



2022 Pi Day Challenge

Rules: The only resources allowed to be used in this contest are: pencils, pens, paper, and rulers. No other resources are permitted.

1. (Oscar Lyu)

Andy and Jenny are having a pie eating contest. They stand on the circumference of a circle of radius 15 meters and repeatedly follow this process: run to the center, grab pies, run back, eat pies. Andy can run at 10 meters per minute and pick up 5 pies every time he runs to the center. It takes him one minute to eat each pie. Jenny runs at 3 meters per minute and can pick up 10 pies each time she runs to the center. However, it takes her 2 minutes to eat each pie. How many total pies can they eat in 2 hours?

- (A) 115
- (B) 125
- (C) 135
- (D) 145

2. (Eric Zhan)

A cylinder has a height of 4 and a base radius of 12. A cone is constructed with the same base radius and same total surface area. What is the height of the cone?

- (A) 10
- (B) 12
- (C) 16
- (D) 20
- (E) 24

3. (Min Z. Kong)

On Pi day, Andy, Bob, Carl, and Dylan make a special pie. They divided the dough into four shares and each of them takes one. Then they make their dough into one big pie which is a flat circle shape with constant thickness. Each one of their pieces has π square inches of dough. What is the radius of their pie?



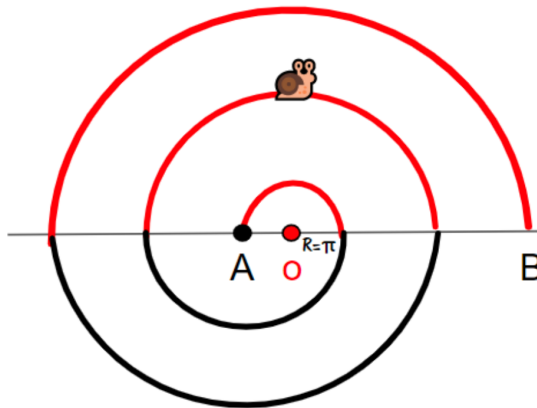
4. (Heather)

Bob was shopping at Watermelon-Pie-Mart, where they sell cylindrical pies and spherical watermelons. He took a watermelon and a pie, and found that the radius of the watermelon was 1 inch larger than the radius of the pie. He also calculated that the volume of the pie was 16π and that the radius of the pie is 4 times the height of the pie. If the volume of the watermelon is $n\pi / 3$, what is n ?

- (A) 50
- (B) 125
- (C) 250
- (D) 500
- (E) 1000

5. (Joanna Kong)

A snail is crawling along the spiral shown from A to B. The spiral consists of 5 semi-circles, with alternating centers of O and A. The smallest semi-circle has radius π meters and the speed of the snail is π meters per hour. After how many hours will the snail reach B?



6. (Eric Zhan)

Ancient Greeks were able to approximate pi by inscribing and circumscribing circles with regular polygons of increasing side numbers. Suppose you inscribe and circumscribe hexagons in and around a unit circle. What is the positive difference between the areas of the circumscribed hexagon and the inscribed hexagon?



7. **(Eric Tang)**

Kai has a cylindrical pie. He noticed that the height of the pie was 3 cm less than the radius of the pie. By looking at the label on the box, he found that the volume of the pie was $108\pi \text{ cm}^2$. Knowing this, what is the surface area of the pie?

- (A) $70\pi \text{ cm}^2$
- (B) $108\pi \text{ cm}^2$
- (C) $154\pi \text{ cm}^2$
- (D) $208\pi \text{ cm}^2$

8. **(Xiyao Gu)**

Circe and Pi are friends, and they decide to go running. Together, they are running on a circular track. They start off simultaneously, but Circe quickly runs ahead. If the ratio of Circe's speed to Pi's speed is 3:1 and the radius of the track is 20 meters, then how many meters would Pi have run by the time the two meet for the third time?

9. **(Vivian Loh)**

A wise lobster is making pies. They are all perfect cylinders with height 1 inch. He uses 1 gram of sugar for every 144 cubic inches of pie. How many grams of sugar does he need for a pie 1 foot in radius?

10. **(Jeffery)**

Two circles with the equations $(x-1)^2 + (y+2)^2 = 9$, and $(x+4)^2 + (y-3)^2 = 16$ lie in the coordinate plane. What is the shortest distance between the circles? Express your answer in simplest radical form.

11. **(Harshil Nukala)**

Consider the following cryptogram:

$$\begin{array}{r} \text{P I} \\ + \text{DAY} \\ \hline \text{3 1 4} \end{array}$$

What is the maximum possible value of $P * I$?

- (A) 40
- (B) 54
- (C) 63
- (D) 72
- (E) 81



12. (Harshil Nukala)

Let the function $\pi(x)$ be the number of ways to arrange x P's and x I's. For example, $\pi(2) = 6$, because there are 6 ways to arrange 2 P's and 2 I's (PPII, PIPI, PIIP, IIPP, IPIP, IPPI). What is the remainder when $\pi(8)$ is divided by 4?

- (A) 0
- (B) 1
- (C) 2
- (D) 3

13. (Jason Tan)

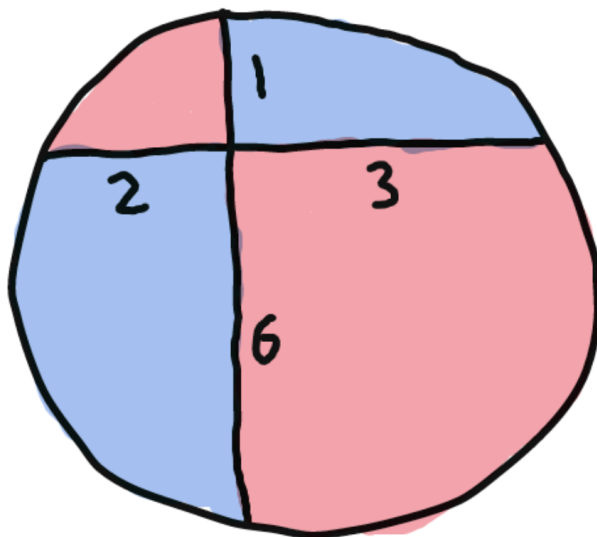
A circle is inscribed in a square of side length π . A dart is thrown at this shape and lands on it. What is the probability that it does NOT land inside the circle?

14. (Eric Zhan)

MK has some pies, pizzas and 3 pizza pies (a very tasty food that can be counted as both a pizza and a pie). If MK claims that she has 4 pies and 6 pizzas. How many total food items does she have? Hint: Use PIE!

15. (Vivian Loh)

A pie is cut into 4 pieces by 2 perpendicular cuts, as shown. Palice gets the two red pieces, while Pob gets the two blue pieces. Who gets more crust?





16. (Harshil Nukala)

Harshil is playing Mathle, a game where one tries to guess a 6-digit math word. He guessed “CIRCLE,” “RADIUS,” and “SECANT,” but they weren’t correct. They did however motivate him to finally guess the correct answer of “SECTOR.”

Given that the area of today’s Mathle word of a circle with radius 4 is 2π , what is the central angle?

- (A) 15
- (B) 30
- (C) 45
- (D) 60
- (E) 90

Problems edited and formatted by Shankar Subramani. Thank you for participating!