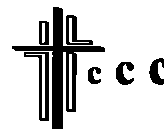


Integrating **MATHEMATICS** and **INFORMATION AND COMMUNICATION TECHNOLOGY**

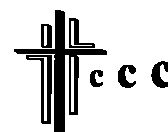


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| Activity: 8G1 | Strand: Geometry and Spatial Sense | Concept: Constructing circles and determining the significance of Pi in relation to the circumference of a circle. |
| Description of Task | <p>Students construct circles in three different ways then use their constructions to explore the relationship between circumference and the radius and diameter using Geometer's Sketchpad.</p> <p>**Note: The focus in this activity will be on the circumference. Activity 8G2 examines area.</p> | |
| Expectations | <p><u>Process</u></p> <p>8m4 select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;</p> <p>8m6 create a variety of representations of mathematical ideas, connect and compare them, and select and apply the appropriate representations to solve problems;</p> <p>8m7 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions;</p> <p><u>Overall</u></p> <p>8m40 demonstrate an understanding of the geometric properties of quadrilaterals and circles and the application of geometric properties in the real world</p> <p><u>Specific</u></p> <p>8m44 construct a circle, given its centre and a radius, or its centre and a point on the circle, or three points on the circle</p> <p><u>Catholic Graduate</u></p> <p>CGE4f applies effective communication, decision-making, problem-solving, time and resource management skills;</p> | |
| Software Type | Dynamic Geometry software (Geometer's Sketchpad) | |

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| Computer Skills Prerequisite | <p>Students must be able to:</p> <ul style="list-style-type: none"> • Instruction is explicit enough that a working use GSP is not necessary, however for a good opportunity for some experience with the program prior to trying this activity, you can have your students access this website http://www.curriculum.org/occ/tips/downloads.shtml where they will go to the activity. The activity is under Grade 9 called Introduction to GSP. This will walk them through some of the main functions of GSP. Having this experience will make them more comfortable which will make their experience much better when they go to do the activity. |
| Student Instructions (for teacher) | <ol style="list-style-type: none"> 1. Pre-activity (optional) - have students use a variety of cans to measure the circumference and radius and diameter. They should create a chart showing each of the measurements and look for a relationship between circumference and diameter then diameter and radius. They should notice that the circumference is approximately 3 times larger than the diameter and 6 times larger than the radius. 2. Introduce the students to the activity either by showing the video or by walking them through the activity yourself using a video projector. It is of great benefit for the students to see the activity done once. It makes it much easier to navigate through the program when it is time for them to do it on their own. Encourage the students to focus on simply watching what is happening on the screen. **They should not try to follow along on their own computer as you do demonstration. 3. Hand out the student instruction page "How to Find the Circumference of a Circle" that students can follow step by step to complete the activity. (Many students will choose to try to do the activity without the direction page based on remembering what they saw. This is okay and the step by step page will help them get back on track if they run into problems.) 4. Students may type their responses to the questions on the student instruction page directly onto the computer in a text box. 5. Return to the pre-activity and compare. Did the GSP activity confirm or refute their observations in the can activity? Why might there be some slight differences? (human error) 6. Using their observations of the relationships, develop a formula. |
| Teacher Notes | <ul style="list-style-type: none"> • It would be most beneficial to your students if they have gone through the online GSP activity so they are able to perform those functions • It would be most beneficial to your students if they have reviewed the following terminology: circumference, radius, diameter, • It would be most beneficial to your students if they have measured the circumference of a variety of circular items using a string (e.g., jars, cans) to familiarize themselves with the idea of what the circumference represents • For students who may struggle with the creation of their own circles, teachers may give them the pre-created set of circles (GSP file) that the students can measure on their own and make observations. • Note: when students try to create a circle using three points, to ensure they have done it correctly, you should be able to drag on each of the points and the circle will stay together. • To create the circle using three points, the key is to select the three points then go to arc through three points in the construct menu to create a part of a circle. To complete it, select the same three points in a different order. |

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| | <p>Additional Measurement expectations:</p> <p><u>Overall</u></p> <ul style="list-style-type: none"> determine the relationships among units and measurable attributes, including the area of a circle and the volume of a cylinder <p><u>Specific</u></p> <ul style="list-style-type: none"> measure the circumference, radius, and diameter of circular objects, using concrete materials (ex. Use string to measure the circumference of different circular objects) determine, through investigation using a variety of tools and strategies, the relationships for calculating the circumference and area of a circle, and generalize to develop the formulas solve problems involving the estimation and calculation of the circumference and area of a circle <p>Additional Number sense and Numeration expectations:</p> <p><u>Overall</u></p> <ul style="list-style-type: none"> solve problems using proportional reasoning in a variety of meaningful contexts <p><u>Specific</u></p> <ul style="list-style-type: none"> identify and describe real-life situations involving two quantities that are directly proportional (ex. Circumference and diameter of a circle) <p>Related Off-line Activities</p> <ul style="list-style-type: none"> Students could use paper and pencil and a compass to create circles then measure those and draw conclusions from there. | |
| | Activity Template File: No | Student Instruction BLM: Yes Student Instruction Video on using GSP: Yes |
| Assessment for Learning | <ul style="list-style-type: none"> Journal entry- based on their observations and discussion in class. If your students do not have a great deal of experience with journals, you may wish to do a class journal entry, or perhaps a group journal entry. (Curriculum) Performance assessment – based on responses to observations within the GSP file (Curriculum) Do they work collaboratively and respectfully with their partners? (CGE) | |

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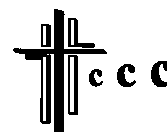


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| Activity: 8G2 | Strand: Geometry and Spatial Sense | Concept: Constructing circles and determining the significance of Pi in relation to the area of a circle. |
| Description of Task | <p>Students construct a circle then use their construction to explore the relationship between area and the radius and diameter using Geometer's Sketchpad.</p> <p>**Note: The focus in this activity will be on the area. Circumference is addressed in related activity, 8G1. It is beneficial if students have done this activity first.</p> | |
| Expectations | <p><u>Process</u></p> <p>8m4 select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;</p> <p>8m6 create a variety of representations of mathematical ideas, connect and compare them, and select and apply the appropriate representations to solve problems;</p> <p>8m7 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions;</p> <p><u>Overall</u></p> <p>8m40 demonstrate an understanding of the geometric properties of quadrilaterals and circles and the application of geometric properties in the real world</p> <p><u>Specific</u></p> <p>8m44 construct a circle, given its centre and a radius, or its centre and a point on the circle, or three points on the circle</p> <p><u>Catholic Graduate</u></p> <p>CGE4f applies effective communication, decision-making, problem-solving, time and resource management skills;</p> | |
| Software Type | Dynamic Geometry software (Geometer's Sketchpad) | |
| Computer Skills Prerequisite | Students must be able to: | |

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| | <ul style="list-style-type: none"> • Instruction is explicit enough that a working use GSP is not necessary, however for a good opportunity for some experience with the program prior to trying this activity, you can have your students access this website http://www.curriculum.org/occ/tips/downloads.shtml where they will go to the activity. The activity is under Grade 9 called Introduction to GSP. This will walk them through some of the main functions of GSP. Having this experience will make them more comfortable which will make their experience much better when they go to do the activity. |
| Student Instructions (for teacher) | <ol style="list-style-type: none"> 1. Pre-activity (optional)- have students use a variety of cans to measure the circumference and radius and diameter. They should create a chart showing each of the measurements and look for a relationship between circumference and diameter then diameter and radius. They should notice that the circumference is approximately 3 times larger than the diameter and 6 times larger than the radius. 2. Introduce the students to the activity either by showing the video or by walking them through the activity yourself using a video projector. It is of great benefit for the students to see the activity done once. It makes it much easier to navigate through the program when it is time for them to do it on their own. Encourage the students to focus on simply watching what is happening on the screen. **They should not try to follow along on their own computer as you do demonstration. 3. Hand out the student instruction page "How to Find the Circumference of a Circle" that students can follow step by step to complete the activity. (Many students will choose to try to do the activity without the direction page based on remembering what they saw. This is okay and the step by step page will help them get back on track if they run into problems.) 4. Students may type their responses to the questions on the student instruction page directly onto the computer in a text box. 5. Using their observations of the relationships, develop a formula when working with area. |
| Teacher Notes | <ul style="list-style-type: none"> • It would be most beneficial to your students if they have gone through the online GSP activity so they are able to perform those functions • It would be most beneficial to your students if they have reviewed the following terminology: circumference, radius, diameter, area • For students who may struggle with the creation of their own circles, teachers may give them the pre-created set of circles (GSP file) that the students can measure on their own and make observations. • Students could use grid paper and pencil and a compass to create circles then measure the diameter and radius and make approximate measures by counting squares and part squares to determine the area and draw conclusions from there. • It is best to have the students do the circumference activity 8G1 before this then apply one of those methods for creating a circle. <p>Additional Measurement expectations:</p> <p><u>Overall</u></p> <ul style="list-style-type: none"> • determine the relationships among units and measurable attributes, including the area of a circle and the volume of a cylinder |

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| | <p><u>Specific</u></p> <ul style="list-style-type: none"> determine, through investigation using a variety of tools and strategies, the relationships for calculating the circumference and area of a circle, and generalize to develop the formulas solve problems involving the estimation and calculation of the circumference and area of a circle <p>Additional Number sense and Numeration expectations:</p> <p><u>Overall</u></p> <ul style="list-style-type: none"> solve problems using proportional reasoning in a variety of meaningful contexts <p><u>Specific</u></p> <ul style="list-style-type: none"> identify and describe real-life situations involving two quantities that are directly proportional (ex. Circumference and diameter of a circle) <p>Related Off-line Activities</p> <ul style="list-style-type: none"> Students could use grid paper and pencil and a compass to create circles then measure the radius and diameter and make approximate area measures by counting coloured in squares those and draw conclusions from there. | |
| | Activity Template File: No | Student Instruction BLM: Yes Student Instruction Video on using GSP: Yes |
| Assessment for Learning | <ul style="list-style-type: none"> Journal entry- based on their observations and discussion in class. If your students do not have a great deal of experience with journals, you may wish to do a class journal entry, or perhaps a group journal entry. (Curriculum) Performance assessment – based on responses to observations within the GSP file (Curriculum) Do they work collaboratively and respectfully with their partners? (CGE) | |

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| Activity: 8G3 | Strand: Geometry and Spatial Sense | Concept: Exploring Euler's Theorem using 5 platonic solids |
| Description of Task | Students will explore the relationship between the numbers of edges, faces and vertices among regular polyhedra. | |
| Expectations | <p><u>Process</u></p> <p>8m4 select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;</p> | |

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| | <p>8m6 create a variety of representations of mathematical ideas, connect and compare them, and select and apply the appropriate representations to solve problems;</p> <p>8m7 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions;</p> <p><u>Overall</u></p> <p>8m41 develop geometric relationships involving lines, triangles and polyhedra, and solve problems involving lines and triangles</p> <p><u>Specific</u></p> <p>8m51 determine, through investigation using concrete materials, the relationship between the numbers of faces, edges, and vertices of a polyhedron (i.e., number of faces + number of vertices = number of edges + 2)</p> <p><u>Catholic Graduate</u></p> <p>CGE4f applies effective communication, decision-making, problem-solving, time and resource management skills;</p> |
| Software Type | Website http://nlvm.usu.edu/en/nav/vlibrary.html |
| Computer Skills Prerequisite | <p>Students must be able to:</p> <ol style="list-style-type: none"> 1. Access and navigate a website |
| Student Instructions (for teacher) | <ol style="list-style-type: none"> 1. Pre-activity (optional) <ol style="list-style-type: none"> a) have students use polydrons or use paper nets to create the 5 platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedron) b) students count the number of faces, edges and vertices and record their findings in a chart c) students look for a relationship between the number of faces, edges and vertices (some may find it, if not explain that they will have a further opportunity to explore it using the computer) 2. Introduce the students to the activity either by showing the video or by walking them through the activity yourself using a video projector. It is of great benefit for the students to see how to navigate the site and use the web-based activity done once. It makes it much easier to navigate through the activity when it is time for them to do it on their own. Encourage the students to focus on simply watching what is happening on the screen. **They should not try to follow along on their own computer as you do demonstration. 3. Hand out the student instruction page "Euler's Theorem Exploration" that students can follow step by step to complete the activity. 4. Class discussion at the end about what they observed to ensure understanding. |

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| Teacher Notes | <ul style="list-style-type: none"> • Make sure you test the website out before you have the class go on. There could be some issues with drivers or add-ons depending on school board. • Review terminology- polyhedron, tetrahedron, cube, octahedron, dodecahedron, icosahedron, edges, faces, vertices, platonic solids, regular and irregular polyhedrons <p>Related Off-line Activities</p> <ul style="list-style-type: none"> • This activity may be done using paper nets or polyhedrons. • This activity could be used as one of three centres, the other two using paper nets and polydrons • The activity can be extended by having students use the polydrons to create irregular polyhedrons to determine if the relationship holds true. | |
| | Activity Template File: No | Student Instruction BLM: Yes Student Instruction Video: Yes |
| Assessment for Learning | <ul style="list-style-type: none"> • Journal entry- based on their observations and discussion in class. If your students do not have a great deal of experience with journals, you may wish to do a class journal entry, or perhaps a group journal entry. (Curriculum) • Performance assessment – based on responses to observations (Curriculum) • Do they work collaboratively and respectfully with their partners? (CGE) | |

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| Activity: 8G4 | Strand: Geometry and Spatial Sense | Concept: The relationship between the areas, perimeters, corresponding angles and corresponding side lengths of similar rectangles. |
| Description of Task | Students create, transform, and explore measurements of similar rectangles in Geometer's Sketchpad. | |
| Expectations | <p><u>Process</u></p> <p>8m4 select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;</p> <p>8m6 create a variety of representations of mathematical ideas, connect and compare them, and select and apply the appropriate representations to solve problems;</p> | |

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| | <p>8m7 communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary and a variety of appropriate representations, and observing mathematical conventions;</p> <p><u>Overall</u></p> <p>8m41 develop geometric relationships involving lines, triangles and polyhedra, and solve problems involving lines and triangles</p> <p><u>Specific</u></p> <p>8m46 determine, through investigation using a variety of tools, relationships between area, perimeter, corresponding side lengths and corresponding angles of similar shapes</p> <p><u>Catholic Graduate</u></p> <p>CGE4f applies effective communication, decision-making, problem-solving, time and resource management skills;</p> |
| Software Type | Dynamic Geometry software (Geometer's Sketchpad) |
| Computer Skills Prerequisite | <p>Students must be able to:</p> <ul style="list-style-type: none"> • Instruction is explicit enough that a working use GSP is not necessary, however for a good opportunity for some experience with the program prior to trying this activity, you can have your students access this website http://www.curriculum.org/occ/tips/downloads.shtml where they will go to the activity. The activity is under Grade 9 called Introduction to GSP. This will walk them through some of the main functions of GSP. Having this experience will make them more comfortable which will make their experience much better when they go to do the activity. |
| Student Instructions (for teacher) | <ol style="list-style-type: none"> 1. Introduce the students to the activity either by showing the video or by walking them through the activity yourself using a video projector. It is of great benefit for the students to see the activity done once. It makes it much easier to navigate through the program when it is time for them to do it on their own. Encourage the students to focus on simply watching what is happening on the screen. **They should not try to follow along on their own computer as you do demonstration. 2. Hand out the student instruction page "Similar Rectangle Investigation" that students can follow step by step to complete the activity. (Many students will choose to try to do the activity without the direction page based on remembering what they saw. This is okay and the step by step page will help them get back on track if they run into problems.) 3. Students may type their responses to the questions on the student instruction page directly onto the computer in a text box. |

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| Teacher Notes | <ul style="list-style-type: none"> • It would be most beneficial to your students if they have gone through the online GSP activity (see website above) so they are able to perform those functions • It would be most beneficial to your students if they have reviewed the following terminology: dilatation, polygon, quadrilateral, rectangle, congruence, similar figures, area, perimeter, corresponding sides and angles • Students need to know how to name an angle (the middle letter is the vertex) • For students who may struggle with the creation of their own set of rectangles, teachers may give them the pre-created set of rectangles (GSP file) that the students can measure on their own and make observations. • To extend, students could create other polygons to see if similar relationships hold true. <p>Related Off-Line Activities</p> <ul style="list-style-type: none"> • Students can do the same activity using grid paper or a geoboard. • The activity could be set up as centres having students explore the task using GSP, geoboards, and grid paper. | |
| | Activity Template File: Yes | Student Instruction BLM: Yes Student Instruction Video: Yes |
| Assessment for Learning | <ul style="list-style-type: none"> • Journal entry- based on their observations and discussion in class. If your students do not have a great deal of experience with journals, you may wish to do a class journal entry, or perhaps a group journal entry. (Curriculum) • Performance assessment – based on responses to observations within the GSP file (Curriculum) • Do they work collaboratively and respectfully with their partners? (CGE) | |