

Groups Act Together

See repeated expressions as one useful quantity.

HIGH SCHOOL • MA.912.AR.1.1

MA.912.AR.1.1 "Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of its parts as a single entity."

NAME _____

DATE _____

NAME THE WHOLE GROUP

When a group of terms repeats, you can treat the entire group as one quantity, such as u . Replace every matching group with u , simplify if needed, then connect u back to what it means in the situation.

WORKED EXAMPLE

A game store models the cost of 9 custom controllers by $C=9(4+p)+7$, where p is the cost of a design on one controller. Let $u=4+p$. Rewrite C using u and interpret u .

1. Let $u=4+p$.
2. Replace $4+p$ with u : $C=9u+7$.
3. u represents the cost of one customized controller before the delivery fee.

Answer: $C=9u+7$; u is the cost of one customized controller before the \$7 delivery fee.

PRACTICE 6 problems

- 1** Let $u=x+3$. Rewrite $5(x+3)$ using u .

ANSWER _____

- 2** Let $u=3x-1$. Rewrite $12-2(3x-1)$ using u .

ANSWER _____

- 3** A parking pass costs $C=6d+15$ dollars, where d is the number of days. What does $6d$ represent? What does 15 represent?

ANSWER _____

- 4** A rectangle has perimeter $P=2(l+w)$. What does $l+w$ represent? What does $2(l+w)$ represent?

ANSWER _____

- 5** Let $u=x+5$. Rewrite $(x+5)^2-8(x+5)$ using u .

ANSWER _____

- 6** The equation is $3(2x+11)=30$. Let $u=2x+11$. Rewrite the equation in u . Then solve for u .

ANSWER _____

APPLY IT Show your work

- 1** A student orders 3 custom phone cases. Each case costs h dollars plus a \$6 design charge. Delivery costs \$12, so $T=3(h+6)+12$. What does $h+6$ represent? If $h=14$, find T .

WORK SPACE

ANSWER _____

- 2** For an esports fundraiser, 8 teams each collect t dollars. Each team spends \$2 on supplies, and the club spends \$20 on posters. Net earnings are $R=8(t-2)-20$. What does $t-2$ represent? If $t=11$, find R .

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A school store models net income by $N=6(x-2)+5(x-2)-3$, where x is the dollars earned from one item before a \$2 cost. Let $u=x-2$. Rewrite and simplify N using u . Then write an equivalent expression in x and explain what $x-2$ means.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let $u=x+3$. Rewrite $5(x+3)$ using u .	$5u$
2	Let $u=3x-1$. Rewrite $12-2(3x-1)$ using u .	$12-2u$
3	A parking pass costs $C=6d+15$ dollars, where d is the number of days. What does $6d$ represent? What does 15 represent?	$6d$ is the cost for d days at \$6 per day; 15 is a \$15 fixed fee.
4	A rectangle has perimeter $P=2(l+w)$. What does $l+w$ represent? What does $2(l+w)$ represent?	$l+w$ is the sum of one length and one width; $2(l+w)$ is the rectangle's perimeter.
5	Let $u=x+5$. Rewrite $(x+5)^2-8(x+5)$ using u .	u^2-8u
6	The equation is $3(2x+11)=30$. Let $u=2x+11$. Rewrite the equation in u . Then solve for u .	$3u=30$; $u=10$

PART 2 · APPLY IT

- $h+6$ is the cost of one customized phone case; $T=\$72$.** Treat $h+6$ as the cost of one case with its design charge. Substitute $h=14$: $T=3(14+6)+12=72$.
- $t-2$ is the net amount collected by one team after supplies; $R=\$52$.** Treat $t-2$ as one team's amount after its supply cost. Substitute $t=11$: $R=8(11-2)-20=52$.

CHALLENGE

$N=11u-3$; $N=11x-25$; $x-2$ is the net income from one item after the \$2 cost.

Accept equivalent forms such as $11(x-2)-3$ for the challenge before expansion. For interpretation responses, require that students identify both the grouped quantity and its meaning in the stated context.