express the total number of tiles needed in terms of s three different ways.
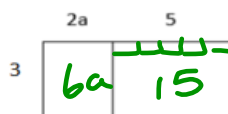
s ft.

s ft.

1 ft.

1 ft.

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Homework

1.
    a.   Write two equivalent expressions that represent the rectangular array below.

2a   5

3 | 6a | 15

$3(2a+5)$

$6a+15$

2.   You and your friend made up a basketball shooting game. Every shot made from the free throw line is worth 3 points, and every shot made from the half-court mark is worth 6 points. Write an equation that represents the total amount of points, P, if f represents the number of shots made from the free throw line, and h represents the number of shots made from half-court. Explain the equation in words.

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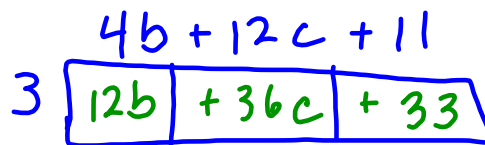3.   Use a rectangular array to write the products in standard form.
    a. $2(x+10)$

$2x+20$

x   +10

2 | 2x | 20
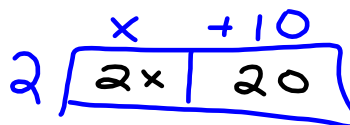
    b. $3(4b+12c+11)$

$12b+36c+33$

$4b+12c+11$

3 | 12b | +36c | +33

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4. Use the distributive property to write the products in standard form.

    a. $3(2x - 1)$

    $6x - 3$

    b. $10(b + 4c)$

    $10b + 40c$

    c. $9(g - 5h)$

    $9g - 45h$

    d. $7(4n - 5m - 2)$

    $28n - 35m - 14$

    e. $a(b + c + 1)$

    $ab + ac + a$

    f. $6(8j - 3l + 9)$

    $48j - 18l + 54$

    g. $(40s + 100t) \div 10$

    $\dfrac{40s}{10} \quad \dfrac{100t}{10}$

    $4s + 10t$

    h. $(48p + 24) \div 6$

    $\dfrac{48p}{6} \quad \dfrac{24}{6}$

    $8p + 4$

    i. $(2b + 12) \div 2$

    $\dfrac{2b}{2} \quad \dfrac{12}{2}$

    $b + 6$

    j. $(20r - 8) \div 4$

    $\dfrac{20r}{4} \quad \dfrac{8}{4}$

    $5r - 2$

    k. $(49g - 7) \div 7$

    $\dfrac{49g}{7} \quad \dfrac{7}{7}$

    $7g - 1$

    l. $(14g + 22h) \div \frac{1}{2}$

    $\dfrac{14g}{\frac{1}{2}} \quad \dfrac{22h}{\frac{1}{2}}$

    $2(14g) + 2(22h) = 28g + 44h$

5. Write the expression in standard form by expanding and collecting like terms.

    a. $4(8m - 7n) + 6(3n - 4m)$

    b. $9(r - s) + 5(2r - 2s)$

    c. $12(1 - 3g) + 8(g + f)$

Relevant Vocabulary

An Expression in Expanded Form: An expression that is written as sums (and/or differences) of products whose factors are numbers, variables, or variables raised to whole number powers is said to be in *expanded form*. A single number, variable, or a single product of numbers and/or variables is also considered to be in expanded form. Examples of expressions in expanded form include: $324, 3x, 5x + 3 - 40, x + 2x + 3x$, etc.

Term: Each summand of an expression in expanded form is called a *term*. For example, the expression $2x + 3x + 5$ consists of 3 terms: $2x, 3x$, and 5.

Coefficient of the Term: The number found by multiplying just the numbers in a term together. For example, given the product $2 \cdot x \cdot 4$, its equivalent term is $8x$. The number 8 is called the coefficient of the term $8x$.

An Expression in Standard Form: An expression in expanded form with all its like terms collected is said to be in standard form. For example, $2x + 3x + 5$ *is an expression written in expanded form; however, to be written in standard form, the like-terms* $2x$ *and* $3x$ *must be combined. The equivalent expression* $5x + 5$ *is written in standard form.*

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Lesson Summary

- Rewrite subtraction as adding the opposite before using any order, any grouping.
- Rewrite division as multiplying by the reciprocal before using any order, any grouping.
- The opposite of a sum is the sum of its opposites.
- Division is equivalent to multiplying by the reciprocal.

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3. Write each expression in standard form. Verify that your expression is equivalent to the one given by evaluating both expressions for the given value of the variable.

a. $-3(8x)$;	b. $5 \cdot k \cdot (-7)$;	c. $2(-6x) \cdot 2$;
d. $-3(8x) + 6(4x)$;	e. $8(5m) + 2(3m)$;	f. $-6(2v) + 3a(3)$;

$$f) -6(2v) + 3a(3)$$
$$-12v + 9a$$

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4. Write each expression in standard form. Verify that your expression is equivalent to the one given by evaluating both expressions for the given value of the variable.

a. $8x \div 2$;	b. $18w \div 6$;	c. $25r \div 5r$;
d. $33y \div 11y$;	e. $56k \div 2k$;	f. $24xy \div 6y$;

$$f) \frac{24 xy}{6y} = 4x$$

$$c) \frac{25r}{5r} = 5$$

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5. Write each word problem in standard form as an expression.

   a. Find the sum of $-3x$ and $8x$.

   b. Find the sum of $-7g$ and $4g + 2$.

   c. Find the difference when $6h$ is subtracted from $2h - 4$.

   d. Find the difference when $-3n - 7$ is subtracted from $n + 4$.

   e. Find the result when $13v + 2$ is subtracted from $11 + 5v$.   1st

   f. Find the result when $-18m - 4$ is added to $4m - 14$.

   g. What is the result when $-2x + 9$ is taken away from $-7x + 2$?

$$e) \quad (11 + 5v) - (13v + 2)$$
$$+ (-13v - 2)$$
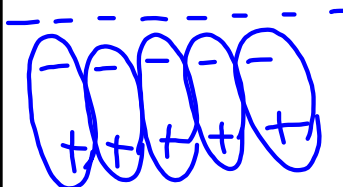
$$9 - 8v \qquad 9 + (-8v)$$

$$-8v + 9$$

6. Marty and Stewart are stuffing envelopes with index cards. They are putting x index cards in each envelope. When they are finished, Marty has 15 envelopes and 4 extra index cards, and Stewart has 12 envelopes and 6 extra index cards. Write an expression in standard form that represents the number of index cards the boys started with. Explain what your expression means. $(15e + 4) + (12e + 6) = 10 + 27e$

7. The area of the pictured rectangle below is $24b$ ft². Its width is $2b$ ft. Find the height of the rectangle and name any properties used with the appropriate step.

$2b$ ft

12 ft $24b$ ft²
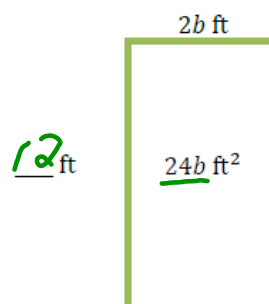
Lesson 3: Writing Products as Sums and Sums as Products
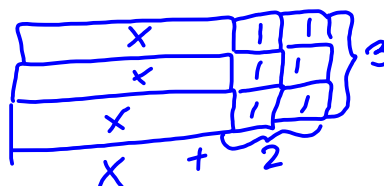
Classwork

Opening Exercise

Solve the problem using a tape diagram. A sum of money was shared between George and Brian in a ratio of $3:4$. If the sum of money was $56.00, how much did George get?

Jan 16-8:55 AM

Example 1

- Represent $3 + 2$ using squares for units.

- Represent $x + 2$ using the same size square for a unit as above.

- Draw a rectangular array for $3(3 + 2)$.

- Draw an array for 3(x+2)

$3x + 6$

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Key Terms

Distributive Property: The distributive property can be written as the identity:

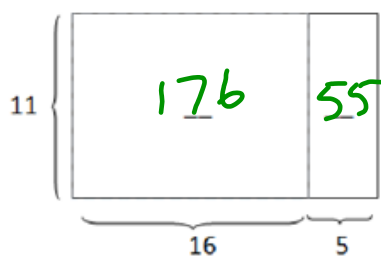$$a(b + c) = ab + ac \text{ for all numbers } a, b, \text{ and } c.$$

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

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Exercise 1

Fill in the blanks.

$$
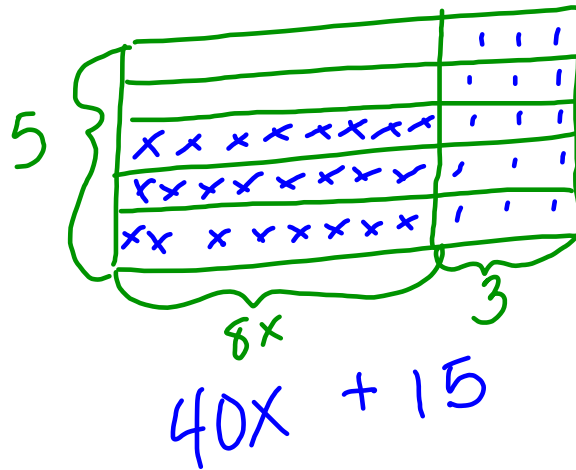\begin{array}{r}
11 \\
\times\ 16 \\
\hline
176
\end{array}
$$

$11\ \{$ 176   55

16   5

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Example 3

Find an equivalent expression by modeling with a rectangular array and applying the distributive property $5(8x + 3)$.

$$40x + 15$$

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Exercise 2

For parts (a) and (b), draw a model for each expression and apply the distributive property to expand each expression. Substitute the given numerical values to demonstrate equivalency.

a. $2(x + 1)$,

$$2(x + 1) = 2x + 2$$

b. $10(2c + 5)$,

$$10(2c + 5) = 20c + 50$$

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For parts (c) and (d), apply the distributive property. Substitute the given numerical values to demonstrate equivalency.

c. $3(4f - 1)$, *two*

$$12f - 3$$

$$3 \boxed{\begin{array}{|c|c|} 12f & -3 \end{array}}$$
$$4f \quad -1$$

d. $9(-3r - 11)$, *true*

$$-27r - 99$$

$$9 \boxed{\begin{array}{|c|c|} -27r & -99 \end{array}}$$
$$-3r \quad -11$$

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Example 4

Rewrite the expression, $(6x + 15) \div 3$, as a sum using the distributive property.

Rewrite $\div 3$ as $\times \frac{1}{3}$ $(6x + 15) \times \frac{1}{3}$

Distribute $(6x)\frac{1}{3} + (15)\frac{1}{3}$

Multiply $2x + 5$

$$(6x + 15) \div 3$$

$$\frac{6x}{3} + \frac{15}{3}$$

$$2x + 5$$

$$3 \boxed{\begin{array}{|c|c|} 6x & + 15 \end{array}}$$
$$2x \quad\quad 5$$

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Exercise 3

Rewrite the expressions as a sum.

e. $(2b + 12) \div 2$

$\dfrac{2b}{2} \quad \dfrac{12}{2}$

$b + 6$

$2 \;\boxed{2b \;|\; +12}$
$\quad\quad 1b \quad 6$

f. $(20r - 8) \div 4$

$\dfrac{20r}{4} \quad \dfrac{8}{4}$

$5r - 2$

$4 \;\boxed{20r \;|\; -8}$
$\quad\quad 5r \quad -2$

g. $(49g - 7) \div 7$

$\dfrac{49g}{7} \quad \dfrac{7}{7}$

$7g - 1$

$7 \;\boxed{49g \;|\; -7}$
$\quad\quad 7g \quad -1$

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Example 5

Expand the expression $4(x + y + z)$.

$4x + 4y + 4z$

$4 \;\boxed{4x \;|\; 4y \;|\; 4z}$
$\quad\quad x + y + z$

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Exercise 4

Expand the expression from a product to a sum so as to remove grouping symbols using an area model and the repeated use of distributive property: $3(x + 2y + 5z)$.

$$3x + 6y + 15z$$

3	$3x$	$6y$	$15z$
	x	$2y$	$5z$

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Example 6

A square fountain area with side length s is bordered by a single row of square tiles as shown. Express the total number of tiles needed in terms of s three different ways.

1 ft.
1 ft.

$$s + s + s + s + 4$$

$$4s + 4$$

$$4(s + 1)$$
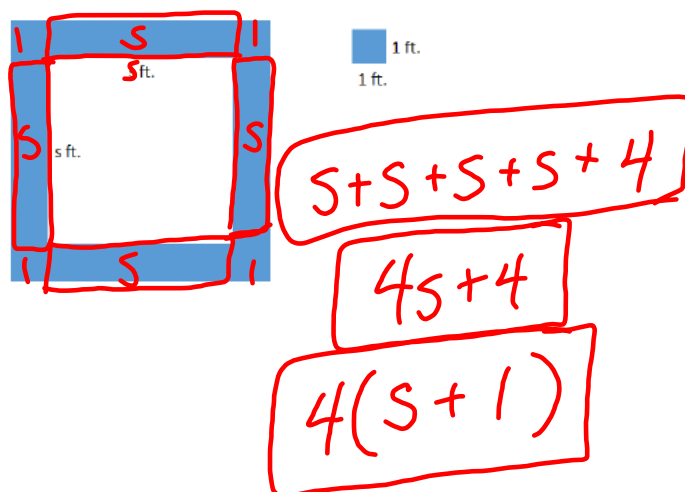
Jan 16-8:56 AM

Problem Set

1.
  a. Write two equivalent expressions that represent the rectangular array below.

         2a   5

3 | $6a$ | 15

$6a + 15$

  b. Verify informally that the two equations are equivalent using substitution.

2. You and your friend made up a basketball shooting game. Every shot made from the free throw line is worth 3 points, and every shot made from the half-court mark is worth 6 points. Write an equation that represents the total amount of points, P, if f represents the number of shots made from the free throw line, and h represents the number of shots made from half-court. Explain the equation in words.

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3. Use a rectangular array to write the products as sums.

  a. $2(x + 10)$
  b. $3(4b + 12c + 11)$

4. Use the distributive property to write the products as sums.

  a. $3(2x - 1)$ $6x - 3$ g. $(40s + 100t) \div 10$
  b. $10(b + 4c)$ $10b + 40c$ h. $(48p + 24) \div 6$
  c. $9(g - 5h)$ $9g - 45h$ i. $(2b + 12) \div 2$
  d. $7(4n - 5m - 2)$ j. $(20r - 8) \div 4$
  e. $a(b + c + 1)$ k. $(49g - 7) \div 7$
  f. $(8j - 3l + 9)6$ l. $(14g + 22h) \div \frac{1}{2}$

5. Write the expression in standard form by expanding and collecting like terms.

a. $4(8m - 7n) + 6(3n - 4m)$

b. $9(r - s) + 5(2r - 2s)$

c. $12(1 - 3g) + 8(g + f)$

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