Math 113 Quiz #1

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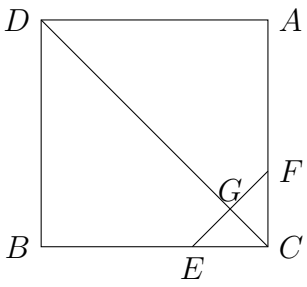
Using what you have learned answer the following questions. Show all work if you want partial credit. If a specific method is mentioned, make sure you show that you are using that method.

(1) (Bonus 5 points) In following figure, the side length of the square is 20 ft and the length of EF is $2\sqrt{2}$ ft. Moreover, $CD$ is perpendicular to $EF$ at $G$, i.e. $CD \perp EF$ at $G$. What's the length of $DG$ ?

**Solution.** $\because CD \perp EF$ at $G$,
$\therefore \angle EGC = \angle FGC = 90°$
And moreover $GC = GC$, $\angle GCE = \angle GCF = 45°$.
$\therefore \Delta EGC \cong \Delta FGC$
$\therefore EG = GF = \frac{1}{2}EF = \sqrt{2}ft.$
$\because DG = CD - GC, CD = \sqrt{2}BD$, $BD = 20ft$
$\therefore DG = 20\sqrt{2} - \sqrt{2} = 19\sqrt{2}ft.$ ◀




(2) (3 points) You and 16 others are eating at Raskin Bobbins. Raskin Bobbins is an ice cream store with 9 different flavors of ice cream. Is it possible for each person to have a different type of ice cream? Why? What if we include the option of having or not having sprinkles? Why?

**Solution.** (a) From the problem, we have that the number of people is 17, while the type of the ice cream is only 9, then by the Pigeonhole Principle, we have that some of the people will have the same favors ice cream.

(b) If the ice cream having sprinkles, then the type of ice cream will be $9 \times 2 = 18$, while the number of people is 17, so that it is possible for each person to have different type of ice cream.

◀

(3) (4 points) Fill in the table below with the desired Fibonacci Numbers.

| $n$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| $F_n$ | 1 | 1 | 2 | 3 | 5 | 8 | 13 | 21 | 34 | 55 |
| $F_{n+1}$ | 1 | 2 | 3 | 5 | 8 | 13 | 21 | 34 | 55 | 89 |

(4) (3 points) What's the formula of the Fibonacci numbers ? Express 75 as a sum of Fibonacci numbers.

(a) The formula of the Fibonacci numbers is as follows :

$$\begin{cases} F_1 = F_2 = 1 \\ F_n = F_{n-1} + F_{n-2}, n \geq 3. \end{cases}$$

(b)

$$75 = 55 + 13 + 5 + 2.$$