YuMi Deadly Maths

Year 5 Teacher Resource:

MG – Skateboard skills

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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QUT

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ACKNOWLEDGEMENT

We acknowledge the traditional owners and custodians of the lands
in which the mathematics ideas for this resource were developed,
refined and presented in professional development sessions.

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Year 5 Measurement and Geometry

Skateboard skills

Learning goal	Students will identify the components and properties of angles, identify right angles and compare angles, classifying them in relation to right angles.
Content description	Measurement and Geometry – Geometric reasoning • Estimate, measure and compare angles using degrees. Construct angles using a protractor (ACMMG112)
Big idea	Geometry – interpretation vs construction
Resources	String (20 cm long), large ropes (6 m long), elastics, marker strips (1–12), paper, geoboards, rubber bands or string, circle tool, paper fastener split pins, Meccano

Reality

Local knowledge

Discuss angles students see in the local environment, e.g. angles at the intersection of roads or what turns are made skateboarding at the Council skateboarding rink: *What kind of turn do you make to avoid colliding with a friend? When you are skating back home and turn a corner, what kind of turn is this? What other kinds of turns can be made?*

Prior experience

Check that students know that an angle is the amount of turn in the measure of the change of direction between the rays (arms).

Kinaesthetic

Students stand with their arms joined together and outstretched in front of them. They select two points of interest or objects in their field of vision. They move one arm to point at the first object, leaving the other arm as it is. They examine the amount of turn that has been created from the original position or, in reverse, look at the amount of turn necessary to get that arm back to join the other arm in the original position (same amount of turn). Classify the amount of turn as narrow (< right angle), square (right angle) or wide (> right angle). *Is this turn narrow, square or wide?*

Leaving the arm pointing to the first object, now move the other arm to point at the second object. Examine the amount of turn that now exists between the two arms. *Is it narrow, square or wide?* Make the turn using their bodies: point the whole body in the direction of the first object and then turn the whole body to face the second object. Use body to make large angles (turning a long way) and small angles (turning only a short amount). Use body to make a right angle – stretch one arm out pointing forward from the chest, turn the other arm so that it follows in a straight line along shoulder (this is like a right angle). *What type of angle has been made?*

Reverse: Make narrow, square or wide angles with pieces of string on the desk and then turn body away from the desk to make the angle that corresponds to the arms of the string. Relate to giving directions, e.g. a sharp left-hand turn to veer off the highway; turn left/right at the intersection; take the second exit.

Abstraction

Body

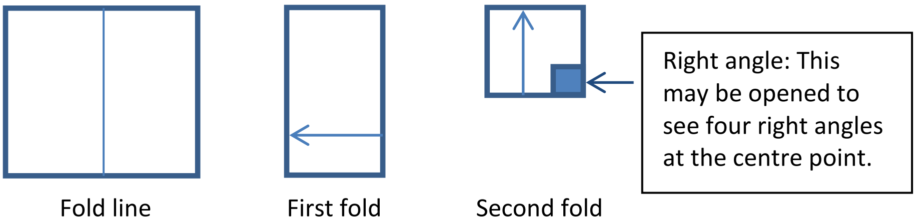
In groups of 12, students take the rope and make a circle. They place the marker strips to represent a clock face. Two elastics of the same colour are placed on the ground to divide the clock into quadrants. Students stand at each of the 12 "minute" positions. Another student with a different-coloured elastic stands in the centre (at the elastics' point of intersection) holding the middle of the elastic. Students in the 12 and 3 positions come and take one of the ends and return to their places. *What kind of angle has been made?* [a square angle that is called a right angle]. *How much turn has taken place around the clock face?* [¼ turn]. *If a full turn is 360°, how many degrees are there in a right angle?* [¼ of 360°, which is 90°]. *One right angle has been made by taking the elastic from the centre point that is called the vertex to the 12 and 3 positions. Notice that one arm is perpendicular to the other arm. From what other* *positions could a right angle be made? Use the centre elastic to make these right angles.* [Students will likely give from 3 to 6, 6 to 9 and 9 to 12. Some may see 1 to 4, 2 to 5 etc.]

Once the right angle has been established as a quarter turn equal to 90°, repeat process to demonstrate that narrow, sharp or acute angles are less than a right angle, i.e. < 90°. Make many acute angles using the centre elastic. Proceed to wide or obtuse angles, ones that are > 90° but < 180° or more than a quarter turn but not up to a straight line, then make straight angles that are = 180°, half a full turn, the two arms stretched out in a straight line going through the vertex. *How many of these could be made with the elastic?* [actually a great many, infinite if we could really make them]. Then make reflex angles, ones that extend past the straight line or are > 180° but < 360°.

Reverse: Give the type of angle, students make it with elastics.

Hand

1. Sketch and name the angles that have been made in the above activities.
2. Make a right-angle reckoner: Take a piece of paper, fold it in halves and crease the line. Bring the bottom up to the top to make the right angle, e.g.



3. Students make a circle tool (see Teacher's notes). Make given angles (acute, right, obtuse) using the circle tool.
4. Draw different triangles (acute, right, obtuse scalene), rectangle, parallelogram and name the angles in these 2D shapes.

Mind

Close your eyes and see the turns you make on your skateboards: a right-angled turn, an obtuse turn, a reflex turn, an acute turn. In your mind, see a right angle and move one arm to take a path that changes the right angle to: acute, reflex, obtuse, straight.

Creativity

Create a skateboard rink that would be exciting because of all the different turns and angles you have designed.

Mathematics

Language/ symbols

angle, arms, vertex, amount of turn, right angle, acute angle, obtuse angle, straight angle, reflex angle, degrees, perpendicular

Practice

1. Geoboards: Using string or rubber bands:
   (a) make a right angle
   (b) make an acute angle
   (c) make an obtuse angle
   (d) make an angle from a starting point near the edge of the geoboard and name the angle you have made
   (e) make an angle from a starting point near the centre of the geoboard and name the angle you have made.
2. Construct angles using two pieces of string or wool connected at the vertex by tying a knot that is then pinned to some cardboard. Experiment with this to represent a variety of angles and discuss the amount of turn between the arms.
3. Paper strips: Join the ends of two paper strips with a paper fastener split pin. Swivel one of the paper strips to make different angles (acute, right, obtuse). Name the angles made and classify them as more or less than or equal to a right angle.

4. Worksheet: Have acute, right, obtuse angles mixed and numbered on a sheet. Students sort and draw them using the number code into a table according to type:

No.	Acute	Right	Obtuse

5. For virtual activities, search: http://www.apples4theteacher.com/math.html; http://au.ixl.com/math/

Connections Relate to angles in nets of solids, transformations, street maps.

Reflection

Validation Students check where angles are found in their world, e.g. hands on the clock, corners of desks, doors, eye movements.

Application/ problems Provide applications and problems for students to apply to different real-world contexts independently; e.g. *Construct a bridge with Meccano using the pieces to join supports that require acute, right, obtuse angles in the framework.*

Extension **Flexibility**. Students are able to name and show right, acute, obtuse and reflex angles in any of their transformations.

Reversing. Students are able to move between describing angles ↔ modelling angles ↔ drawing angles ↔ naming angles, starting from and moving between any given point.

Generalising. *An angle is the opening between two rays that have a common end point; it is the amount of turn, the measure of the change of direction between the rays. The point is called the vertex and the two rays that form the angle are called the arms of the angle. The image of a right angle can be used as a tool to classify acute and obtuse angles.*

Changing parameters. Students photograph right, acute and obtuse angles in the environment and create a class chart inserting a dotted line to show the internal or external position of the arm that would make a right angle in the images. Explore the effect that different angles in taking the same image may have in the resulting photograph. Students may experiment with this by taking a series of the same image from different angles to demonstrate the effect of perspective.

Teacher's notes

- Explore and discuss angles in the environment before moving into the kinaesthetic activities.
- A circle tool is made with two equal paper or card circles, one white placed on top of the other circle of a different colour. Holding both circles together, cut a radius through both circles from circumference to the centre. Move the paper so that one part of the white circle slips under the coloured circle. Angles are formed by the amount of turn that pushes the white circle underneath the coloured circle, thus exposing more or less, backwards and forwards, of the coloured circle.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a shape, students look at it, remove the picture, students then close their eyes and see the shape in their mind; then make a mental picture of a different shape.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; https://www.qcaa.qld.edu.au/3035.html

- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.