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2017-2018 Spring Semester MATH 3050 Section 101 (Barsamian) Homework 4, Due Wed Feb 14, 2018

Problem:	1	2	3	4	5	6	7	8	9	10	Total	Rescaled
Your Score:												
Possible:	10	10	10	10	10	10	10	10	10	10	100	20

[1] (Similar to suggested problem 4.3 #15) Prove that for all integers a, b, c, if $a|b$ and $a|c$, then $a|(b-c)$.

[2] (Similar to suggested problems 4.3 # 26, 27, 30) Prove or disprove Statement *D*.

Statement *D*: for all integers a, b, c, if $a|bc$, then $a|b$ or $a|c$.

[3] (Similar to suggested problem 4.3 # 41) How many zeros are at the end of $45^6 \cdot 44^{13}$? Explain how you can answer this question without actually computing the number. (Hint: $10 = 2 \cdot 5$)

[4] (Similar to suggested problem 4.3 #47) Prove that for any nonnegative integer n, if the sum of the digits of n is divisible by 3, then n is divisible by 3.

[5] (Sim. to sugg. probs 4.4 # 2,6) For each given n, d
(i) Write the corrsponding $n = dq + r$ equation with $q, r \in \boldsymbol{Z}$ and $0 \le r < d$.
(ii) Write the corresponding *mod* and *div* expressions.
(a) $n = 61, d = 8$ (b) $n = -27, d = 5$ (c) $n = 32, d = 4$

[6] (Sim. to sugg. probs 4.4 # 9) For the given *mod* and *div* expressions,
(i) Write the corrsponding $n = dq + r$ equation with $q, r \in \boldsymbol{Z}$ and $0 \le r < d$.
(ii) Find the value of the given *mod* and *div* expression. (Present answers as $32 \; div \; 5 = BLAH$.)
(a) $32 \; div \; 5$ and $32 \; mod \; 5$
(b) $29 \; div \; 2$ and $29 \; mod \; 2$

[7] (Similar to suggested problem 4.4 # 21)
Suppose that c is an integer such that $c \; mod \; 15 = 3$. What is $7c \; mod \; 15$? In other words if division of c by 15 gives a remainder of 3, what is the remainder when $7c$ is divided by 15?

[8] (Suggested problem 4.4 # 30)
Use the quotient-remainder theorem with $d = 3$ to prove that the product of any two consecutive integers has the form $3k$ or the form $3k + 2$, for some integer k.

[9] (Suggested problem 4.4 # 44) Prove this property of the absolute value. (Use book's hint.)

$$\forall x, y \in \boldsymbol{R}(\, |x| \cdot |y| = |xy| \,)$$

[10] (Suggested problem 4.4 # 46) Prove this property of the absolute value.

$$\forall c \in \boldsymbol{R}^+\big(\forall r \in \boldsymbol{R}(\, If \; |r| \le c \;\; then \;\; -c \le r \le c \,)\big)$$

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