Retro Gaming With Lambdas

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JDK 8 Feature Overview

Innovation

- Lambda aka Closures
- Language Interop
- Nashorn

Core Libraries

- Parallel operations for core collections APIs
- Improvements in functionality
- Improved type inference

General Goodness

- JVM enhancements
- No PermGen limitations
- Performance Improvements

Java for Everyone

- Profiles for constrained devices
- JSR 310 - Date & Time APIs
- Non-Gregorian calendars
- Unicode 6.2
- ResourceBundle.
- BCP47 locale matching
- Globalization & Accessibility

Tools

- Compiler control & logging
- JSR 308 - Annotations on Java Type
- Native app bundling
- App Store Bundling tools

Client

- Deployment enhancements
- JavaFX 8
- Java SE Embedded support
- Enhanced HTML5 support
- 3D shapes and attributes
- Printing

Security

- Limited doPrivilege
- NSA Suite B algorithm support
- SNI Server Side support
- DSA updated to FIPS186-3
- AEAD JSSE CipherSuites

Coordinated Platform Upgrade with Lambda

- Language
  - Lambda Expressions (closures)
  - Interface Evolution with default methods
- Libraries
  - Bulk data operations on Collections
  - More library support for parallelism
- JVM
  - Default methods
  - Enhancements to invokedynamic

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Java.net The Source for Java Technology Collaboration

JDK 8
- Downloads
- Feedback Forum
- OpenJDK
- Planet JDK

JDK™ 8 Early Access Releases

April 04, 2013

8 Build b84

Summary of changes in JDK 8 build b84

Previous Early Access Releases
Feedback forum
Report Bugs

Please note:

This list offers files for different platforms - please be sure to select the proper file(s) for your platform. Carefully review the files listed below to select the ones you want, then click the link(s) to download.

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Documentation

- JDK Docs (44.81 MB zip | HTML)
- JavaFX Docs (9.81 MB zip)

Platforms	JRE	JDK

IDE Support for Lambdas

```
for (Shape s : shapes) {
   if (s.getColor() == BLUE)
      s.setColor(RED);
}
```

```
shapes.forEach(s -> {
   if (s.getColor() == BLUE)
      s.setColor(RED);
});
```

Extension Methods

```
interface Collection<T> {
  default void forEach(Block<T> action) {
    Objects.requireNonNull(action);
    for (T t : this)
      action.apply(t);
  }

  // Rest of Collection methods…
}
```

Lambda Syntax

- `(int a, int b) -> { return a + b; }`
- `(a, b) -> a + b`
- `a -> a * a`
- `() -> a`
- `() -> { System.out.println("done"); }`

Method References

- `Objects::toString` `obj -> Objects.toString(obj)`
- `Object::toString` `obj -> obj.toString()`
- `obj::toString` `() -> obj.toString()`
- `Object::new` `() -> new Object()`

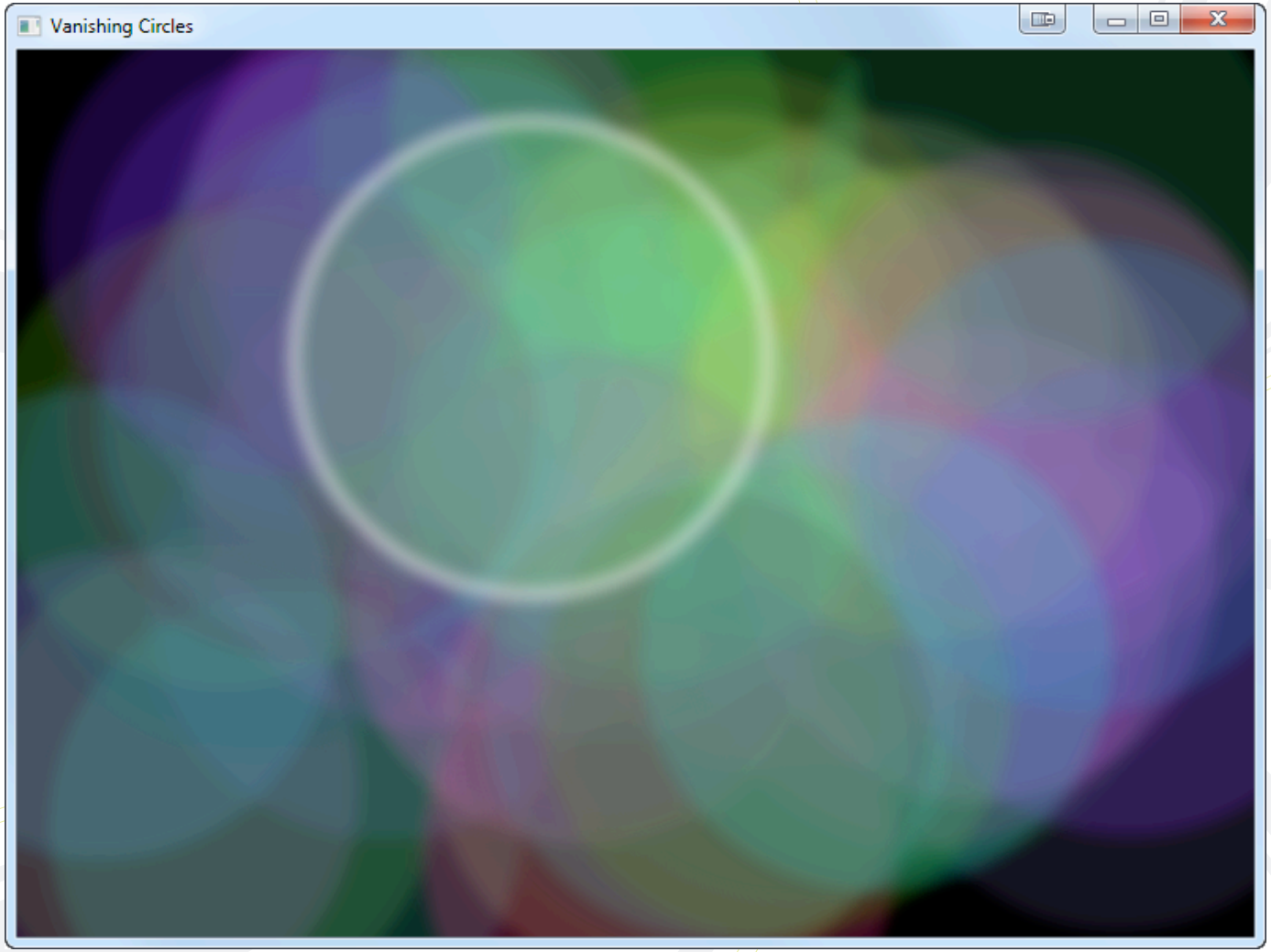
Functional Interfaces

```
@FunctionalInterface

@FunctionalInterface
interface Sum {
  int add(int a, int b);
}

sum = (a, b) -> a + b;
sum = Integer::sum;
```

Vanishing Circles



Application Skeleton

```
public class VanishingCircles extends Application {
  public static void main(String[] args) {
    Application.launch(args);
  }
  @Override
  public void start(Stage primaryStage) {
    primaryStage.setTitle("Vanishing Circles");
    Group root = new Group();
    Scene scene = new Scene(root, 800, 600, Color.BLACK);
    [create the circles…]
    root.getChildren().addAll(circles);
    primaryStage.setScene(scene);
    primaryStage.show();
    [begin the animation…]
  }
}
```

Create the Circles

```
List<Circle> circles = new ArrayList<Circle>();
for (int i = 0; i < 50; i++) {
  final Circle circle = new Circle(150);
  circle.setCenterX(Math.random() * 800);
  circle.setCenterY(Math.random() * 600);
  circle.setFill(new Color(Math.random(), Math.random(),
                           Math.random(), .2));
  circle.setEffect(new BoxBlur(10, 10, 3));
  circle.setStroke(Color.WHITE);
  [setup binding…]
  [setup event listeners…]
  circles.add(circle);
}
```

Create the Circles

```
List<Circle> circles = Streams.generate(() -> {
  final Circle circle = new Circle(150);
  circle.setCenterX(Math.random() * 800);
  circle.setCenterY(Math.random() * 600);
  circle.setFill(new Color(Math.random(), Math.random(),
                           Math.random(), .2));
  circle.setEffect(new BoxBlur(10, 10, 3));
  circle.setStroke(Color.WHITE);
  [setup binding…]
  [setup event listeners…]
  return circle;
}).limit(50).collect(Collectors.toList());
```

Setup Binding

```
circle.strokeWidthProperty().bind(Bindings
   .when(circle.hoverProperty())
   .then(4)
   .otherwise(0)
);
```

Setup Event Listeners

```
circle.addEventHandler(MouseEvent.MOUSE_CLICKED,
                       new EventHandler<MouseEvent>() {
  public void handle(MouseEvent t) {
    KeyValue collapse = new KeyValue(circle.radiusProperty(), 0);
    new Timeline(new KeyFrame(Duration.seconds(3),
                              collapse)).play();
  }
});
```

Lambda-ized Event Listeners

```
circle.addEventHandler(MouseEvent.MOUSE_CLICKED, e -> {
  KeyValue collapse = new KeyValue(circle.radiusProperty(), 0);
  new Timeline(new KeyFrame(Duration.seconds(3),
                            collapse)).play();
});
```

Begin the Animation

```
Timeline moveCircles = new Timeline();
for (Circle circle : circles) {
  KeyValue moveX = new KeyValue(circle.centerXProperty(),
                                Math.random() * 800);
  KeyValue moveY = new KeyValue(circle.centerYProperty(),
                                Math.random() * 600);
  moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40),
                                              moveX, moveY));
}
moveCircles.play();
```

Lambda-ized Begin the Animation

```
Timeline moveCircles = new Timeline();
circles.forEach(circle -> {
  KeyValue moveX = new KeyValue(circle.centerXProperty(),
                                Math.random() * 800);
  KeyValue moveY = new KeyValue(circle.centerYProperty(),
                                Math.random() * 600);
  moveCircles.getKeyFrames().add(new KeyFrame(Duration.seconds(40),
                                              moveX, moveY));
});
moveCircles.play();
```

Mary Had a Little Lambda

Mary had a little lambda
Whose fleece was white as snow
And everywhere that Mary went
Lambda was sure to go!

https://github.com/steveonjava/MaryHadALittleLambda

Generating Streams

From a collection:

```
anyCollection.stream();
```

Known set of objects:

```
Stream.of("bananas", "oranges", "apples");
```

Numeric range:

```
IntStream.range(0, 50)
```

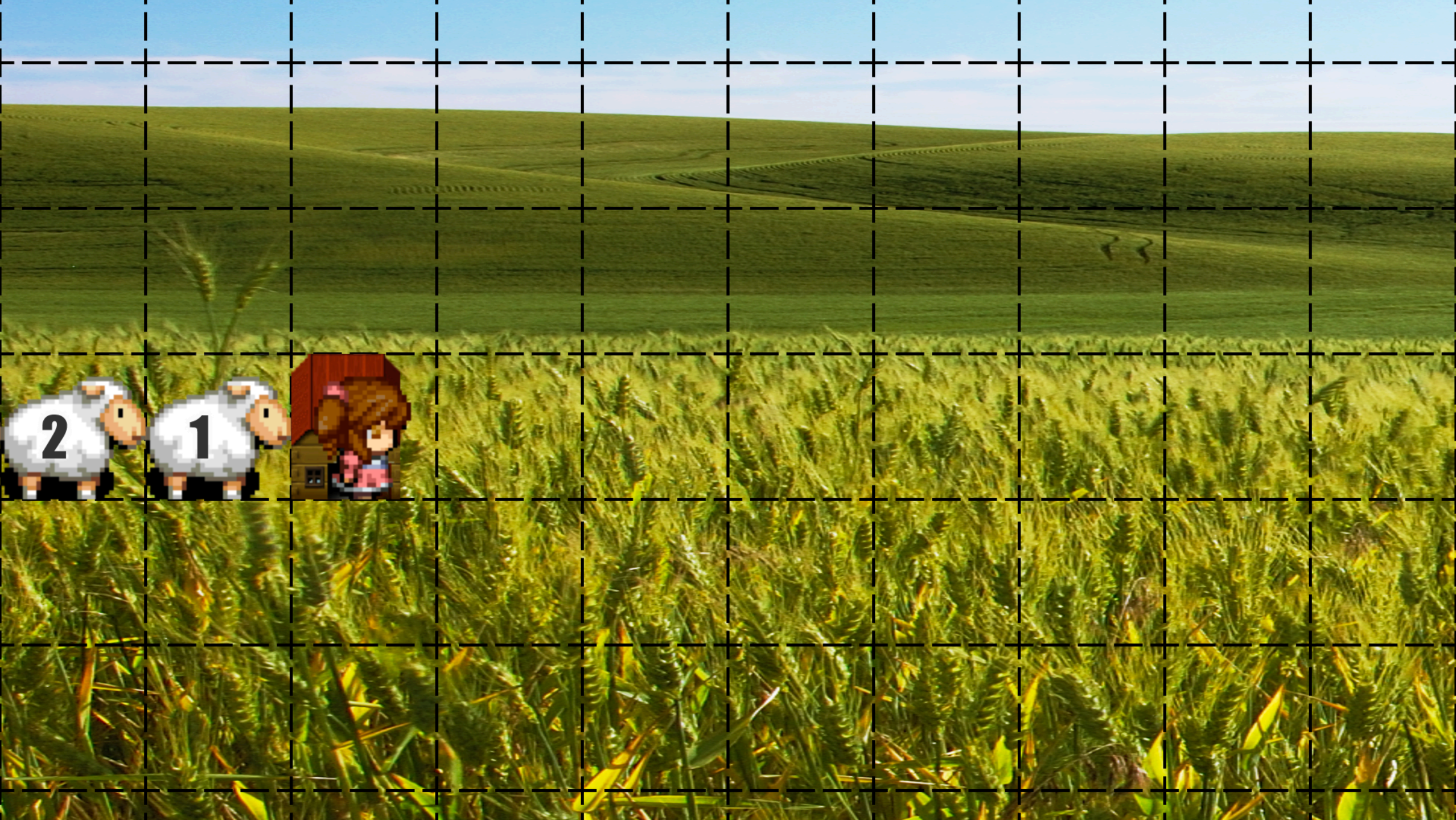
Iteratively:

```
Stream.iterate(Color.RED,
   c -> Color.hsb(c.getHue() + .1, c.getSaturation(),
                                   c.getBrightness()));
```

Let's Create Some Barn Animals!

```
SpriteView tail = s.getAnimals().isEmpty() ?
  s : s.getAnimals().get(s.getAnimals().size() - 1);

Stream.iterate(tail, SpriteView.Lamb::new)
    .skip(1).limit(7)
    .forEach(s.getAnimals()::add);
```


2
1

Filtering Streams

Predicate Expression

```
> public interface Predicate<T> {
>   public boolean test(T t);
> }
```

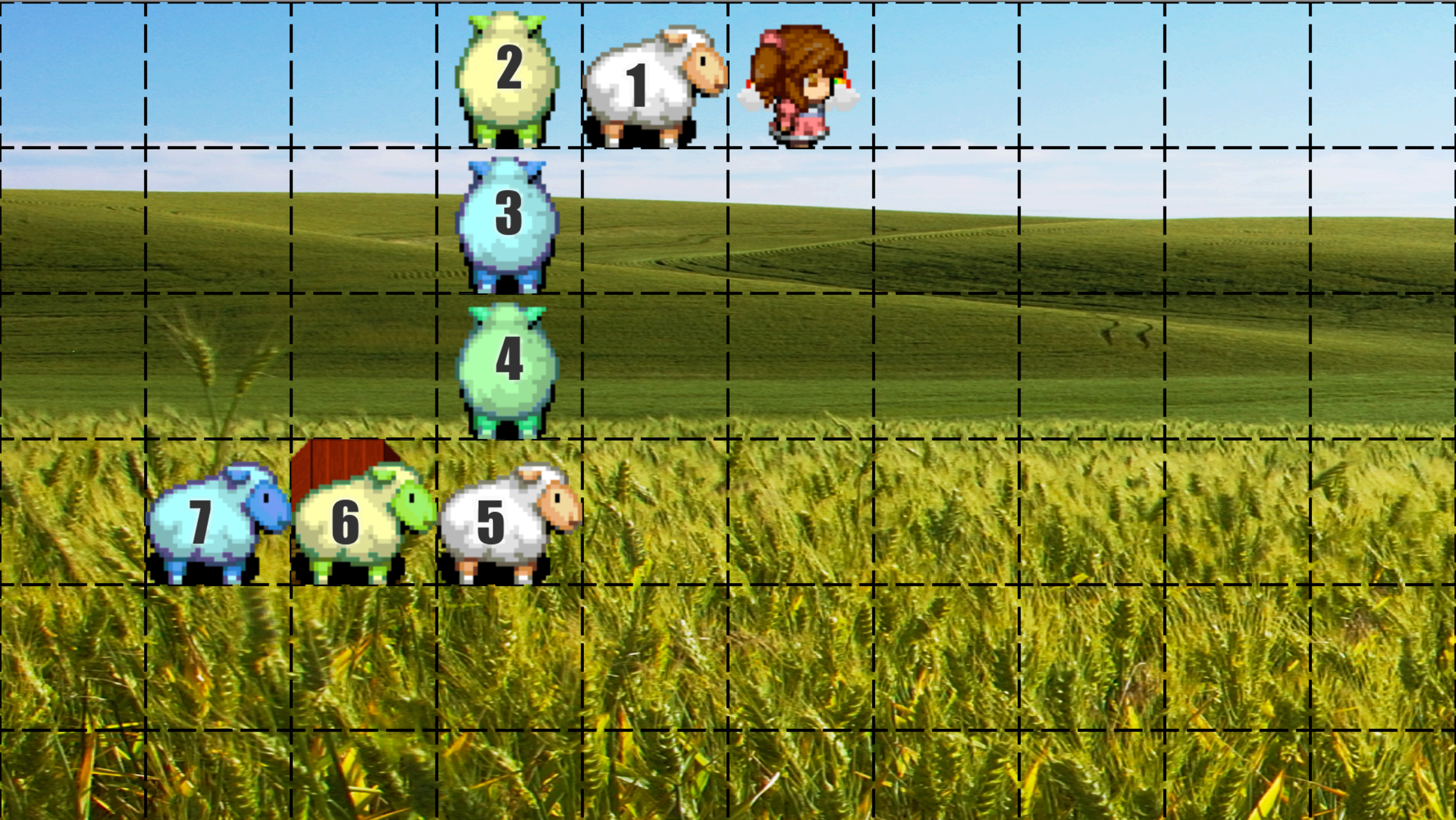
Filter out minors

```
> hackers = attendees.filter(a -> a.getAge() >= 1.8)
```


TWINLIFE
ORACLE

Rainbow-colored Lambs!

```
s.getAnimals().stream()
   .filter(a -> a.getNumber() % 4 == 2)
   .forEach(a -> a.setColor(Color.YELLOW));
s.getAnimals().stream()
   .filter(a -> a.getNumber() % 4 == 3)
   .forEach(a -> a.setColor(Color.CYAN));
s.getAnimals().stream()
   .filter(a -> a.getNumber() % 4 == 0)
   .forEach(a -> a.setColor(Color.GREEN));
```


2
1
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4
7
6
5

Filtering Collections

Collection.removeIf

- Removes all elements that match the predicate

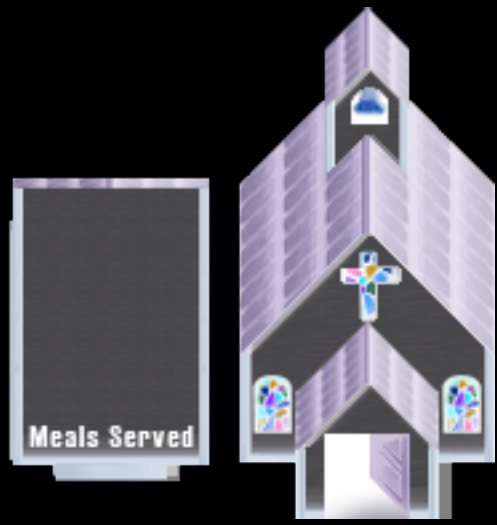
List.replaceAll

- In-place filtering and replacement using an unary operator

ObservableCollection.filtered

- Returns a list filtered by a predicate this is also Observable

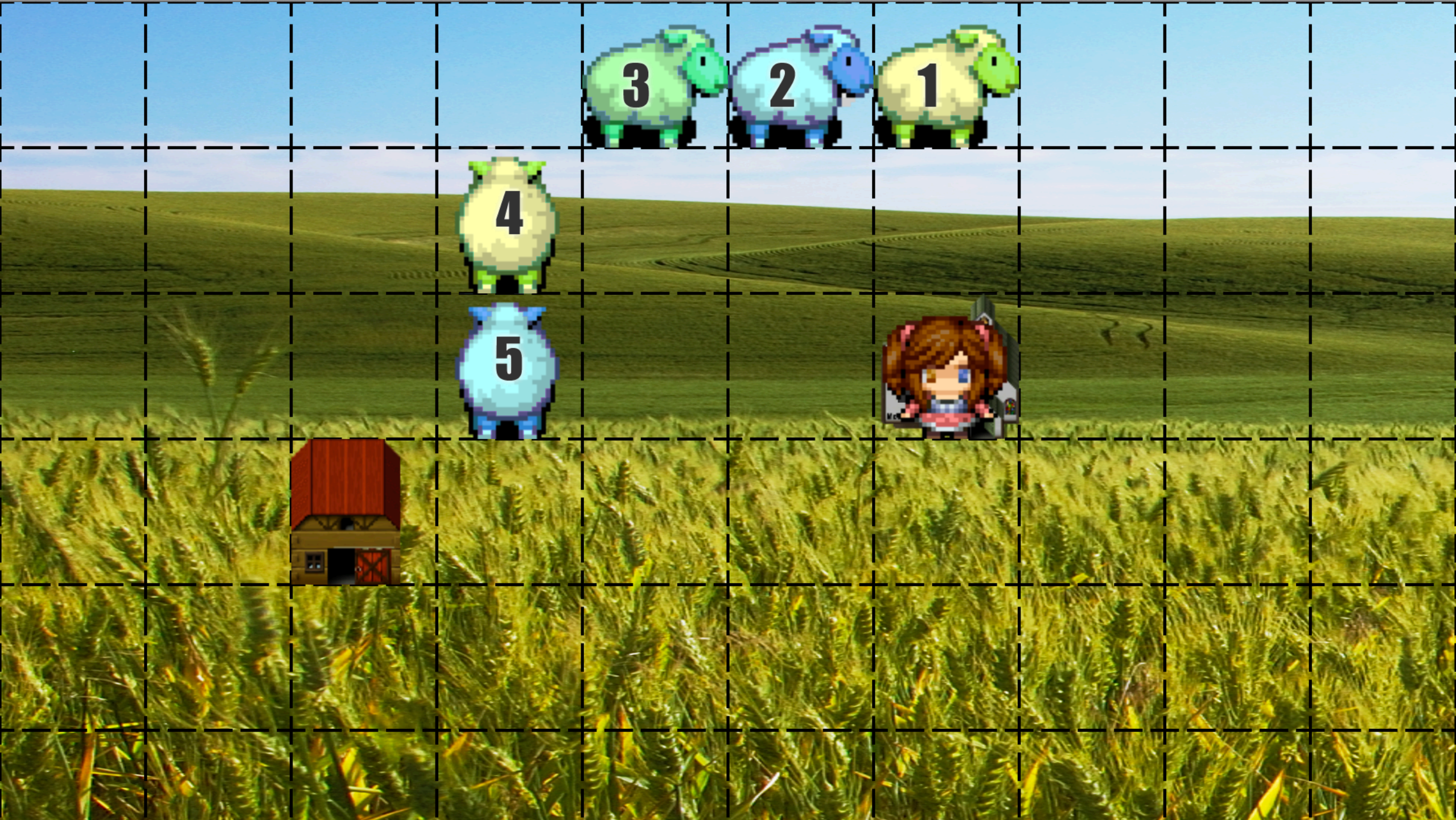
Picky Eaters…




```
Predicate<SpriteView> pure =
  a -> a.getColor() == null;

mealsServed.set(mealsServed.get() +
  s.getAnimals().filtered(pure).size()
);

s.getAnimals().removeIf(pure);
```


3
2
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4
5

Mapping Streams

Applies a Map Function to each element:

- `Function<? super T, ? extends R>`

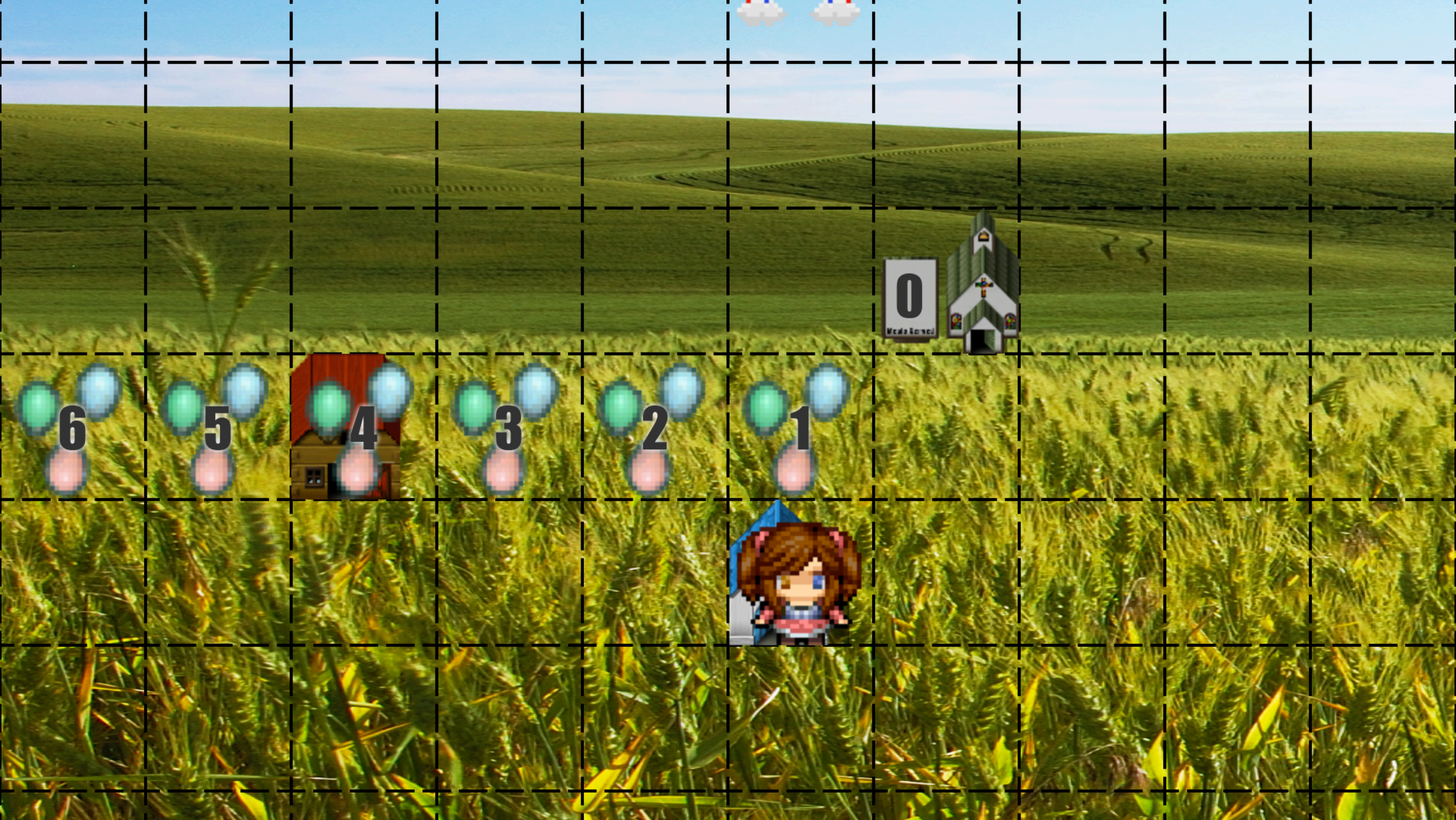
Result: List is the same size, but may be a different type.

Single Map

```
s.getAnimals().setAll(s.getAnimals()
    .stream()
    .map(sv -> new Eggs(sv.getFollowing()))
    .collect(Collectors.toList())
);
```

Or a Double Map!

```
s.getAnimals().setAll(s.getAnimals()
        .stream()
        .map(SpriteView::getFollowing)
        .map(Eggs::new)
        .collect(Collectors.toList())
);
```


6
5
4
3
2
1
0

Flat Map

Applies a One-to-Many Map Function to each element:

- Function<? super T, ? extends Stream<? extends R>>

And then flattens the result into a single stream.

Result: The list may get longer and the type may be different.

Hatching Eggs

```
s.getAnimals().setAll(s.getAnimals()
    .stream()
    .flatMap(SpriteView.Eggs::hatch)
    .collect(Collectors.toList())
);
```


9
8
0
20
19
16
13
10
7
4
1
2
3

Reduce

Reduces a list to a single element given:

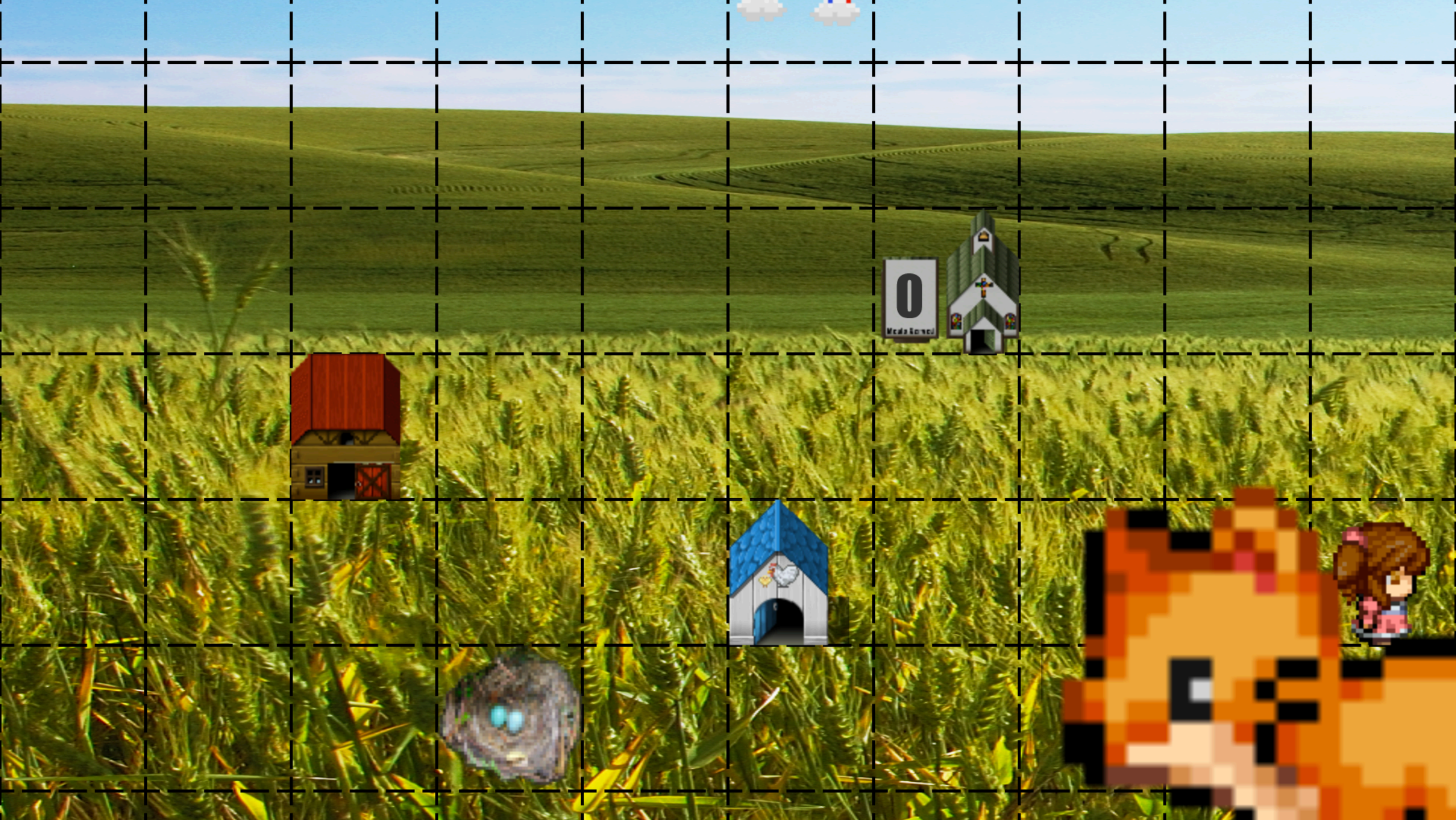
- Identity: T
- Accumulator: BinaryOperator<T>

Result: List of the same type, but only 1 element left.

And the (formerly little) Fox ate them all!

```
Double mealSize = shepherd.getAnimals()
    .stream()
    .map(SpriteView::getScaleX)
    .reduce(0.0, Double::sum);

setScaleX(getScaleX() + mealSize * .2);
setScaleY(getScaleY() + mealSize * .2);
shepherd.getAnimals().clear();
```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Parallel Streams

Apply parallel() to any stream to optimize for multicore

- Collection.parallelStream() is a convenient shortcut
- Use sequential() to get back a normal stream
- Sometimes unordered() can improve performance

Sequential and parallel streams should give the same results as long as:

- No Interference – You don't modify the data source
- Stateless Behavior – No side effects

Parallel walking…

```
animals.parallelStream()
    .reduce(location.get(), (loc, sprt) -> {
        sprt.moveTo(loc);
        return sprt.location.get();
    }, (loc1, loc2) -> loc1);
```


3
2
1
0
WUT?

Mary Had a Little Lambda Project

- Open-source project to demonstrate lambda features
- Visual representation of streams, filters, and maps

https://github.com/steveonjava/MaryHadALittleLambda

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blog: http://steveonjava.com

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