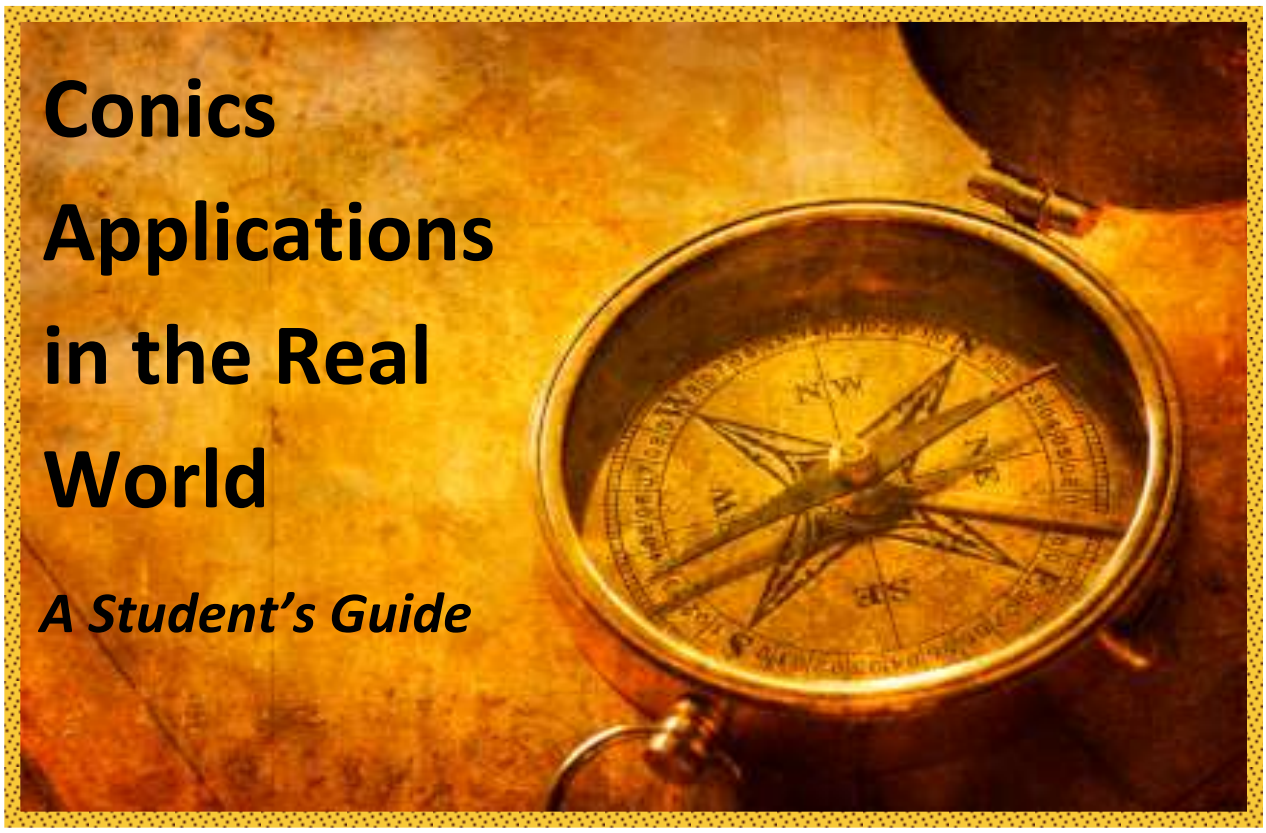

An Instruction Package created by:
Jodi Kohler
Teacher of Mathematics

Produced in:
EDTEC 572
San Diego State University

Online Resources can be found at:
http://www.kohlerconics.com

There is a link to the online resources that can be found on my website.

8 Steps of Instruction:

Step 1: You will be graphing circles using a given quadratic equation, identifying the radius and the center. You will also define the term, "center form".

Step 2: You will be graphing ellipses using a given quadratic equation. You will identify the foci, vertices and co-vertices based on the major and minor axis. You will write an equation of an ellipse in center form given a graph.

Step 3: You will be graphing parabolas using a given quadratic equation, identifying the vertex, the focus, the directrix and the latus rectum. You will also determine whether a parabola is vertical or horizontal by looking at an equation and/or graph.

Step 4: You will be graphing hyperbolas using a given quadratic equation, identifying the center, the foci and the asymptotes. You will also determine whether a hyperbola is vertical or horizontal by looking at an equation and/or graph.

Step 5: You will be conducting a web search to discover applications of conic sections.

Step 6: You will collect digital images, whether personal or taken from the internet, to be used for a presentation on conic applications. Once you select the images, you will save them to an easily transportable memory device. You will also be able to locate and bring to class physical objects that represent a conic application. You will have four days (outside of class time) to locate and store these items.

Step 7: With the aid of a graphic organizer you will create a five to seven minute presentation using any media you would like (video, PowerPoint, Posters etc.) that showcases your findings on all four conic sections and meets all of the criteria listed on the content check-off sheet.

Step 8: You will be delivering a five to seven minute presentation using the information collected on the graphic organizer, the digital images, the conic scavenger hunt sheets and notes on the lectures.

Supplementary Materials

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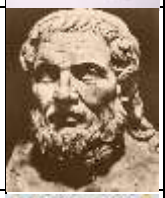
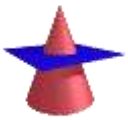
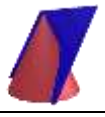
Web Search on Conics: A Job Aid

Directions: Listed below are websites that contain information on conic applications. With the aid of an online computer and the scavenger hunt list, use the links below to complete a webquest on conics.

Contents		Website
Variety of Applications of Conic Sections		http://britton.disted.camosun.bc.ca/jbconics.htm http://www2.krellinst.org/UCES/archive/resources/conics/node67.html
Algebraic Background on Conic Sections		http://www.mathacademy.com/pr/prime/articles/conics/index.asp
Historical View on Conic Sections		http://www2.krellinst.org/UCES/archive/resources/conics/node5.html
Animation of how Conic Sections are formed		http://britton.disted.camosun.bc.ca/conics.swf
Circle Applications		http://mathforum.org/~sanders/geometry/GP17Circle.html http://www-groups.dcs.st-and.ac.uk/~history/Curves/Circle.html
Ellipse Applications		http://mathforum.org/~sanders/geometry/GP18Ellipse.html
Parabola Applications		http://mathforum.org/~sanders/geometry/GP19Parabola.html
Hyperbola Applications		http://mathforum.org/~sanders/geometry/GP20Hyperbola.html http://mathcentral.uregina.ca/beyond/articles/LoranGPS/Navigation.html

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Web Search on Conics: The Circle

Directions: Using the URLs provided on the job aid, complete the scavenger hunt.

Circle Scavenger Hunt:

1. The study of the circle predates recorded history. One of the first uses was probably the _____.

2. The circle and an estimation of pi is even mentioned in the Bible. What King used a circular basin, called a "sea"?

3. _____ was the first mathematician to attribute theorems about circles.

4. "The circle is the first, simplest and most perfect form." The circle is considered a perfect shape due to its _____.

5. Bonus Question (not found in a website) Name a current musical group that pertains to the above question. A _____ / _____.

6. A circle with a radius of one and the origin as the center is called a

_____/ _____.

7. List any applications of circles not listed above that you discovered during the web search.

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Web Search on Conics: The Ellipse

Directions: Using the URLs provided on the job aid, complete the scavenger hunt.

Ellipse Scavenger Hunt:

1. The reflection property of the ellipse plays an important role in medicine. A light or signal that starts on one focus will reflect to the other. This is used in _____, the medical procedure for treating kidney stones.

2. Due to their reflection property, ellipses are used in acoustics. St Paul's Cathedral and the White House have this in common, a _____ / _____.

3. Before he was president, _____/_____/_____ used this refection property of the ellipse to eavesdrop on his colleagues.

4. _____ _____ discovered in the 17th century that the planets travel around the sun in an elliptical orbit with the sun as its foci.

5. What part of the atom moves in elliptical orbits?

6. List any applications of ellipses not listed above that you discovered during the web search.

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Web Search on Conics: The Parabola

Directions: Using the URLs provided on the job aid, complete the scavenger hunt.

Parabola Scavenger Hunt:

1. What Greek mathematician was one of the first to study conics and apply them to Greek astronomy?

2. Under what condition is the axis of symmetry horizontal?

3. A parabola is formed when a plane intersects a cone and is _____ to the side of the cone.

4. If the number in front of the x-squared term is negative, the parabola will open in what direction?

5. A sharpshooter on a SWAT team uses parabolas because they are used in _____, the study of the movement of a body under the force of gravity.

6. Galileo made this discovery about the path of a projectile in the 17th century. Who did this help to figure out how to hurtle their weapons?

7. Television addicts love parabolas because they are used in _____ / _____.

8. One of the practical uses of parabolas is their reflection property. The part of a car that uses this is the _____.

9. The largest parabolic mirror in existence is located in _____. It is used to collect light and radio waves from outer space.

10. A parabolic equation could help find the length of a cable in a _____ / _____. (Hint: I could sell you one from Brooklyn.)

11. List any applications of ellipses not listed above that you discovered during the web search.

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Web Search on Conics: The Hyperbola

Directions: Using the URLs provided on the job aid, complete the scavenger hunt.

Hyperbola Scavenger Hunt:

1. Many studied the one branch of the hyperbola. Who was the first to study the two branches?

2. _____ was the first mathematician to write about the focus and directrix of the hyperbola.

3. When concentric circles intersect hyperbolas are formed. Boats and cars to navigate utilize this principle. This hyperbolic radio navigation system is called _____.

4. Planets have elliptical orbits. A comet has a path similar to a _____.

5. The reflection property of a hyperbola is used in optics. This property is used in the making of a_____ / _____, part of an astronomer's favorite tool.

6. Due to the shape of the hyperbola, a _____ / _____from an airplane can be heard at the same time by people in different places along the curve on the ground.

7. List any applications of hyperbolas not listed above that you discovered during the web search.

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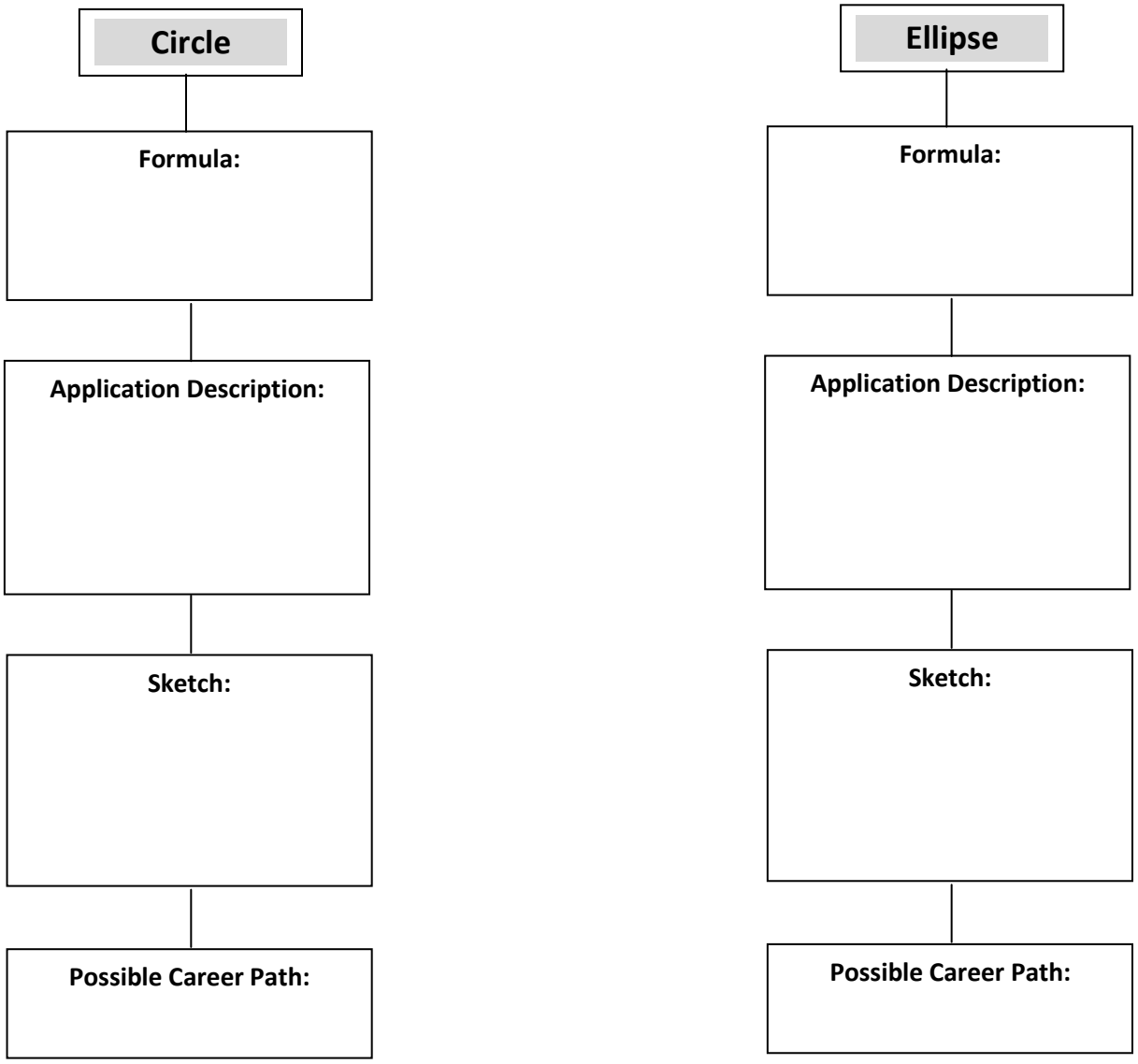
Graphic Organizer for Conics

Directions: Using the results from the web search, complete the graphic organizer. Once complete, use the compiled information to create a digital presentation.



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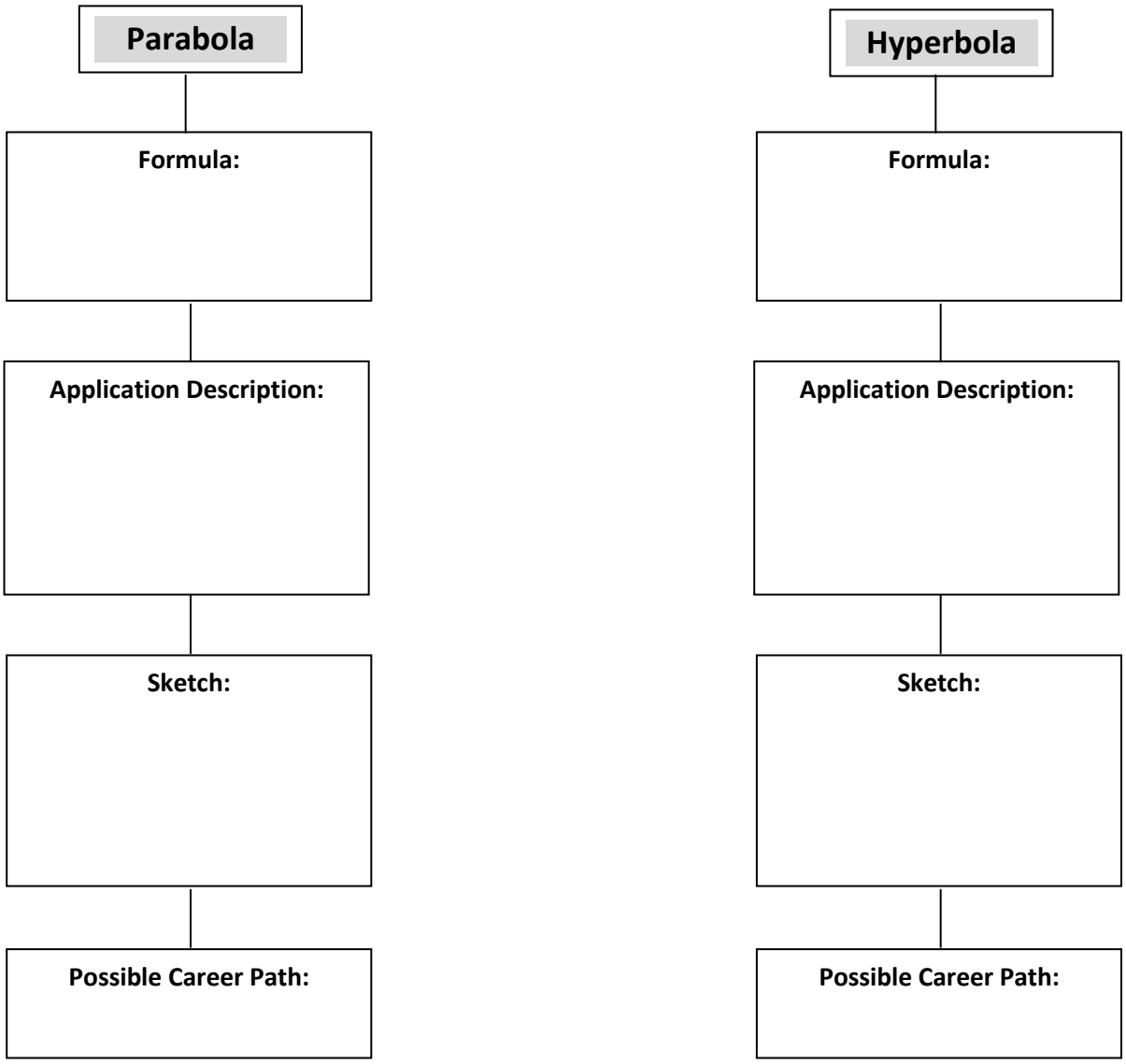

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Graphic Organizer for Conics: A sample

Directions: Using the results from the web search, complete the graphic organizer. Once complete, use the compiled information to create a digital presentation.

Circle

Formula:

$$(x-h)^2+(y-k)^2=r^2$$

Application Description:

A Roulette Table

Sketch:

Possible Career Path:

A Roulette Table Desianer

Ellipse

Formula:

$$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$$

Application Description:

The Planet's Orbits

Sketch:

Possible Career Path:

Astrologist

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Parabola

Formula:

$$(y-k)=a(x-h)^2$$

or

$$(x-h)=a(y-k)^2$$

Application Description:

A Flashlight

Sketch:

Possible Career Path:

Desian Liaht Filaments

Hyperbola

Formula:

$$\frac{(x-h)^2}{a^2}-\frac{(y-h)^2}{b^2}=1$$

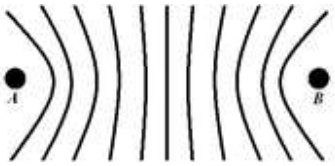
or

$$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$$

Application Description:

Long Range Navigation

Sketch:



Possible Career Path:

Government Researcher

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Conic Presentation: The Content Checklist

Directions: Prepare a presentation on Conic Applications using your outline, graphic organizer, images and manipulatives. Your presentation should contain the following elements:

For Circles:

- The general quadratic equation for a circle in center form.
- A description of a conic application that represents a circle.
- A visual aid in the form of a digital image, drawing or manipulative

For Ellipses:

- The general quadratic equation for an ellipse in center form.
- A description of a conic application that represents an ellipse.
- A visual aid in the form of a digital image, drawing or manipulative.

For Parabolas:

- The general quadratic equation for a vertical and horizontal parabola in vertex form.
- A description of a conic application that represents a parabola.
- A visual aid in the form of a digital image, drawing or manipulative.

For Hyperbolas:

- The general quadratic equation for vertical and horizontal hyperbolas in vertex form.
- A description of a conic application that represents a hyperbola.
- A visual aid in the form of a digital image, drawing or manipulative.

Optional:

- Any video clips that describe a conic application and its function are encouraged yet not required.
- A description of an occupation that utilizes a conic application.

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Conic Presentation: The Execution Checklist

Directions: Present your findings on conic applications through a written, oral and visual presentation. This presentation will be conducted in front of the class. For pictures, equations and descriptions of the conics presentation software, videos, photos and/or hand-drawn posters may be used. The presentation should be delivered using the following guidelines:

Content of the Presentation:

- The spoken content of the presentation is equally distributed among group members.
- The content meets all of the requirements listed on the "Content Checklist".
- The presentation follows the group's outline and graphic organizer.

Projection:

- Each presenter projects his/her voice to be comfortably heard by all students.

Clarity:

- The presentation flows well and makes sense.
- Each presenter uses correct grammar and incorporates math terms related to the unit on conics.
- The images and/or manipulatives presented connect well to the chosen conic.
- The visual aids are easy to see by all students.

Time:

- The presentation is between 5 to 7 minutes.

Overall Appearance:

- The group fulfills all of the expectations listed on the content and execution checklist.
- The presentation is interesting and creative.

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Conic Presentation: The Rubric

Content:

Circle Content	Includes the correct equation for a circle.	0	1
	Includes a description of a conic application that represents a circle.	0	1
	Includes a visual aid in the form of a digital image, drawing or manipulative.	0	1
Ellipse Content	Includes the correct equation for an ellipse.	0	1
	Includes a description of a conic application that represents an ellipse.	0	1
	Includes a visual aid in the form of a digital image, drawing or manipulative.	0	1
Parabola Content	Includes the correct equation for a vertical and horizontal parabola.	0	1
	Includes a description of a conic application that represents a parabola.	0	1
	Includes a visual aid in the form of a digital image, drawing or manipulative.	0	1
Hyperbola Content	Includes the correct equation for a vertical and horizontal hyperbola.	0	1
	Includes a description of a conic application that represents a hyperbola.	0	1
	Includes a visual aid in the form of a digital image, drawing or manipulative.	0	1

Total Content Points _____

Execution Points:

Distribution and Alignment of Content	The content of the presentation is equally distributed among the group members.	1	2	3
	The presentation corresponds with the group's graphic organizer.	1	2	3
Projection	Each person projects his/her voice to be comfortably heard by all students.	1	2	3
Clarity	The presentation is organized and makes sense.	1	2	3
	Each presenter uses correct grammar and incorporates math terms related to the unit on conics.	1	2	3
	The images and/or manipulatives presented adequately connect to the chosen conic section.	1	2	3
	The visual aids are easy to see by all students.	1	2	3
Overall Appearance	The presentation fulfills all of the requirements listed on the content and execution checklists.	1	2	3
	The presentation is interesting and creative.	1	2	3
Time	The presentation is between five and seven minutes.	0		1

Total Execution Points _____

1 to 3 scale	0 to 1 scale
1 = Little effort shown and expectation is not met.	0= Does Not Meet the Expectation
2 = Satisfactory effort show and expectation is almost met.	1= Does Meet the Expectation
3 = Meets and exceeds the expectation.	