

HOW CAN YOU TRANSFORM CONIC SECTIONS TO CREATE A DESIGN? كيف يمكنك تحويل القطوع المخروطية لإنشاء تصميم؟

Teacher Notes:

This exploration should be completed in groups of 2-4 over a period of approximately 7 lessons. Because this task has a large ICT component, we suggest teachers consider using smaller groups so it is easier for all students to participate and contribute effectively.

ملاحظات المعلم: ينبغي أن يستكمل هذا الاستكشاف في مجموعات من 2-4 على مدى ما يقرب من 7 الدروس. لأن هذه المهمة لديها جزء كبير تكنولوجيا المعلومات والاتصالات، فإننا نقترح المعلمين النظر في استخدام مجموعات صغيرة ولذلك فمن السهل لجميع الطلاب للمشاركة والمساهمة بشكل فعال.

A **suggested** timeframe is below. This can be changed to suit the school, resources and teacher where appropriate. However, it is important to constantly remind yourself that explorations are intended to be student directed. Your role as the teacher is to guide the students in their interpretation of the task in relation to the rubric criteria. This is to ensure that students use the mathematics content as the context for the problem and the three exploration skills as their learning.

والإطار الزمني المقترح هو أدناه. يمكن تغيير هذا لتناسب مع المدرسة والموارد والمعلم عند الاقتضاء. ومع ذلك، فمن المهم أن نذكر نفسك باستمرار والتي تهدف الاستكشافات أن يكون الطالب توجيهه. دورك المعلم هو توجيه الطلاب في تفسيرهم للمهمة فيما يتعلق بمعايير الموضوع. هذا هو التأكد من أن الطلاب استخدام محتوى الرياضيات سياق لهذه المشكلة ومهارات الاستكشاف ثلاثة كما تعلمهم.

This task should be used at the **beginning** of the Conics unit (ML3.PA5). Through completing this task, students will learn for themselves how to graph and transform conics and understand the relationship between the equation and the graph. The teacher should **not** do any teaching on conics before the exploration.

Teachers must go through the explorations rubric and supporting document with students before the task is given.

وينبغي أن تستخدم هذه المهمة في بداية وحدة هندسة المخروطيات (ML3.PA5) من خلال استكمال هذه المهمة، وسوف يتعلم الطلاب لأنفسهم كيفية الرسم البياني وتحويل هندسة المخروطيات وفهم العلاقة بين المعادلة والرسم البياني. يجب أن المعلم لن تفعل أي تعليم على هندسة المخروطيات قبل الاستكشاف. يجب على المعلمين تذهب من خلال عنوان الاستكشافات وثيقة دعم مع الطلاب قبل إعطاء المهمة.

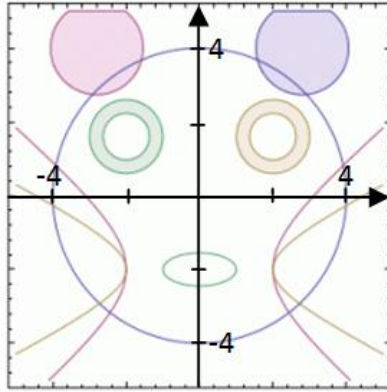
	Plan	Resources
<p>Lesson 1-2</p> <p>Introduction to the task</p> <p>Defining the problem and plan</p>	<p>This lesson needs to take place in the ICT lab.</p> <p>Tell the students, “We are starting a new unit today about Conic Sections. Conic Sections are special types of graph. By doing this exploration you will learn about these conics and their equations, and how to graph and transform them.</p> <p>نقول للطلاب، "إننا نبدأ وحدة جديدة اليوم حول القطوع المخروطية. القطوع المخروطية هي أنواع خاصة من الرسم البياني. من خلال ذلك استكشاف سوف تتعلم حول هذه هندسة المخروطيات والمعادلات، وكيف لرسم وتحويلها.</p> <p>“The first thing we will do is simply explore what Conic Sections look like and how they are made from a plane cutting a cone. Go to this website: http://illuminations.nctm.org/ActivityDetail.aspx?ID=195</p> <p>You can move the cone view (on the left) and change the values at the bottom. As you do this, the graph (on the right) will change. Your goal is to use this website to find <u>four</u> different types / shapes of graph that can be made from a plane cutting a cone.”</p> <p>"إن أول شيء سنقوم به هو مجرد استكشاف ما تبدو أقسام مخروطي مثل وكيف أنها مصنوعة من طائرة قطع مخروط. الذهاب إلى هذا الموقع http://illuminations.nctm.org/ActivityDetail.aspx?ID=195 يمكنك تحريك العرض مخروط (على اليسار) وتغيير القيم في القاع. كما كنت تفعل هذا، فإن الرسم البياني (على اليمين) تتغير. هدفك هو استخدام هذا الموقع للعثور على أربعة أنواع مختلفة / الأشكال من الرسم البياني التي يمكن أن تكون مصنوعة من طائرة قطع مخروط."</p> <p>Now let the students explore the conics in their exploration groups using the website. As students find the 4 different shapes, have them sketch them and describe when / how each type is made.</p> <p>الآن السماح للطلاب استكشاف هندسة المخروطيات في مجموعات استكشافهم استخدام الموقع. حيث يجد الطلاب 4 أشكال مختلفة، ويكون لهم رسم لهم ووصف عندما / الطريقة التي يتم بها كل نوع.</p> <p>After groups find all 4 shapes, the teacher can give them the four names – circle, ellipse, parabola, hyperbola – and ask the students to try and match the names with the four shapes. (They should recognise the circle and parabola easily from previous years, and some students may also remember hyperbolas from 10Ac5 Curve Sketching).</p> <p>بعد العثور على جماعات جميع الأشكال 4، يمكن للمدرس أن يقدم عليها أسماء أربعة - دائرة، والقطع الناقص، القطع المكافئ، القطع الزائد - ويطلب من الطلاب في محاولة لمطابقة الأسماء مع الأشكال الأربعة. (ينبغي أن تعترف الدائرة والقطع المكافئ بسهولة من السنوات السابقة، وبعض الطلاب قد تذكر أيضا القطوع الزائدة من 10Ac5 المنحني انطباعات).</p> <p>After the groups finish, ask these reflection questions:</p> <ul style="list-style-type: none"> - What things had to change to make the different types of conic? - Why do you think these four types of graph are called “Conic Sections”? What does “conic” mean? What is a “section”? - Do you think there could be other types of conic section, or just these four? Why or why not? Was anyone able to find a different type of graph using the website? <p>بعد الانتهاء من الجماعات، نسأل هذه الأسئلة التفكير:</p> <ul style="list-style-type: none"> - ما هي الأشياء التي اضطر إلى تغيير لجعل أنواع مختلفة من مخروطي؟ - لماذا تعتقد أن تسمى هذه الأنواع الأربعة من الرسم البياني "القطوع المخروطية"؟ ماذا تعني عبارة "مخروطي" يعني؟ ما هو "الباب" لذلك؟ 	<ul style="list-style-type: none"> • ICT lab access • Grid paper • Exploration worksheets • Explorations rubric and supporting document (students should already have these)

- هل تعتقد أن يمكن أن يكون هناك أنواع أخرى من قطع مخروطي، أو مجرد هذه الأربعة؟ لما و لما لا؟ كان أي شخص قادرا على العثور على نوع مختلف من الرسم البياني باستخدام هذا الموقع؟

NOTE: The above section of the exploration is not to be marked. It is simply an introduction where students can meet the conic sections for the first time so they are ready for the main task.

ملاحظة: القسم أعلاه من الاستكشاف هو عدم وضع علامة. بل هو مجرد مقدمة حيث يمكن للطلاب تلبية القطوع المخروطية لأول مرة لتكون جاهزة للمهمة الرئيسية.

Now introduce the main exploration task: *“In your group, you need to use grid paper to make a picture that includes each of the four conic shapes. Your picture can be anything – for example, a face, a car, an animal, a building etc. but it must include all four conics. Here is an example:*



“The big question that you need to answer in this exploration is:

“How can you transform conic sections to create a design?”

Designing your picture on grid paper is how you will define the problem you will solve for the exploration. Then during the exploration you need to research and learn how to graph and transform conics so that you can form the equations needed to graph your design in a program called GrafEq.”

Now give out the student exploration worksheets and have groups start defining the problem they will explore (i.e. sketching their design) and writing their plan for solving the problem.

Move around and listen to students discussing their problem and plan. If several groups have chosen similar designs (e.g. all faces), encourage them to select something different so there is variety across the class.

Remind students to refer to the explorations rubric and supporting document to guide them as they work on their problem and plan.

After exploration lesson 1, the teacher should collect each group’s work and mark their definition of the problem (their sketch) and their plan. Then return this to the students at the start of the next lesson so they can implement their plan.

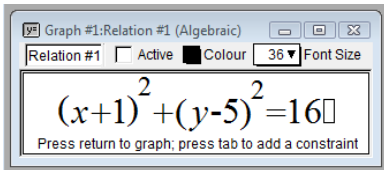
بعد الدرس التنقيب 1، يجب على المعلم بجمع عمل كل فريق وعلامة تعريفهم للمشكلة (رسم لهم) وخطتهم. ثم يعود هذا للطلاب في بداية الدرس القادم حتى يتمكنوا من تنفيذ خطتهم.

<p>Lessons 3-5</p> <p>Gathering and recording information and generating solutions</p>	<p>These lessons are for students to gather the information they need to solve the problem. They will need to research the equations and graphs for each conic and also spend time experimenting with graphing the different conics in the GrafEq program. Therefore, they will be both gathering and recording information <u>and</u> generating solutions during these lessons.</p> <p>Give students the GrafEq resource sheet to help them start using the program. They can discover more complex features by themselves as they experiment with the program e.g. how to colour their design.</p>	<ul style="list-style-type: none"> • ICT lab / library access • GrafEq program installed on computers • GrafEq resource sheet
<p>Lesson 6</p> <p>Suggesting conclusions</p>	<p>This lesson is for groups to use the information they have gathered to write their conclusion to answer the original question. Groups need to write (in their own words) general statements summarising what they have learned about how to graph each type of conic, how the graph and equation are related, and how each type of conic can be transformed.</p> <p>Groups can also use this period to prepare their product for presentation (this could be a report, poster or PPT). Remind students to refer to the explorations rubric to make sure they have met all the requirements and included all necessary information in their product.</p>	<ul style="list-style-type: none"> • Calculators • Computer access if preparing a PPT or report • Poster paper • Scissors, glue • Explorations rubric and supporting document (students should already have this)
<p>Lesson 7</p> <p>Presentation to the class</p>	<p>It is important for students to be given the opportunity to explain their work to the class. Sometimes students learn better from each other than they do from the teacher.</p> <p>Ensure that all groups have a fair chance to present. Each group should only need a few minutes and all groups should be able to present within one period.</p>	<ul style="list-style-type: none"> • Data projector • Wall space to display posters / booklets

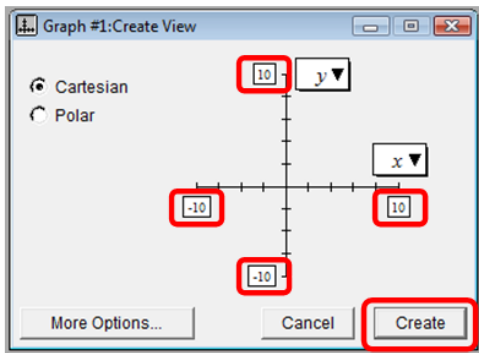
Resource Sheet – GrafEq

To graph your first equation:

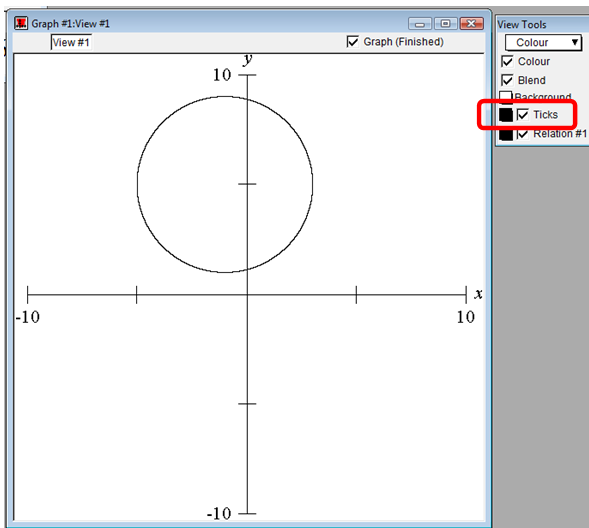
1. Type the equation then press “Enter”



2. Check the minimum and maximum values for your axes then press “Create”



3. Make sure “ticks” is turned on so the axes appear on your graph



To add another equation to the same graph:

“Graph” menu → “New relation”

To create a new graph (on a new set of axes):

“File” menu → “New graph”