

# learning focus:

- ✓ write equations of parallel and perpendicular lines and equations involving direct variation
- ✓ determine effects on the graph of a parent function
- ✓ determine association and make scatter plot predictions

# APPLYING LINEAR RELATIONSHIPS UNIT

## 10 DAY TEKS-ALIGNED UNIT

A collage of educational materials. In the foreground, a clipboard holds a 'Table of Contents' for the 'APPLYING LINEAR RELATIONSHIPS UNIT'. Behind it, a 'PACING GUIDE' for 'APPLYING LINEAR RELATIONSHIPS' is visible, showing a 10-day schedule. To the right, a worksheet titled 'SCATTER PLOTS AND ASSOCIATION' features a scatter plot and text about data association. The background includes colorful sticky notes and a pink folder.

| PAGE  | TOPIC                                      | RESOURCE          |
|-------|--|-------------------|
| 4     | Sample Pacing Guide                        |                   |
| 5-6   | Ideas For Implementation and Helpful Hints | Student Handout 1 |
| 7-15  | Binder Covers, Dividers and Spine Labels   | Homework 1        |
| 17-18 | Direct Variation                           | Student Handout 2 |
| 19    | Direct Variation                           | Homework 2        |
| 21-22 | Equations of Parallel Lines                | Student Handout 3 |
| 23    | Equations of Parallel Lines                | Homework 3        |
| 25-26 | Equations of Perpendicular Lines           | Student Handout 4 |
| 27-28 | Equations of Perpendicular Lines           | Homework 4        |
| 29-30 | Transformations of Linear Functions I      | Student Handout 5 |
| 31    | Transformations of Linear Functions I      | Homework 5        |
| 33-34 | Transformations of Linear Functions II     | Quiz              |
| 35-36 | Transformations of Linear Functions II     | Student Handout 6 |
| 37-38 | Transformations of Linear Relationships    | Homework 6        |

**APPLYING LINEAR RELATIONSHIPS PACING GUIDE**

DAY 1 Direct Variation  
DAY 2 Direct Variation  
DAY 3 Direct Variation  
DAY 4 Direct Variation  
DAY 5 Direct Variation  
DAY 6 Direct Variation  
DAY 7 Direct Variation  
DAY 8 Direct Variation  
DAY 9 Direct Variation  
DAY 10 Direct Variation

**SCATTER PLOTS AND ASSOCIATION**

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

Scatter graphs that use points to display relationships between data and can be useful for observing \_\_\_\_\_ between two variables.

If the shape of the data resembles a line, the association is \_\_\_\_\_.

Types of association:

- POSITIVE**
- NEGATIVE**
- NO ASSOCIATION**

**POSITIVE**  
As **TV GONE SALES** increases, \_\_\_\_\_  
The change in one variable has \_\_\_\_\_ effect on the other.

**NEGATIVE**  
As **PAIRS OF SOCKS OWNED** increases, \_\_\_\_\_  
The change in one variable has \_\_\_\_\_ effect on the other.

**NO ASSOCIATION**  
As **PERSON'S AGE** increases, \_\_\_\_\_  
The change in one variable has \_\_\_\_\_ effect on the other.

When the change in one variable causes the other to change, scatter plots above display causation:

# APPLYING LINEAR RELATIONSHIPS

a 10 day TEKS-aligned unit

TEKS: A.2D, A.2E, A.2F, A.2G, A.3E, A.4A, A.4B,  
A.4C

ready-to-go, scaffolded  
student materials

## APPLYING LINEAR RELATIONSHIPS UNIT

### Table of Contents

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# APPLYING LINEAR RELATIONSHIPS

a 10 day TEKS-aligned unit

TEKS: A.2D, A.2E, A.2F, A.2G, A.3E, A.4A, A.4B, A.4C

## student friendly + real-world application

interactive practice

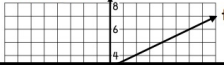
Unit: Applying Linear Relationships  
Student Handout 2

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

### EQUATIONS OF PARALLEL LINES

The graph shows two parallel lines, f and g. Use the graph to answer A–C.

A. Write the equation of line f in slope-intercept form.



B. Write the equation of line g in slope-intercept form.

C. Compare the equations of line f and line g.

**PARALLEL LINES**

- Parallel lines on a coordinate plane are the same distance from each other.
- Parallel lines will never intersect.

Find the slope of a line parallel to the given line.

|                            |          |
|----------------------------|----------|
| 1. $y = \frac{5}{3}x + 14$ | 2. _____ |
|----------------------------|----------|

Use your knowledge of parallel lines to answer the question.

4. Write the equation of the line that is parallel to the line  $y = -4x + 10$  and has a y-intercept of  $(0, -8)$ .

slope: \_\_\_\_\_  
equation: \_\_\_\_\_

For 6 & 7, write an equation in slope-intercept form.

6. A line parallel to  $y = \frac{1}{4}x - 9$  and passes through the point  $(8, 1)$ .

7. A line parallel to  $y = -2.4x + 11$  and passes through the point  $(10, -5)$ .

Sketch a dotted line parallel to the x-axis. Then, write an equation for the line.

**PARALLEL TO THE X-AXIS**

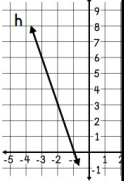
- A line parallel to the x-axis will be \_\_\_\_\_ slope of \_\_\_\_\_.
- A line parallel to the y-axis will be \_\_\_\_\_ slope.

Use your knowledge of parallel lines to answer the question.

8. Determine the slope of the line that is parallel to the x-axis and passes through point  $(6, -8)$ . Then, write the equation of the line.

slope: \_\_\_\_\_  
equation: \_\_\_\_\_

10. Write the equation of the line that is parallel to line h and passes through the point  $(2, 3)$ .



Summarize today's lesson:

Unit: Applying Linear Relationships  
Homework 2

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

### EQUATIONS OF PARALLEL LINES

Six equations are given below. Match the pairs of parallel lines and find the slope of the equations.

A.  $y = 8x - 13$

C.  $3y = 3 + 24x$

E.  $y = -\frac{1}{2}x - 13$

D.  $y = 12 - \frac{1}{2}x$

F.  $y = \frac{2}{5}x + 1$

- Line \_\_\_\_\_ is parallel to line \_\_\_\_\_ and the slope is \_\_\_\_\_.
- Line \_\_\_\_\_ is parallel to line \_\_\_\_\_ and the slope is \_\_\_\_\_.
- Line \_\_\_\_\_ is parallel to line \_\_\_\_\_ and the slope is \_\_\_\_\_.

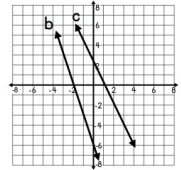
|   |  |  |
|---|--|--|
| 4. Write the equation of the line that is parallel to $y = 9x + 4$ and crosses the y-axis at $-3$ . | 5. Write the equation of the line that is parallel to $y = 1.5x - 6$ and passes through the point $(4, 2)$ . | 6. Write the equation of the line that is parallel to $y = 12 - 5x$ and passes through the point $(1, -7)$ . |
|---|--|--|

7. A line is parallel to the x-axis and passes through the point  $(-3, 6)$ . Which of the following statements are true?

- The slope of the line is zero.
- The equation of the line is  $x = -3$
- The line is horizontal.

a. I only  
b. II & III  
c. I & III  
d. All of the statements are true.

8. Gena says that line b and line c are parallel because they do not cross. Do you agree or disagree? Justify your answer.



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higher-level analysis



# APPLYING LINEAR RELATIONSHIPS ALG 1

a 10 day TEKS-aligned unit

TEKS: A.2D, A.2E, A.2F, A.2G, A.3E, A.4A, A.4B, A.4C

## streamline your planning process with unit overviews

### APPLYING LINEAR RELATIONSHIPS OVERVIEW

**STANDARDS**

**SUPPORTING**

**A.2D** write and solve equations involving direct variation

**A.2E** write the equation of a line that contains a given point and is parallel to a given line

**A.2F** write the equation of a line that contains a given point and is perpendicular to a given line

**A.2G** write an equation of a line that is parallel or perpendicular to the x- or y-axis and determine whether the slope of the line is zero or undefined

**A.3E** determine the effects on the graph of the parent function  $f(x) = x$  when  $f(x)$  is replaced by  $af(x)$ ,  $f(x) + d$ ,  $f(x - c)$ ,  $f(bx)$  for specific values of  $a$ ,  $b$ ,  $c$ , and  $d$

**A.4A** calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association

**A.4B** compare and contrast association and causation in real-world problems

**A.4C** write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions

✓ key vocabulary

✓ vertical alignment

sample  
pacing  
calendar

**TEACHING IDEAS**

- When values vary directly, e
- Attributes of parallel and pe
- The linear parent function, fi subtraction and multiplicati
- We can calculate the streng to make predictions.

**ESSENTIAL QUESTIONS**

- What does it mean to "vary i direct variation relationship?"
- What can you assume abou
- What is the difference betw
- How can linear scatter plots

### APPLYING LINEAR RELATIONSHIPS PACING GUIDE

| DAY 1                               | DAY 2                         | DAY 3                            | DAY 4                                 | DAY 5                                  |
|-------------------------------------|-------------------------------|----------------------------------|---------------------------------------|--|
| Direct Variation                    | Equations of Parallel Lines   | Equations of Perpendicular Lines | Transformations of Linear Functions I | Transformations of Linear Functions II |
| Student Handout 1 Homework 1        | Student Handout 2 Homework 2  | Student Handout 3                | Student Handout 4                     | Student Handout 5                      |
| DAY 6                               | DAY 7                         |                                  |                                       |  |
| Quiz: Applying Linear Relationships | Scatter Plots and Association |                                  |                                       |  |
| Quiz                                | Student Handout 6 Homework 6  |                                  |                                       |  |

### APPLYING LINEAR RELATIONSHIPS OVERVIEW

| TOPIC                               | TEACHING TIPS   |
|-------------------------------------|---|
| Direct Variation                    | <ul style="list-style-type: none"> <li>Use the discussion of solving <math>y = kx</math> for <math>k</math> to reinforce skills and make connections with solving literal equations.</li> <li>Students have been exposed to proportional situations well before Algebra 1, but the vocabulary associated with direct variation is often new. Spend time connecting some of the new terminology with their prior knowledge of proportional relationships.</li> <li>My students always wanted to know why "K" was used for the constant of proportionality. When I told them that the word "constant" translated in German begins with a <math>k</math>, it helped them remember the meaning of "K"!</li> </ul>   |
| Parallel and Perpendicular Lines    | <ul style="list-style-type: none"> <li>Once students know the patterns of slope with parallel and perpendicular lines, the rest of the skills relate to writing equations. Use these lessons as a great reinforcement of point-slope and slope-intercept form.</li> <li>Allow students to create their own equations for parallel and perpendicular lines and graph them on a calculator to visually see that they are correct. With perpendicular lines on a graphing calculator, use "Zoom Square" (Zoom, 5) to help the lines correctly appear perpendicular. The standard zoom view often skews the lines.</li> <li>When determining the slopes of perpendicular lines, always have your students write a whole number slope over 1 first so they can then correctly find the opposite reciprocal.</li> <li>Visit <a href="https://www.desmos.com">teacher.desmos.com</a> and search for the activity called "Parallel Lines" for students to explore connections between equations of parallel lines.</li> </ul> |
| Transformations of Linear Functions | <ul style="list-style-type: none"> <li>Consider using a graphing calculator to help students visualize effects on the parent function. Students can graph <math>y = x</math> on the same grid as its transformation and discuss the general effects of adding, subtracting and multiplying the function.</li> <li>This is a great time to lay the foundation for transformations of quadratic functions.</li> <li>Give students a chance to both identify transformations that have already occurred and graph their own transformations.</li> </ul>  |

teaching ideas 

# APPLYING LINEAR RELATIONSHIPS

a 10 day TEKS-aligned unit

TEKS: A.2D, A.2E, A.2F, A.2G, A.3E, A.4A, A.4B, A.4C

## unit study guide + assessments

✓ quizzes

✓ editable unit test

Unit: Applying Linear Relationships Quiz 1

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

**QUIZ: APPLYING LINEAR RELATIONSHIPS**

Show all work as you answer each question below. Record your solutions in the box at the right.

1. The value of  $y$  varies directly with  $x$  and if  $x = 104$  then  $y = 78$ . What is the value of  $x$  when  $y = 39$ ?

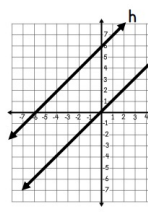
a. 29.25      b. 52      c. 65

2. The distance that Jacobi's remote-control car travels is proportional to the time. If Jacobi's car travels 150 cm in 10 seconds, find the total distance in cm the car will travel in 30 seconds.

3. Nia graphed the line  $x = -6$ . Which of the following lines is perpendicular to the line  $x = -6$ ?

a. The line will be parallel to the  $y$ -axis.  
b. The line will be perpendicular to the  $x$ -axis.  
c. The line has a slope of zero.  
d. Nia drew a vertical line passing through  $x = -6$ .

4. The linear functions  $f$  and  $h$  are shown on the graph. Which function is represented by the graph of  $h$ ?



a.  $h(x) = f(x) + 6$   
b.  $h(x) = f(x) - 6$   
c.  $h(x) = 6f(x)$   
d.  $h(x) = 6 - f(x)$

6. Write an equation of the line that is perpendicular to the line  $y = 2x + 3$  and passes through the point  $(-1, 4)$ .

Answers

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

Unit: Applying Linear Relationships Review

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

**APPLYING LINEAR RELATIONSHIPS STUDY GUIDE**

Solve each problem below. Be sure to ask questions if you need more help with a topic.

**I CAN WRITE AND SOLVE EQUATIONS INVOLVING DIRECT VARIATION. A.2D**

1. The value of  $y$  varies directly with  $x$ . If  $x = 4$ , then  $y = 10$ .

a. Find the constant of proportionality.

b. Write an equation to represent the relationship.

2. The value of  $y$  varies directly with  $x$ . If  $x = 25$ , then  $y = 20$ .

a. Find the constant of proportionality.

b. Write an equation to represent the relationship.

3. The cost of a sailing rope is directly proportional to the length of rope purchased. An 80-foot rope costs \$112, find the cost of a 120-foot rope.

**I CAN WRITE EQUATIONS OF PARALLEL LINES**

5. Write the equation of the line that is parallel to  $y = -6x + 10$  and crosses the  $y$ -axis at  $(0, 4)$ .

slope: \_\_\_\_\_  
equation: \_\_\_\_\_

7. Determine if each statement below is true or false. Write "true" or "false" in the given chart.

A.  $x = 7$   
B. undefined slope  
C. a horizontal line  
D.  $y = -9$   
E. zero slope

ALGEBRA 1 CURRICULUM

# APPLYING LINEAR RELATIONSHIPS

UNIT FOUR: ANSWER KEY

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answer keys included 