How Do You Celebrate Pi?



It seems like there is a holiday for everything, even pi. In the United States, Pi Day is celebrated on March 14 (3.14). In many other countries, people celebrate on July 22 (22/7). Around the world, people recognize this number, but most people do not really understand what it is or why it matters.

That is where you come in.

Pi is a ubiquitous symbol in mathematics. It represents the relationship between a circle's diameter and circumference. Long ago, the Greek mathematician Archimedes developed a way to calculate pi, helping others better understand how circles work.

Even though pi is closely connected to circles, it is used in much more than just geometry. It appears in fields such as computer science, engineering, and physics. It helps explain patterns, solve problems, and make sense of how the world works. So why is pi used in so many different areas of math and science?

Your challenge is to help others understand.

You will create something that brings pi to life for others. Your work should grab attention, spark curiosity, and help people understand why pi matters in the real world. It will be shared with other students, families, or members of your community.

By the end, people should not just recognize pi. They should understand it and begin to notice where it shows up in the world around them.

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How Do You Celebrate Pi? *Rubric*

	Novice	Apprentice	*Practitioner*	Expert
Math Journal — Defining Pi	includes: • description of pi • definition of circumference, diameter, radius, and area • use of pi in formulas for circumference and area	includes: • description of pi • explanation of how pi is related to circumference and diameter of circles • explanation of relationship between circumference and area of circles • most geometric formulas for which pi is used	includes: • description of pi and its historical background • explanation of how pi is derived from circumference and diameter of a circle • explanation of relationship between circumference and area of circles • the derivative relationship between circumference and area • all geometric formulas in which pi is used; explanation of each formula	all of *Practitioner* plus: explanation of the history of the circle and how its use and pi evolved over time
Math Journal — Calculations	includes: • two or more mathematical examples for calculating circumference of a circle rounded to nearest hundredth • two or more mathematical examples for calculating area of a circle rounded to nearest hundredth • mathematical example for calculating volume of a cylinder with solution rounded to the nearest hundredth	includes: • two or more mathematical examples for calculating circumference of a circle with whole number and fractional units of measurement and solutions rounded to the nearest hundredth • two or more mathematical examples for calculating area of a circle with whole number and fractional units of measurements and solutions rounded to the nearest hundredth • mathematical examples for finding the volume of a cone and cylinder with solutions rounded to nearest hundredth	includes: • three or more mathematical examples for calculating circumference of a circle with whole number and fractional units of measurement and solutions rounded to the nearest hundredth • two or more mathematical examples for calculating area of a circle with whole number and fractional units of measurements and solutions written in terms of pi and rounded to the nearest hundredth • mathematical examples for finding the volume of a cone, cylinder, and sphere with solutions written in terms of pi and rounded to nearest hundredth	all of *Practitioner* plus: description of scientific formulas where pi is used and an example of a problem worked out

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How Do You Celebrate Pi? *Rubric*

Display Board	includes: • title • written and symbolic forms of pi • numerical form of pi to at least the hundredths place • illustrations related to pi • one example of the use of pi from the calculations in your math journal	includes: • title related to poster's theme • written and symbolic forms of pi • numerical form of pi to at least the thousandths place • illustrations to support poster's theme • two examples of the use of pi from the calculations in your math journal	includes: • title related to poster's theme • written and symbolic forms of pi • numerical form of pi to at least the millionths place • illustrations to support poster's theme • three or more examples of the use of pi from the calculations in your math journal • color scheme that is visually appropriate for the audience	all of *Practitioner* plus: includes hyperlinked resources using QR codes and/or shortened URLs
Display Placard	includes: • same title as display board • two or three sentences describing how pi is used across mathematics • grammatically correct writing with appropriate grade-level conventions	includes: • same title as display board • paragraph describing history of pi and how it is used across mathematics • citations in MLA format • grammatically correct writing with appropriate grade-level conventions	includes: • same title as display board • paragraph describing history of pi, its importance, and how it is used across mathematics and science • citations in MLA format • grammatically correct writing with appropriate grade-level conventions	all of *Practitioner* plus: includes screencast explaining use of pi across mathematics and science

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Teacher Material

How Do You Celebrate Pi? *Sample Scaffold for Learning*

Benchmark Video and Discussions
- Launch
- Why Pi?
- Circumference and Area



Instructional Activities: Learning

Instructional Activities: Additional

Instructional Texts	Instructional Videos	How-to Sheets	Practice
• Fiction and nonfiction texts from your curriculum (I/P)	• Finding the circumference of a circle (I) • Finding the area of a circle (I) • Writing solutions in terms of pi (IV)	• Finding the circumference of a circle • Finding the area of a circle • Writing solutions in terms of pi	• Researching history of pi (HW) • Finding the circumference of a circle (I/P) • Finding the area of a circle (I)
			Application • Editing/polishing final product (SG) • Calculating the circumference and area of circles (I/P)
Interactive Websites	**Learning Centers**	**Small-Group Mini-Lessons**	**Assessment**
• Khan Academy • IXL • Math is Fun • Geogebra	• Circumference or Area (SG) • Geometric Formula Sort (P/SG) • Exploring Pi (I)	• Finding the circumference of a circle • Finding the area of a circle • Multiplying with fractional units	• Use rubric to self-assess (I) • Peer edit of all elements in final product (P)
			Reflection • Learning exit ticket • Two stars and a wish • Complete: Something that I thought was tricky today was . . .

Key: Individual **(I)**, Pairs **(P)**, Small Groups **(SG)**, Activities suitable for homework **(HW)**, Insights Video **(IV)**

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Teacher Material

How Do You Celebrate Pi? *Content Facilitation Grid (Week 1 Sample)*

Student	Defines the diameter and radius of a circle	Describes how to use the formula for the circumference of a circle	Describes how to use the formula for the area of circle	Explains which formula of circumference to use	Explains how to derive pi from the diameter and circumference	Explains the concept of area	Explains the concept of circumference	Explains the difference between using area formulas vs. circumference formulas	Defines pi	Defines derive	Explains how to derive a formula			

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How Do You Celebrate Pi? *Facilitation Questions*

COMPREHENSION: *Ask questions that ensure students understand content and skills needed to solve the problem.*	• What does area mean and how do you find it for a circle? • What does circumference mean and how do you find it for a circle? • What is the difference between the area and circumference of a circle? • How are the area and circumference of a circle related? • How would you define pi?
APPLICATION: *Ask questions that ensure the ability of students to apply learning to new situations.*	• How is pi derived from the diameter and circumference of a circle? • How do you derive geometric formulas? • How do you know when to find the area vs. the circumference in a word problem? • How do you write solutions in terms of pi?
CONNECTION: *Ask questions that ensure the ability of students to apply learning to their lives.*	• Why is pi used across different content areas? • How are circles used in other polyhedra? • Where do you see circles used across your life? • How is circumference related to how you find perimeter?
SYNTHESIS: *Ask questions that encourage students to create new information from existing data.*	• Why do we learn to derive formulas? • What is an important aspect of understanding the area of a circle that can be used in other formulas? • How are the geometric formulas for volume connected to finding the area of polygons? • How else can pi be used outside of geometry?
METACOGNITION: *Ask questions that prompt students to think about their own thinking process.*	• What challenges do you foresee as you move through this unit? • What information can you use from previous learning that applies to this unit? • What mistakes did you make in your calculations at the beginning of this unit? How did you adjust as you moved forward? • What advice would you share with future students learning this topic?

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How Do You Celebrate Pi? *Transfer Task*

Now that you have designed a display about the properties of circles and pi, you will apply what you know in a new situation.

You have been asked to design packaging for a sweet or healthy treat that will be shared with your audience. The packaging must be visually appealing, practical, and make smart use of space and materials.

Create three different packaging designs.

- ☐ one of each of the following: sphere, cone, and cylinder
- ☐ The individual volumes of each are within 20 in^3 and 900 in^3
- ☐ The sketches are labeled with the following:
  - Precise measurements with unit of inches
  - Radius of the circle
  - Height of the figure
- ☐ All calculations are written on a separate sheet of paper
- ☐ Packaging is colorful to match the aesthetic of your display

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How Do You Celebrate Pi? *Teacher Notes*

Unit Overview	
How well do you know pi? Students learn about pi in geometry. They practice finding the area of circles and the volume cylinders using this constant. But why is pi so important? There are even holidays dedicated to celebrating pi! In this *Authentic Learning Unit*, students research, learn, and apply the various uses of pi. They will use their knowledge to design a display to share with their school or community inspiring others to celebrate pi!	
Enduring Understandings	**Essential Questions**
• Relationships and patterns can be represented numerically or symbolically. • Geometric solutions can be represented in a variety of ways. • The application of geometry involves understanding the basic elements of shapes.	• How can you define the characteristics of a circle? • When is it best to use an approximation in geometric calculations? • How do you express patterns to describe geometric relationships? • How do you know where to start when beginning a geometric problem?
Common Core State Standards Addressed	
CCSS.MATH.CONTENT.7.G.B.4; CCSS.MATH.CONTENT.8.G.C.9	
21st Century Skills Addressed	
Core Content and Interdisciplinary Themes • Subject-Area Mastery • Global Awareness	*Information and Media Literacy* • Information Literacy • Information and Communication Technology
Learning and Innovation • Critical Thinking and Problem Solving • Communication and Collaboration	*Life and Career* • Flexibility and Adaptability • Initiative and Self-Direction • Social and Cross-Cultural Skills • Productivity and Accountability

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