Christina School District Assignment Board

Grade Level: 9th

Week of April 20th, 2020

	Day 1	Day 2	Day 3	Day 4	Day 5
ELA	Answer the following in a 5-8 sentence response. Do you think the concept of identity has changed since Shakespeare's time? Do last names hold as much weight as they once did?	Read the *Excerpt from Act II, Scene II,* summarize what each speaker is saying in the margins. At the bottom of the poem write a 1-2 sentence summary of what the poem is saying.	Re-read the excerpt, answer the Text Dependent questions 1-4.	On a separate sheet of paper write a 1-2 paragraph essay explaining the figurative language Juliet uses in lines 25-26 and how it relates to a theme of the excerpt.	On the same sheet of paper rewrite the scene in your own words as if the conversation takes place in the year 2020. You may use slang, but refrain from using profane language.
Math (IM1/ Algebra 1)	*Reasoning to Equivalent Expressions/Quadratic Functions in Standard Form* Read pages 89-92. (attached) Use the examples as a guide. Complete p. 92 #1-10. (attached)	Use the examples from pages 89-92 as a guide to complete p. 92 #11-20. (attached)	Review Concept Summary: Quadratic Functions in Standard Form (attached), and complete Quadratic Functions in Standard Form Worksheet 1 #1-5. (attached)	Complete Quadratic Functions in Standard Form Worksheet 2 #1-10. (attached) Reference Concept Summary if needed.	Complete Quadratic Functions in Standard Form Worksheet 3 #1-4. (attached) Reference Concept Summary if needed
Science	**Mount Pinatubo and the Ring of Fire (part 1):** Read article. Highlight, annotate, and/or underline for understanding.	**Mount Pinatubo and the Ring of Fire (part 2):** Reread notations from yesterday as necessary. Write your answers to the following questions: a) What happened in 1990 and 1991 on the island of Luzon? b) Most earthquakes occur in areas close to where tectonic plates meet. There are earthquakes in San Francisco. What can be concluded from this	**Continental Drift (part 1):** Read 1st 2 pages. Highlight, annotate, and/or underline for understanding.	**Continental Drift (part 2):** Read 2nd 2 pages (starting with "Magnetic Polarity Evidence". Highlight, annotate, and/or underline for understanding.	**Continental Drift (part 3):** Reread notations made on Days 3 & 4. In your own words, write 2-3 paragraphs summarizing your learning about Continental Drift so far.

Christina School District Assignment Board

		information? c) Why might the 1990 earthquake and 1991 volcanic eruption in Luzon be related? d) What is the Ring of Fire? e) Why do so many earthquakes and volcanoes occur around the Ring of Fire?			
Social Studies	Complete Activity 1 from the document titled, “Harrington Accessibility Case Study”	Complete Activity 2 from the document titled, “Harrington Accessibility Case Study”	Complete Activity 3 from the document titled, “Harrington Accessibility Case Study”	Complete Activity 4 from the document titled, “Harrington Accessibility Case Study”	Complete Activity 5 from the document titled, “Harrington Accessibility Case Study”

COMMONLIT

Name: _____ Class: _____

Excerpts from Romeo and Juliet

By William Shakespeare
c. 1593

William Shakespeare (1564-1616) was an English poet, playwright, and actor. He wrote 38 plays, including Romeo and Juliet, which recounts the tragic romance of two young lovers divided by their families' ongoing feud. The following excerpts are taken from the play's prologue and its famous balcony scene. As you read, take notes on how the figurative language used throughout the passage contributes to the themes.

Prologue

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CHORUS:

Two households, both alike in dignity,
In fair Verona, where we lay our scene,
From ancient grudge break to new mutiny,[1]
Where civil blood makes civil hands unclean.
From forth the fatal loins of these two foes
A pair of star-cross'd lovers take their life;
Whose misadventured piteous overthrows
Do with their death bury their parents' strife.
The fearful passage of their death-mark'd love,
And the continuance of their parents' rage,
Which, but their children's end, nought could remove,
Is now the two hours' traffic of our stage;
The which if you with patient ears attend,
What here shall miss, our toil shall strive to mend.[2]

Excerpt from Act II, Scene II

JULIET:

O Romeo, Romeo! wherefore[3] art thou Romeo?
Deny thy father, and refuse thy name;
Or, if thou wilt not, be but sworn my love,
And I'll no longer be a Capulet.

ROMEO:

[Aside] Shall I hear more, or shall I speak at this?[4]

1. In this context, "mutiny" means violence or turmoil. The more modern use of "mutiny" refers to a rebellion against authority.
2. Whatever hasn't been mentioned (in the prologue) will be explained on stage.
3. "Wherefore" means "why."

JULIET:

'Tis but thy name that is my enemy;
Thou art thyself, though not a Montague.
What's Montague? it is nor hand, nor foot,
Nor arm, nor face, nor any other part
Belonging to a man. O! be some other name:
What's in a name? that which we call a rose
By any other name would smell as sweet;
So Romeo would, were he not Romeo call'd,
Retain that dear perfection which he owes
Without that title. Romeo, doff[5] thy name;
And for that name, which is no part of thee,
Take all myself.

ROMEO:

I take thee at thy word.
Call me but love, and I'll be new baptiz'd;
Henceforth I never will be Romeo.

JULIET:

What man art thou, that, thus be-screen'd in night,[6]
So stumblest on my counsel?

ROMEO:

By a name
I know not how to tell thee who I am:
My name, dear saint, is hateful to myself,
Because it is an enemy to thee:
Had I it written, I would tear the word.

JULIET:

My ears have not yet drunk a hundred words
Of that tongue's uttering, yet I know the sound:
Art thou not Romeo, and a Montague?

ROMEO:

Neither, fair maid, if either thee dislike.

JULIET:

4. Romeo says this line as an aside, or spoken dialogue that is heard by the audience but not by the other characters in the play. Romeo says this line as an aside because Juliet is not aware that he is listening.
5. **Doff** ***(verb):*** to remove or rid of
6. hidden or shrouded in darkness

How cam'st thou hither, tell me, and wherefore?
The orchard walls are high and hard to climb,
And the place death, considering who thou art,
If any of my kinsmen[7] find thee here.

ROMEO:

[50] With love's light wings did I o'erperch these walls;
For stony limits cannot hold love out,
And what love can do that dares love attempt;
Therefore thy kinsmen are no stop to me.

7. family member; relative

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which statement best describes a theme of the play excerpts?
    A. Love makes people more willing to change and face obstacles.
    B. Children should be obedient and not go against their parents' wishes.
    C. Grudges are easy to overcome, to forgive, and to forget.
    D. People's fates are set in stone and cannot be changed.

2. PART B: Which of the following quotes best supports the answer to Part A?
    A. "From forth the fatal loins of these two foes / A pair of star-cross'd lovers take their life" (Lines 5-6)
    B. "The fearful passage of their death-mark'd love, / And the continuance of their parents' rage, / Which, but their children's end, nought could remove" (Lines 9-11)
    C. "What's Montague? it is nor hand, nor foot, / Nor arm, nor face, nor any other part / Belonging to a man." (Lines 22-24)
    D. "Call me but love, and I'll be new baptiz'd; / Henceforth I never will be Romeo." (Lines 33-34)

3. What purpose does the prologue serve in the text?
    A. It updates the audience on the current state of the feud.
    B. It informs the audience of past and future events in the play.
    C. It discusses the reasons behind why the two families hate each other.
    D. It outlines the themes of the play by describing them.

4. How does Juliet's monologue in lines 15-31 affect Romeo?
    A. He is shocked by her insistence that he give up his name.
    B. He regrets being a Montague but resigns himself to being apart from Juliet.
    C. He is willing to give up his family name in order to be with her.
    D. He falls more in love with her and convinces her to marry him.

IM1/Algebra 2 – Week of April 20th

Reasoning to Equivalent Expressions/Quadratic Function in Standard Form

FACTORING QUADRATICS 8.1.1 through 8.1.4

Chapter 8 introduces students to rewriting quadratic expressions and solving quadratic equations. Quadratic functions are functions which can be rewritten in the form $y = ax^2 + bx + c$ (where $a \neq 0$) and when graphed, create a U-shaped curve called a parabola.

There are multiple methods that can be used to solve quadratic equations. One of them requires factoring the quadratic expression first. In Lessons 8.1.1 through 8.1.4, students factor quadratic expressions.

In previous chapters, students used algebra tiles to build "generic rectangles" of quadratic expressions. In the figure below, the length and width of the rectangle are $(x + 2)$ and $(x + 4)$. Since the area of a rectangle is given by (base)(height) = area, the area of the rectangle in the figure below can be expressed as a *product*, $(x + 2)(x + 4)$. But the small pieces of the rectangle also make up its area, so the area can be expressed as a *sum*, $4x + 8 + x^2 + 2x$, or $x^2 + 6x + 8$. Thus students wrote $(x + 2)(x + 4) = x^2 + 6x + 8$.

In the figure at right, the length and width of the rectangle, which are $(x + 2)$ and $(x + 4)$, are *factors* of the quadratic expression $x^2 + 6x + 8$, since $(x + 2)$ and $(x + 4)$ multiply together to produce the quadratic expression $x^2 + 6x + 8$. Notice that the $4x$ and the $2x$ are located diagonally from each other. They are like terms and can be combined and written as $6x$.

+4	$4x$	8
x	x^2	$2x$
	x +	2

The factors of $x^2 + 6x + 8$ are $(x + 2)$ and $(x + 4)$.

The ax^2 term and the c term are always diagonal to one another in a generic rectangle. In this example, the ax^2 term is $(1x^2)$ and the c term is the constant 8; the product of this diagonal is $1x^2 \cdot 8 = 8x^2$. The two x-terms make up the other diagonal and can be combined into a sum since they are like terms. The b of a quadratic expression is the *sum* of the coefficients of these factors: $2x + 4x = 6x$, so $b = 6$. The product of this other diagonal is $(2x)(4x) = 8x^2$. *Note that the products of the two diagonals are always equivalent.* In the textbook, students may nickname this rule "Casey's Rule," after the fictional character Casey in problem 8-4.

To factor a quadratic expression, students need to identify the coefficients of the two x-terms so that the products of the two diagonals are equivalent, and also the sum of the two x-terms is b. Students can use a "diamond problem" to help organize their sums and products. For more information on using a diamond problem and generic rectangle to factor quadratic expressions, see the Math Notes box in Lesson 8.1.4.

For additional information, see the Math Notes boxes in Lessons 8.1.1 through 8.1.4. For additional examples and more practice, see the Checkpoint 10B materials at the back of the student textbook.

Example 1

Factor $x^2 + 7x + 12$.

Sketch a generic rectangle.

Place the x^2 and the 12 along one diagonal.

	12
x^2	

Find two terms whose product is $12x^2$ and whose sum is $7x$. In this case, $3x$ and $4x$. (Students are familiar with this situation as a "diamond problem" from Chapter 1.)

Write these terms along the other diagonal. Either term can go in either diagonal space.

$3x$	12
x^2	**$4x$**

Determine the base and height of the large outer rectangle by using the areas of the small pieces and finding the greatest common factor of each row and column.

+ 3	$3x$	12
x	x^2	$4x$
	x +	4

Write the sum as a product (factored form).

$x^2 + 7x + 12 = (x + 3)(x + 4)$

Example 2

Factor $x^2 + 7x - 30$.

Sketch a generic rectangle.
Place the x^2 and the -30 along one diagonal.

	-30
x^2	

Find two terms whose product is $-30x^2$ and whose sum is $7x$. In this case, $-3x$ and $10x$.

Write these terms along the other diagonal. Either term can go in either diagonal space.

$-3x$	-30
x^2	**$10x$**

Determine the base and height of the large outer rectangle by using the areas of the small pieces and finding the greatest common factor of each row and column.

-3	$-3x$	-30
x	x^2	$10x$
	x +	10

Write the sum as a product (factored form).

$x^2 + 7x - 30 = (x - 3)(x + 10)$

Example 3

Factor $x^2 - 15x + 56$.

Sketch a generic rectangle.
Place the x^2 and the 56 along one diagonal.

	56
x^2	

Find two terms whose product is $56x^2$ and whose sum is $-15x$. Write these terms as the other diagonal.

$-8x$	56
x^2	**$-7x$**

Determine the base and height of the large outer rectangle by using the areas of the small pieces and finding the greatest common factor of each row and column.

-8	$-8x$	56
x	x^2	$-7x$
	x	-7

Write the sum as a product (factored form).

$x^2 - 15x + 56 = (x - 7)(x - 8)$

Example 4

Factor $12x^2 - 19x + 5$.

Sketch a generic rectangle.

Place the $12x^2$ and the 5 along one diagonal.

$-15x$	5
$12x^2$	**$-4x$**

→

-5	$-15x$	5
$4x$	$12x^2$	$-4x$
	$3x$	-1

Find two terms whose product is $60x^2$ and whose sum is $-19x$. Write these terms as the other diagonal.

Find the base and height of the rectangle. Check the signs of the factors.

Write the sum as a product (factored form). $(3x - 1)(4x - 5) = 12x^2 - 19x + 5$

Example 5

Factor $3x^2 + 21x + 36$.

Note: If a common factor appears in all the terms, it should be factored out first.
For example, $3x^2 + 21x + 36 = 3(x^2 + 7x + 12)$.

Then $x^2 + 7x + 12$ can be factored in the usual way, as in Example.
$x^2 + 7x + 12 = (x + 3)(x + 4)$.

Then, since the expression $3x^2 + 21x + 36$ has a factor of 3,
$3x^2 + 21x + 36 = 3(x^2 + 7x + 12) = 3(x + 3)(x + 4)$.

Problems

1. $x^2 + 5x + 6$	2. $2x^2 + 5x + 3$	3. $3x^2 + 4x + 1$	4. $3x^2 + 30x + 75$
5. $x^2 + 15x + 44$	6. $x^2 + 7x + 6$	7. $2x^2 + 22x + 48$	8. $x^2 + 4x - 32$
9. $4x^2 + 12x + 9$	10. $24x^2 + 22x - 10$	11. $x^2 + x - 72$	12. $3x^2 - 20x - 7$
13. $x^3 - 11x^2 + 28x$	14. $2x^2 + 11x - 6$	15. $2x^2 + 5x - 3$	16. $x^2 - 3x - 10$
17. $4x^2 - 12x + 9$	18. $3x^2 + 2x - 5$	19. $6x^2 - x - 2$	20. $9x^2 - 18x + 8$

CONCEPT SUMMARY Standard Form of a Quadratic Function

ALGEBRA Standard form: $f(x) = ax^2 + bx + c$, where $a \neq 0$.

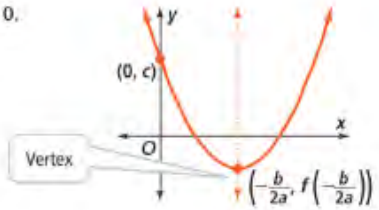
y-intercept: c

Axis of symmetry: $x = -\frac{b}{2a}$

x-coordinate of the vertex: $-\frac{b}{2a}$

y-coordinate of the vertex: $f\left(-\frac{b}{2a}\right)$

Vertex: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$



NUMBERS Standard form: $f(x) = 2x^2 + 8x + 5$.

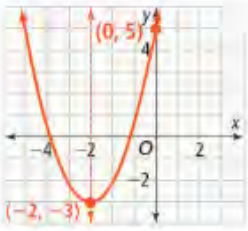
y-intercept: 5

Axis of symmetry: $x = -\frac{8}{2(2)} = -2$

x-coordinate of the vertex: $-\frac{8}{2(2)} = -2$

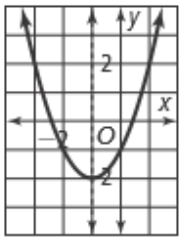
y-coordinate of the vertex: $f(-2) = -3$

Vertex: $(-2, -3)$



Quadratic Functions in Standard Form Worksheet 1

1. Fill in the matching part on the graph to the right.



The *y*-intercept is _____.

The axis of symmetry is _____.

The vertex is _____.

2. Circle the correct answer.

The equation for finding the x-coordinate of the axis of symmetry is:

c $\quad -\frac{b}{2a}$ $\quad f(x) = ax^2 + bx + c$

3. For the graph of $f(x) = -3x^2 + 6x - 1$, draw lines from each part of the parabola to the correct answer.

y-intercept	1
axis of symmetry	−1
x-coordinate of the vertex	$x = 1$
y-coordinate of the vertex	(1, 2)
vertex	2

4. Chen predicted that the function $f(x) = 1.5x^2 - 9x + 7$ would have an axis of symmetry at $x = 3$ with the vertex at (3, 7). Do you agree or disagree with Chen? Explain.

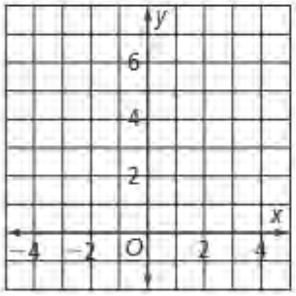
5. Fill in the missing spaces in the table below.

Features	$f(x) = -2x^2 + 8x + 1$	$g(x) = 3x^2 + 6x - 4$
y-intercept		(0, −4)
vertex	(−2, _____)	(_____, −7)
axis of symmetry	$x = -2$	
maximum or minimum value		minimum
opens upward or downward		upward

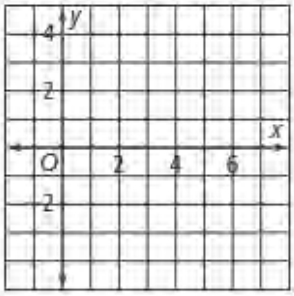
Quadratic Functions in Standard Form Worksheet 2

Graph each function. What are the *y*-intercept, axis of symmetry, and vertex of each function? Does the vertex represent a maximum or minimum value?

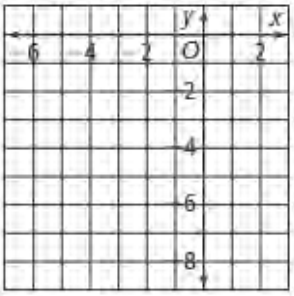
1. $f(x) = x^2 + 1$



2. $f(x) = -x^2 + 4x - 2$



3. $f(x) = 2x^2 + 4x - 6$



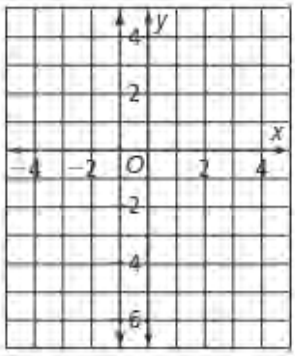
Find the axis of symmetry using the midpoint between the *x* values of the *x*-intercepts.

4. $f(x) = -9x^2 + 1$

5. $f(x) = -2x^2 + 8x - 9$

6. $f(x) = 4x^2 + 24x + 131$

7. The parabola shown has the form $y = ax^2 + bx + c$.



a. What is the axis of symmetry?

b. Use the formula $x = \frac{-b}{2a}$ to find b.

c. What is the equation of the parabola?

8. The position of a ball after it is thrown is modeled by the function $f(x) = -2(x - 1)^2 + 7$ in vertex form, where x is the height, in feet, above the ground and y is the horizontal distance, in feet, of the ball when it lands.

a. Write the function in standard form.

b. What is the height of the ball when it is thrown?

c. What is the horizontal distance from the point the ball was thrown from to the highest point that the ball reached?

Write each function in standard form.

9. $f(x) = -3(x + 1)^2 - 4$

10. $f(x) = -(x - 2)^2 + 5$

Quadratic Functions in Standard Form Worksheet 3

1. Look at the equations in the set below and decide which one is not part of the set. Explain why.

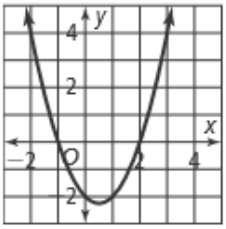
$y = x^2 - x - 2$

$y = (x - 2)(x + 1)$

$y = (x - 1)^2 - 3 + x$

$y = (x - 1)^2 + x$

2. From Exercise 1, use your graphing calculator to graph the equations at the same time. What happens to the equations? Explain.



3. Write an equation for a quadratic function whose graph satisfies the given criteria below. Use whatever form you prefer.

- Has a y-intercept at (0, −1).
- Has a vertex at (1.5, −3.25).
- Has *x*-intercepts at (−0.3, 0) and (3.3, 0).
- Has line of symmetry at (1.5, 0).
- Goes through the points (0, −1) and (3, −1).

4. Describe the similar characteristic within each group of quadratic equations.

Group A	Group B	Group C
$y = (x - 1)(x + 1)$	$y = x^2 - 12$	$y = 3(x - 9)^2 + 2$
$y = 3(x^2 - 1)$	$y = -x^2 - 3x - 12$	$y = -(x - 9)^2 + 2$
$y = \frac{1}{2}(x - 1)(x + 1)$	$y = 9x^2 - 12$	$y = -0.5(x - 9)^2 + 2$

Mount Pinatubo and the Ring of Fire

the June 12, 1991 eruption column from Mount Pinatubo taken from Clark Air Base

On July 16, 1990, a large earthquake struck Luzon, an island in the Philippines. The earthquake devastated cities for hundreds of miles around, and killed more than 1,600 people. Yet the destruction was not over.

Two weeks later, residents of Luzon discovered steam coming out of a volcano called Mount Pinatubo. But when scientists inspected the volcano, they did not find any evidence the volcano would erupt. However, on March 15, 1991, villagers on the northwestern side of the island were startled by a series of earthquakes. The earthquakes continued until two weeks later, when Mt. Pinatubo began to rumble.

On April 2, the mountain sent an explosion of steam, water, ash, and rock into the air. Over the next several weeks, it continued to belch volcanic ash into the air. Scientists detected increased levels of carbon dioxide, a sign that hot liquid magma was nearing the surface. By June 7, a dome of lava 130 feet high and 660 feet across had formed on the surface of the volcano.

Five days later, the volcano erupted. Hot volcanic ash rose about 20 miles into the air. An ash cloud of almost 50,000 square miles blanketed the island in darkness. The summit of the volcano was blown off, replaced by a new hole 1.6 miles wide. 847 people in surrounding communities died, most of them when their roofs, buckling under the weight of wet ash, collapsed. Geologists would later rank the eruption of Mt. Pinatubo as the second-largest volcanic eruption of the 20th century.

While scientists have never determined whether the earthquake in 1990 directly caused the volcanic eruption a year later, the two events are generally considered to be related. Although it's difficult to predict when or where an earthquake or a volcanic eruption will strike, these events can occur in patterns.

Mt. Pinatubo is located on the Ring of Fire. The Ring of Fire is a horseshoe-shaped zone characterized by earthquakes and more than 450 volcanoes. It is 25,000 miles long and runs roughly along the edges of the Pacific Ocean. The Ring of Fire begins on the southern edge of South America, runs north along the western coast of the Americas, cuts across the southern edge of Alaska, and down the eastern edge of Eurasia before culminating in a series of deep trenches, several thousand miles off the coast of Australia. Seventy-five percent of the world's active volcanoes are located on this ring, and almost 90% of the world's earthquakes happen there.

The reason why so many earthquakes and volcanic eruptions occur here has to do with plate tectonics. On the surface of the earth is a patchwork of enormous plates, atop which all geographic features—seas, oceans, fields, mountain ranges—sit. These plates are in constant motion, although they move very slowly—under six inches per year. These plates separate, collide, or slip past each other along their boundaries. These movements are referred to as plate tectonics. Massive events, such as earthquakes and volcano eruptions, can occur along plate boundaries.

Most earthquakes occur in areas often close to plate boundaries. Areas that are in the middle of the plates generally do not suffer from these same forces. This is why there are earthquakes in San Francisco, which is close to where two plates slide past each other, and usually not in Chicago, a thousand miles from any plate boundary.

Similarly, volcanoes tend to form near plate boundaries where the movement of the earth's plates creates vents, which are openings on the earth's surface. Magma, liquid rock located below the earth's surface, can rise toward the surface of the earth and erupt out of volcanoes. The island of Luzon, where Mt. Pinatubo erupted, is near a location where a sea plate has been sliding under a continental plate.

The location of mountain ranges is also closely linked to the activity of plates. The collision of two continental plates has formed Earth's tallest mountain ranges on land, such as the Himalayas. These mountain chains are essentially crumpled up parts of continental plates, formed when two continental plates push against each other.

Deep ocean trenches, such as the Mariana Trench of the Pacific Ocean, can also form along plate boundaries. The Mariana Trench reaches almost seven miles down.

If you look on a detailed map, one that includes physical features, such as mountain ranges and trenches, you will begin to see patterns. You may even be able to guess where some of the giant continental plates are located.

Continental Drift

Describe Continental Drift including supporting evidence.

The continental drift hypothesis was developed in the early part of the twentieth century, mostly by Alfred Wegener. Wegener said that continents move around on Earth's surface and that they were once joined together as a single supercontinent. While Wegener was alive, scientists did not believe that the continents could move.

In this outcome, we will discuss the basics of the hypothesis, as well as the contributions of Alfred Wegener.

WHAT YOU'LL LEARN TO DO

- Identify key components and evidence of Continental Drift.
- Know the shortcomings of Continental Drift.

Continental Drift

The Continental Drift Idea

Figure 1. The continents fit together like pieces of a puzzle. This is how they looked 250 million years ago.

Find a map of the continents and cut each one out. Better yet, use a map where the edges of the continents show the continental shelf. That's the true size and shape of a continent. Can you fit the pieces together? The easiest link is between the eastern Americas and western Africa and Europe, but the rest can fit together too (Figure 1).

Alfred Wegener proposed that the continents were once united into a single supercontinent named Pangaea, meaning *all earth* in ancient Greek. He suggested that Pangaea broke up long ago and that the continents then moved to their current positions. He called his hypothesis **continental drift.**

Evidence for Continental Drift

Besides the way the continents fit together, Wegener and his supporters collected a great deal of evidence for the continental drift hypothesis.

- Identical rocks, of the same type and age, are found on both sides of the Atlantic Ocean. Wegener said the rocks had formed side-by-side and that the land had since moved apart.
- Mountain ranges with the same rock types, structures, and ages are now on opposite sides of the Atlantic Ocean. The Appalachians of the eastern United States and Canada, for example, are just like mountain ranges in eastern Greenland, Ireland, Great Britain, and Norway (figure 2). Wegener concluded that they formed as a single mountain range that was separated as the continents drifted.

Figure 2. The similarities between the Appalachian and the eastern Greenland mountain ranges are evidences for the continental drift hypothesis.

- Ancient fossils of the same species of extinct plants and animals are found in rocks of the same age but are on continents that are now widely separated (figure 3). Wegener proposed that the organisms had lived side by side, but that the lands had moved apart after they were dead and fossilized. He suggested that the organisms would not have been able to travel across the oceans.
    - Fossils of the seed fern *Glossopteris* were too heavy to be carried so far by wind.
    - *Mesosaurus* was a swimming reptile but could only swim in fresh water.
    - *Cynognathus* and *Lystrosaurus* were land reptiles and were unable to swim.

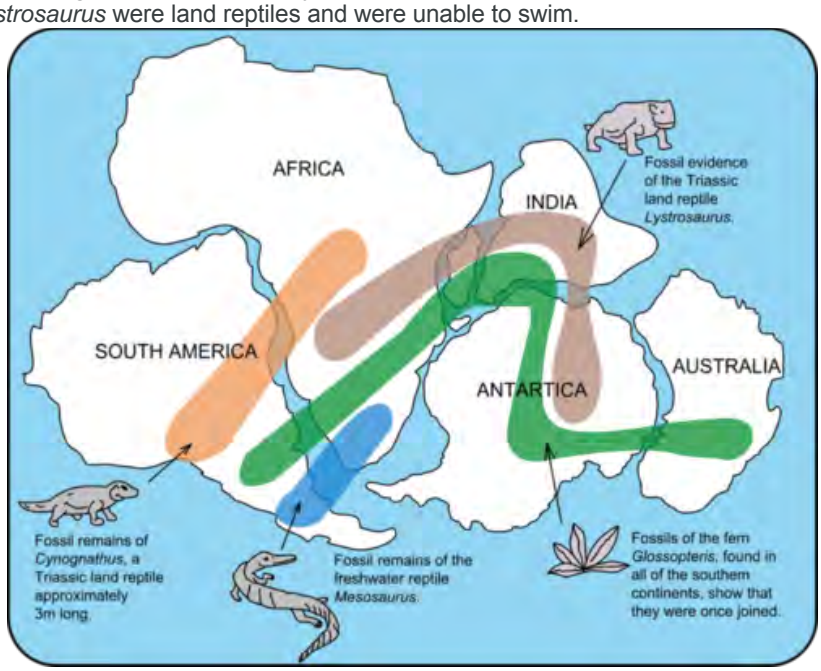


Figure 3. Wegener used fossil evidence to support his continental drift hypothesis. The fossils of these organisms are found on lands that are now far apart.

- Grooves and rock deposits left by ancient glaciers are found today on different continents very close to the equator. This would indicate that the glaciers either formed in the middle of the ocean and/or covered most of the Earth. Today glaciers only form on land and nearer the poles. Wegener thought that the glaciers were centered over the southern land mass close to the South Pole and the continents moved to their present positions later on.
- Coral reefs and coal-forming swamps are found in tropical and subtropical environments, but ancient coal seams and coral reefs are found in locations where it is much too cold today. Wegener suggested that these creatures were alive in warm climate zones and that the fossils and coal later had drifted to new locations on the continents.

Although Wegener's evidence was sound, most geologists at the time rejected his hypothesis of continental drift. Why do you think they did not accept continental drift?

Scientists argued that there was no way to explain how solid continents could plow through solid oceanic crust. Wegener's idea was nearly forgotten until technological advances presented even more evidence that the continents moved and gave scientists the tools to develop a mechanism for Wegener's drifting continents.

Magnetic Polarity Evidence

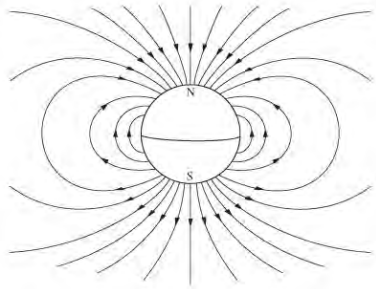


Figure 4. Earth's magnetic field is like a magnet with its north pole near the geographic North Pole and the south pole near the geographic South Pole.

Puzzling new evidence came in the 1950s from studies on the Earth's magnetic history (figure 4). Scientists used **magnetometers**, devices capable of measuring the magnetic field intensity, to look at the magnetic properties of rocks in many locations.

Magnetite crystals are like tiny magnets that point to the north magnetic pole as they crystallize from magma. The crystals record both the direction and strength of the **magnetic field** at the time. The direction is known as the field's **magnetic polarity.**

Magnetic Polarity on the Same Continent with Rocks of Different Ages

Geologists noted important things about the magnetic polarity of different aged rocks on the same continent:

- Magnetite crystals in fresh volcanic rocks point to the current magnetic north pole (figure 5) no matter what continent or where on the continent the rocks are located.

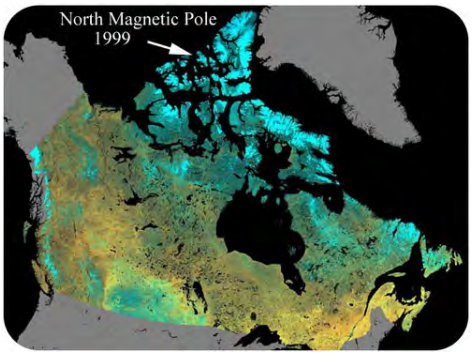


Figure 5. Earth's current north magnetic pole is in northern Canada.

- Older rocks that are the same age and are located on the same continent point to the same location, but that location is not the current north magnetic pole.
- Older rock that are of different ages do not point to the same locations or to the current magnetic north pole.

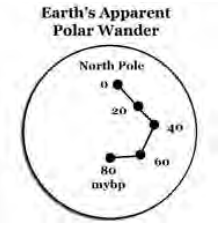


Figure 6. The location of the north magnetic north pole 80 million years before present (mybp), then 60, 40, 20, and now.

In other words, although the magnetite crystals were pointing to the magnetic north pole, the location of the pole seemed to wander. Scientists were amazed to find that the north magnetic pole changed location through time (figure 6).

There are three possible explanations for this:

1. The continents remained fixed and the north magnetic pole moved.
2. The north magnetic pole stood still and the continents moved.
3. Both the continents and the north pole moved.

Magnetic Polarity on Different Continents with Rocks of the Same Age

Geologists noted that for rocks of the same age but on different continents, the little magnets pointed to different magnetic north poles.

- 400-million-year-old magnetite in Europe pointed to a different north magnetic pole than the same-aged magnetite in North America.
- 250 million years ago, the north poles were also different for the two continents.

The scientists looked again at the three possible explanations. Only one can be correct. If the continents had remained fixed while the north magnetic pole moved, there must have been two separate north poles. Since there is only one north pole today, the only reasonable explanation is that the north magnetic pole has remained fixed but that the continents have moved.

To test this, geologists fitted the continents together as Wegener had done. It worked! There has only been one magnetic north pole and the continents have drifted (figure 7). They named the phenomenon of the magnetic pole that seemed to move but actually did not **apparent polar wander.**

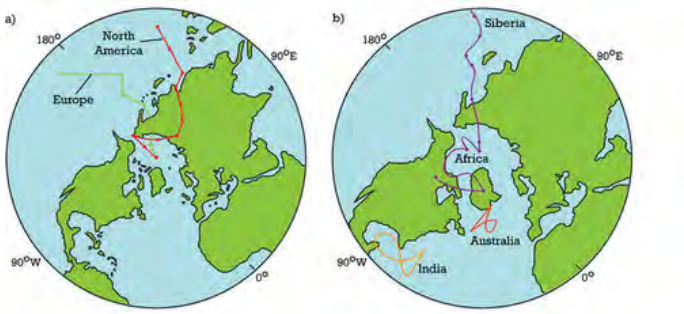


Figure 7. On the left: The apparent north pole for Europe and North America if the continents were always in their current locations. The two paths merge into one if the continents are allowed to drift.

This evidence for continental drift gave geologists renewed interest in understanding how continents could move about on the planet's surface.

Summary

- In the early part of the 20th century, scientists began to put together evidence that the continents could move around on Earth's surface.
- The evidence for continental drift included the fit of the continents; the distribution of ancient fossils, rocks, and mountain ranges; and the locations of ancient climatic zones.
- Although the evidence for continental drift was extremely strong, scientists rejected the idea because no mechanism for how solid continents could move around on the solid earth was developed.
- The discovery of apparent polar wander renewed scientists interest in continental drift.

Benchmark Standard	Geography 1a: Students will identify geographic patterns which emerge when collected data is mapped, and analyze mapped patterns through the application of such common geographic principles as hierarchy, accessibility, diffusion, and complementarity.
Grade	9
Vocabualry / Key Concepts	Accessibility

DRC Unit - Harrington Accessibility Case Study – Modified by CSD for Home Use

DIRECTIONS: Read the following information and answer the questions that correspond with the information and/or the maps.

ACTIVITY 1:

Every day, people make decisions…

- Where should I shop for food?
- Where can we grab a quick lunch?
- What's the best way to get to work on time?
- Where should I locate my small business?
- Where can I find a convenient parking spot?

All of these decisions involve the geographic principle called ACCESSIBILITY.

Accessibility is how easily one place can be reached from another.

Generally speaking, we try to minimize distance and time spent traveling.

We try to avoid interferences, barriers and roadblocks.

Businesses or locations are convenient when they have high levels of accessibility.

HMMM…(Answer the following question on a separate sheet of paper).

- How can understanding accessibility help people solve everyday problems?

IMAGINE:

You are a business owner. Experts suggest that selecting the right location for your business is critical to business success.

- CONSIDER:
    - How are your target clients or customers likely to travel? Will they drive? Ride bikes? Walk? Use public transit?
    - What route are they likely to follow?
    - Are there any traffic problems or barriers?
    - How will supplies arrive? How will shipments leave?

PROBLEM 1: Choosing a location for a Retail Business

- You want to open a Subway franchise sandwich shop in Harrington, DE – What are some good locations?
- The Subway company must approve your location before you can open a shop.
- A real estate agent has given you four possible business locations to choose from.

THINK ABOUT IT!... (Answer the following questions on the same sheet of paper you used for the "Hmmm" question).

- Who will your customers be? Residents, tourists, etc. What factors will make a location more accessible for your target customers?
- What location will be most visible to passers-by?
- What types of existing businesses would attract customers like yours? (Gas stations, retail shopping, services, offices?) Where are these businesses likely to be located?

RATE EACH OF THE FOLLOWING LOCATIONS ON A SCALE OF 1 TO 5. (1 IS VERY LOW ACCESSIBILITY, 5 IS VERY HIGH)

_____ Customers can reach this location easily.

_____ Parking is available.

_____ Location is near other similar businesses.

_____ Location is highly visible.

_____ Location is free from barriers or restrictions.

ACTIVITY 2:

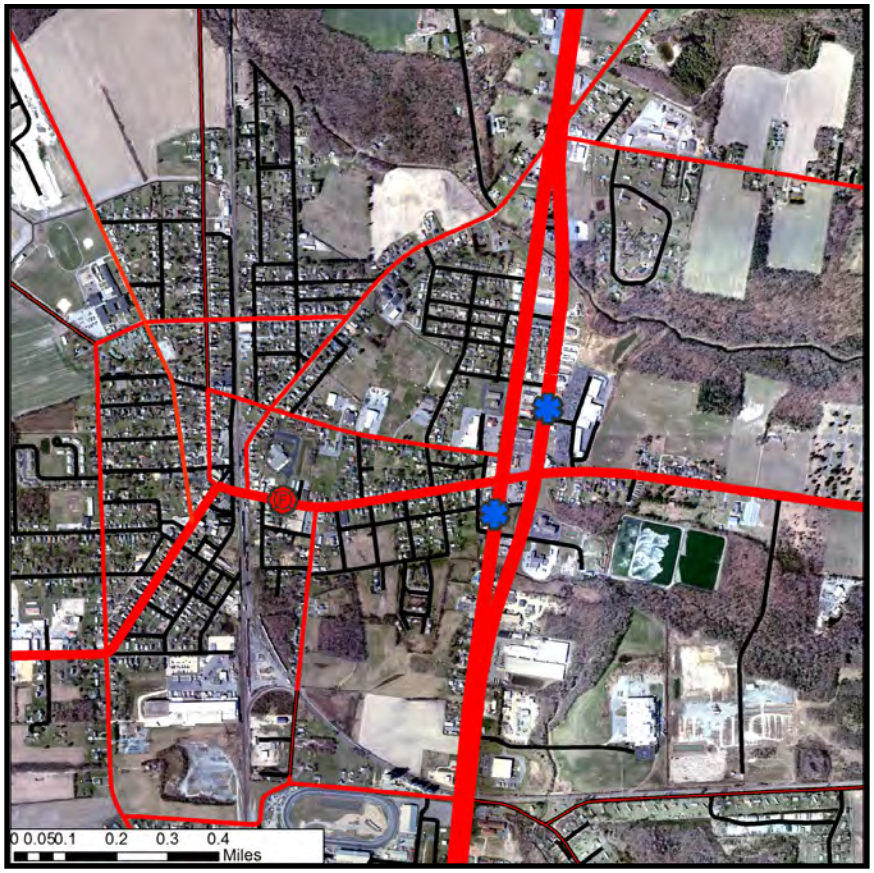
TO HELP YOU MAKE THIS DECISION, THE AGENT HAS GIVEN YOU A SET OF MAPS OF THE AREA:

- A Traffic Map – shows how vehicles move through the area
- A Zoning Map – shows approved uses of land in the area
- An aerial photo showing all the choices and the surrounding area.

Use the maps and what you have learned about accessibility to identify the best spot for your sandwich business:

MAP 1: AREAS OF HIGH TRAFFIC IN HARRINGTON

Traffic data provided by DE Dept of Transportation- 2009



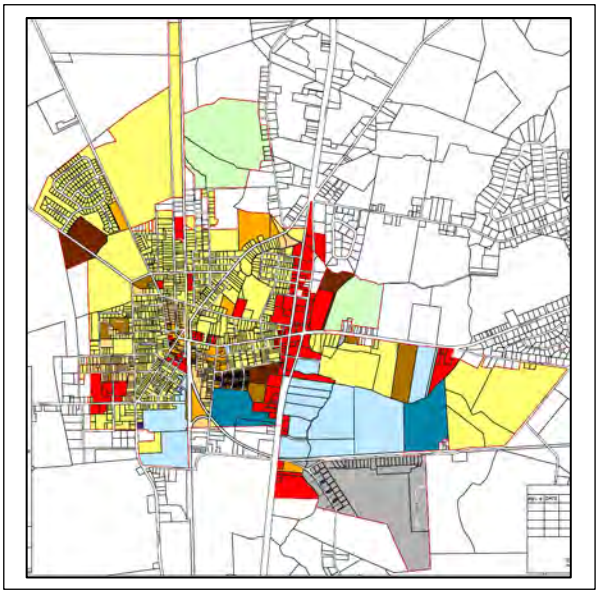
Your map will be in black and white, so the roads with a thick black arrow pointing to them are the roads with high traffic.

ADD ARROWS!

Fire Station

Pharmacy

Map 2:2010 Harrington Zoning



Because you have a black and white map, it may be hard to tell the different zoning areas. The below map is "zoomed in" and has the areas outlined and labeled with how the majority of the area is zoned.

MAP 2: 2010 HARRINGTON ZONING

The map below is a "zoomed in" area from the middle of the above map.

In this area, the zoning is mostly "C-2, Central Commercial"

In this area, the zoning is mostly "C-3, Service Commercial"

In this area, the zoning is mostly "R-1, One Family Residential"

MAP 3 A: THE ALTERNATIVES

Map 3 shows four possible business locations (each has a rectangle around it and labeled with an "A", B, C or D.

- Which location would be best for a sandwich shop? Why?
- Consider accessibility – Why are the four possible locations better than other locations?

ACTIVITY 3:

PROBLEM 2: BEST PLACE FOR A HEALTH CLINIC

- Harrington needs a health clinic!
- Choose a location for a health clinic for the community
- Use the maps of the area, zoning, and traffic to help you.

THINK ABOUT IT! (Answer the following questions on the same sheet of paper you used for the previous questions).

- Who will be the users of the clinic? Where would they have easiest access to the clinic?
- Remember **accessibility**! – There should be easy **access** to the clinic for emergency vehicles. Customers may need handicapped parking.
- A medical clinic is a "service". What kinds of services might be near-by? Is it best for a medical facility to be in a residential or a commercial area? Why?

ACTIVITY 4:

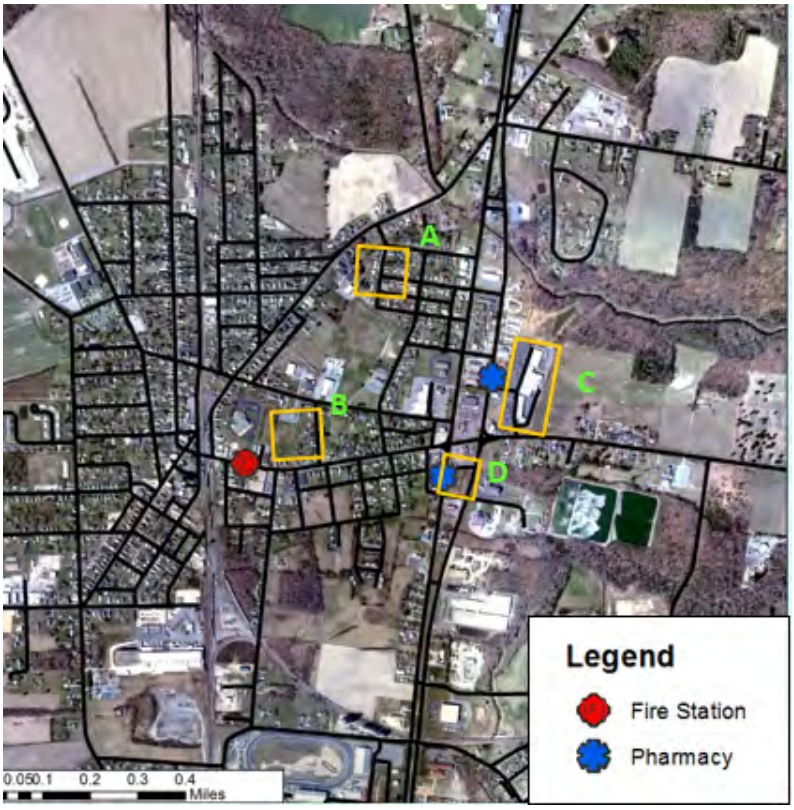
OBSERVE MAP 1:

- Notice the roads with high traffic
- Notice the location of the fire department and the pharmacies.

OBSERVE MAP 2:

- Notice how the areas are zoned.

Map 3 B: The Alternatives



(Answer the following questions on the same sheet of paper you used for the previous questions).

To the left (Map 3 B) are some appropriate areas for setting up the health clinic (each outlined with a rectangle or square and labeled with an A, B, C, or D.

- Which area do you think is best and why?
- Are there any other areas you can think of that might be better? Explain why or why not.

ACTIVITY 5:

- Summarize what accessibility is and how it can be useful and important.