# Activity 4: Now You See Me



### CATEGORY: ALGEBRA

**DOMAIN : SEEING STRUCTURE IN EXPRESSIONS**

**Interpret the structure of expressions.**

1. Interpret expressions that represent a quantity in terms of its context.
	1. Interpret parts of an expression, such as terms, factors, and coefficients.
	2. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P\left(1+r\right)^{n}$ as the product of *P* and a factor not depending on *P*.
2. Use the structure of an expression to identify ways to rewrite it. For example, see

 $x^{4}-y^{4}$ as $\left(x^{2}\right)^{2}-\left(y^{2}\right)^{2}$, thus recognizing it as a difference of squares that can be factored as $\left(x^{2}-y^{2}\right)\left(x^{2}+y^{2}\right)$.

### LEARNING OBJECTIVES

Students will be able to identify the different parts of the expression and explain their meaning within the context of a problem. Students will also be able to decompose expressions and make sense of the multiple factors and terms by explaining the meaning of the individual parts. Finally, students will be able to rewrite algebraic expressions in different equivalent forms, such as factoring or combining like terms.

### Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

### Activity 4 : Getting Started

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### GETTING STARTED

In English, we have many different ways of saying the same thing. "Come here!" and "Come over here!" and "Come over to my house!" all may mean the same thing, but it's important to be able to know which one to use. Well, if you want someone to come to your house, then any of those will probably work.

Math works much the same way. Writing mathematical expressions in different ways is incredibly important, especially in algebra. It's not about redundancy; it's about simplicity. For example, a company uses two different-sized trucks to deliver sand. The first truck can transport x cubic meters per trip, and the second y liters per trip. The first truck makes *S* trips to a job site, while the second makes *T* trips. What quantities do the following expressions represent in terms of the problem's context?

1. *S* + *T*
2. $x+y$
3. $xS+yT$
4. $\frac{xS+yT}{S+T}$

### UNDERSTAND

5. Suppose$f\left(x\right)=\left(x-4\right)\left(x-2\right)\left(x^{2}-1\right)+412$

* 1. Find $f\left(4\right)$.
	2. List four values of $x$ for which $f\left(4\right)=$ 412
1. Find a nonconstant polynomial (in any form) that agrees with the table at the right.

|  |  |
| --- | --- |
| $$x$$ | $$f\left(x\right)$$ |
| 1 | 0 |
| 3 | 0 |
| 6 | 0 |

1. Terry, Sherri, and Mary are triplets who love math. They all wanted to find a function that describes the table below.

|  |  |
| --- | --- |
| $$x$$ | $$f\left(x\right)$$ |
| 0 | 0 |
| 1 | 3 |
| 2 | 8 |
| 3 | 15 |
| 4 | 24 |
| 5 | 35 |

**Activity 4: Getting Started**

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Terry saw that each output is the input times two more than the input.

She wrote: $t\left(x\right)=x\left(x+2\right)$. Sherri noticed that the outputs are 1 less than a perfect square and the number that is squared is one more than the input. She wrote: $s\left(x\right)=x\left(x+1\right)^{2}-1$. Mary noticed that if she squared the input and subtracted the answer from the output, the difference was twice the input, so she wrote: $m\left(x\right)=x^{2}+2x$. Is Terry’s rule equivalent to Sherri’s rule and Mary’s rule?

### PRACTICE

1. Suppose A and B are the sizes of two different classes at a local high school, where A > B. In the following sub-questions, say which of the pair is greater. Explain your reasoning in terms of the two populations.
	1. *A* + *B* and 2*A*
	2. $\frac{A}{A+B}$ and $\frac{A+B}{2}$
	3. $\left(B-A\right)/ $2 and *B* – *A* / 2
	4. *A* + 35*C and B* + 35*C*
	5. $\frac{A}{A+B}$ and 0.5
	6. $\frac{A}{B}$ and $\frac{B}{A}$

### EXTEND

1. Find the complex number *z* that satisfies $z\left(2-i\right)=21+i$