Unit: Patterns & Expressions (D-1, D-2)

(Review B-1 Integers, C-1 Cartesian Plane)

**D-1: Students will be able to continue and explain a pattern as a relation.**

This entire unit is based on PATTERNS. Name at least 3 patterns you noticed when we converted between fractions and decimals. These are number patterns.

10.1 Can you Describe Patterns Using Words?

Patterns: arrangements of shapes, colors, number, letters that have something predictable so that you can tell what comes next if you know the pattern. We say that one part of the pattern RELATES to another part. The parts have a RELATIONSHIP.

Figure: a drawing/shape; figures in a pattern are Figure 1, Figure 2, Figure 3, etc.

Table of Values: two columns that show two sets of numbers. The text calls the numbers “TERMS”.

-the first column is usually the number of the first figure or the first value you

measured EX: time in minutes; your independent variable, graphed on the x-axis

-the second column might be the total number of squares/circles/triangles

in each figure OR the result of some “rule” (add/subtract/multiply/divide)

EX: temperature; your dependent variable; graphed on the y-axis

√ help us “see” patterns (relationships)

√ help us “predict” the next number in a pattern

√ help us make a “rule” (algebraic expression) that shows how to get the

number in the second column from the first column

√ help us organize large amounts of information

√ help us get ordered pairs to graph

**To DESCRIBE a pattern, describe how to get to the next TERM.**

**Can you describe patterns involving figures or numbers? p.354** #3,5-14

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List of Assignments

**Can you describe patterns involving figures or numbers? p.354** #3,5-14

**Can you describe patterns using variables and expressions? p.361 #4-15, 18 (cool)**

**Can you evaluate expressions? p.368 #3,4-14, 16-18, 21**

**p.386 Puzzling Expressions**

**Can you graph linear relations? YOU WILL NEED GRAPH PAPER!!! p. 378 #1-12**

**Chapter Review p.382 #1-16**

**Chapter Test p.384 #1-8**

10.2 Can you Describe Patterns Using Variables & Expressions?

What’s a Variable?

A **variable** is a letter that “stands for” or represents a number. We need variables because the number always changes or varies.

Examples:

\*the number of weeks you get an allowance (choose “w” for the variable weeks)

\*the number of hours you babysit (choose “h” for the variable hours)

\*the number of days you pay to play on online video game (choose “d” for days)

Variable: any letter that “stands for” (represents) a number

-changes (varies)

Constant: a number that you add to OR subtract from a variable

-stays the same (constant)

Coefficient: a number that multiplies the variable

Examples:

-doubling the variable “f” can be written as 2 x f OR just 2f

-tripling the variable “f” can be written as 3 x f OR just 3f

What’s an Expression?

Expression: can be a number by itself Example: 6

can be a variable by itself Example: r

can be a variable with a number

Example: 6r (the number and the variable “r” are being multiplied)

6 – r (the variable “r” is subtracted from the number)

r + 6 (the number is being added to the variable “r”)

5r – 6 (“r” is multiplied by 5 and 6 is subtracted from the result)

r/6 (a fraction is just a division; the variable “r” divided by 6)

Practice Writing Expressions

Write the following real-life situations as expressions:

1. Number of pizzas is the variable. Use the letter \_\_\_\_. Double the number of pizzas because twice as many people are coming. \_\_\_\_\_\_\_\_\_\_
2. Number of guests is the variable. Use the letter \_\_\_\_. Write an expression for the number of guests for today which is “three more guests than yesterday” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Practice Writing Expressions

1)The number of horizontal shelves is the variable. Use the letter\_\_\_\_.

There are 2 more horizontal shelves that are needed.

Write the expression for the total number of shelves needed\_\_\_\_\_\_\_\_\_\_\_\_

2)The number of weeks is the variable. Use the letter \_\_\_\_\_\_\_

Your allowance is $3.00 per week. Write an expression for your

allowance \_\_\_\_\_\_

1. Jaxon buys some cans of vegetable soup (which are all on sale for the same price). The variable is the cost of a can of soup. Use the letter \_\_\_\_\_\_\_He buys 9 cans. Write an expression to describe what he paid for the 9 cans of soup.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Isabella’s age is twice her cousin’s age plus 1. Write an expression for Isabella’s age \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. I will be three times older than my cat plus 2. Write an expression for my age. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. I paid $150.00 to rent a hall for my grandma’s opera performance, and each person paid $5.00 for each plate of food. Write an expression for my total cost \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. For your allowance in question #2, You make an extra $1.00 if you pick the

produce from the garden that week. Write an expression for your

total allowance for the summer weeks. Assume that you pick the produce from

the garden faithfully every week.\_\_\_\_\_\_\_\_\_\_\_\_\_

**D-2: From a relation, students will be able to construct a table of values, graph and analyze it.**

10.3 Can You Evaluate Expressions?

E**valu**ate: substitute a number for the mystery variable. Then calculate to find out what the expression is equal to (its **VALUE**)

Order of Operations

BEDMAS – **B**rackets first then **E**xponents, then

**D**ivision/**M**ultiplication as they appear from left to right, then

**A**ddition/**S**ubtraction as they appear from left to right

Substituting Values for Variables

Substituting is very useful because we can “put” different values in for a variable and calculate what the equation is equal to when that value is substituted.

Example: x + 2; x =9

This is the expression This is the value of the variable you must SUBSTITUTE into the expression

x + 2; x =9

When you substitute 9 in the place of the variable “x”, you get the following:

x + 2

9 + 2

11

We have EVALUATED the expression. Working DOWNWARD like this is very important because soon we will have expressions on BOTH sides of the equal sign (which are called EQUATIONS).

Try this one: m + 3; m = 13

10.4 Can You Graph Linear Relations?

linear: shape of a line

relation: a mathematical equation that shows how two variables are related.

Example: you (Y) and your brother (B) are “related” because you are brothers

plot: to draw a dot on the Cartesian plane at the location of the ordered pair you are given

ordered pairs: a way of writing a location on the Cartesian plane Start at the origin and move left/right on the x-axis.

Then move up/down on the y-axis.

Example (3, 9)

Start at the origin. Move 3 right 9 up

x-axis: the horizontal line on the Cartesian plane

y-axis: the vertical line on the Cartesian plane

3 ways to describe a pattern on a Cartesian Plane (coordinate grid)

See example p.374 Three fish in a tree and a pup in a cup

Describe in words:

“The pattern of points forms a straight line starting at (1,3). When the pattern forms a

line, we say it is LINEAR. The y-coordinate is 3 times larger than the x-coordinate. We

could also say that the y-coordinate is worth 3x”

Describe using horizontal (left/right) and vertical (up/down) distances:

“The points increase by 1 to the right and then 3 units up, starting at (1,3)”

Describe using a relationship (an algebraic expression):

“The number of pups is p. The number of fish is f. The coordinates of the points are now

called (f,p). The relationship between p and f is a line (linear) and can be expressed as

(p, 3p). For an algebraic expression, we could say f = 3p because for every 1 fish there

are 3pups.

Four Different Ways to Show the Same Pattern

\*ordered pairs \*table of values

\*algebraic expression \*graphs

Tables of values can turn into ordered pairs. Ordered pairs can turn into graphs.

Tables of values can turn into “rules” (algebraic expressions). “Rules” (algebraic expressions) can turn into graphs.