



Helping With Math

The Distributive Property and Algebraic Expressions

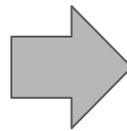
GRADE 6



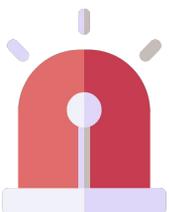
Distributive property holds that multiplying the sum/difference of two or more quantity by a number is equal to multiplying each quantity separately by the number and then adding/subtracting the products together.

DISTRIBUTIVE PROPERTY

$$a(b+c) = ac + bc$$

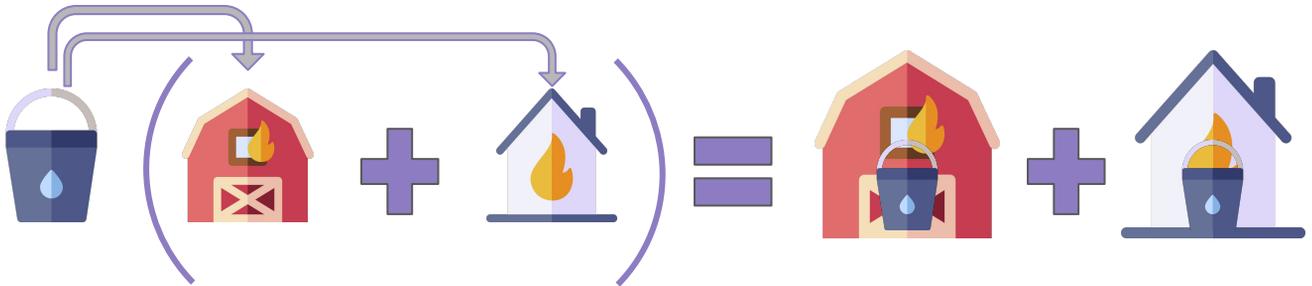


The distributive property states that the product of an expression and a sum is equal to the sum of the products of the expression and each term in the sum.



DEFINITION OF TERMS

Distribute means...



When you distribute something to each person or thing,

you give that thing to each person or thing.

ILLUSTRATIVE EXAMPLES

For example,

$$\begin{aligned}2(5 + 3) &= (2 \times 5) + (2 \times 3) \\2(8) &= 10 + 6 \\16 &= 16\end{aligned}$$



Notice that we distribute 2 to 5 and 3. That means multiplying 2 to 5 and 3, then we get the sum which is 16.

$$\begin{aligned}4(x + y) &= (4)(x) + (4)(y) \\&= 4x + 4y \\4(x + y) &= 4x + 4y\end{aligned}$$



Notice that we distribute 4 to x and 2. That means multiplying 4 to x and 2, then we get the sum which is 4x + 8.

$$\begin{aligned}4(x - 2) &= (4)(x) - (4)(2) \\&= \boxed{} \\4(x - 2) &= \boxed{}\end{aligned}$$



Explain your answer.



WORD PROBLEMS



Kurt, a probationary firefighter is x years old. His brother, Kian who is a paramedic firefighter, is 2 years older than Kurt. Their uncle, Mario who is the fire chief, is four times as old as Kian. Write and simplify an expression that represents Mario's age in years.

| Name | Description | Algebraic Expression |
|-------|----------------------------------|----------------------|
| Kurt | He is x years old. | x |
| Kian | He is 2 years older than Kurt. | $x + 2$ |
| Mario | He is four times as old as Kian. | $4(x + 2)$ |

SOLUTION:



To represent Mario's age in years, we need to use our understanding of distributive property and algebraic expressions. Thus,

$$\begin{aligned}4(x + 2) &= (4)(x) + (4)(2) \\ &= 4x + 8\end{aligned}$$

Mario's age in years is represented by the algebraic expression $4x + 8$.



TABLE OF ACTIVITIES

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9. Fire Incidents
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THE FIREFIGHTERS

Here are heroic firefighters of your town! Help them on their task by writing algebraic expressions using the distributive property.

1. A number is multiplied to the sum of three and ten.



2. X times the difference of seven and 2.



3. The product of five times the sum of x and y.



4. The result of a being multiplied to the sum of b, c, and d.



5. When p is multiplied to difference of three and x.



6. Eleven times x minus seventeen.



DEALING WITH FIRE EXPLOSIVES

These are objects that you need to watch out because this will cause fire! Alongside, simplify the following expressions using the distributive property. Show your complete solution.

1. $x(a + 3)$

2. $0.5(m - n)$



3. $\frac{1}{4}(c + 2)$

5. $10(x + 30)$

4. $m(p - 1.5)$



Essay. Why is it important to know the things that can cause fire at your house? Give three reasons.

1. _____
2. _____
3. _____



THE EMERGENCY RESPONSE TEAM

This is the emergency response team of your town. Your neighbor just reported a fire incident while you are doing your homework in math. You are now answering the question: "Which of the following expressions do not require distributive property?" Why?



These are the algebraic expressions.

1. $x(3-y)$

2. $9x - 5 + 2x$

3. $-3 + (x+1)$

4. $(2m - 4)(8)$

5. $x + (a + b + c)$

6. $x(a+b) + c$

7. $(6y)(2)$

8. $(t + s) - 7$

Answer sheet:

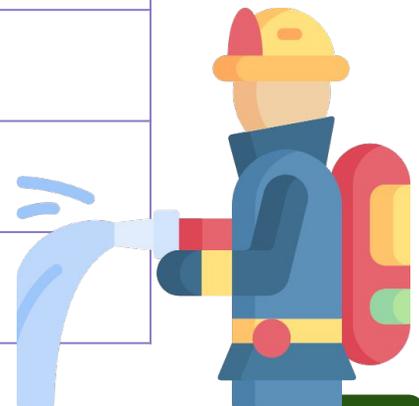


THE HOUSES ARE ON FIRE

Oh no! The houses are on fire! Quick and help the firefighters to ease the fire by simplifying the following algebraic expressions.

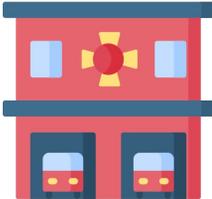
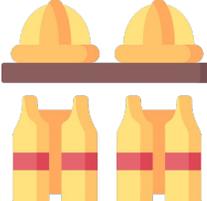


| | |
|----------------------------------|--|
| 1. $2(a + b + c)$ | |
| 2. $x(4 - y + z)$ | |
| 3. $-3(b + 2y + 9)$ | |
| 4. $-6(k + 2r - 7m)$ | |
| 5. $-1(3 + x - 8)$ | |
| 6. $10(\frac{1}{2}n + 2.5p - 1)$ | |
| 7. $5m(a + 3q - 2c)$ | |



THE FIRE DEPARTMENT

Let us welcome the Fire Department! As you get familiarized with them, simplify the following algebraic expressions then identify the number of terms, coefficients, and constant. The first one is done for you.

| | |
|--|--|
| <p>Example: $3(d - 4)$ $3(d - 4) = (3)(d) - (3)(4)$ $= 3d - 12$</p> | <p>Number of terms: 2 Coefficient: 3 Constant: -12</p>  |
| <p>1. $-6(x + 5)$</p> | <p>Number of terms: Coefficient: Constant:</p> |
| <p>2. $x(-3 + 7)$</p> | <p>Number of terms: Coefficient: Constant:</p> |
| <p>3. $(m + 8)(-12)$</p> | <p>Number of terms: Coefficient: Constant:</p> |
| <p>4. $2(x + y - 5)$</p> | <p>Number of terms: Coefficient: Constant:</p> |
| <p>5. $-1(r - t - 2)$</p>  | <p>Number of terms: Coefficient: Constant:</p>  |



FIREFIGHTER TOOLS AND EQUIPMENT

Get familiarized with tools and equipments being used by a firefighter. Also, simplify the following algebraic expressions using the distributive property. Combine like terms if necessary.

Example: $3(m - n) + 2(3m + 4n)$

$$\begin{aligned} 3(m - n) + 2(3m + 4n) &= (3)(m) - (3)(n) + (2)(3m) + (2)(4n) \\ &= 3m - 3n + 6m + 8n \end{aligned}$$

(Combine like terms) $= 3m + 6m + 8n - 3n$

(Simplify) $= \underline{\mathbf{9m + 5n}}$

1. $4(x + 5) + (x + 5)$



2. $3(x + 2) + 6(x + 1)$



3. $8(a + 4) + 2(a + 2)$



4. $10r(2 + 7) + 2r$



5. $\frac{1}{2}(2x + 1) + (x + 1)$



6. $8x(4) + 7(x + 3)$



THE EMERGENCY PLAN

Look at the emergency plan of the fire department. Also, simplify the following expressions using the distributive property.



1. $3x - 5(x - 1)$



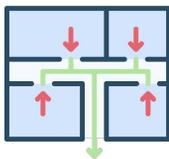
2. $2(x - 7) + 2(6x - 2)$



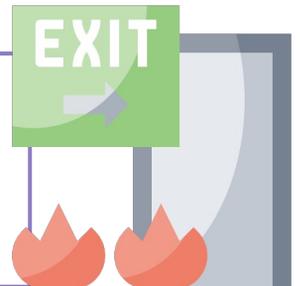
3. $12(a - 10) - 8(a - 3)$



4. $-1(b - 14) + 4(7b - 1)$

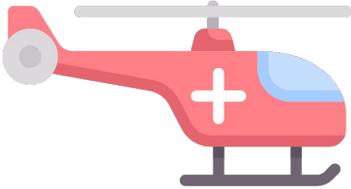


5. $2(p - 1) + 3(9p - 20)$



CALLING 911

Many people are calling 911 to report some fire incidents. Help them reach out as you solve the following given. Simplify using the distributive property.

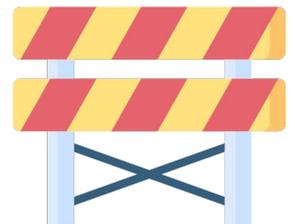
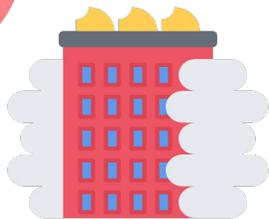


1. $5(x - 3) + 2(4 - 3x)$

2. $20(2m - 400) - 72(m + 20)$

3. $150(35 - r) + 38(13r + 25) + 15$

4. $200(10 - 500x) - 3(x - 200) - 105$

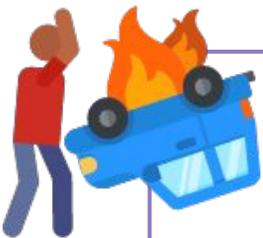


FIRE INCIDENTS

Oh no! There are fire incidents being reported today. What do you think happened? Also, analyze what went wrong with the following solutions then correct it.



$$\begin{aligned} & 15(m - n) + 3(2n - m) \\ &= 15m - n + 6n - m \\ &= 15m - m + 6n - n \\ &= 14m + 5n \end{aligned}$$



$$\begin{aligned} & 2m - n(3+2) \\ &= 2m - 3n + 2 \\ &= -n + 2 \end{aligned}$$



Essay. Last August 4, 2020, an explosion happened at the Port of Beirut, Lebanon when nearly 3,000 tons of ammonium nitrate blew up, resulting to a shock wave that killed nearly 200 people and caused widespread damage. In your opinion, can this major incident be avoided in the future? How?



FIREFIGHTERS LIVES

Here are some firefighters' stories. Solve them using your understanding of the distributive property.

1. Mr. Scott is a firefighter officer for x years. Mr. Lance started becoming a firefighter officer five years before Mr. Scott. Mr. Redd, a senior officer, started three times the years of service of Mr. Lance. Represent Mr. Redd's years of service.



Solution:



2. As part of their training and keeping themselves fit and healthy, firefighters for three days, run on a treadmill for r minutes and lift weights for 15 minutes. Write an algebraic expression that represents the given situation.

Solution:

Write a thank you letter to our fire heroes--- firefighters. What do you want to say to them?



ANSWER GUIDE

Activity 1

- | | |
|----------------|-------------------|
| 1. $x(3 + 10)$ | 4. $a(b + c + d)$ |
| 2. $x(7 - 2)$ | 5. $p(3 - x)$ |
| 3. $5(x + y)$ | 6. $11(x - 17)$ |

Activity 2

- | | |
|---------------------------------|---------------------|
| 1. $ax + 3x$ | 4. $mp - 1.5m$ |
| 2. $0.5m - 0.5n$ | 5. $10x + 300$ |
| 3. $\frac{1}{4}c + \frac{1}{2}$ | 6. Answers may vary |

Activity 3

1. Yes
2. No, it just needs addition
3. No, it just needs simple addition
4. Yes
5. No, it just needs simple addition
6. Yes
7. No, it just needs simple multiplication
8. No, it just needs simple subtraction

Activity 4

- | | | |
|--------------------|----------------------|-----------------------|
| 1. $2a + 2b + 2c$ | 4. $-6k - 12r + 42m$ | |
| 2. $4x - xy + xz$ | 5. $-x - 5$ | 7. $5am + 15mq - 10a$ |
| 3. $-3b - 6y - 27$ | 6. $5n + 25p - 10$ | |



ANSWER GUIDE

Activity 5

1. $-6x - 30$; $T = 2$, $C = -6$, $Co = -30$
2. $-3x - 21$; $T = 2$, $C = -3$, $Co = -21$
3. $-12m - 96$; $T = 2$, $C = -12$, $Co = -96$
4. $2x + 2y - 10$; $T = 3$, $C = 2$, $Co = -10$
5. $-r + t + 2$; $T = 3$, $C = -1, 1$, $Co = 2$

Activity 6

1. $5x + 25$
2. $9x + 12$
3. $12a + 36$
4. $92r$
5. $2x + 1.5$
6. $39x + 21$

Activity 7

1. $-2x + 1$
2. $4a - 124$
3. $27b + 10$
4. $27b + 10$
5. $29p - 62$

Activity 8

1. $-x - 7$
2. $-32m - 8144$
3. $344r + 6215$
4. $-100, 003x + 2615$



ANSWER GUIDE

Activity 9

1. 15 was only distributed to m and not on $-n$
6 was only distributed to n and not on $-m$
The answer should be $12m - 9n$.
2. $-n$ was not distributed to 2.
The answer should be $-5m + 2n$

Activity 10

1. $3x + 15$ years of service
2. $3r + 45$ minutes of training
3. Answers may vary



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