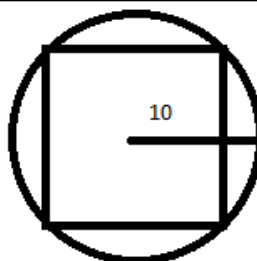# PERENNIAL MATH
November 2011

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1) A computer program uses a 2 digit security key. If the sum of the digits must be a non-negative multiple of ten for the key to be valid, how many keys are possible?	
2) What is the sum of all the prime numbers between 20 and 60?	
3) In the figure shown the circle has a radius of 10 units. What is the area of the square who's corners are all points on the circle? 10	
4) Together Cathy and Felix have 60 marbles. Cathy gives Felix half her marbles and then 12 more marbles. Felix now has three times as many marbles as Cathy has. How many marbles did Felix have originally?	
5) Square tiles with 9-inch sides are used to cover a rectangular room. There is one row of green border tiles and the interior tiles are yellow. The room measures 24 feet by 18 feet. How many tiles are green?	

PERENNIAL MATH

November 2011 ANSWER KEY

TEST # **1**

1) A computer program uses a 2 digit security key, if the sum of the digits must be a non negative multiple of ten for the key to be valid, how many keys are possible?	**10**
2) What is the sum of all the prime numbers between 20 and 60?	**363**
3) In the figure shown the circle has a radius of 10 units. What is the area of the square who's corners are all points on the circle? 10	**200**
4) Together Cathy and Felix have 60 marbles. Cathy gives Felix half her marbles and then 12 more marbles. Felix now has three times as many marbles as Cathy has. How many marbles did Felix have originally?	**6**
5) Square tiles with 9-inch sides are used to cover a rectangular room. There is one row of green border tiles and the interior tiles are yellow. The room measures 24 feet by 18 feet. How many tiles are green?	**108**
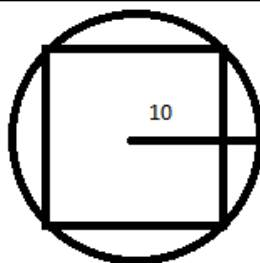
1) By enumerating the possibilities 9+1 = 1+9 = 8+2 = 2+8 = 7+3 = 3+7 = 6+4 = 4+6 = 5+5 =10
noting that 9+9 = 18, there can't be any keys with a digit sum of 20 or greater, so the only options are those that sum to 10, and those that sum to a number less than 10 (the only option of which is 0 = 0+0). Therefore there are 10 possible security keys.

10

2) Add the prime numbers 20-60 you get
 23 +29 + 31 + 37 + 41 + 43 + 47 + 53 + 59 = 363

363

3) Since r = 10 , one can make a 45-45-90 right triangles making up a quarter of the square. The sides have a length of 10 units because they are both a radius of the circle. Using the formula for area of a right triangle (Area=1/2 b x h, the area is ½ * 10 *10 , or ½ *100 = 50. Since this triangle is the area of ¼ the square, the total area is 4 * 50, or 200 square units.
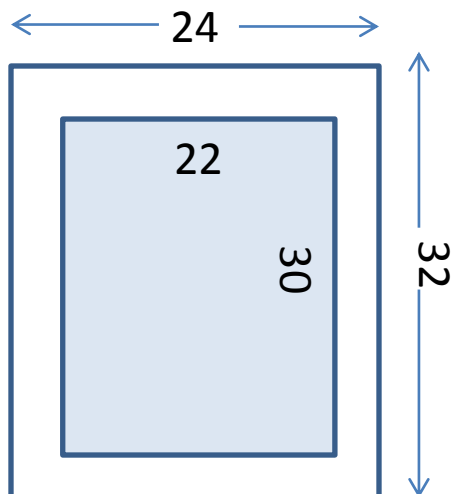
200
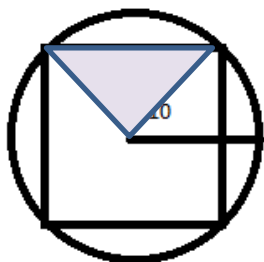
4) After the exchange, Felix has 3 marbles for every 1 that Cathy has, a ratio of 3:1. That is of the 60 marbles, Felix has 3 of every 4 and Cathy has 1 or every 4. Therefore, Felix ends with 45 and Cathy with 15 marbles.

	Total	Cathy	Felix
Step 3. Cathy has 1/4 of the marbles.	60	15	45
Step 2. Cathy gives Felix 12 marbles.	60	27	33
Step 1. Cathy gives Felix 1/2 her marbles.	60	54	6

Before Cathy gave 12 of her marbles to Felix, he had 45-12=33 and Cathy had 15 +12=27. Before Cathy gave half her marbles to Felix, she had 2 x 27=54 and he had 33-27=6. Felix **originally had 6 marbles.**

6

5) The length of one side of each tile is ¾ of a foot. Thus, the floor is 24 feet divided by ¾ foot = 32 tiles long and 18 divided by ¾ = 24 tiles wide. The entire floor consists of 32 x 24 = 768 tiles. The yellow portion of the floor consists of 30 x 22 = 660 tiles. Thus, 768-660 =**108** tiles that are green.

108