

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

Please write your name on *every* page.

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## Section C

### C1

A bucket filled with water weighs 600 grams. When the bucket is half full, it weighs 350g. What is the weight of the bucket?

#### **Solution:**

Let  $b$  = bucket weight and  $w$  = water weight.  $600 = b + w$ , while  $350 = b + w/2$ . By subtracting the equations, we get that  $w/2 = 250$ , or  $w = 500$  and thus  $b = 100$ . Thus the bucket weighs 100g

Answer to C1: 100g

### C2

Pete is baking apple pies. If each pie takes 3 apples to make, and each of Pete’s apple trees produces 8 apples, when harvested, how many apple trees must Pete harvest in order to make 30 pies?

#### **Solution:**

Pete must harvest 90 apples to make 30 pies.  $90/8 = 11.25$ , and thus Pete must harvest one extra or 12 trees.

Answer to C2: 12

### C3

January 1st 2024 is a Monday. How many days after January 1st is it until another month starts on a Monday.

(Reminder: 2024 is a leap year!)

#### **Solution:**

Add the number of days in the months until their sum is divisible by 7.

31 is not divisible by 7,  $31 + 29 = 60$  is not divisible by 7,  $31 + 29 + 31 = 91$  is divisible by 7.

Thus in 91 days, April 1st will be a Monday

Answer to C3: 91

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**C4**

Terry is walking to school. It takes him 30 minutes to walk to school. Halfway to school, there is a bus stop, where a bus arrives at 8:15, 8:30 and 8:45. It takes 5 minutes for the bus to drive from the stop to the school. Between 8:00 and 9:00, how many starting times at a whole minute number is it faster for Terry to walk to school rather than taking the bus?

**Solution:** First notice obviously if Terry arrives to the bus stop after 8:45. There is no bus to take him to school and thus it is faster to walk. This occurs for anytime after 8:30, which is 30 possible starting times. If Terry arrives at the bus stop less than 5 minutes after it leaves, it is also faster for him to walk as, it is more than 10 minutes away from the next bus arriving, and then the bus takes 5 minutes to drive to the school, which means it will take more than 15 minutes to get to the school by bus. Thus, if Terry arrives at the bus stop at 8:16-8:19 or 8:31-8:34, it is faster for him to continue walking. Thus, in total, there is 38 minutes which it is faster for Terry to walk.

Answer to C4: 38

**C5**

Finn is going shopping at the mall. He buys a pair of Jeans that are 20% off. Sales tax is currently 20%. If the jeans end up costing \$50, and the discount was applied before the tax, what was the original value of the undiscounted jeans?

**Solution:**

Let  $x$  be the original price of the Jeans. Then  $x * 0.8 * 1.2 = 50$ . Thus  $0.96x = 50$  or  $x = 50/0.96 = 625/12$ .

Answer to C5: 625/12

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**C6**

An apartment floor has 42 rooms in a 7 by 6 room layout. Every room on the edge of the apartment has windows facing outside. How many rooms have windows facing the outside?

**Solution:**

The border of the floor is  $7 \times 6$ , which suggests there are  $7 + 6 + 7 + 6 = 26$  total rooms. However, there are 4 corner rooms counted twice, which lowers the actual amount of rooms to 22

Answer to C6: 22

**C7**

How many scalene triangles with integer side lengths of perimeter of 12 can be created?

**Solution:**

By the triangle inequality, any two sides of a triangle must be greater than the third side length. Thus the valid triangles have side lengths  $(4,4,4)$  or  $(5,4,3)$ . However  $(4,4,4)$  is an equilateral triangle, and thus only 1 scalene triangle can be made.

Answer to C7: 1

**C8**

There are 100 people in Gerald’s math class, and each student has a unique numerical grade from 1-100 after the midterm. Gerald starts above the median grade. However, after 25 students drop the course upon seeing their midterm grade, Gerald is now below the median grade. What is the difference between the highest and lowest grade Gerald could have had?

**Solution:**

Consider that the lowest grade Gerald could have had is if he started just a grade above the median grade, with a grade of 51. The highest grade Gerald could’ve had is a 62, as this would mean he would have had the 62nd lowest grade. After 25 people drop, he now has the  $62 - 25 = 37$ th lowest grade. Thus since there are 75 people left, 37th lowest is below the median, and Gerald is below median. Thus  $62 - 51 = 11$

Answer to C8: 11