A group of friends decided to divide the $800 cost of a trip equally among themselves. When two of the friends decided not to go on the trip, those remaining still divided the $800 cost equally, but each friend's share of the cost increased by $20. How many friends were in the group originally?

Claim:

Evidence:

Reasoning:

Powers of i

$i^1 = \sqrt{-1} = i$

$i^2 = \left(\sqrt{-1}\right)^2 = -1$

$i^3 = i^2 \cdot i = (-1)i = -i$

$i^4 = i^3 \cdot i = (-i)(i) = -i^2 = -(-1) = 1$

$i^5 = i^4 \cdot i = (1)i = i$

$i^6 = i^5 \cdot i = (i)i = i^2 = -1$

$i^7 = i^6 \cdot i = (-1)i = -i$

$i^8 = i^7 \cdot i = (-i)(i) = -i^2 = -(-1) = 1$

$i^9 = i^8 \cdot i = (1)i = i$

$i^{10} = i^9 \cdot i = (i)i = i^2 = -1$

$i^{11} = i^{10} \cdot i = (-1)i = -i$

$i^{12} = i^{11} \cdot i = (-i)(i) = -i^2 = -(-1) = 1$

The powers of have a repeating pattern. This pattern repeats every four powers of i.

Simplify each.

1. $i^{37} = i$

$4\overline{)37}$ 9 r 1, 36, 1

a remainder of 1 indicates it is one fourth of the way into another pattern of four which is the same as i^1

2. $i^{172} = 1$

$4\overline{)172}$ 43, 16, 12, 12, 0

no remainder indicates it has just completed a pattern of four which is the same as i^4

3. $i^{331} = -i$

$331 \div 4 = 82.75$

The decimal .75 indicates it is 3/4 of the way into another pattern of four which is the same as the same as i^3

4. $i^{454} = -1$

$454 \div 4 = 113.5$

The decimal .5 indicates it is 1/2 of the way into another pattern of four which is the same as the same as i^2