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Quiz 5A, MTH 2010 - No Calculators

Dr. Graham-Squire, Fall 2014

Name: Key

⇒ 20 min.

1. (3 points) P is a prime number that divides 252. Which of the following must be true? Explain your reasoning and/or show your work.

   (A) P divides 28 ✗ Not divisible by 3 0.5

   (B) P divides 42 $= 2 \cdot 3 \cdot 7$ ✓

   (C) P divides 63 $= 3 \cdot 3 \cdot 7$ ✗ Not div. by 2 0.5

   (D) P divides 72 = ✗ Not divisible by 7 0.5

$252 = 2^2 \cdot 3^2 \cdot 7$ ✓

$$2\overline{)252}\quad 2\overline{)126}\quad 3\overline{)63}\quad 3\overline{)21}\quad 7$$

⇒ # Number must be divisible by

2, 3 or 7 0.5

2. (2 points) What is the 100th digit to the right of the decimal place in the decimal expansion of the fraction $\frac{317}{999}$? Explain your reasoning and/or show your work.

$\frac{317}{999} = 0.317317317\ldots$ ✓

(3rd, 6th, 9th, ...)

Every 3rd digit repeats, and when divisible by 3 it is a 7 ✓

⇒ 99th digit is a 7, so next one is

100th will be a $\boxed{3}$

3. (3 points) Exactly one of the numbers below is a prime number. Which one is it? Explain your reasoning and/or show your work.

(A) 417 ✗ div by 3 b/c 4+1+7 = 12

(B) 415 ✗ div. by 5

(C) 412 ✗ div. by 2

(D) 409

(E) 407 ✗ div. by 11

Not div. by 2, 3, or 5

So try 7, 11, ...

$$7\overline{)409}\quad 58,\ 35,\ 59,\ 56,\ 3,\ \times$$

$$11\overline{)409}\quad 37,\ 33,\ 79,\ -77,\ 2,\ \times$$

$$7\overline{)407}\quad 58,\ 35,\ 57,\ 56,\ 1,\ \times$$

$$11\overline{)407}\quad 37,\ -33,\ 77,\ \checkmark\ 77,\ 0$$

4. (2 points) The prime factorization of 1239 is $3 \times 7 \times 59$. How many factors does 1239 have, including 1 and itself? Explain your reasoning and/or show your work.

1, 3, 7, 59, 3×7, 3×59, 7×59, 1239

⇒ 8 factors total