1. Show that 2 is a promitive root module 11.

## Answer !

Given that

A number 8 is a proimitive most module 11. since 11 is prime, we need the order of 2 modulo 11

9=9-1= (2) H(2) h= (4) H

A MSWEVE.

2. a. show that

Let godn (a) = K

to be 4 (11) = 10 ming heavy propri to reduce and

Compute powers of 2 mod 11.

23 = (a) P = atom or itiming to growing . 0 =

24=16=5

25 = 24. 2 = 5. 2 = 10

26 = 10.2 = 20 = 9

27=9.2=18=7 (0)

28 = 7.2 = 14=3

29 = 32 = 6

210 = 6.2 = 12 = 11 Lorr) [ = 210 : arcour boil

We reached 1 first at exponent 10. 80 the order of mod 11 13 P = 6(11). Simplify: (0-1) = 1 (mod.

Thorefore 2 is a primitive most modulo 11.

Homes the two orders divided each other. so they are equal.

( a) apas . (0) upaso

(howed)

2. How many incommend primitive roots does 14 have?

## Answer:

Promitive posts exist for n=2,4, pk on 28k with add prime P. Since 14=2.7, proimutive roots exists The number of incongruent primitive poots module 9

compute paragres of 2 mad 11

## compute:

4 (14)=4(2) 4(7)=1.6=6 so, number of primitive moto = 4(6) = 2

6=00=001=05 3. a. Show that,  $andn(a) = andn(a^{-1})$ 

Let andn (a) = K

That means: ak = 1 (mod 1) = si = a die

Now, (ak) 1 = 1-1 (mod n)

simplify: (a-1) k = 1 (mod n)

That means the order of a 1 divides k.

Hence the two orders divided each others. So, they are equal.

ordy (0) = ord n (20-1)

<u>b</u>.

Answers:

Yes.

If a is a promitive most mod n, then and n (a) = p (n)

From part (a),

ordn (0-1) = ordn (0) = 4 (n)

So, a-1 also has orders 4 (m).

Therefore, at is also a proimitive most modulo n.

(AVD)