YuMi Deadly Maths

Year 3 Teacher Resource:

MG – Angle it

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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ACKNOWLEDGEMENT

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Year 3 Measurement and Geometry

Angle it

Learning goal	Students will describe angles as the amount of turn between two lines and locate angles in the real world.
Content description	Measurement and Geometry – Geometric reasoning • Identify angles as measures of turn and compare angle sizes in everyday situations (ACMMG064)
Big idea	Geometry – line and angle
Resources	Maths Mat and elastics/velour cords, scissors, string (20 cm long), angler tool made with strip paper and circle angle tool made with two paper or cardboard circles (see Teacher's notes), geostrips, camera

Reality

Local knowledge	Students can identify a line or edge in the local environment, see and describe where two lines meet, e.g. the horizon, two walls meeting at right angles, a wall and the ceiling. Find angles outside/inside the classroom, corners of buildings, roofs (square, triangle).
Prior experience	Check students have prior experience with: • drawing, seeing lines • finding lines that meet at corners.
Kinaesthetic	Emphasise the concept of "turn", so that students understand that angles are made by turning from one direction to another. Have students stretch arms out with hands together pointing straight out in front of them. Look ahead and find an object their hands are pointing towards. Use this object as the starting/reference point and then, keeping arms together, find other objects and note objects that are a small/medium/large amount of turn from the original object. Turn arms both ways from the original object, to the right and the left. This gives a body experience of the amount of turn and gives a reason for the arrow at the end of lines when drawing an angle as the arrow is like our hands pointing in a specific direction from the original object to the object of our choice. Students make angles with their bodies and describe/feel the amount of turn between the spread of two fingers, an arm lifted out from their bodies, legs apart, knees bent, head and shoulder. Feel with their hand and describe the different amounts of turn that can be made. In pairs, students lie on the ground side by side. One student swivels around while the other student stays still to create different amounts of turn, 0°–360°. Reverse roles. Make/describe different angles by separating the blades of scissors, or swinging the classroom door open and closed, and describe the different amounts of turn that can be made**.** Lay a pencil/ruler on the desk and lift one end up so that different angles are made between the raised pencil and the desk. Run a finger between the arm of the pencil and the arm of the desk to feel the different amounts of turn in the angles being made. Encourage students to describe the amounts of turn, e.g. *When I lift the pencil only a little bit, the angle I make has only a small amount of turn from the desk.*

Abstraction

Body	Explore angles with students' bodies, elastics/velour cords on the Maths Mat; small amount of turn, large amount of turn; make the angle bigger/smaller; make a narrow angle, a square angle, a wide angle, a straight angle, a full-turn angle. Classroom door: Measure and compare the number of students that can fit sideways between different openings of the door; describe this in terms of amount of turn (narrow/small angle 1–2 students, square angle 4–5 students, etc.)

Hand

Students place a 20 cm piece of string in line with the bottom of the desk; hold one end down with finger of one hand, use other hand to "swivel" the string from the end point to make different angles: small/narrow, square, wide/larger than square, straight, whole turns; make an angle then make a bigger/smaller angle. Discuss amount of turn.

Make an angler tool by cutting out two strips of paper with arrow heads at one end of each strip. Join these at the other end by a paper fastener. Have the students make many angles by turning the arms in many ways: one arm held down and the second swivelling different amounts of turn (describe the amount of turn); both arms turning to create different amounts of turn. It is important that students see that the inside from one arm to the other arm denotes the amount of turn or size of the angle. Each time, an arc can be drawn with the finger from one arm to the other arm of the angle to show the amount of turn. Geostrips can be used to create the same understanding.

To emphasise that the length of the arms does not determine the size of the angle, have students make another angler with longer arms than the first. Then have them make angles that are the **same size** – narrow/medium/square/wide (same amount of turn, one angler superimposed on the other). Then make random angles with the two anglers that are smaller/larger/same sizes. Reinforce that it is the amount of turn that gives the size of the angle, not the length of the arms.

Use the circle angle tool and turn the tool to make angles of varying amounts of turn; e.g. *A small turn gives a narrow angle, a greater turn gives a bigger angle* (turn → angle). Reverse: *I want you to show me a square angle, a narrow angle* (angle → turn).

Mind

Shut your eyes and see in your mind the different types of angles. Keeping one arm as the direction point, move the other to make a small sharp angle, a bigger angle, a square angle, a wide angle.

Creativity

Students draw pictures of the objects and the angles made in the kinaesthetic activity in Reality, making sure their outstretched arms have an arrow head pointing to each of the pictures of objects. Draw an arc inside the arms to show the amount of turn. They create many different angles from these different pictures. Describe where these angles could be found in the environment.

Clock face: Draw lines to show each type of angle going from the centre to various digits.

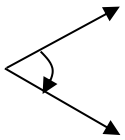
Collect digital images of angles in the environment and make a class chart for discussion of the images.

Mathematics

Language/ symbols

line, straight, curved, corner, end point, angle, amount of turn

Angle symbol:



Practice

1. Circle angle tool (see Teacher's notes): Students make different angles using the circle angle tool (white on top and colour underneath).
2. In pairs, students trace and describe the amount of turn they have made in the various angles they have made with their angler tool. Draw the arc that shows the amount of turn.
3. Digital photos: Make a class chart/s.
4. Worksheets:
   (a) Draw a smaller angle than the one in the box.
   (b) Draw a bigger angle than the one in the box.

(c) Circle the smallest angle in the box.

(d) Put an **X** under the biggest angle in the box.

(e) Pairs of angles, some with arms of equal length but others where the arms are of different lengths. **Size of the angle: Write smaller, same or larger under the angles in each pair.** (This is to assess whether the students are looking at the amount of turn or the length of the arms to determine the size of the angle.)

5. Teacher directions: *Show me a sharp/straight/square/whole angle, using the circle tool. Make me a sharp/straight/square/whole angle, using the angler tool.*

Connections Explore angles/corners in 2D shapes. Discuss and compare size of angles in a square and in triangles.

Reflection

Validation Students look at the size of the turns and the angles they make when going from one place to another, e.g. walking from their desk to the door, from the door to their bags, from their bags to the lunch area/school gate. They replicate these with their arms.

Application/ problems Find where lines and angles are used in buildings, artwork, street directions, maps, patterns/ graphics.

Make a racetrack that has different angles that the drivers need to turn around.

Make a garden bed that has two small angles and two big angles.

Extension **Flexibility**. Students recognise and construct the many different types of angles seen in a variety of contexts and identify these in simple terms.

Reversing. Students are able to complete all parts of the cycle given any one starting point, e.g. stories (*the clock is showing the time school finishes*) ↔ act out (use arms) ↔ pictures (clock face) ↔ language (*show me the amount of turn or make the angle*) ↔ symbols.

Generalising. *An angle is made by two arms that start at the same point and turn from one direction to point in another direction. Two rays meeting at a point form an angle. An angle is the amount of turn between two straight lines that start from the same point. The amount of turn determines the size of the angle*.

Changing parameters. Students explore the number of angles in a 2D shape and compare that to the number of lines that make the 2D shape. Explore the angles on the faces of 3D shapes.

Teacher's notes

- Angler tool: Cut out two strips of paper with arrow heads drawn on one end. Pin the two square ends of the paper strips together using a paper fastener. Swivel the arms to construct many different sizes of angles. Make anglers with short/medium/long arms to reinforce that it is the amount of turn, not the length of the arms, that creates the size of the angle. It is helpful for students to draw an arc with their finger between the arms to feel the size of the angle between the arms and later to draw an arc with their pencil to show the size of the angle.
- Circle angle tool: Two equal paper or light cardboard circles, the top one white, the bottom one a different colour; put both circles together and make one cut into the centre of both circles. Slide the top circle so that it spins underneath the coloured circle (or vice versa) thus forming an angle determined by the amount of turn.
- 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 kookaburra, students look at it, remove the picture, students then close their eyes and see the picture in their mind; then make a mental picture of a different bird.

- 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.

