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CECS 229

**HW2**

*Section 4.3*

2) Determine whether each of these integers is prime.

a) 19

19 is a prime number

b) 27

27 is not a prime number because 27 / 3 = 9

c) 93

93 is not a prime number because 93 / 3 = 31

d) 101

101 is a prime number

e) 107

107 is a prime number

f) 113

113 is a prime number

4) Find the prime factorization of each of these integers

a) 39

39 = 13 x 3

b) 81

81 / 3 = 27

27 / 3 = 9

9  / 3 = 3

3  / 3 = 1

81 = 3x3x3x3⬄34

c) 101

101 / 1 = 101

d) 143

143 = 11(13)

e) 289

289 = 17(17) = 172

f) 899

899 = 29 / 31

10) Show that if 2m+1 is an odd prime, then m=2n for some nonnegative integer *n*.

1. t is odd and m = kt
2. xkt + 1 = (xk+1)(xk(t-1)-xk(t-2)+ … - xk+1)
3. (xk+1)(xk(t-1)-xk(t-2)+ … - xk+1) = xk(xk(t-1)-xk(t-2)+ … - xk+1)+1(xk(t-1)-xk(t-2)+ … - xk+1)
4. = (xk(t-1)+k-xk(t-2)+k+ … - xk+k+1(xk)) + (xk(t-1)-xk(t-2)+ … - xk+1)
5. = (xk(t)-xk(t-1)+ xk(t-2) … - x2k + xk)
6. + (xk(t-1)-xk(t-2)+ … + x2k - xk + 1)
7. Xkt+1

18) We call a positive integer **perfect** if it equals the sum of its positive divisors other than itself.

a) Show that 6 and 28 are perfect.

1. Divisors for 6 are 1,2,3,6
2. Divisors for 28 are 1,2,4,7,14,28
3. 6: 1 + 2 + 3 = 6 , so 6 is perfect
4. 28: 1 + 2 + 4 + 7 + 14 = 28, so 28 is perfect

b) Show that 2p-1(2p-1) is a perfect number when 2p-1 is prime.

1. The divisor for 2p-1(2p-1) other than itself is: all powers of 2 up to 2p-1 ddwhich is 20,21,22…2p-1

20) Determine whether each of these integers is prime, verifying some of Mersenne’s claim.

a) 27-1

1. 27-1 = 127
2. = 11.26, prime numbers less than 11.23 are 2,3,5,7,11
3. Since 127, is not divisible by those numbers means 27-1 is a prime number

b) 29-1

1. 29-1 = 511
2. = 22.60, prime numbers less than 22.60 are 2,3,5,7,11,13,14,19
3. Since 511, is divisible by 7 numbers means 29-1 is not a prime number

c) 211-1

1. 211-1 = 2047
2. = 45.24, prime numbers less than 45.24 are 2,3,5,7,11,13,14,19,23,29,31,37,41,43
3. Since 2047, is divisible by 23 numbers means 211-1 is not a prime number

d) 213-1

1. 213-1 = 8191
2. = 90.50, prime numbers less than 90.50 are 2,3,5,7,11,13,14,19,23,29,31,37,41,43,47,53,59,61,67,71,73,79
3. Since 8191, is not divisible means 213-1 is a prime number

24) What are the greatest common divisors of these pairs of integers?

a) 22\*33\*55, 25\*33\*52

1. gcd(22\*33\*55,25\*33\*52)= 22\*33\*52

b) 2\*3\*5\*7\*11\*13 , 211\*39\*11\*1714

1. gcd(2\*3\*5\*7\*11\*13,211\*39\*11\*1714 )= 2\*3\*5\*11

c) 17, 1717

1. gcd(17,1714 )=17

c) 22\*7, 53\*13

1. gcd(22\*7, 53\*13)=1

d) 0, 5

1. gcd(0, 5)=5

e) 2\*3\*5\*7, 2\*3\*5\*7

1. gcd(2\*3\*5\*7, 2\*3\*5\*7)=2\*3\*5\*7

28) Find gcd(1000,625) and lcm(1000,625) and verify that gcd(1000,625) \* lcm(1000,625) = ddd1000\*625.

1. 1000 = 2(500) 625 = 5(125)
2. 500 = 2(250) 125 = 5(25)
3. 250 = 2(125) 25 = 5(5)
4. 125 = 5(25) 5 = 5(1)
5. 25 = 5(5) 625 = 54
6. 5 = 5(1)
7. 1000 = 23\*53
9. gcd(23\*53,54) = 53 lcm(23\*53,54) = 23\*54
10. 53\*23\*54 = 625000

30) If the product of two integers is 273852711 and their greatest common divisor is 23345, what ddd.is their least common multiple?

1. Product = gcd \* lcm
2. lcm = Product / gcd
3. lcm = = 243451711

*GCD*

1. Prime Factorization
2. # Prime Factorization Algorithm
3. def primeFactors(n):
4. d = 2
5. factors = []# empty list
6. while n > 1:
7. if n % d == 0:
8. factors.append(d) n = n / d
9. else:
10. d = d + 1
11. return factors
12. #Euclidean Algorithm
13. def pgcd(a, b):
14. i = 0
15. x = primeFactors(a)
16. y = primeFactors(b)
17. print(x)
18. print(y)
19. while i < len(x):
20. z = 0
21. return z
22. s = pgcd(315, 13)
23. print(s)

1. Euclidean
2. #Euclidean Algorithm
3. def gcd(a, b):
4. x = a y = b
5. while (y != 0):
6. r = x % y
7. x = y
8. y = r
9. return x
10. s = gcd(100, 111)
11. print(s)