7. [10 points] Let $P(r)$ be a periodic function, defined for all real numbers r, where

- $P(r)$ has period 8
- $P(r)$ has midline $y = 4$
- $P(r)$ has amplitude 6.
- $P(r)$ attains its minimum value at $r = 5$.

a. [4 points] Fill in each blank with an appropriate value in the following table using the information about $P(r)$ given above.

r	-5	4	5	12
$P(r)$	7	6	-2	6

Solution: $P(5)$ is the minimum value, which is $4 - 6 = -2$ using the midline and amplitude. $P(12) = P(4) = 6$ by using that the period is 8.

b. [2 points] What is the value of $P(2019)$?
If it's not possible to find the value, write "NOT POSSIBLE." Circle your final answer.

Solution: We have that 2019/8 has a remainder of 3, so using periodicity with period 8, we get

$$P(2019) = P(3) = P(-5) = 7$$

c. [1 point] What is the maximum value attained by $P(r)$?
If it's not possible to find the value, write "NOT POSSIBLE." Circle your final answer.

Solution: The max value is $4+6 = 10$, obtained by looking at the midline and amplitude of the function.

d. [3 points] Can you tell for sure at which r-coordinates $P(r)$ attains its maximum? If so, give one such value and briefly explain your answer. If not, briefly explain why.

Solution: No. A function being periodic doesn't imply anything about where the maximum could occur. Since we don't know the general shape of the function, we cannot determine where the maximum is.