Graphical Communication Curriculum Units
with examples of teaching activities
Form 1

Directorate for Quality and Standards in Education
Curriculum Management and eLearning Department
Malta 2012
Curriculum for Graphical Communication
GRAPHICAL COMMUNICATION CURRICULUM UNITS – FORM 1

GRA 7.1  Grasping the principles of basic Geometrical Construction
GRA 7.2  Constructing angles and patterns by means of Compasses and Set Squares
GRA 7.3  Understanding and Constructing Basic Geometric Shapes
GRA 7.4  Understanding and Constructing Circles and Polygons
GRA 7.5  Projecting Isometric Drawings
GRA 7.6  Introducing Information Graphics
Subject: GRAPHICAL COMMUNICATION

Unit code and title: **GRA 7.1 Grasping the principles of basic Geometrical Construction**

Strand: Geometry

Unit Duration: 9 sessions by 40 minutes (6hours)

**Objectives**
The teacher will:

1. help students use drawing material and equipment correctly to complete simple exercises.
2. help students mark out using dividers and ruler in order to draw borderline and title block.
3. help students bisect horizontal, vertical and angled lines using compasses (single and multiple bisections).
4. help students erect perpendiculars from points on line; drop a perpendicular from a point above line.
5. help students construct parallel lines.
6. help students bisect angles by means of set squares or compasses.

**Key Words**
- Drawing board,
- drawing clips,
- tee-square,
- compasses,
- set squares,
- protractor,
- 2H, H pencils,
- bisection,
- perpendicular,
- angles,
- grid.

**Points to note**
The teacher demonstrates how to use drawing equipment. At this stage students require individual attention until they attain the necessary skills to handle the drawing instruments.

The recommended teaching method at this stage would be direct exposition and a small dose of learning by discovery.

**Resources**
- Interactive whiteboard
- Whiteboard, large drawing instruments to be used on the whiteboard.
- Graphical Communication Website link: [http://graphicalcommunication.skola.edu.mt/](http://graphicalcommunication.skola.edu.mt/)
- Textbooks:
  - Graphical Communication 1 Stuart Bland
  - Technical Drawing (omnibus) F.B. Mayock
  - Understanding Technical Graphics J.&T. O’Sullivan
- Understanding Technical Graphics Workbook
- Graphical Communication Handouts
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| The teacher will: help students use drawing material and equipment correctly to complete simple exercises. | The teacher discusses the importance of Graphical Communication through its relevance in everyday life and in the industrial world. The teacher also stresses the importance of accuracy and clarity of expression required to produce a good drawing. The teacher demonstrates the correct use and maintenance of each of the drawing equipment and lets students practice using them. **Possible Activities:**  
- Students practice parallel lines by drawing a grid on an A3 paper by using the T-square and set squares.  
- Students use the grid as a guide to draw attractive patterns as displayed on the Graphical Communication website. *Practice and experimentation at home is advisable.*  
[http://graphicalcommunication.skola.edu.mt/](http://graphicalcommunication.skola.edu.mt/) | Students will use the ruler to measure and draw vertical and horizontal lines one centimetre apart with a low degree of accuracy and neatness. They will require continuous support to draw and shade in the given patterns. (Level 5)  
Students will select and use standard metric units and their abbreviations when estimating, measuring and recording length, drawing and measuring lines to the nearest centimetre. Students will identify and use the correct drawing equipment and materials. Students will require support to align the drawing paper correctly, to exert the correct pencil pressure and to use the Tee-square and set squares correctly. (Level 6)  
Students will identify and use the correct drawing equipment and materials. They will give an indication of their disposition to develop good working habits by maintaining correct paper alignment, cleanliness and accuracy. They will require minimum support to use the correct pencils (H, 2H) with the necessary pressure to draw neat construction lines and outlines. Students will use the Drawing board, T-square, ruler, set squares, drawing paper and drawing clips to measure and draw parallel, vertical and horizontal grid lines. Students will render neatly the chosen design. Students will explore different patterns that suit their competence, neatly line in and render the chosen design. (Level 7) |
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| help students mark out using dividers and a ruler in order to draw borderline and title block. | The teacher explains the importance of organised presentation and demonstrates the drawing of the borderline and the title block (emphasis is to be made on line thickness, correct measurement and the lettering). The teacher also stresses that this exercise is to be repeated with every new drawing. A typical title block layout is shown on the Graphical Communication website (see link below). **Possible Activities:**  
  - Students draw the borderline and title block on an A3 drawing paper.  
  - Students prepare a number of A3 papers by drawing borderlines and title blocks as part of their homework. These will be used later for their class work.  
  [Link](http://graphicalcommunication.skola.edu.mt/) | Students will use ruler to mark out and draw a title block with reasonable precision. Students will measure lines and spaces, use fairly consistent line thicknesses and print moderately legible lettering with rather consistent height. Students will draw a fairly accurate grid by using construction lines with reasonable consistency and line in the correct lettering by using rather consistent outlines. (Level 6) |
<p>|                      |                                                 | Students will use dividers and ruler to mark out and draw a neat, precise title block. Students will measure lines and spaces correctly, use the correct line thicknesses and print legible and uniform lettering. Students will draw a neat grid by using construction lines and line in accurately the correct lettering by using outlines. (Level 7) |</p>
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| help students bisect horizontal, vertical and angled lines using compasses (single and multiple bisections). | The teacher emphasises the importance of compasses as an indispensable tool to complete geometric constructions. The teacher allows the students some time to experiment with the compasses (as per example on the right) and later demonstrates on the whiteboard the principle underlying the bisection of lines while referring to the distributed handout (below). **Possible Activities:**  
  - Students measure lines and bisect lines as per handout. | Students will measure and draw lines and will divide the lines mathematically. (Level 5)  
  - Students will measure and draw lines with a fair degree of accuracy and rather correct line thickness. Students will recognise the compass as an instrument used to draw circles and arcs. (Level 6)  
  - Students will measure and draw lines accurately with the correct line thickness. Students will use compasses correctly to draw neat arcs to bisect lines accurately. (Level 7) |

**Diagram:**

![Diagram of line bisection](image-url)
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</table>
| help students erect perpendiculars from points on line; drop a perpendicular from a point above line. | The teacher demonstrates on the whiteboard the method of erecting perpendiculars from points on a line and from a point above a line while referring to the distributed handout. **Possible Activities:**  
- Students measure lines and erect perpendiculars from points on the lines as per handout.  
- Students measure lines and erect perpendiculars from points above the lines as per handout. | Students will need support to draw and measure lines. Students will recognise right angles. (Level 5)  
Students will draw fairly accurately measured lines. Students will recognise and draw right angles by means of the set squares. (Level 6)  
Students will draw accurately measured lines and with the correct line thickness in order to construct neat perpendiculars from a point on the line and above the line with accurate results. (Level 7) |
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</table>
| help students construct parallel lines. | The teacher demonstrates on the whiteboard the method of constructing lines parallel to other lines by means of compasses and ruler while referring to the distributed handout / worksheet. **Possible Activities:**  
  
  - Students work on worksheet as shown in the example below. | Students will recognise lines which meet and lines which never meet. (Level 5)  
  
  Students will define parallel lines as lines which never meet and will draw lines parallel to given lines by means of a ruler. (Level 6)  
  
  Students will define parallel lines as lines which never meet and will construct lines parallel to given lines by means of compasses and ruler with a good degree of accuracy. Students will accurately construct lines parallel to plane figures inside and outside to enlarge and reduce the given figures. (Level 7) |
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</table>
| help students bisect angles by means of set squares or compasses. | The lesson starts off with a set induction consisting of geometric designs which consist mainly of bisected angles. The teacher discusses the designs and demonstrates how angles are bisected. The teacher and the students work out a number of examples on the whiteboard and eventually, with the newly acquired knowledge, the students can construct more complex designs.  
**Possible Activities:**  
The students construct a number of graded examples in angle bisection.  
The students construct geometric designs consisting of angle bisections while referring to the handout / textbooks.  
*Exercises not completed in class are to be continued at home.* | Students will bisect angles by folding paper.  
(Level 5)  

Students will bisect angles mathematically by means of a protractor.  
(Level 6)  

Students will bisect angles by means of compasses and apply this knowledge to construct accurate designs which involve multiple angular bisections.  
(Level 7) |
Digital Technology Enhanced Learning – Graphical Communication

The suggested URL for this subject at http://graphicalcommunication.skola.edu.mt offers a growing repository of material that can be used by the teacher to explain the various aspects in the proposed units. The examples can also be used by students to review the work done in class.

The suggested examples and software in the following units allow students to explain in different ways the content learned in each unit. While the teacher may see the end result of a drawing, the students can be asked to explain the different steps taken to get to the final drawing. This can take different forms like drawings, designing cartoons, and other uses of multimedia. While practice remains a fundamental requirement in Graphical Communication, the concepts can be investigated by means of software, without the need to reproduce a huge amount of drawings.

Unit 7.1 Grasping the principles of basic Geometrical Construction

For each objective described in Unit 1, students can create their own videos describing the process in drawing the borderline, or how to use the dividers or bisect a line and angle. Students can be grouped to tackle different objectives in this unit and then share their work online by uploading their explanations on a blog http://wordpress.org/ or http://edublogs.org (ref. to table 5).

This URL http://www.youtube.com/watch?v=S-atsonr8w&NR=1 shows an example of how students explained the bisections of a line and an angle by drawing and creating a simple animation. The same idea can be developed to make use of GeoGebra and the video capture on the interactive whiteboard. http://www.youtube.com/watch?v=kBtQ8OYn7zs shows an example of bisection of a line in GeoGebra. Students can further investigate what happens if the radius is smaller than half the line since GeoGebra is dynamic. GeoGebra can also be used by the teacher on the interactive whiteboard to investigate the concepts behind the construction of bisection of angles and lines. http://www.youtube.com/watch?v=A-mJEIPkD1g is another example of how GeoGebra can be used to explain bisection of a line.
Subject: GRAPHICAL COMMUNICATION

Unit code and title: **GRA 7.2 Constructing angles and patterns by means of Compasses and Set Squares**

Strand: Geometry

**Objectives**

The teacher will:

1. help students draw different types of angles (right, acute, obtuse, reflex, complimentary and supplementary).
2. help students construct compass angles (60°, 120°, 30°, 90°, 150°, 15°, 45°, 75°, 105°, 135°, 155° etc).
3. help students draw the following angles by means of set squares: 30°, 60°, 90°, 45°, 75° etc.
4. help students draw various shapes and geometric patterns using set squares and Tee-square.
5. help students divide lines into a number of equal parts using compasses and set squares.
6. help students work practical examples involving division of lines.

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**Key Words**

Right, acute, obtuse and reflex angles
30° / 60° set squares,
45° set squares,
set square angles,
drafting board,
parallel drafting arm,
parallel drafting head,
parallel lines.

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**Points to note**

At these early stages of learning Graphical Communication, students need to be given stimulating exercises so that they are encouraged to develop a keen interest in the subject.

The recommended method of teaching and learning is through exposition and learning by discovery.

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**Resources**

Interactive whiteboard
Whiteboard, large drawing instruments to be used on the whiteboard.
Graphical Communication Website link:
http://graphicalcommunication.skola.edu.mt/

Textbooks:
Graphical Communication 1 Stuart Bland
Technical Drawing (omnibus) F.B.Mayock
Understanding Technical Graphics J.&T. O’Sullivan
Understanding Technical Graphics Workbook
Graphical Communication Handouts
### Teaching objectives

The teacher will:

- help students draw different types of angles (right, acute, obtuse, reflex, complimentary and supplementary).

### Examples of Teaching Experiences and Activities

The lesson starts with a video clip "The Angles Song".

The teacher discusses the video clip with the students and explains the different names given to different angles. The teacher distributes notes and worksheet which will be worked out in class.

### Indicators of Learning Outcomes

<table>
<thead>
<tr>
<th>Students will identify right angles. (Level 5)</th>
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</thead>
<tbody>
<tr>
<td>Students will identify acute, obtuse, right and reflex angles. (Level 6)</td>
</tr>
<tr>
<td>Students will construct, identify and name different types of angles. (Level 7)</td>
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<tr>
<td><strong>Teaching objectives</strong></td>
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<tr>
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<tr>
<td>help students construct compass angles (60°, 120°, 30°, 90°, 150°, 15°, 45°, 75°, 105°, 135°, 155° etc).</td>
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<tr>
<td>Teaching Objectives</td>
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| help students draw the following angles by means of set squares: 30°, 60°, 90°, 45°, 75° etc. | The teacher explains the rationale of having two types of set squares and proceeds by demonstrating how these are used in conjunction with the tee-square. **Possible Activities:**  
- The students practice with single set squares  
- The students practice with a combination of two set squares to produce various set square angles.  
*Note: The teacher still has to assist most of the students individually to ensure that they acquire good working habits.* | Students will identify and name the two types of set squares. (Level 5)  
Students will identify and name the two types of set squares and use them to draw perpendicular line. (Level 6)  
Students will use individual set squares to produce 30°, 45°, 60° and 90°. Students will combine set squares to produce 75° and 105°. (Level 7) |
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| help students draw various shapes and geometric patterns using set squares and Tee-square. | The lesson starts off with a set induction consisting of attractive set square exercises; the teacher elicits the students’ opinions of how the designs were produced. The lesson continues in an exposition and hands-on approach. **Possible Activities:**  
  - The teacher presents a variety of attractive designs (both utilitarian and aesthetic) which were completed by means of set squares. A handout with the same designs is distributed and the students try to match the angles on the designs with the set square angles.  
  - The students are given graded set square exercises either on a work sheet / handout or from the text book. | Students will identify the two types of set squares. (Level 5)  
Students will identify and name the two types of set squares and use them to draw perpendicular line. (Level 6)  
Students will construct geometrical shapes and patterns using single set squares, combined set square angles and an arrangement of lines and circles. (Level 7) |
<table>
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| help students divide lines into a number of equal parts using compasses and set squares. | The teacher demonstrates on the white board the principle underlying the division of a line by means of the set square method and works a number of graded examples. Some students may be asked to assist in the exposition. **Possible Activities:**  
  - Students carry out a number of graded exercises in division of lines. | Students will able to measure and draw horizontal and vertical lines. (Level 5)  
Students will able to measure and draw horizontal and vertical lines and divide the lines mathematically. (Level 6)  
Students will divide horizontal, vertical and inclined lines into equal parts by using the set square method. (Level 7) |

![Diagram](image)
<table>
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<tr>
<td>help students work practical examples involving division of lines.</td>
<td>The teacher presents a set of attractive patterns that were constructed by means of divided lines. The teacher together with the students discusses each pattern to determine the sequence of steps necessary to complete the given tasks.</td>
<td>Students will be able to measure and draw vertical, horizontal and lines. (Level 5)</td>
</tr>
<tr>
<td><strong>Possible Activities:</strong></td>
<td></td>
<td>Students will be able to measure and draw vertical, horizontal and lines. They will draw the given patterns with a low degree of accuracy. (Level 6)</td>
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<td>Students complete the graded line division exercises.</td>
<td>Students will be able to complete division of horizontal, vertical and inclined lines exercises accurately by using the set square method. (Level 7)</td>
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</tbody>
</table>
Unit 7.2 Constructing angles and patterns by means of Compasses and Set Squares

http://www.mathsisfun.com/geometry/constructions.html helps students grasp the principles of basic geometric construction. The tutorials also cover the objectives in Unit 2. This site is basically an animated step by step tutorial and covers the objectives set in the unit.
Subject: GRAPHICAL COMMUNICATION

Unit code and title: GRA 7.3 Understanding and Constructing Basic Geometric Shapes

Strand: Geometry
Unit Duration: 9 sessions by 40 minutes (6hours)

Objectives

The teacher will:
1. help students construct different types of triangles and name by sides and by angles.
2. help students learn the mathematical terms of triangles.
3. help students explore the properties of triangles in a semicircle and between parallel lines.
4. help students construct triangles from given data.
5. help students construct quadrilaterals and explore their properties.

Key Words

<table>
<thead>
<tr>
<th>Triangles, Scalene, Isosceles, Equilateral, Right, Acute, Obtuse, Quadrilaterals</th>
<th>Points to note</th>
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## Teaching Objectives

The teacher will:
- help students construct different types of triangles and name them by sides and by angles.

## Examples of Teaching Experiences and Activities

The lesson starts with a short video clip “Triangle Song”.

http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/

The teacher and the students discuss the contents of the video and together make a list of possible utilitarian and aesthetic uses of triangles.

The teacher distributes a handout and demonstrates the methods of constructing different types of triangles.

### Possible Activities:

Students construct and name the triangles as per handout and according to the dimensions on the whiteboard.

### Indicators of Learning Outcomes

Students will identify and recognize equilateral and isosceles triangles. (Level 5)

Students will locate triangles in their environment and name them by sides and by angles. (Level 6)

Students will construct triangles given three sides (SSS), and two sides with their included angle (SAS).

Students will calculate missing angles in a triangle and name the triangle by sides and by angles. (Level 7)

Students will be able to draw simple objects composed of parts of triangles. (Level 8)
### Teaching Objective

a) help students learn the mathematical terms of triangles.

b) help students explore the properties of triangles in a semicircle and between parallel lines.

### Examples of Teaching Experiences and Activities

a) The teacher explains the basic terms related to triangles i.e. vertex, vertical angle, base, base angles and altitude.

b) The teacher draws a semi-circle on the white board and asks a number of students to mark points on the semi-circle and join lines to both ends of the diameter. The students are asked to compare the angles formed on the semi-circle.

c) The teacher draws a line on the whiteboard to represent the base of a triangle. A line above and parallel to the base is also drawn. Some students are asked to draw two lines starting from the edges of the base and joining points on the opposite parallel line, in order to form various triangles. The teacher asks the students to determine what is common in the triangles formed.

**Possible Activities:**

- Students work out the distributed handout.

### Indicators of Learning Outcomes

Students will identify and recognize triangles. (Level 5)

Students will name the basic mathematical terms of triangles. (Level 6)

Students will explore, identify and state the properties of triangles in semicircles and between parallel lines. Students will apply their newly acquired knowledge to solve problems related to triangles in semicircles and between parallel lines. (Level 7)
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| help students construct triangles from given data (part 1) | The teacher writes the data on the whiteboard and after discussing the task with the class, asks some of the students to construct the triangles on the whiteboard (using whiteboard drawing instruments). **Possible Activities:**  
  - Students complete exercises from the given handout. *Worked examples can be accessed on:* [http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/](http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/). | Students will identify and recognize triangles. (Level 5) Students can copy the shapes of triangles without using specific dimensions. (Level 6) Students will construct triangles from the following data:  
  - 3 sides  
  - 2 sides and their included angle  
  - Base, one base angle and the length of the side opposite the base angle  
  - Base and two base angles  
  - The base of an equilateral triangle  
  - The altitude of an equilateral triangle (Level 7) |
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| help students construct triangles from given data (part 2) | The teacher writes the data on the whiteboard and after discussing the task with the class, asks some of the students to construct the triangles on the whiteboard (using whiteboard drawing instruments). **Possible Activities:**  
  - Students complete exercises from the given handout. *Worked examples can be accessed on: [http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/](http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/)*  
  - Students complete graded exercises from textbook. | Students will identify and recognize triangles. (Level 5)  
  Students can copy the shapes of triangles without using specific dimensions. (Level 6)  
  Students will construct triangles from the following data:  
  - Base and altitude of an isosceles triangle.  
  - The length of one side/angle and hypotenuse of a right triangle. (Level 7) |
### Teaching Objective

help students construct quadrilaterals and explore their properties.

### Examples of Teaching Experiences and Activities

The lesson starts with a video clip “The Quadrilateral Song” http://graphicalcommunication.skola.edu.mt/syllabus/syllabus-close-up/
The teacher discusses the contents of the video clip with the students, draws six quadrilaterals on the whiteboard and asks the students to list as many properties as they can remember underneath each quadrilateral.

**Possible Activities:**
- Students copy the given handout.
- Students work graded exercises from textbook.

### Indicators of Learning Outcomes

- **Students will identify and state the name given to simple 2-D shapes.** (Level 5)

- **Students will identify, state the name given to simple 2-D shapes and sketch the lines of symmetry in simple shapes and recognize shapes with no line of symmetry.** (Level 6)

- **Students will explore, identify and state the properties of quadrilaterals. Students will be able to construct quadrilaterals from given graphic and written data.** (Level 7)
**Digital Technology Enhanced Learning – Graphical Communication**

**Unit 7.3 Understanding and Constructing Basic Geometric Shapes**


The above sketches are an example of the step by step procedure that pops up when the user clicks on the image. The above suggested sites do not take over the essential practice of pencil and paper but supplement the work done in class. They also give the opportunity to students to engage in understanding concepts without losing time in manipulating lines on paper.
Subject: GRAPHICAL COMMUNICATION
Unit code and title: GRA 7.4 Understanding and Constructing Circles and Polygons
Strand: Geometry

Unit Duration: 9 sessions by 40 minutes (6hours)

Objectives
The teacher will:
1. help students learn the parts of a circle.
2. help students construct concentric and eccentric circles.
3. help students learn the names of polygons (3-9 sides), construct regular polygons by protractor angles and explore their properties.
4. help students construct a hexagon using set squares and Tee-Square.
5. help students construct a hexagon inscribed in a circle and circumscribed around a circle.
6. help students construct an octagon in a circle and in a square.

Key Words
Parts of circle, circumference, radius, diameter, arc, chord, sector, segment and tangent.
Concentric circles, eccentric circles.
Polygons, equilateral triangle, square, pentagon, hexagon, heptagon, octagon and nonagon.

Points to note
By this time the students should have improved their manual dexterity and are able to complete accurate and neat drawings. Their interest in the subject needs to be maintained high through motivating exercises. The teacher needs to nurture creativity in the students by allowing them to explore different patterns which can be created through their newly acquired knowledge about polygons.

The recommended method of teaching and learning is through exposition and learning by discovery.

Resources
Whiteboard, large whiteboard drawing instruments.
Laptop / interactive whiteboard
Graphical Communication 1 Stuart Bland
Technical Drawing (omnibus) F.B.Mayock
Understanding Technical Graphics J.&T. O’Sullivan
Understanding Technical Graphics Workbook
Graphical Communication Handouts
Graphical Communication Website link:
http://graphicalcommunication.skola.edu.mt/
### Teaching Objective

The teacher will:
- help students learn the parts of a circle.

### Examples of Teaching Experiences and Activities

The lesson builds on the students’ prior knowledge of circles. The students are introduced to the terminology used to define different parts of the circle. The new terms are listed on the distributed handout.

**Possible Activities:**
- Students copy the handout on A3 paper using the appropriate instruments.

### Indicators of Learning Outcomes

- **Students will recognise circles.** (Level 5)
- **Students will be able to name the basic parts of a circle.** (Level 6)
- **Students will name and draw parts of circles and indicate the parts by means of neat labelling. Students will also be able to answer simple written questions related to the topic in a graphic form.** (Level 7)
- **Students will be able to draw simple objects composed of parts of circles (see example below).** (Level 8)

### Parts of Circle

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<th>NAME:</th>
<th>TITLE: PARTS OF CIRCLE</th>
<th>DRG No</th>
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<tbody>
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<td>QUADRANT</td>
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<td>SEMI-CIRCLE</td>
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<td>CIRCUMFERENCE</td>
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![Diagram of Circle Parts](image_url)
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| help students construct concentric and eccentric circles. | The lesson starts with a set induction consisting of a coloured drawing displaying concentric and eccentric circles. Students are invited to reason out the underlying methods. The teacher then demonstrates the method of constructing the circles. **Possible Activities:**  
  - Students copy the handout on A3 paper using the appropriate instruments.  
  - Students work out graded circle construction exercises from the textbook. | Students will recognize and identify circles.  
  (Level 5)  
  Students will recognize and identify circles which share the same centre.  
  (Level 6)  
  Students will identify and name concentric and eccentric circles.  
  Students will construct concentric and eccentric circles from either written or graphic data.  
  (Level 7) |

| ![Diagram of Concentric and Eccentric Circles] | | |

| NAME: | TITLE: CIRCLES | DRG No |
### Teaching Objective

Help students learn the names of polygons (3-9 sides), construct regular polygons by protractor angles and explore their properties.

### Examples of Teaching Experiences and Activities


After a discussion about the basic properties of polygons, the lesson proceeds with the teacher demonstrating the method of constructing polygons by means of the protractor angles.

**Possible Activities:**

- Students construct polygons using the protractor as per handout.

### Indicators of Learning Outcomes

- Recognise reflective symmetry in regular polygons. Students will recognize reflective symmetry in regular polygons. (Level 5)

- Students will identify and name the following polygons: pentagon, hexagon and octagon. (Level 6)

- Students will construct polygons means of a protractor. Students will identify the properties of polygons and can use this knowledge to solve basic polygon related problems. (Level 7)
## Teaching Objective
help students construct a hexagon using set squares and Tee Square.

help students construct a hexagon inscribed in a circle and circumscribed around a circle.

## Examples of Teaching Experiences and Activities
The teacher refers to previous discussions about set square angles and polygons’ exterior angles and tries to elicit from the students which set square is required to draw the hexagon. The lesson proceeds with the teacher demonstrating how to draw hexagons in various situations.

*Note: A similar procedure applies to the drawing of an octagon.*

**Possible Activities:**
- Students construct hexagons using the 60º / 30º set squares as per handout.

## Indicators of Learning Outcomes
Recognise reflective symmetry in regular polygons
Students will recognize reflective symmetry in regular polygons. (Level 5)

Students will identify and name the following polygons: pentagon, hexagon and octagon. (Level 6)

Students will construct hexagons and octagons by means of the appropriate set squares starting from a given base.
Students will construct hexagons and octagons by means of the appropriate set square from given A/C and A/F dimensions. (Level 7)
<table>
<thead>
<tr>
<th>Teaching Objective</th>
<th>Examples of Teaching Experiences and Activities</th>
<th>Indicators of Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>help students construct an octagon in a circle and in a square.</td>
<td>The teacher stimulates the students by displaying a number of eye-catching patterns which are derived from the octagon. The teacher explains the method of constructing an octagon in a square and in a circle and stresses the point that once they have learnt the method, they can construct the other patterns by themselves.</td>
<td>Recognise reflective symmetry in regular polygons. Students will recognize reflective symmetry in regular polygons. (Level 5)</td>
</tr>
<tr>
<td></td>
<td>Possible Activities:</td>
<td>Students will identify and name the following polygons: pentagon, hexagon and octagon. (Level 6)</td>
</tr>
<tr>
<td></td>
<td>• Students construct an octagon in a square and in a circle as per demonstration on the whiteboard.</td>
<td>Students will construct an octagon in a circle and in a square. Students will use the newly acquired knowledge to construct other patterns derived from the octagon. (Level 7)</td>
</tr>
<tr>
<td></td>
<td>• Students construct other designs as per handout.</td>
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<tr>
<td></td>
<td>• Students may try to originate their own designs derived from the octagon in a square.</td>
<td></td>
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</table>

Digital Technology Enhanced Learning – Graphical Communication

Unit 7.4 Understanding and Constructing Circles and Polygons

Many of the sites suggested for these units are found under mathematics as the area of geometry is also covered in Math. http://www.thinkmathematics.com/geo/Constructing_Quadrilaterals/index.htm has a prepared GeoGebra file downloaded from the “Dynamic Geometry” button which helps students describe the defining properties of quadrilaterals. The circle topic can be tackled through an interactive site prepared by MathsClass at http://mathsclass.net/comments/parts-of-a-circle and download http://mathsclass.net/files/parts_of_a_circle_geogebra.ggb which is GeoGebra file. Students can investigate each property of the circle and look at the different qualities that make up each item. Students can use Gimp http://www.gimp.org/ and SumoPaint 3.0 http://www.sumopaint.com/app/ drawing packages to investigate patterns that prepares students for polygons through investigation. The Arabeske gallery http://www.wozzeck.net/arabeske/gallery/ara-gallery.html shows a number of patterns that can be copied by students using the suggested software and later worked out on the drawing board. Students may be asked to produce a colouring book for younger students made up of patterns involving circles and regular polygons as in the examples shown below.
Subject: GRAPHICAL COMMUNICATION
Unit code and title: **GRA 7.5 Projecting Isometric Drawings**
Strand: Geometry

**Unit Duration:** 9 sessions by 40 minutes (6 hours)

The teacher will:

1. help students explore 3-D representation by drawing on an isometric grid.
2. help students construct isometric blocks with a single step by means of the 30° set square and tee-square.
3. help students reduce vertical and horizontal cuts from isometric blocks.
4. help students add vertical and horizontal extensions to isometric blocks.
5. help students apply their knowledge of isometric drawing to draw authentic objects.

---

**Key Words**

Isometric grid, Isometric drawing, Spatial visualisation skills,

**Points to note**

This unit introduces the students to three-dimensional drawing and is intended to help them develop their spatial visualization skills. Some students may have already begun to develop these skills through non-formal activities such as playing with construction toys as children, while other students would need to develop their spatial visualization skills through continuous sketching practice.

The recommended method of teaching and learning is through exposition and learning by discovery.

**Resources**

Whiteboard, large drawing instruments to be used on the whiteboard.
ProDesktop 8 computer program.
Laptop / interactive whiteboard
Text books:
Graphical Communication 1 Stuart Bland
Technical Drawing (omnibus) F.B.Mayock
Understanding Technical Graphics J.&T. O’Sullivan
Understanding Technical Graphics Workbook
Graphical Communication Handouts
Graphical Communication Website link:
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</table>
| The teacher will:  | The lesson starts with a video clip “*Isometric drawing for young people*” [http://graphicalcommunication.skola.edu.mt/syllabus/isometric-drawing/](http://graphicalcommunication.skola.edu.mt/syllabus/isometric-drawing/). The teacher discusses the video clip with the students and guides them into realizing that isometric drawings help the viewers to visualize an object realistically. **Possible Activities:**  
  - The teacher explains the grid lines, angles, and demonstrates how to use an isometric grid (as shown on video clip). The teacher distributes isometric grid worksheets and the students draw an isometric block. The teacher then allows the students to experiment by drawing simple objects of their choice taken from their home or classroom environment.  
  - Students will experiment with the isometric grid paper and, with support, copy simple isometric blocks. (Level 5)  
  - Students will experiment with the isometric grid paper to copy simple isometric blocks. (Level 6)  
  - Students will use the isometric grid paper to put their own input and draw isometric blocks from their own imagination. (Level 7) |
<p>| help students explore 3-D representation by drawing on an isometric grid. | | |</p>
<table>
<thead>
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</table>
| help students construct isometric blocks with a single step by means of the 30° set square and tee-square. | The lesson starts with a display of various computer generated simple blocks (ProDesktop 8) which can be rotated when displayed on the monitor screen or the interactive whiteboard. An isometric drawing of the object is also displayed. The teacher rotates the image until the students agree that the drawing and the computer generated image are in a similar position. The lesson proceeds with the teacher demonstrating how to draw an isometric block by means of the 30° set square and Tee-square. **Possible Activities:**  
  - Students practice isometric drawing as per handout and textbook exercises.  
  - Students will require continuous support to measure and draw vertical and inclined lines. (Level 5)  
  - Students will measure and draw vertical and inclined lines. (Level 6)  
  - Students will construct stepped blocks by means of the 30° set square and the Tee-square. (Level 7) | Students will require continuous support to measure and draw vertical and inclined lines. (Level 5)  
Students will measure and draw vertical and inclined lines. (Level 6)  
Students will construct stepped blocks by means of the 30° set square and the Tee-square. (Level 7) |
Teaching Objective

help students reduce vertical and horizontal cuts from isometric blocks.

Examples of Teaching Experiences and Activities

The teacher prepares a computer generated image of a cube and, while referring to the distributed handout, shapes the cube by removing parts till the required shape is identical to that in the handout. The students may participate in this activity by instructing the teacher which parts to remove or by using the computer under the teacher’s supervision. The teacher briefly explains the students’ task as detailed on the handout and allows students time to practice (most students prefer to learn by doing and are impatient to listen to lengthy lessons).

Possible Activities:

Students construct shaped isometric blocks as per handout and/or textbook.

Indicators of Learning Outcomes

Students will require continuous support to measure and draw vertical and inclined lines. (Level 5)

Students will measure and draw vertical and inclined lines. (Level 6)

Students will draw shaped isometric blocks from their imagination. (Level 7)
<table>
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</tr>
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<tbody>
<tr>
<td>help students add vertical and horizontal extensions to isometric blocks.</td>
<td>The teacher explains that in isometric drawings, material can either be reduced, as demonstrated during the previous lesson, or added as illustrated in the given handout. The teacher explains briefly the handout and allows the students to proceed with their exercise.</td>
<td>Students will require continuous support to measure and draw vertical and inclined lines. (Level 5)</td>
</tr>
<tr>
<td>Possible Activities:</td>
<td></td>
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<tr>
<td>• Students build isometric blocks as per handout.</td>
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<td></td>
<td>Students will measure and draw vertical and inclined lines. (Level 6)</td>
</tr>
<tr>
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<td></td>
<td>Students will build virtual isometric blocks from their imagination. (Level 7)</td>
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<tr>
<td>Teaching Objective</td>
<td>Examples of Teaching Experiences and Activities</td>
<td>Indicators of Learning Outcomes</td>
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| Help students apply their knowledge of isometric drawing to draw authentic objects. | The teacher demonstrates on the whiteboard how to draw a simple isometric drawing of a house (in the form of a cube). Some students are asked to make extensions to the house on the whiteboard. Other students may suggest additions. The game can continue till there is no space left on the whiteboard. Possible Activities:  
   - The students are allowed time to draw their own “dream house” in isometric.  
   - The students draw other real-world objects.  
   - The students are allowed to experiment with shading to make the three dimensional drawings more lifelike. | Students will require continuous support to measure and draw vertical and inclined lines. (Level 5)  
Students will measure and draw vertical and inclined lines. (Level 6)  
Students will draw the isometric building as per the teacher’s instructions and add a number of extensions. (Level 7)  
Students will construct isometric drawings of authentic and imaginary objects as per drawing below. (Level 8) |

![Model House Diagram]
Digital Technology Enhanced Learning – Graphical Communication

Unit 7.5 Projecting Isometric Drawings

Google SketchUp for K-12 Education is the ideal playground for students. An isometric view as in the example below takes only a few seconds to create. This gives ample space for the students to create, investigate and explore the concept behind isometric views. Although orthographic is not described in this unit, Google SketchUp also shows how each side will look by a simple click of a button. It will take more time for students to draw the same simple shapes on paper in isometric as they will need to learn how to handle the set squares and the tee square. The software helps to create many simple blocks in a short time and with ease, letting the students assimilate what makes an isometric view. Further still with one click students can also see the difference between isometric and perspective.

Isometric

Orthographic

Perspective
Subject: GRAPHICAL COMMUNICATION  
Form 1

Unit code and title: GRA 7.6 Introducing Information Graphics
Unit Duration: 9 sessions by 40 minutes (6 hours)

Objectives
The teacher will:
1. help students appreciate the importance of Information Graphics in today’s world.
2. help students learn the standard colours and geometrical shapes used to denote safety and general information signs.
3. help students draw and colour warning signs from given graphical information.
4. help students draw and colour general information signs from given graphical information.
5. help students draw stylized human figures to the correct proportions from given graphical information.
6. help students draw preparatory sketches to develop simple warning and general information signs.

Key Words
Pictograms, safety signs, prohibition, mandatory, hazard, information, colouring, custom design, sketching, development of ideas, final realisation.

Points to note
This is the last unit of the year and apart from teaching the relevant material regarding information graphics, the teacher needs to incorporate revision of geometry by choosing examples of signs which involve geometric constructions where possible. Intrinsically creative students tend to fare better in this unit. Other students need to be encouraged and provided the right environment to stimulate their creativity. The teacher needs to be an example of a creative person in action. The recommended method of teaching and learning is through exposition, research and investigation by the students.

Resources
Whiteboard, large drawing instruments to be used on the whiteboard. Laptop / Interactive whiteboard
Text books:
Graphical Communication 1 Stuart Bland
Technical Drawing (omnibus) F.B.Mayock
Understanding Technical Graphics J.&T. O’Sullivan
Understanding Technical Graphics Workbook
Graphical Communication Handouts
Graphical Communication Website link:
http://graphicalcommunication.skola.edu.mt/
<table>
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<th>Examples of Teaching Experiences and Activities</th>
<th>Indicators of Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher will:</td>
<td>The teacher demonstrates a chart which illustrates a wide range of information graphics examples. A discussion with the students follows. The teacher encourages the students to start collecting cuttings of similar examples from newspapers, magazines, photographs or any other source in order to use them as a reference for future assignments.</td>
<td>Students will recognize commonly used safety signs by their shape and colour. (Level 5)</td>
</tr>
<tr>
<td>help students</td>
<td>The teacher explains that for this year they are only expected to have a basic knowledge about health and safety signs and shows them a short video-clip about safety signs. <a href="http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/">http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/</a></td>
<td>Students will recognize commonly used safety signs by their shape and colour and read the message embedded in the pictograms . (Level 6)</td>
</tr>
<tr>
<td>appreciate the</td>
<td>The teacher emphasises that the colour and shape of these signs are regulated by international standards organizations.</td>
<td>Students will recognize commonly used safety signs by their shape and colour and read the message embedded in the pictograms and will be able to give examples of “Information Graphics” from their everyday life experience. (Level 7)</td>
</tr>
<tr>
<td>importance of</td>
<td></td>
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<tr>
<td>Information Graphics in today’s world.</td>
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<tr>
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| help students learn the standard colours and geometrical shapes used to denote safety and general information signs. | The teacher distributes a handout to illustrate the geometrical shapes and colours used to denote prohibition, mandatory, safe condition and general information signs. The dimensions and proportions are explained. **Possible Activities:**  
- Students copy the outline and are asked to colour the signs as per handout. | Students will identify and state the standard colours and geometrical shapes used to denote commonly used health and safety / general information signs. (Level 5)  
Students will identify and state the standard colours used to denote commonly used Health and Safety / general information signs and be able to draw, coloured copies of blank health and safety / general information signs. (Level 6)  
Students will identify and state the standard colours used to denote commonly used Health and Safety / general information signs. They will also be able to draw neat, coloured copies of blank health and safety / general information signs and give examples of Health and Safety signs from their everyday life experience. (Level 7) |

**Title:** SAFETY SIGNS

<table>
<thead>
<tr>
<th>PROHIBITION</th>
<th>MANDATORY</th>
<th>SAFETY</th>
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</thead>
<tbody>
<tr>
<td>BLACK GRAPHIC SYMBOL</td>
<td>WHITE GRAPHIC SYMBOL</td>
<td>WHITE GRAPHIC SYMBOL</td>
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</table>

<table>
<thead>
<tr>
<th>INDUSTRIAL WARNING</th>
<th>ROAD WARNING</th>
<th>PUBLIC INFORMATION</th>
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<tr>
<td>BLACK GRAPHIC SYMBOL</td>
<td>BLACK GRAPHIC SYMBOL</td>
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<tr>
<th>FORM</th>
<th>DATE</th>
<th>TITLE</th>
<th>DRAWING NUMBER</th>
<th>CHECKED BY</th>
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<tr>
<td>NAME</td>
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<td>SAFETY SIGNS</td>
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<tr>
<td>Teaching Objective</td>
<td>Examples of Teaching Experiences and Activities</td>
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| help students draw and colour warning signs from given graphical information. | The teacher presents a number of warning signs which have geometrically constructed symbols. The teacher asks the students to analyze the drawings and elicits from them the steps necessary to construct the design. **Possible Activities:**  
  - Students construct and colour the given safety signs. | Students will identify and state the standard colours and shapes used to denote health and safety warning signs. (Level 5)  
Students will identify and state the standard colours and shapes used to denote health and safety warning signs and will be able to draw neat, coloured copies of geometrically shaped signs. (Level 6)  
Students will identify and state the standard colours and shapes used to denote health and safety warning signs and will be able to draw neat, coloured copies of geometrically shaped signs and give examples of Warning signs from their everyday life experience. (Level 7) |
<table>
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<th>Indicators of Learning Outcomes</th>
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</table>
| help students draw and colour general information signs from given graphical information. | The teacher presents other signs which have geometrically constructed symbols and borders. The teacher asks the students to analyze the drawings and elicits from them the steps necessary to construct the design. **Possible Activities:**  
  * Students construct and colour the given signs. | Students will identify and state the standard colours and shapes used to denote general information signs. (Level 5) |
<p>| | | Students will identify and state the standard colours and shapes used to denote general information signs and will be able to draw rendered copies of simple signs. (Level 6) |
| | | Students will identify and state the standard colours and shapes used to denote general information signs and will be able to draw neat, rendered copies of simple signs. They will also be able to give examples of general information signs from their everyday life experience. (Level 7) |</p>
<table>
<thead>
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</thead>
</table>
| help students draw stylized human figures to the correct proportions from given graphical information. | The teacher emphasises the importance of minimizing detail when drawing pictograms depicting human figures, presents a number of examples and shows a video clip about Olympic pictograms through the ages. [http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/](http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/) The video is discussed and the teacher concludes by once again emphasising the importance of producing a proportional and legible yet simple and minimalist symbol. Possible Activities:  
  - Students construct and colour signs as per handout / textbook. | Students will recognize and understand the meaning of general information graphics which consists of simplified human figures. (Level 5) Students will be able to draw freehand simplified human figures. (Level 6) Students will use drawing instruments and drawing aids to draw simplified, well proportioned human figures. (Level 7) |
<table>
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<tbody>
<tr>
<td>help students draw preparatory sketches to develop simple warning and general information signs.</td>
<td>The lesson starts with an animated cartoon video clip which shows various hazardous situations at a workplace. The video is discussed and each student chooses a particular situation to create a suitable safety sign to warn of a possible hazard. <a href="http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/">http://graphicalcommunication.skola.edu.mt/syllabus/information-graphics/</a></td>
<td>Students will be able to identify commonly used safety or information signs. (Level 5)</td>
</tr>
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<td>Captain Safety animated cartoon series</td>
<td>Students will be able to choose the correct safety or information sign from a list of already existing safety signs, to match the particular requirement. (Level 6)</td>
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<td>The teacher explains the process of preparatory sketching before reaching the final realization stage and gives examples.</td>
<td>Students will use their own ideas to draw preparatory sketches of an information or safety warning sign. Students will develop and complete the final idea. (Level 7)</td>
</tr>
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<td>Possible Activities:</td>
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<td></td>
<td>• Students make a number of sketches of their chosen message and consult each other and the teacher to refine and develop their final idea. <em>Students with artistic orientation can opt for challenging ideas while others can opt for geometric shapes.</em></td>
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</tbody>
</table>
One of the final processes in the design of pictograms is the testing phase. Students may test their pictogram on an audience to see if it is effective in transmitting the intended meaning. One of the best ways to share and get feedback is to publish the design either on a blog e.g. [http://edublogs.org/](http://edublogs.org/) (see table 5) or invite friends to send feedback via Google docs in the form of a poll. [http://www.jasonmorrison.net/content/2008/create-a-survey-or-poll-for-your-blog-with-google-docs-and-spreadsheets/](http://www.jasonmorrison.net/content/2008/create-a-survey-or-poll-for-your-blog-with-google-docs-and-spreadsheets/) describes all the steps required to set up a poll in Google docs.