

Names: _____

Loop Questions

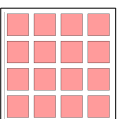
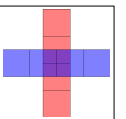
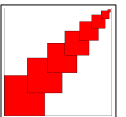
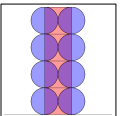
- Is a loop needed?
 - yes, if there are more than a few copies and you either want to do the same thing repeatedly or what changes between copies changes in a predictable way
- What is repeated?
- What changes from one repetition to the next?
- How do things start?
- How do things change?
- When do you keep going?
 - repeat n times (counting loop)
 - repeat as long as / until – condition involves one or more of the “what changes” elements

for Loop Syntax Recap

```
for ( declare and initialize loop variables ; loop condition ;  
    update loop variables ) {  
    loop body  
}
```

Identifying Loops

- single loop with a single loop variable – only one pattern of repetition and only one thing changes from one repetition to the next
- single loop with multiple loop variables – only one pattern of repetition but multiple things change from one repetition to the next
- multiple loops, one after another – multiple patterns of repetition
- nested loops – often a grid pattern; multiple things change but not at the same time
 - break down the repetition into two stages - “what repeats?” - drawing a whole row (or column) of things”, then go through the loop questions again for one row (or column)
- loop + animation – when there is repetition in a single snapshot, and also something that changes over time



At the End of Class

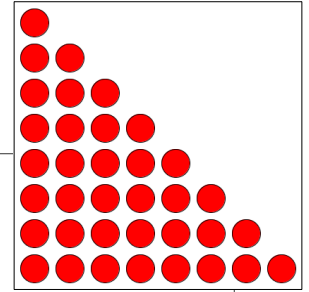
Hand in this worksheet.

Also hand in any sketches you have worked on during class, even if a sketch is incomplete.

- Make sure each sketch is named as directed and has a comment with the names of your group. Also be sure to save your sketches! (This should be in your sketchbook ~/**cs120/sketchbook**)
- Copy the entire directory for each sketch (not only the .pde file) into your handin directory (**/classes/cs120/handin/username**). You only need to hand in one copy for the group.

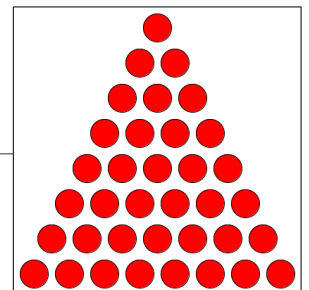
Exercises

1. A sketch which draws the picture shown. The pattern should fill the window (without going outside) no matter what size the window is. Make the circles a fixed size rather than always ensuring exactly 8.



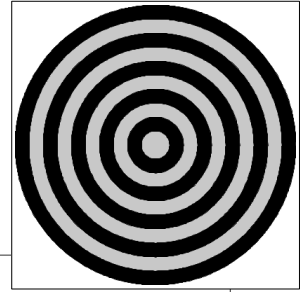
what pattern? (single loop, multiple loops one after another, nested loops)	nested loops (decompose into repeating rows or repeating columns of circles, where each row or column itself involves repeating ellipses)	
what is repeated?	rows of circles	(for each row) an ellipse
what changes from one repetition to the next?	y coordinate number of circles in the row	x coordinate
how do things start?	from the top – $y = 25$, number of circles = 1 (CENTER mode)	from the left – $x = 25$ (CENTER mode)
how do things change?	$y = y + 50$ number of circles increases by 1	$x = x + 50$
when do you keep going?	the bottom of the window hasn't been reached – $y \leq \text{height} - 25$	repeat number of circles times

2. A sketch which draws the picture shown. The pattern should fill the window (without going outside) no matter what size the window is. Make the circles a fixed size rather than always ensuring exactly 8..



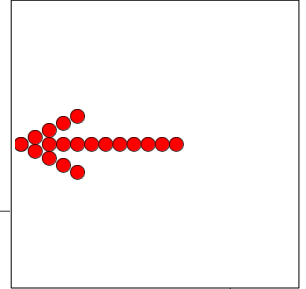
what pattern? (single loop, multiple loops one after another, nested loops)	nested loops (decompose into repeating rows, where each row involves repeating ellipses)	
what is repeated?	rows of circles	(for each row) an ellipse
what changes from one repetition to the next?	y coordinate number of circles in the row where the row starts (x coordinate)	x coordinate
how do things start?	from the top – $y = 25$, number of circles = 1, rowx = width/2 (CENTER mode)	where the row starts – $x = \text{rowx}$
how do things change?	$y = y + 50$ number of circles increases by 1 $\text{rowx} = \text{rowx} - 20$ (each row starts half a circle to the left of the previous)	$x = x + 50$
when do you keep going?	the bottom of the window hasn't been reached – $y \leq \text{height} - 25$	repeat number of circles times

3. A sketch which draws the picture shown. The pattern should fill the window (without going outside) no matter what size the window is. Make the ring width a fixed size rather than always ensuring exactly the number shown.



what pattern? (single loop, multiple loops one after another, nested loops)	single loop	
what is repeated?	gray circle + black circle	
what changes from one repetition to the next?	size of the circles (CENTER mode)	
how do things start?	from the outside – size = width (larger circles must be drawn first because smaller ones need to be drawn on top of larger ones)	
how do things change?	decrease by the combined width of one set of gray and black circles size = size-40	
when do you keep going?	as long as there is room for the next set of circles – size $\geq$ 40	

4. A sketch which draws the picture shown. The arrow should have the number of circles shown and should follow the mouse around, with the mouse position at the tip of the arrowhead.



what pattern? (single loop, multiple loops one after another, nested loops)		
what is repeated?		
what changes from one repetition to the next?		
how do things start?		
how do things change?		
when do you keep going?		

5. Create a new sketch called **sketch_251027a** which draws the picture shown in #1.
6. Create a new sketch called **sketch_251027b** which draws the picture shown in #2.
7. Create a new sketch called **sketch_251027c** which draws the picture shown in #3.
8. Create a new sketch called **sketch_251027d** which draws the picture shown in #4.

If you have time –

- Save a copy of your sketch from #2 as **sketch_251027e**, then modify it so that the whole pattern moves to the right.
- Save a copy of your sketch from #2 as **sketch_251027f**, then modify it to animate the transition between the picture from #1 and the picture from #2 – that is, the first frame should look like the picture from #1 and then the pattern should shift so that it eventually looks like the picture from #2. The animation should continue until the top circle reaches the right side of the window (so the pattern looks like a mirror image of #1) and then reset.