Unit 6 Summary

Prior Learning

Grades 1–5
- Basic operations ($+$, $-$, $\times$, $\div$)
- Operations with grouping symbols
- Graphing positive numbers
- Powers of 10

Math 6
- Dividing fractions (Unit 4)
- Decimal operations (Unit 5)

Math 6, Unit 6

- Solving equations
- Equivalent expressions
- Expressions involving exponents
- Introduction to representing relationships

Future Learning

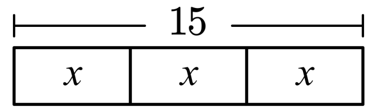
Math 6, Unit 7
- Graphing with positive and negative numbers

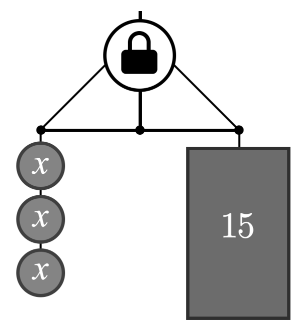
Math 7
- Proportional relationships
- Solving more complex equations
- Factoring and expanding expressions

Solving Equations

A *solution* is a value of a variable that makes an equation true.

Tape diagrams and hangers can help us make sense of equations. Here is a tape diagram and a hanger that show the equation $3x = 15$.





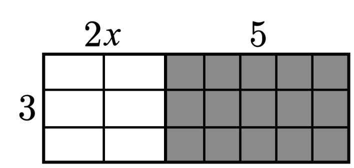
Solving an equation is the process of determining a solution.
In the equation $3x = 15$, the solution is $x = 5$ because $3(5) = 15$.

Replacing x with 5 in the hanger will keep the hanger balanced.

Equivalent Expressions

Equivalent expressions are different ways of describing the same quantity.
$x + x + x$ is equivalent to $3x$ because they both describe three copies of an unknown number, x.

The area of this rectangle can be written in two different ways.



$3(2x + 5)$
the length times width

$6x + 15$
the sum of two smaller areas

$$3(2x + 5) = 3(2x) + 3(5) = 6x + 15$$

This is an example of the *distributive property.*

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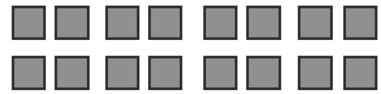
Unit 6.6, Family Resource

Expressions Involving Exponents

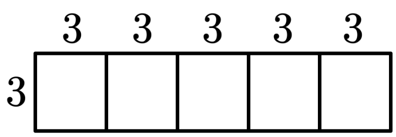
Exponents are a way to describe repeated multiplication.

2^4 is called "2 to the power of 4" or "2 to the fourth".

In 2^4, 2 is called the base and 4 is called the exponent.



$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$



$$5 \cdot 3^2 = 5 \cdot 9 = 45$$

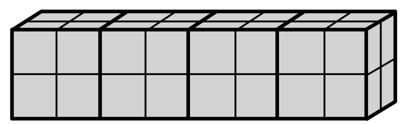
Diagrams can help make sense of expressions that involve exponents and other operations.

For example, $5 \cdot 3^2$ can describe 5 copies of a 3–by–3 square.

Exponents can also appear in expressions with variables.

What is the value of $4x^3$ when $x = 2$?

$$4(2)^3 = 4(2 \cdot 2 \cdot 2) = 4(8) = 32$$



32 unit cubes

Introduction to Representing Relationships

Math can help make sense of the relationship between two different quantities or variables.

Tables, equations, and graphs can each show the same relationship in different ways.

Here is an example:

n = the number of quarters in my pocket $\quad$ v = the value of my quarters (in cents)

Description

Every quarter in my pocket is worth 25 cents.

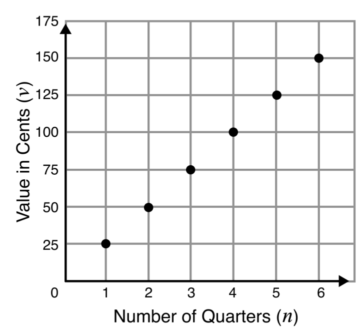
Table

n	v
1	25
2	50
3	75

Equation

$$v = 25n$$

Graph



Try This at Home

Solving Equations

1.1 Determine the solution to each equation. Draw a diagram if it helps you with your thinking.

$x + 2 = 11$ $\qquad$ $2x = 11$ $\qquad$ $x - 11 = 2$

Matias bought 2 plants, which cost $\$11$ total. x represents the cost of each plant.

1.2 Which of the equations above represents this situation? Explain how you know.

1.3 Explain what the solution to the equation means in this situation.

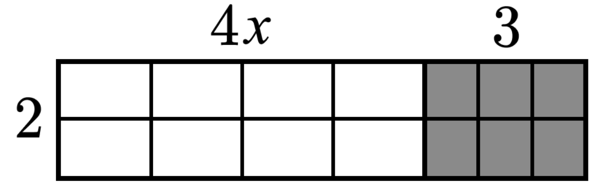
Equivalent Expressions

2. At Kai's pizza shop, they charge $\$4$ for delivery on top of the cost of the pizza.
   How much would the total charge be if the cost of the pizza was:

$\$15?$ $\qquad$ $\$24?$ $\qquad$ d dollars?

3. Select all the expressions that describe the area of this rectangle.

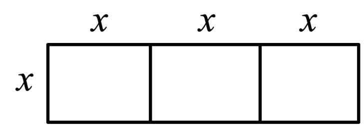
- ☐ $2(4x + 3)$
- ☐ $2(4x + 6)$
- ☐ $8x + 6$
- ☐ $(4x + 3) + (4x + 3)$
- ☐ $6x + 5$



Expressions Involving Exponents

4.1 Which expression represents the diagram on the right?

☐ $3 + x^2$ ☐ $(3 + x)^2$ ☐ $3x^2$



4.2 Determine the value of each expression when $x = 4$.

5. What is $2(4)^3$? Explain how you know.

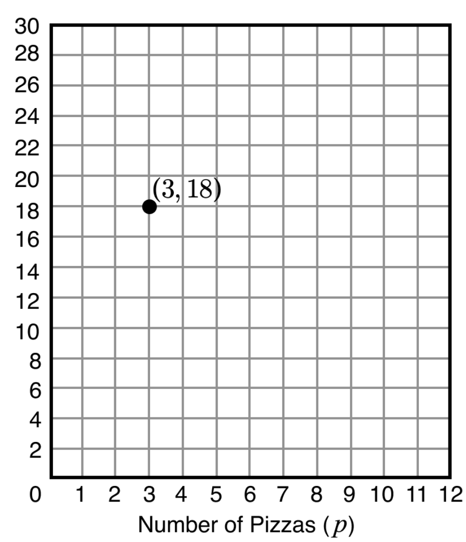
Introduction to Representing Relationships

Kai uses 6 mushrooms on every large Super Mushroom Pizza. They are wondering about the relationship between the number of pizzas made, p, and the number of mushrooms they use, m.

6.1 They started making a graph of the relationship. What does the point $(3, 18)$ mean in Kai's situation?

6.2 Add at least three more points to Kai's graph. Use a table if it helps you with your thinking.

p	m



6.3 Write an equation to represent the relationship between p and m.

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Unit 6.6, Family Resource

Solutions:

1.1 $x = 9$ $x = 5.5$ (or equivalent) $x = 13$

1.2 $2x = 11$

Explanations vary. Since each plant costs the same amount, we are doubling the cost of one plant, which we can show with $2x$.

1.3 *Responses vary.* This means that each plant that Matias bought cost $\$5.50$.

2. $\$19$ $\$28$ $d + 4$

3. ✓ $2(4x + 3)$
✓ $8x + 6$
✓ $(4x + 3) + (4x + 3)$

4.1 ✓ $3x^2$

4.2 $3 + (4)^2 = 3 + 16 = 19$
$(3 + 4)^2 = (7)^2 = (7 \cdot 7) = 49$
$3(4)^2 = 3(4 \cdot 4) = 3(16) = 48$

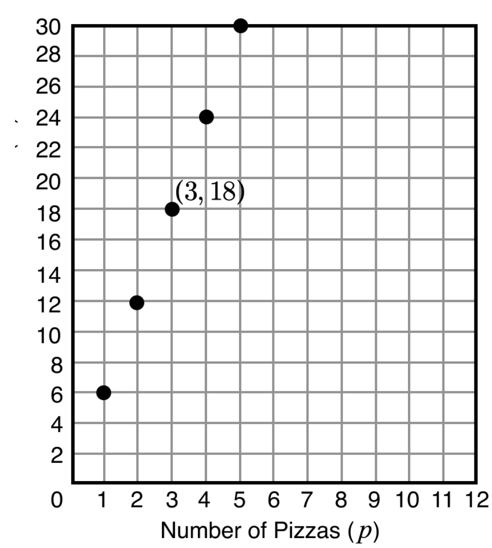
5. $2(4)^3 = 128$.

Explanations vary. Any number to the power of 3 is $\# \cdot \# \cdot \#$, so $4^3 = 4 \cdot 4 \cdot 4 = 64$. The 2 in front means that there are two of the 64s and $64 \cdot 2 = 128$.

6.1 *Responses vary.* $(3, 18)$ means that when Kai makes 3 pizzas, they use 18 mushrooms.

6.2 *Responses vary.* See the graph to the right.

p	m
1	6
2	12
4	24



6.3 $m = 6p$