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Multiplicative inverse of 1-71 modulo 20: > We need to find & such that -7x = 1 mod 20 多是在外元(引力的) > if ax = 1 (mod m), then x is the mult Plicative inverse of a modulo m. Thus 2=17 is multiplicative traven 7-7 = 13 (mod 20) et 19 produke 20. We are boking for an integer & such that 13x = 20k+1 fore some integer K. We can test values of k: if x=2, 13(2)= 26 \$ 1 mod 20 if x = 3, 13(3)= 32 = 1 mod 20 if x=4, 13(4)=527,7 mod 20 if x=5, 13(5)=67 \$ 1 mod 20 if x=6, 13(6)= 78 \ 1 mod 20 if x=7, 13(8) = 104 \$4 mod 20 if x=8,13(9) = 117 = 17 mod 20 if x = 10) 13(10) = 130 = 10 mod 20 if 2 = 11, 13(11)=143 =3 mod 20 x=12, $13(12)=156=16 \mod 20$ 1+ x=13, $13(13)=169=9 \mod 20$ 1+

if x = 19, 13(14) = 1812 = 12 2 vi mod 20 if x=15, 13(15) = 1951 = 15 mod 20 if x=16, 13(16)=208 = 8 mod 20 if 2=17, 13(17) = 221=11 mod 20 plicative invertee of o modula in. Thus 2=17 is multiplicative inverse of 13 modulo 20. (00 born) 81 = 5-6 The multiplicative inverse of 77
made of 20 is 17. : The multiplicative inverse of 17 made of 20+ is, 17(8)01 # 217 mod 23: = (8) 81 if x = 3, 03 pora 83/25++(1)ET it send 08 6000 1 + 2-1238 81 it x=5 50 pour E # 8t = (3) 81 69= K 1: =>-17=(-1 x 23)+ at=x +1 R = K-17 mod 23 = 16 (Ans) ~ 13 (11) = 193 = 3 med 20 13 118) = 129 = 11 Jucq 30 X = 12)

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* Multiplication Inverse of -13 mod 23:

=> The multiplicative inverse of a number a made m is a x such that: ax = 1 mod m.

In oure cose use vee booking tor a number resuch that:

13x = 1 mod 23

to simplify, we first convert-13 into a pasitive equivalent modulo 23.

 $-13 \mod 23 = -13 + 23 = 1911$

so, the equational equation become 5: $10x \equiv 1 \mod 23$

Now, we find the integer x such that 10x = 1 mod 23

if x=4, $10x4=10\neq 4$ mod 23

if x=2, 10×2=20 \ 1 mod 23

if x=3, 10x3=30=7 mod 23

1. x=4 10x = 90 = 17 mod 231. x=5 10x = 90 = 9 mod 231. x=6 10x = 60 = 19 mod 231. x=7 10x = 70 = 1 mod 231. x=7 10x = 70 = 1 mod 23

We found it: $10.7 = 70 \equiv 1 \mod 23$ Since $-13 \equiv 10 \mod 23$ and $10^{-1} \mod 23 = 7$ We conclude

The multiplicative inverse of -13 mod 23 is 7 (Ans).

the equericlent equeries bearing

New er find the integer x work

155m + +01 = 15 xor (1=x

8-3 194 1 th = 6 x 31 4 = 34

Lance Francisco Contraction