Around and Inside: Circumference and Area

Teacher		**Class**	Grade 7
Subject	Math	**Topic**	Circumference and area of circles
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn the formulas for circumference and area. They cut circles into slices to see why the formulas work.

Curriculum links

- Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. [1]

Learning objectives

- Students will know C = pi x d and A = pi x r squared and use them.
- Students will explain how half circumference times radius gives area formula informally.

Success criteria

- I can find circumference and area from radius or diameter.
- I can explain why area equals pi times radius squared.
- I can work backward from circumference to find radius and area.

What students already know

Show a paper circle: point to center, ask a student to show radius and diameter and tell how they are linked.

Key words

circumference	distance all the way around the outside edge of a circle [4][5]
area	amount of flat space inside an outline [4]
radius	distance from the middle point to the edge [7]
diameter	straight distance across through the middle point [7]
pi	number about 3.14 showing how many across-lengths fit around [3][19]

Materials

- Slides 1-5, 7, 9-11 with Video clip 1 (0:00-5:00) and Video clip 4 (0:00-2:47)
- Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14) and Worksheet Task E (Put in order: Put the steps that show where the area formula comes from in order.), one copy per student
- paper circles, scissors, glue sticks, large paper and rectangle outline

Before the lesson

- Print Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14) and Task E (Put in order: Put the steps that show where the area formula comes from in order.), one per student, plus spare pre-cut wedges and rectangle outlines
- Test Slide 5 Video clip 1 (0:00-5:00) and Slide 7 Video clip 4 (0:00-2:47) with sound and pi button

Created with LessonDino.com · AI lesson planner with checkable sources

- pre-cut circles in 8 large wedges for support
- rulers, calculators, whiteboards and markers
- Set out paper circles, safety scissors, glue sticks and large paper in pairs trays, clear floor space

Lesson outline

0–8 min **Starter** 8 min · Whole class

Hook students with the slice-to-rectangle puzzle and recall radius and diameter.

YOU DO

1. Show Slide 1 Around and Inside, then hold up a paper circle.
2. Say the hook and show the slices idea briefly without cutting yet.
3. Show Slide 2 One number for every circle and explain pi is about 3.14.
4. Quick-check radius and diameter on the circle through the center.

STUDENTS DO

1. Look at the circle and listen to the hook question.
2. Call out radius and diameter and how they are linked.
3. Repeat that pi is about 3.14 times around.

Say: What if we cut this circle up like slices and built a rectangle out of it? Look at this circle. The width straight across through the middle fits around the outside about 3.14 times for every circle.

Ask: If the diameter is 10 inches, what is the radius? (5 inches, because radius is half the diameter [4].) · How many times does the diameter fit around any circle? (About 3.14 times, because pi is the ratio of circumference to diameter [3].)

Check understanding: Thumbs up for diameter equals two times radius [7]; re-show center dot and double-check halving if unsure.

Support: Mark the center dot so measuring diameter through the center is easier [7]. **Stretch:** Ask students to predict the circumference of a 10-inch lid from its diameter before measuring.

Use: Slides 1-2

8–20 min **Teaching** 12 min · Whole class

Teach when to use circumference and area formulas with a model.

YOU DO

1. Show Slide 3 Around vs Inside to contrast distance around with space inside.
2. Show Slide 4 Parts you must know for center, radius and diameter.
3. Play Slide 5 Video clip 1 Circles, circumference and area.
4. Model r = 3 in. for both formulas and stress inches versus square inches.

STUDENTS DO

1. Copy both formulas and label radius and diameter on a mini circle.
2. Watch the video to spot when to use diameter or radius.
3. Copy the r = 3 model with units.

Say: Circumference is the total length of the outline [4]. Area is the total space inside the outline [4]. Use C = pi x d or 2 x pi x r for around, and A = pi x r squared for inside. Area is measured in square units [9].

Worked example: Radius r = 3 in. Diameter d = 6 in. because diameter is two times radius [7]. Circumference C = 2 x pi x 3 = 6pi, about 18.84 in. using 3.14 [4]. Area A = pi x 3 x 3 = 9pi, about 28.26 square inches [4].

Ask: Do we use diameter or radius in A = pi x r squared? (Radius, so halve the diameter first to get radius.) · Why is circumference in inches but area in square inches? (Circumference is a length around, area covers flat space [4][9].)

Check understanding: Whiteboards up: C for d = 6 in.? Expect about 18.84 in.; reteach C = pi x d [9] if mixed.

Support: Give a reference strip showing diameter equals two times radius [7] and worked example for r = 3.
Stretch: Ask what changes if you know diameter but the question asks for area.

Use: Slides 3-5, Video clip 1 (0:00–5:00)

Created with LessonDino.com · AI lesson planner with checkable sources

20–38 min **Main activity** 18 min · Pairs

Derive area from circumference by rearranging slices into a near-rectangle.

YOU DO

1. Show Slide 7 and play Video clip 4 Why area is pi r squared.
2. Demo cutting a circle into 12-16 wedges and laying them point-up, point-down to make a shape close to a parallelogram [12].
3. Guide labeling: long bumpy side is half the circumference, or pi times radius [12], short side is radius, so area is pi x r x r [13].
4. Give Worksheet Task E (Put in order: Put the steps that show where the area formula comes from in order.).

STUDENTS DO

1. Cut circles into wedges, rearrange and glue down the near-rectangle on large paper.
2. Label length as pi x r and width as r, and write A = pi x r squared underneath.
3. Complete Worksheet Task E (Put in order: Put the steps that show where the area formula comes from in order.).

Say: Cut slices and flip every other one. It looks like a rectangle. The length is half the way around, pi times radius. The width is radius. Length times width is pi times radius times radius.

Worked example: Circumference C = 2 x pi x r. Half of it is pi x r. Rectangle area = length x width = pi x r x r = pi x r squared. More, smaller slices look closer to a rectangle [13].

Ask: Where does pi x r come from in your rectangle? (It is half the circumference, half of 2 x pi x r [12].) · Why does the edge get straighter with more slices? (Smaller slices make the bumpy edge flatter, closer to a rectangle [13].)

Check understanding: Walk around to see glued rectangles labeled pi x r by r; if length is wrong, point to half-way-around and recount.

Support: Provide circles already cut into 8 large wedges and a rectangle outline to fill, noting the width of the rectangle is the radius of the circle [13]. **Stretch:** Ask what would happen with 32 slices and why the edge gets straighter.

Use: Slide 7, Video clip 4 (0:00–2:47), Worksheet Task E (Put in order: Put the steps that show where the area formula comes from in order.)

Created with LessonDino.com · AI lesson planner with checkable sources

38–52 min **Practice** 14 min · On their own

Use both formulas accurately without mixing radius and diameter.

YOU DO

1. Show Slide 9 Solve without mix-ups for pick formula and halve first.
2. Model one area with radius 4 cm: A = 3.14 x 4 x 4 = 50.24 square cm.
3. Hand out Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14).
4. Remind students to use approximately equals with 3.14 and keep same units [3].

STUDENTS DO

1. Copy the 4-cm area model showing squaring.
2. Work Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14) on their own using 3.14.
3. Box answers with correct units or square units.

Say: Pick the formula first. Around uses C = pi x d, inside uses A = pi x r squared. Given diameter, divide by 2 before using radius. Circumference is in linear units and area is in square units.

Worked example: Radius 4 cm. Area A = pi x r squared. A = 3.14 x 4 x 4 = 3.14 x 16 = 50.24 square cm. If given diameter 8 cm, halve first to r = 4 cm because diameter is two times radius [7].

Ask: Circle has diameter 10 cm. What do you do before A = pi x r squared? (Halve to radius 5 cm, then square 5 x 5.) · Why do we write approximately equals for 50.24? (Because 3.14 is only an approximate value for pi [4], which never ends or repeats [7].)

Check understanding: Check first two answers from Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14) on whiteboards; pull small group to reteach halving if diameter is squared.

Support: Give multiplication table and reference strip with C = 2 x pi x r or pi x d [4]. **Stretch:** Add wild cards that give circumference and ask for radius, so students work backward.

Use: Slide 9, Worksheet Task B (Practice questions: Practice finding circumference and area. Use π ≈ 3.14)

52–60 min **Plenary** 8 min · Whole class

Prove students can go from circumference to area and give both exact and decimal forms.

YOU DO

1. Show Slide 10 Think, pair, share: only circumference 31.4 inches is known.
2. Talk through C to r to A, since radius bridges the gap between circumference and area [17].
3. Run Slide 11 Quick quiz for r = 3 in. circumference and r = 4 cm area.
4. Link back to success criteria and slice model.

STUDENTS DO

1. Think then pair to explain how to still find area from 31.4 inches.
2. Answer quiz questions with units and square units.
3. Self-rate against I can statements.

Say: You only know the way around. Divide by 2 times pi to get radius, then square to get inside. Use 3.14 as an approximation of pi [7]. Give answers in terms of pi and as decimals.

Worked example: C = 31.4 in. C = 2 x pi x r, so r = 31.4 divided by 6.28 = 5 in. Then A = 3.14 x 5 x 5 = 78.5 square inches. Exact forms would be 10pi inches around and 25pi square inches.

Ask: First step with C = 31.4 in. to find area? (Divide by 2 x 3.14 to get radius 5 in., then use A = pi x r squared.) · Same circle, two answers: what are they? (Exact in terms of pi [6], like 10pi, and decimal with about, like 31.4, because pi is non-terminating [7].)

Check understanding: Exit on whiteboards: r from C = 18.84 in.? Expect 3 in.; reteach dividing by 6.28 if stuck.

Support: Provide first step started: divide circumference by 6.28 to get radius. **Stretch:** Give an area and ask students to work backward to circumference the same way.

Use: Slides 10-11

Common mistakes

Mistake	How to spot it	How to fix it
Using diameter instead of radius in A = pi x r squared	Area is 4 times too big	Halve diameter to radius first, because diameter is two times radius [7].
Mixing formulas and units, giving area in inches	Uses single length for area or square units for circumference	Sort fence versus floor: around uses C = pi x d, inside uses A = pi x r squared [4]; area is in square units [9].
Writing = with 3.14 instead of approximately equals	Writes C = 18.84 exactly after using 3.14	Use about sign, because 3.14 is only approximate [4] and pi never ends or repeats [7].

Support

- Pre-cut 8 wedges with rectangle outline, mark center dot for diameter through center [7].
- Reference strip with C = pi x d and A = pi x r squared plus r = 3 model [4].

Stretch

- Predict circumference from diameter before measuring, try 32 slices, work backward from area to circumference.
- Design ring by subtracting inner area from outer area.

For the LSE or teaching assistant

Stay with main activity pairs: help line up wedges point-up and down, label pi x r length and r width, check Task E order for Put in order: Put the steps that show where the area formula comes from in order.

Safety

- Use safety scissors, cut away from fingers, and keep paper scraps off the floor to prevent slips.

Check for understanding

Question	Answer
Radius is 3 in. What is circumference? Use 3.14.	18.84 in., C = 2 x 3.14 x 3
Radius is 4 cm. What is area? Use 3.14.	50.24 square cm, A = 3.14 x 4 x 4
Circumference is 31.4 in. What is radius? What is area?	r = 5 in.; A = 78.5 square inches

Homework

Measure a lid diameter in inches, find C = pi x d and A = pi x r squared with 3.14.

Sources

1. Grade 7 » Geometry | Common Core State Standards Initiative · thecorestandards.org · https://www.thecorestandards.org/Math/Content/7/G/
2. 7th grade Math Curriculum 2025 - thoreaums.fcps.edu · thoreaums.fcps.edu · https://thoreaums.fcps.edu/sites/default/files/media/inline-files/7th%20grade%20Math%20Curriculum%202025%20.pdf
3. Circumference, Area and Volume | NIST · nist.gov · https://www.nist.gov/pml/owm/circumference-area-and-volume
4. Finding Area, Perimeter, and Circumference · isu.edu · https://www.isu.edu/media/libraries/student-success/tutoring/handouts-math/area_perimeter_circumference.pdf
5. Circles: Circumference and Area of a Circle - DoDEA · content.dodea.edu · https://content.dodea.edu/VS/HS/Aventa/Geometry/GEOMx-HS-A09/b/unit07/g_7.D.3.html
6. Area and Circumference of a Circle · cedu-spw-p06.austin.utexas.edu · https://cedu-spw-p06.austin.utexas.edu/canvas-files/GEO-B-66504/unit06/lsn05/U06L05ENCircleReview.pdf
7. Section 2.5: Circles - MAT112 Mathematical Concepts & Applications · open.maricopa.edu · https://open.maricopa.edu/mat112/chapter/section-2-5-circles/
8. Section 2.5: Circles – MAT112 Mathematical Concepts ... · open.maricopa.edu · https://open.maricopa.edu/mat112/chapter/section-2-5-circles/
9. Circumference and area of a circle - Perimeter and area ... - BBC · bbc.co.uk · https://www.bbc.co.uk/bitesize/guides/ztndmp3/revision/6
10. Circumference of a circle KS3 | Y8 Maths | Lesson Resources · thenational.academy · https://www.thenational.academy/teachers/programmes/maths-secondary-ks3/units/perimeter-area-and-volume/lessons/circumference-of-a-circle
11. Explaining circumference and area of a circle - Khan Academy · khanacademy.org · https://www.khanacademy.org/math/als-k-to-12-math/x54b4346ef80b5dcc:performance-standard/x54b4346ef80b5dcc:perimeter-and-circumference/a/explaining-circumference-and-area-of-a-circle
12. Flexi answers - How to find circumference and area of circle? | CK-12 Foundation · ck12.org · https://www.ck12.org/flexi/geometry/understand-arcs-and-sectors/how-to-find-circumference-and-area-of-circle/
13. Area of circles - KS3 Maths - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/zsp37p3
14. Checking and securing understanding of circles GCSE | KS4 ... · thenational.academy · https://www.thenational.academy/teachers/programmes/maths-secondary-ks4-foundation/units/2d-and-3d-shape-compound-shapes/lessons/checking-and-securing-understanding-of-circles
15. Radius, diameter, & circumference | Circles (article) | Khan Academy · en.khanacademy.org · https://en.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/a/radius-diameter-circumference
16. Circumference of a Circle and Area of a Circle - Formula ... · flexbooks.ck12.org · https://flexbooks.ck12.org/cbook/ck-12-interactive-geometry-for-ccss/section/8.2/primary/lesson/area-and-circumference-of-circles-geo-ccss/
17. Area of circles review (article) | Geometry | Khan Academy · en.khanacademy.org · https://en.khanacademy.org/math/basic-geo/basic-geo-area-and-perimeter/area-circumference-circle/a/area-of-circles-review

Created with LessonDino.com · AI lesson planner with checkable sources

18. Circumference and Area of Circles Worksheets · mathworksheets4kids.com · https://www.mathworksheets4kids.com/area-circumference.php
19. Circles: Circumference and Area | Math | EducaWeb · educaweb.org · https://educaweb.org/math/circles-circumference-and-area/
20. Circumference and Area of Circles - Online Tutorials Library · tutorialspoint.com · https://www.tutorialspoint.com/circumference_and_area_of_circles/index.htm
21. Area and Circumference of Circles - K12 Math Worksheets · k12mathworksheets.com · https://k12mathworksheets.com/worksheets/area-and-circumference-of-circles/
22. Area and Circumference of a Circle Worksheets - Cuemath · cuemath.com · https://www.cuemath.com/worksheets/area-and-circumference-of-a-circle-worksheets/
23. Circle Worksheets PDF | Area, Circumference & Parts of a Circle · mathfunworksheets.com · https://www.mathfunworksheets.com/circle-worksheets/
24. Circle Area and Circumference Practice - Effortless Math · effortlessmath.com · https://www.effortlessmath.com/math-topics/practice-circle-area-and-circumference/
25. Circumference and Area of a Circle Worksheet (12 Free ... · algebra911.com · https://algebra911.com/worksheets/circumference-and-area-of-a-circle-worksheet/

Created with LessonDino.com · AI lesson planner with checkable sources