Year 7 Perimeter and Circumference Lesson Plan

*Students' background knowledge includes an understanding of the basics of algebra and algebraic techniques and a basic understanding of how to the calculate areas of simple shapes i.e. squares, triangles and rectangles. In previous lessons, we have covered irrational numbers with a focus on π and all of the perimeter topic up to the perimeter/circumference of circles.

NSW OUTCOMES AND LEARNING OBJECTIVES
Outcome: Calculates the perimeters of plane shapes and the circumferences of circles (MA4-12MG). Lesson Objectives: - Students will be able to solve problems involving the perimeter of plane shapes. - Students will be able to develop and use formulas to find the circumferences of circles in terms of the diameter and radius. - Students will be able to find the perimeter of quadrants and semicircles.
ASSESSMENT.
Students complete all questions on perimeter and/or circumference worksheet up to extension question. Students complete the extension question on perimeter and/or circumference worksheet. Students participate in class discussions. Students complete their 3-2-1 list.
KEY POINTS.
Use appropriate units when solving questions (i.e. mm, cm and m). Recall algebraic techniques when setting out questions. Apply the appropriate perimeter formula to the corresponding plane shape when finding its perimeter. Adjust circumference formula and construct new formulas to solve questions.
OPENING.
Begin class by listing some plane shapes from previous lessons and asking students to recall their corresponding perimeter formulas. Then ask in what ways can they can connect the importance of knowing the perimeter of such shapes to the real world and everyday life. List objects that relate to circles and let students guess the next part of the topic: circles. Now ask students why would knowing the perimeter/circumference of a circle be important in the real world and everyday life but furthermore, when would it be necessary to know both the perimeter of circles and previously mentioned plane shapes, to get students talking, engaged and interested in the lesson topic. * Remind students about key perimeter formulas * Encourage students to answer as it forces them to use their own experiences to answer the question.
INTRODUCTION OF NEW MATERIAL.
Materials: Whiteboard, students' Mathematics book Introduce the next part of the topic: the perimeter/circumference of circles, stating its formula: $2\pi r$, writing it on the whiteboard and relating it back to the previous lesson on irrational numbers and π. Establish what the word circumference means both inside and outside Mathematical context. As a class, ask students to name a few circular objects and work through the calculation of their approximate circumference with them ensuring you explain all the steps.
* Remind students to always write down the formula(s) they will need in questions before solving them.
GUIDED PRACTICE.

Materials: Whiteboard, students' Mathematics book

Class activity 2 – Problem: Superman and Batman decided to have a pizza eating contest to see who had the bigger stomach, Superman bought the round Hawaiian pizza with a 0.15m radius while Batman bought the round Supreme pizza with a 190mm radius. If Superman ate three quarters of his pizza and a quarter of Batman's pizza and Batman ate only a quarter of Superman's pizza but half of his pizza, who ate the most pizza and ended up winning the pizza eating contest?

First ask students through a show of hands, who they think won the contest. Recall the circumference formula for a circle ($2\pi r$) and discuss with students how dividing the pizza up in quarters would change the circumference of the pizza and how that would relate to diameter and/or radius. Then ask students as a class how they would combine these ideas to construct a new formula for the perimeter of a quarter of a circle and for a semicircle. After discussion, randomly assign 9 students into groups of 3 and ask them to work through the problem on the whiteboard with each group using a different unit of measurement i.e. mm, cm and m. When completed, discuss with students which was the most appropriate unit to use and examine the working out step by step and let them write the solution in their book. Finally ask students through a show of hands who predicted the winner correctly at the beginning and ask if any of them would like to share why they thought so.

* Provide as much support as needed to students.
* Praise hard work, not intelligence, and students' involvement in the activity, discussions and questions.

INDEPENDENT PRACTICE.

Materials: Worksheet 1 and 2, students' Mathematics books (for working out questions)

Hand out both worksheets 1 and 2, and inform students that in the first 7 minutes they will be working on worksheet 1 and in the next 7 minutes they will be working on worksheet 2. The unfinished questions will be for homework.

Encourage all students to attempt the extension question in the final 3 minutes for each worksheet.

Monitor/assess their mastery of the objective by walking around and checking students' progress and how they've set out their answers whilst providing support when necessary. Also, by asking students who completed all questions up until the extension question to stand up after each worksheet and to be applauded, and then students who completed the extension question as well to be applauded again.

* Praise hard work, not intelligence, and how much students completed in the worksheets.
* Congratulate students on their effort and persistence throughout the lesson before moving onto Closing.

CLOSING.

Materials: Students' Mathematics book

In groups of 2-3, have students discuss and write a 3-2-1 list in their Mathematics book: 3 things they have learnt from the lesson, 2 reasons why knowing the circumference of a circle or circular object is important, and 1 question they have for another group.

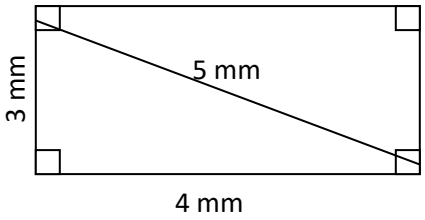
Have groups then compare lists and ask their question. Walk around helping when necessary and join in on group discussions asking what their lists and/or question was.

Praise all students for their hard work and effort in class and to see you if they had any more questions.

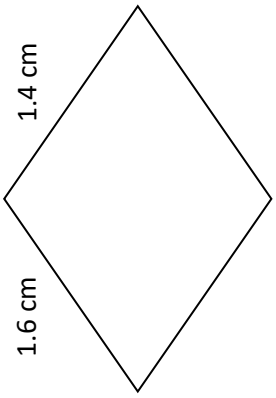
Name_____ Period_____ Date_____

Perimeter

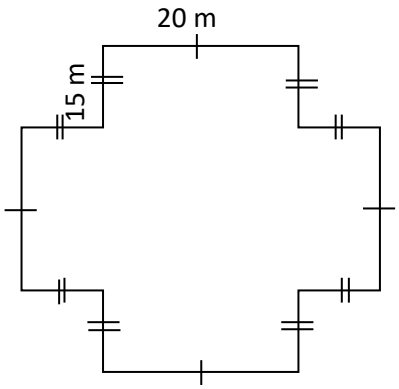
1) Perimeter = _____ mm



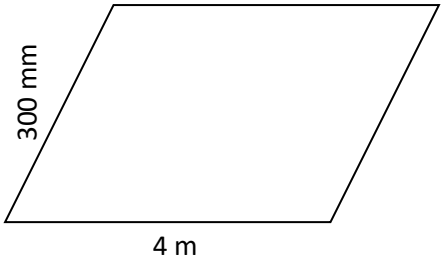
2) Perimeter = _____ mm



3) Perimeter = _____ m



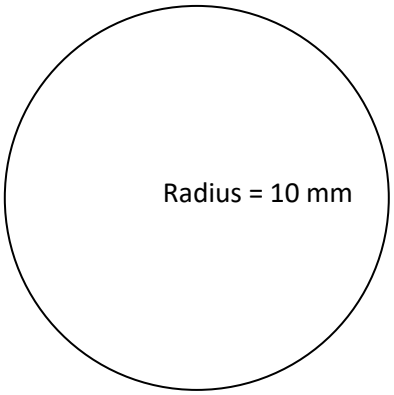
4) Perimeter = _____ m
HINT: This is a parallelogram.



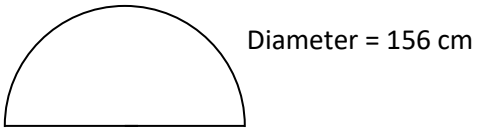
[Extension] 5) Simon's building a fence around his rectangular garden. How much fencing will he need to buy if he needs to leave space for a rectangular door with 1900mm and 60cm sides?

Circumference

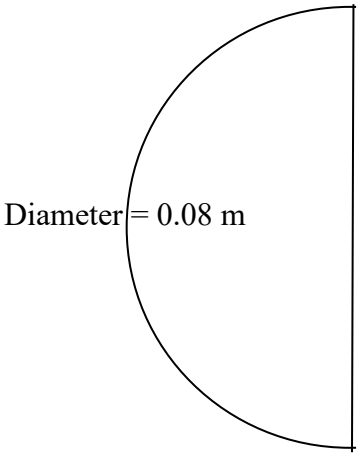
6) Circumference = _____ mm



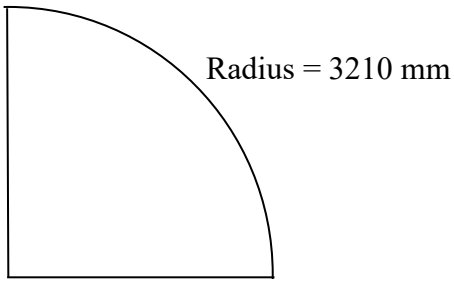
7) Circumference = _____ mm



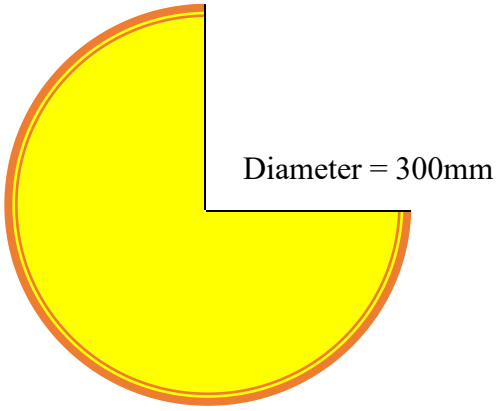
8) Circumference = _____ cm



9) Circumference = _____ cm



10) After learning about circumference in Mathematics, Henry and Maddy wanted to know the circumference of their favourite extra-large sized cheese pizza so they bought one to measure. However, Ivy stole a quarter of the pizza, what is the circumference of the remaining pizza in cm?



Analytic Paper

Strength one

The first strength of my lesson plan is that I ensure it reflects my high expectations for my students by incorporating into it both higher and lower order thinking skills in terms of Bloom's Taxonomy through my key points. In Zohar's (2000) study, he found that 45% of teachers believed that higher order thinking was only appropriate for high-achieving students which led to lower order questions often being posed to low-achieving students (p.469). However, several other researchers have argued that lower-achieving students in fact stand to benefit more from higher order thinking (Zohar, 2000) (p.483). Because all students benefit from higher order thinking skills, by involving both low and high-achieving students in class discussions and activities and expecting all students to complete the same independent work whether in class and/or in their own time, my lesson plan reflects my high expectations, providing equal learning opportunities to all students and engaging them in higher order thinking.

TES Identifying research into Higher Order Thinking skills and activating prior knowledge and teaching implications.

Strength two

The second strength of my lesson plan is by getting students to answer questions that relate to the real world, their everyday life, and/or previous lessons such as shown in my opening, it forces them to activate their prior knowledge. No student enjoys learning something they are not interested in however, when students are interested, they tend to both work harder and learn more (Tobias, 1994) (p.38). In Tobias's (1994) study, he found that prior knowledge and interest had a substantial liner relationship and moreover, that interest may have an energising effect that results in the use of deeper comprehension processes (p.45). The best time in a lesson to capture students' interest and get them engaged is at the beginning of the lesson hence, the opening of my lesson plan aims to activate as much of my students' prior knowledge as possible with my guided practice and extension worksheet questions maintaining this throughout the lesson. By tapping into students' interests at the beginning of the lesson it results in them being more concentrated and engaged throughout the lesson which in turn, increases learning efficiency and enjoyment also benefitting following lessons.

Strength three

The third strength of my lesson plan is giving both my class and worksheet questions purpose. Snow (2002) emphasises the importance of tasks, questions or activities having a purpose as it guides and allows the reader to engage in reading operations intended to address it (p.15). Following this idea, the activity discussion and questions in my guided practice aim to guide students' attention to manipulating different aspects of the circumference formula in order to help them achieve the corresponding lesson objective. The questions in both my worksheets similarly, guide their attention towards certain aspects of the question such as the change in units thus, preparing them for the extension question. Furthermore, this idea is also especially beneficial to language-background-other-than-English (LBOTE) students as difficulties in understanding secondary content-area texts may hinder their ability to identify and/or achieve the purpose of a task. LBOTE students should not be working on simpler tasks solely due to language inadequacy, especially in Mathematics, therefore, by providing a purpose in my activities and questions, my lesson plan helps to both maintain high-challenge material for the class and guide LBOTE students into the material.

TES is beginning to apply knowledge of students' literacy skills and affect on learning.

Strength four

The fourth strength of my lesson plan is that I ensure I praise students for their hard work, involvement and progress whilst avoiding praising students simply for their intelligence. Dweck (2010) explains, students with a growth mindset tend to tackle work enthusiastically and welcome challenges whereas students with a fixed mindset dislike effort and the possibility of failing as they believe being smart means being able to succeed without effort (p.1–2). Dweck's (2010) findings have shown that praising students for their hard work, what they have engaged in, their persistence and many more–yields far more benefits than praising intelligence. Therefore, in following Dweck's findings and praising students throughout the lesson as seen in my guided and independent practice and closing, my lesson plan aims to build and foster a growth mindset in my students whilst simultaneously discouraging a fixed mindset.

Strength five

The fifth strength of my lesson plan is that I also ensure that the literacy level of the lesson is kept to an understandable and accessible level through my support, making sure it is not unnecessarily complicated but also not too simple for students. Snow (2002) states that many content-area teachers presuppose that students' literacy skills are satisfactory for their grade-level which leads to students' inability to fully understand the information and task presented, restricting their potential (p.6). By being aware that many students may not have the adequate literacy levels to understand secondary texts, I avoid unnecessarily complicated material and assigning new texts to students and expecting them to understand it themselves. Instead, by having preview discussions for students' independent practice in my guided practice, I am able to provide as much support as needed. Moreover, by being thorough and guiding their attention to important aspects and working through the question in various ways I can reduce uncertainties and misunderstandings about the question as well as any literacy barriers that may have prevented any students from understanding specific parts of the question. Additionally, Hart and Risley's (2003) findings show an enormous 30-million-word gap by the age of 3 between lower and higher-SES groups (p.4). With such an enormous word gap, this also severely affects students' literacy levels in regard to their ability to read and comprehend. Consequently, the strength of my lesson plan addresses these findings in ensuring an understandable and accessible level of literacy in the lesson whilst providing as much support as needed.

Strength six

The sixth strength of my lesson plan as well as past and future lesson plans, is that it frequently revisits a small set of high-utility academic words pertinent to the topic whilst providing multiple exposures of them in a variety of contexts. As proposed by Kelley et al (2010), effective vocabulary instruction includes targeting a small number high-utility academic words and teaching them in depth which encompasses planned exposures of the words and anchoring them in texts (p.12). By revisiting and embedding high-utility academic words such as diameter, radius, perimeter and circumference throughout all parts of my lesson plan, I provide multiple exposures of the words and allow students to create meaningful interactions with them. In turn, this effective vocabulary instruction also benefits both lower–SES and LBOTE students by developing their academic vocabulary which will support them in their ability to participate in discussions, interact with other students, and fully understand tasks.

References

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