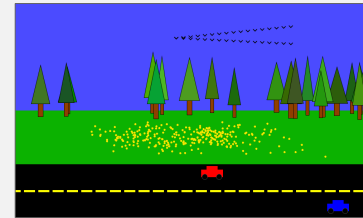


Repetition

Repetition

- drawing functions make it easier to have multiple copies of something, but we need a better solution if there are more than a few copies

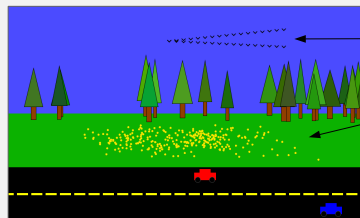


Loops

for repetition within a frame

When do you need a loop?

- you have more than a few copies of something, and
- you either want to
 - do the same thing repeatedly, or
 - what changes between copies changes in a predictable way



predictable change in position

do the same thing repeatedly – draw with random positions, sizes, colors

Loop Questions

- What is repeated?
- What changes from one repetition to the next?
- How do things start?
- How do things change?
- When do you keep going?
 - two patterns
 - repeat n times (counting loop)
 - repeat as long as / until – condition involves one or more of the “what changes” elements

Loop Questions

- What is repeated? draw a red circle
- What changes from one repetition to the next? the y coordinate of the circle
- How do things start? at the bottom – (CENTER mode)
 $y = \text{height} - \text{radius of circle}$
- How do things change? y decreases – subtract the diameter of the circle
- When do you keep going?
 - two patterns
 - repeat n times (counting loop)
 - repeat as long as / until – condition involves one or more of the “what changes” elements

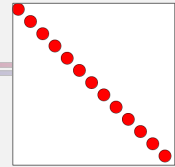
as long as the center of the circle is within the window –
 $y \geq 0$ (CENTER mode)



Loop Questions

- What is repeated? draw a red circle
- What changes from one repetition to the next? the x and y coordinates of the circle
- How do things start? at the top – (CENTER mode)
 $x = \text{radius of circle}$
 $y = \text{radius of circle}$
- How do things change? x, y increase – add the diameter of the circle
- When do you keep going?
 - two patterns
 - repeat n times (counting loop)
 - repeat as long as / until – condition involves one or more of the “what changes” elements

as long as the whole circle fits within the window – (CENTER mode)
 $x + \text{radius} \leq \text{width}$
 $y + \text{radius} \leq \text{height}$



Loop Questions

- What is repeated? draw a red circle
- What changes from one repetition to the next? the y coordinate of the circle
- How do things start? at the bottom – (CENTER mode)
 $y = \text{height} - \text{radius of circle}$
- How do things change? y decreases – subtract the diameter of the circle
- When do you keep going?
 - two patterns
 - repeat n times (counting loop)
 - repeat as long as / until – condition involves one or more of the “what changes” elements

repeat 4 times

stack of
four circles

