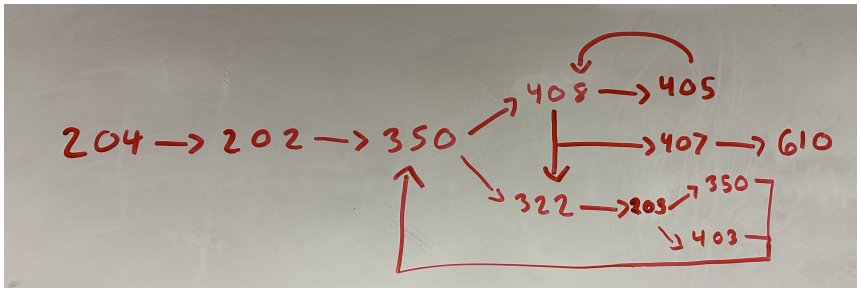
Greek Math Answer Key

1 Layout



Narration that needs to be said aloud is bolded.

204

You have started on your hero's journey with the gods on your side. You must pass their initial test to be deemed worthy of their assistance.

Berate them and call them 32nd notes.

Squares ZEUS and HERA have side length 1. Given that segments AS and ER don't intersect, find 134.667 times the maximum possible area of ARES.

Solution:

$$[ARE] = \frac{1}{2}, AE = \sqrt{2}, ES = \sqrt{2}$$

$$\max([AES]) = \frac{1}{2}(\sqrt{2})(\sqrt{2}) = 1$$

$$\max([ARES]) = \frac{1}{2} + 1 = \frac{3}{2}$$

$$\frac{3}{2}(134.667) = 202$$

202

You have made your way to the underworld by that one portal. Reaching the darkest depths will be your next mission.

You have to pay the boatman a coin. He directs you to an infinite field of coins, but you are lazy, so you don't want to walk very far. The field of coins looks suspiciously like $\mathbb{Z}^2$. Find $350P(\text{closest coin } \leq 3 \text{ away})$ knowing that $P(\text{coin at } (x, y)) = \frac{1}{1+x^2+y^2}$.

Solution: There exists a coin at 0, so the probability is 1.

$$1 * 350 = 350$$

350

You have found Pandora's Cabinet at the bottom. Etched in the wall by it is a problem. Do you choose to change its state for a new problem?

Open Problem and Solution:

$$319 + 4 \int_{-\frac{3}{4}}^{2024} \lfloor \sqrt{\frac{1}{x+1}} \rfloor dx$$

$$= 322$$

Closed Problem and Solution:

$$319 + \lfloor \int_{-\frac{3}{4}}^{2024} \sqrt{\frac{1}{x+1}} dx \rfloor$$

$$= 408$$

408

You continue on your journey through the underworld. Solve this problem correctly to calmm Cerberus.

The number of words here times nineteen added to thirteen is more than the answer by exactly the number of letters, demisemiquavers!

Correct Solution: 22 words and 26 letters in the alphabet leads to 407
Alternate Solution: 22 words and 24 letters in the Greek alphabet leads to 405
Alternate Solution: 22 words and 109 letters in the problem leads to 322

405

You continue on your journey through the underworld. Solve this problem.

$\nu_\rho(\chi)$ is the exponent of ρ in the prime factorization of χ.

$204 \lim_{\eta \to \infty} \frac{\nu_2(\eta!)}{\nu_3(\nu!)}$ is the number of souls in the River Styx that almost pulled you under.

Solution:

$$\frac{\gamma(\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots)}{\gamma(\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \cdots)}$$

$$= \frac{1}{1/2} = 2$$

$$2 * 204 = 408$$

You think you're lost.

322

Someone has opened Pandora's Cabinet. The gods warn you that the box must be closed for your mission to be completed. You continue on your journey through the underworld, trying to return to close Pandora's Cabinet. Solve this problem.

The number of bottles of wine Dionysus has drank in the last year is

$$408 \int_{\frac{1}{32}}^{\frac{\pi}{4}} \sqrt{(e^{2\chi \sin^2(\chi)} \sin(\chi))(e^{2\chi \cos^2(\chi)} \cos(\chi)) \tan(\chi)} d\chi.$$

Solution:

$$408 \int_{\frac{1}{32}}^{\frac{\pi}{4}} \sqrt{(e^{2\chi \sin^2(\chi)} \sin(\chi))(e^{2\chi \cos^2(\chi)} \cos(\chi)) \tan(\chi)} d\chi$$

$$= 408 \int_{\frac{1}{32}}^{\frac{\pi}{4}} \sin(\chi) e^{\chi} d\chi$$

$$= 408(\frac{1}{2} e^{\chi} \sin(\chi) - \frac{1}{2} e^{\chi} \cos(\chi))$$

$$= 203$$

203

You continue on your journey through the underworld. You are trying to find your way back to Pandora's Cabinet.

You arrive at a fork in the road. You think one path might lead back to Pandora's Cabinet. What is $26.5i\alpha$+376.5 where α is valued such that $\alpha, \alpha^2, \alpha^3,$ and α^4 are solutions to $x^4 + e^{i\pi} = 0$. Find $26.5i\alpha + 376.5$ to attempt to find the correct path.

Solution: 350 or 403

350: The path to Pandora's Cabinet appears in front of you with a radiant glow that almost blinds you.

403: You walk down the closest path because the odds are a 50/50 whether it's the correct path or not.

403

You think you're lost. You make one final attempt to get back.

Persephone is attempting to keep travelers trapped like her. Solve her puzzle to open the secret door. Find:

$$\sum_{x=1}^{6}\sum_{y=1}^{6}|x-y|g(x,y)$$

where x and y are the coordinates of the grid below.

	β		α	γ	
δ		α			ϵ
	α				μ
μ				α	
γ			δ		α
	ϵ	δ		β	

Solution:

ϵ	β	μ	α	γ	δ
δ	γ	α	β	μ	ϵ
β	α	ϵ	γ	δ	μ
μ	δ	γ	ϵ	α	β
γ	μ	β	δ	ϵ	α
α	ϵ	δ	μ	β	γ

$$\alpha = 1$$
$$\beta = 2$$
$$\gamma = 3$$
$$\delta = 4$$
$$\epsilon = 5$$
$$\mu = 12$$

$$1(5+1+1+1+1+3)+2(2+2+1+1+2+2)+3(4+1+0+0+1+4)+$$
$$4(3+2+1+1+2+5)+5(4+0+0+0+0+4)+12(3+3+2+2+3+3)$$
$$=350$$

The path to Pandora's Cabinet appears in front of you with a dull hue of yellow-green.

407

You continue on your journey through the underworld, attempting to reach the surface.

Before you reach the surface, you are surprised by an angry looking hydra. The probability of after killing a head, n heads regrowing is $P(\text{n heads}) = \frac{2}{3^{n+1}}$. What is the expected number of heads that have to be cut off to completely defeat it. The hydra starts with 305 heads.

Solution:

$$E(1) = 1 + \sum_{k+1}^{\infty} E(1)P(k)k$$

$$E(1)(1 - \sum_{k-1}^{\infty} \frac{2k}{3^{k+1}}) = 1$$

$$E(1) = \frac{1}{1 - \sum_{k=1}^{\infty} \frac{2k}{3^{k+1}}}$$

$$= \frac{1}{1 - (1/2)} = 2$$

$$2 * 305 = 610$$

You succeed and see some sunlight piercing the veil. You are completely blinded for a minute as the gods descend to congratulate you.

610

The gods have invited you up to Olympus to claim your prize, unless that other hero team beat you to it.

Welcome to Olympus.