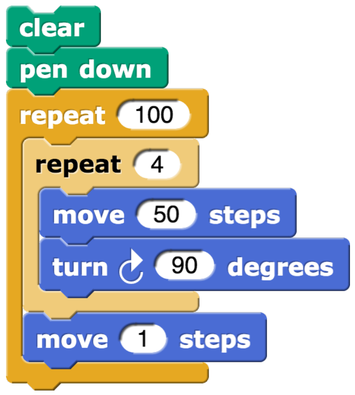
CS10 Spring 2018 Quest Answers

Question 1: Which of the following is the *worst example of Abstraction*? Designing a traffic simulation and including *everything* about all cars in your model: color, year, make, etc. [The point of Abstraction is Removing Detail and Generalization, how does the color of a car affect its performance in a traffic simulation? It doesn't, we would normally remove that detail to focus on the important aspects, like its (x,y,z) position over time]

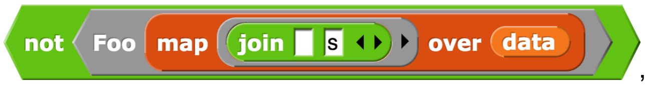
Question 2: What is the order of these numbers, smallest to largest: **A**=11000_2; **B**=29_{10}; **C**=$1E_{16}$? **A**=11000_2 which is $1*16+1*8+0*4+0*2+0*1=24_{10}$, **B**=$29_{10}$, and **C**=$1*16+14*1=30_{10}$, so it's **A** < **B** < **C**.

Question 3: If the sprite starts in the middle of the stage facing up and runs the script to the right with line width set to 1 (the default), *what is drawn*? It's a rectangle (a square "smeared" over and over 100 times).



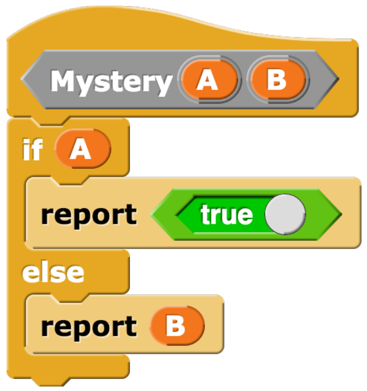
```
clear
pen down
repeat (100)
    repeat (4)
        move (50) steps
        turn ↻ (90) degrees
    move (1) steps
```

Question 4: Given the expression



```
not (Foo (map (join [ ] [s] ◂▸) over (data)))
```

, that runs without error, what is your best guess as to the *Domain* and *Range* of **Foo**? (select ALL that apply for each side) **`map`** return a list so the Domain is lists (at least, it might take more than that), and **`not`** takes in a Boolean so the Range is Booleans.



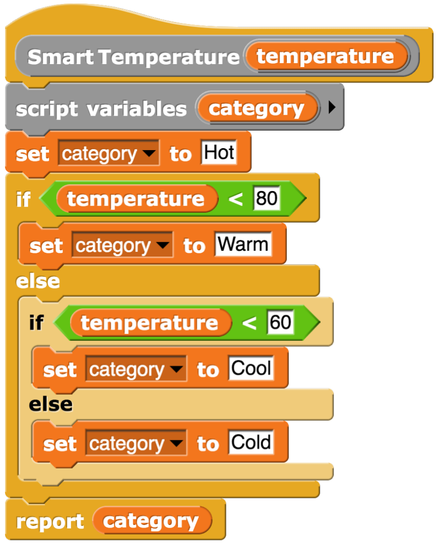
```
Mystery (A) (B)
if (A)
    report <true>
else
    report (B)
```

Question 5: If the output from **Mystery** is false, which can you say *for sure*? If A is true, it returns true so **A must be false** (in which case it goes to the else and returns B, but if it returns false then **B must be false** too)!

Question 6: You realize you could replace the *entire* body of **Mystery** with a single **report** (as shown below). "What could go in there so that it it will function exactly the same as the original **Mystery** block? The block returns true when A is true OR when A is false and B is true, which is exactly what **A or B** does.

Question 7: Match each programming paradigm with properties that describe it. Seems like "magic"; great for logic puzzles? **Declarative.** Doesn't allow for any side-effect procedures? **Functional.** It's all about message passing and inheritance? **Object-Oriented.** Do this, then that, then that. Aka sequential? **Imperative**

Question 8: The makers of the Nozama smart speakers learn that users who ask for the weather don't want the *exact* temperature, they want a temperature *category*: **Cold**, **Cool**, **Warm** or **Hot**, based on the table below. E.g., Cool is between 40 and 60. They write code for it, shown to the right. However, when given the following temperatures, what is actually returned?" 30? Less than 80 so **Warm**! 50? Less than 80 so **Warm**! 70? Less than 80 so **Warm**! 90? Not less than 80, not less than 60 so **Cold**.



```
Smart Temperature (temperature)
script variables (category) ▸
set [category ▾] to [Hot]
if <(temperature) < [80]>
    set [category ▾] to [Warm]
else
    if <(temperature) < [60]>
        set [category ▾] to [Cool]
    else
        set [category ▾] to [Cold]
report (category)
```

Question 9: You have a list of **NUMBERS**; if *any two different numbers add to 100*, **AddTo100** should be set to **true**. Here is our (possibly buggy) algorithm. When will it return **true** on a list of 10 numbers? If the *first two* are 40,60 and the rest are 0? **No.** If the *last two* are 40,60 and the rest are 0. **No.** If the *last one* is 50 and the rest are 0. **Yes.** *all* ten numbers are 10? **No**

Question 10: What is the running time of the algorithm in Question 9? **Quadratic**, which is **Reasonable Time**.

Question 11: Are the left and right expressions below *always the same*? If stuck, put your own reporters and predicates in there, try it on an easy list, and see if they are the same… **map(keep())** vs **keep(map())?** What if map squares numbers and keep preserves only negative numbers (and D contains half positive and negative)? Then **map(keep())** would have half the numbers (the squares of the negatives) and **keep(map())** would be empty! So **NO.**

map(R1(R2)) vs **map(R1)over(map(R2))**? Each element *elt*, either case, is effectively **R1(R2(elt))** so **YES**.

keep(P1(P2)) vs **keep(P1)suchthat(keep(P2))**? The domain of P1 is elements, but in the earlier case **P1(P2(*elt*))** means that P2 returns Booleans and P1 may not have Booleans as its Domain, since P1 needs to be looking at elements! **NO**

keep(P1 and P2) vs **keep(P1)suchthat(keep(P2))**? You keep the element when it passes both the P1 and P2 filter, which is AND! **YES**

keep(P1 or P2) vs **keep(P1)suchthat(keep(P2))**? You keep the element when it passes both the P1 and P2 filter, not when it passes either! **NO**