

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Quiz name: Discrete Math Mar 30 (Quotients)

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1. Consider  $G=[8] \times [10]$ , which is the grid of points with  $x$  coordinates  $1, 2, \dots, 8$  and  $y$  coordinates  $1, 2, \dots, 10$ . Suppose I define an equivalence relation by  $(a,b) \sim (c,d)$  iff  $a+b=c+d$ . How many elements does  $G/\sim$  have?

- (A) 80  
 (B) 17  
 (C) 10  
 (D) 163  
 (E) 1
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2. Suppose I partition the plane  $\mathbb{R}^2$  so that the horizontal lines are the blocks of the partition. Remember that a partition induces an equivalence relation by declaring two elements to be equivalent iff they are in the same block. What's a description of  $\mathbb{R}^2/\sim$ ?

- (A) I can model it as a vertical cylinder that I get by gluing the sides of each horizontal line together.  
 (B) I can model it by the  $y$  axis, by indentifying any point  $(x,y)$  with the equivalent point  $(0,y)$ . Then only the points  $(0,y)$  are left after all the identifications have been done.  
 (C) It is the set of all vertical lines because  $x=2 \sim y=2$ .  
 (D) I can't form the quotient space at all because  $\sim$  is not a partial order.