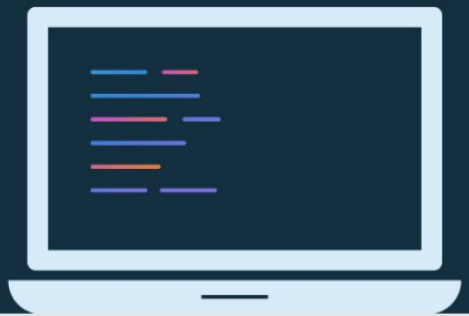
# Lesson 10: Advanced RecyclerView use cases



# About this lesson

Lesson 10: Advanced `RecyclerView` use cases

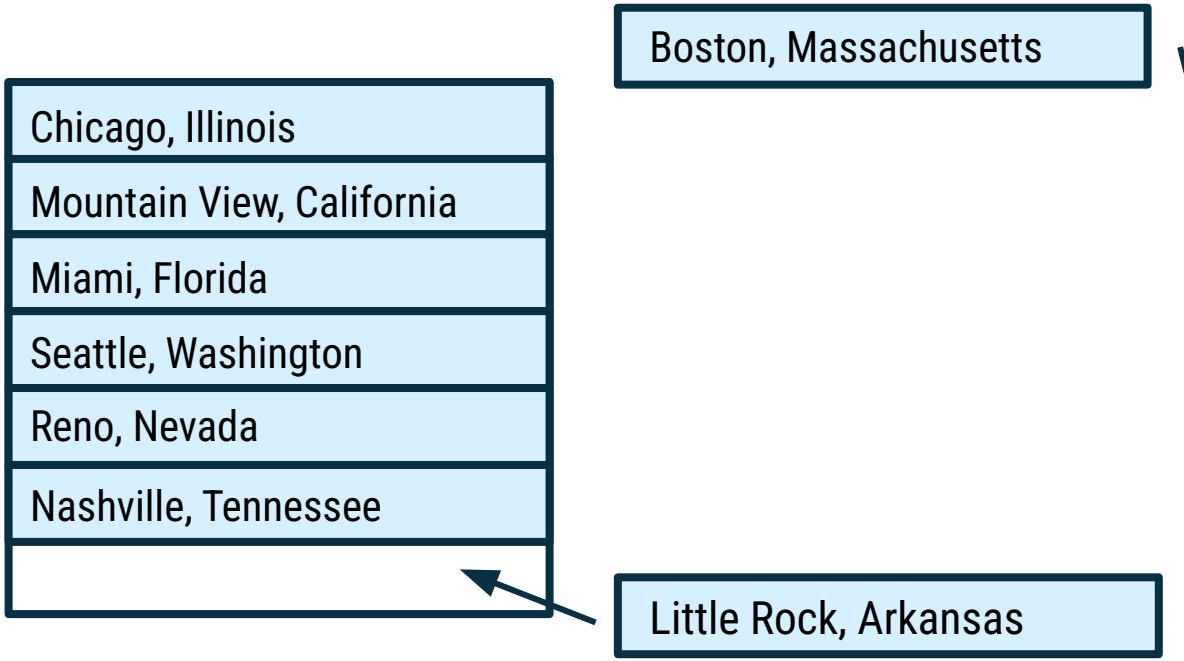
- RecyclerView recap
- Advanced binding
- Multiple item view types
- Headers
- Grid layout
- Summary

# RecyclerView recap

# RecyclerView overview

- Widget for displaying lists of data
- "Recycles" (reuses) item views to make scrolling more performant
- Can specify a list item layout for each item in the dataset
- Supports animations and transitions

# View recycling in RecyclerView




If item is scrolled offscreen, it isn't destroyed. Item is put in a pool to be recycled.

onBindViewHolder binds the view with the new values, and then the view gets reinserted in the list.

# RecyclerViewDemo app

# Adapter for RecyclerViewDemo

```
class NumberListAdapter(var data: List<Int>):
        RecyclerView.Adapter<NumberListAdapter.IntViewHolder>() {
    class IntViewHolder(val row: View): RecyclerView.ViewHolder(row) {
        val textView = row.findViewById<TextView>(R.id.number)
    }
```

# Functions for RecyclerViewDemo

```
override fun onCreateViewHolder(parent: ViewGroup, viewType: Int):
        IntViewHolder {
    val layout = LayoutInflater.from(parent.context)
        .inflate(R.layout.item_view, parent, false)
    return IntViewHolder(layout)
}

override fun onBindViewHolder(holder: IntViewHolder, position: Int) {
    holder.textView.text = data.get(position).toString()
}
```

# Set the adapter onto the RecyclerView

In `MainActivity.kt`:

```
override fun onCreate(savedInstanceState: Bundle?) {
    super.onCreate(savedInstanceState)
    setContentView(R.layout.activity_main)

    val rv: RecyclerView = findViewById(R.id.rv)
    rv.layoutManager = LinearLayoutManager(this)

    rv.adapter = NumberListAdapter(IntRange(0,100).toList())
}
```

# Make items in the list clickable

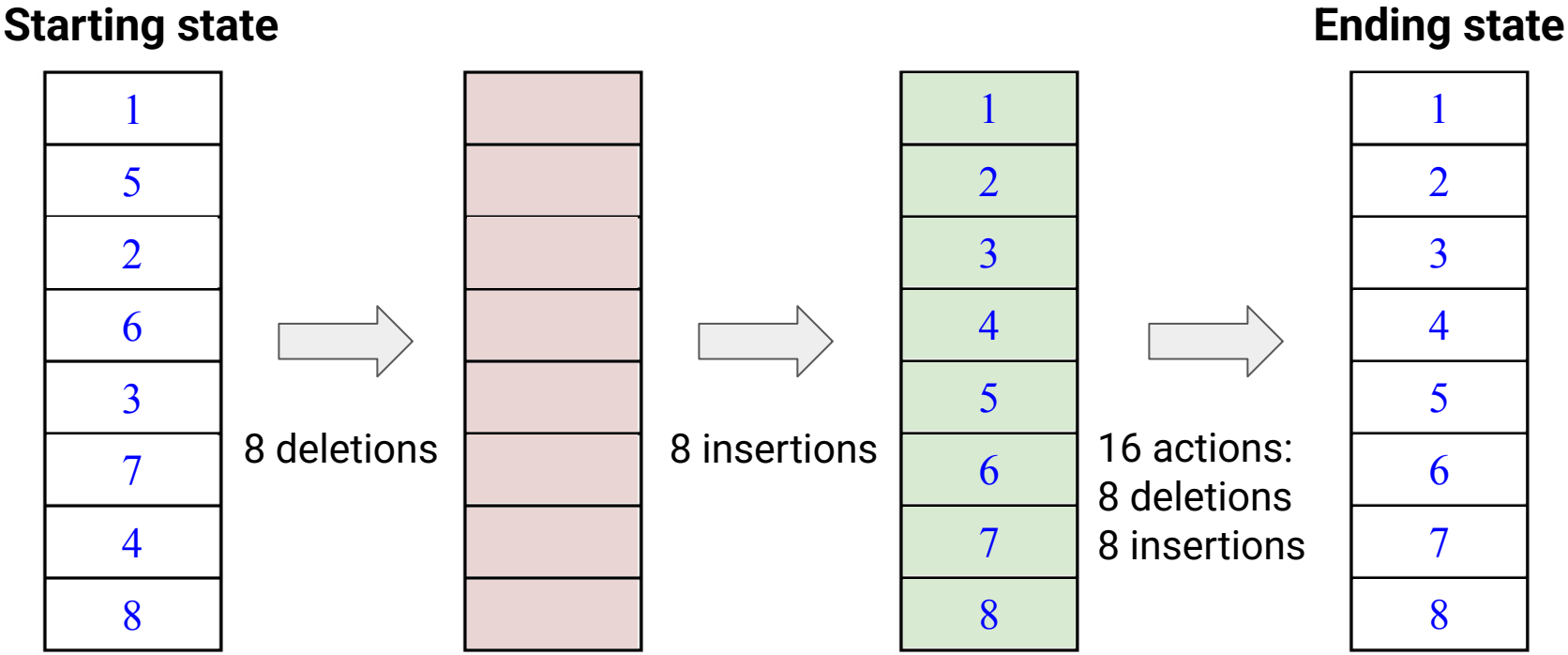
In `NumberListAdapter.kt`:

```
override fun onCreateViewHolder(parent: ViewGroup, viewType: Int): IntViewHolder{
    val layout = LayoutInflater.from(parent.context).inflate(R.layout.item_view,
         parent, false)
    val holder = IntViewHolder(layout)
    holder.row.setOnClickListener {
        // Do something on click
    }
    return holder
}
```

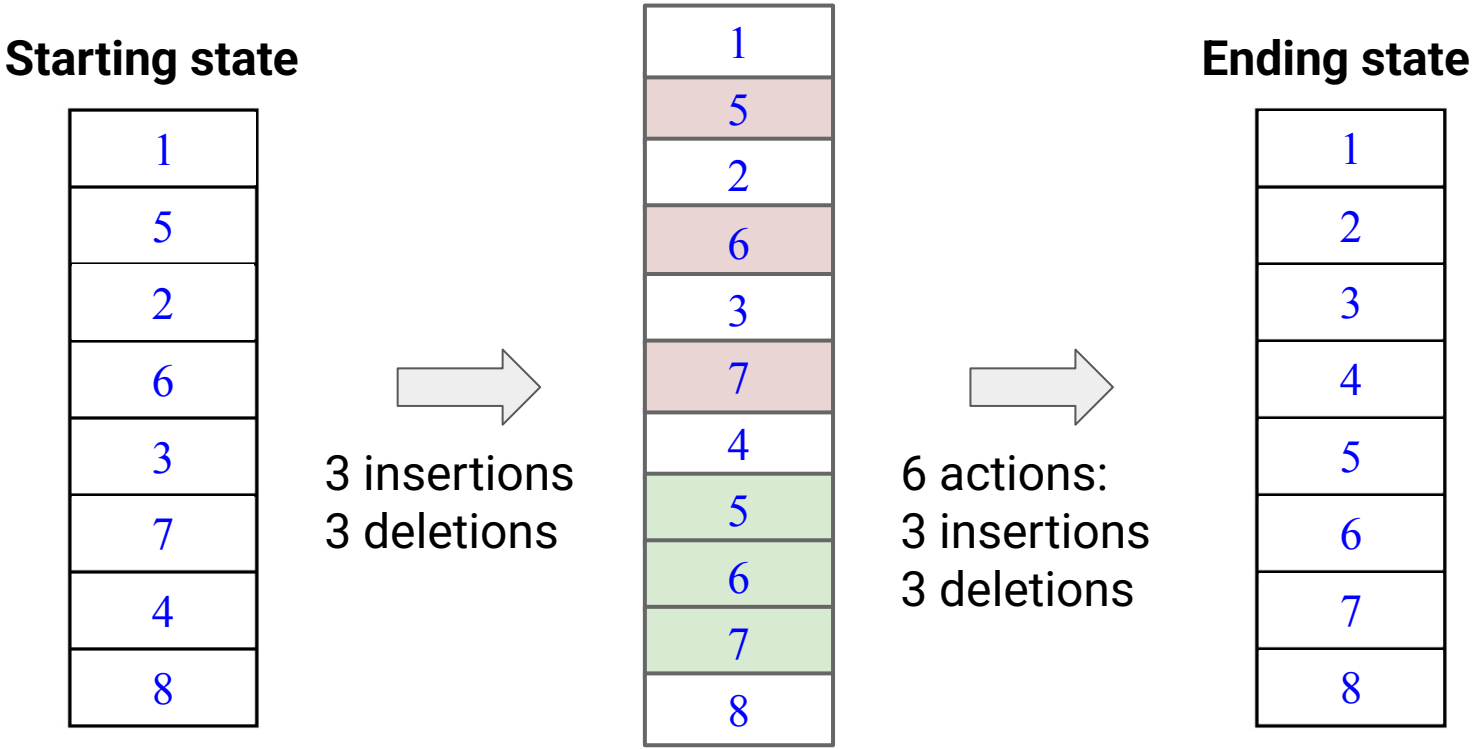
# ListAdapter

- `RecyclerView.Adapter`
  - Disposes UI data on every update
  - Can be costly and wasteful
- `ListAdapter`
  - Computes the difference between what is currently shown and what needs to be shown
  - Changes are calculated on a background thread

# Sort using RecyclerView.Adapter



# Sort using ListAdapter



# ListAdapter example

```
class NumberListAdapter: ListAdapter<Int,
        NumberListAdapter.IntViewHolder>(RowItemDiffCallback()) {

    class IntViewHolder(val row: View):RecyclerView.ViewHolder(row) {
        val textView = row.findViewById<TextView>(R.id.number)
    }

    ...
```

# DiffUtil.ItemCallback

Determines the transformations needed to translate one list into another

- `areContentsTheSame(oldItem: T, newItem: T): Boolean`
- `areItemsTheSame(oldItem: T, newItem: T): Boolean`

# DiffUtil.ItemCallback example

```
class RowItemDiffCallback : DiffUtil.ItemCallback<Int>() {

    override fun areItemsTheSame(oldItem: Int, newItem: Int): Boolean {
        return oldItem == newItem
    }

    override fun areContentsTheSame(oldItem: Int, newItem: Int): Boolean {
        return oldItem == newItem
    }
}
```

# Advanced binding

# ViewHolders and data binding

```
class IntViewHolder private constructor(val binding: ItemViewBinding):
        RecyclerView.ViewHolder(binding.root) {

    companion object {
        fun from(parent: ViewGroup): IntViewHolder {
            val layoutInflater = LayoutInflater.from(parent.context)
            val binding = ItemViewBinding.inflate(layoutInflater,
                parent, false)
            return IntViewHolder(binding)
        }
    }
}
```

# Using the ViewHolder in a ListAdapter

```
override fun onCreateViewHolder(parent: ViewGroup, viewType: Int):
        IntViewHolder {
    return IntViewHolder.from(parent)
}

override fun onBindViewHolder(holder: NumberListAdapter.IntViewHolder,
        position: Int) {
    holder.binding.num = getItem(position)
}
```

# Binding adapters

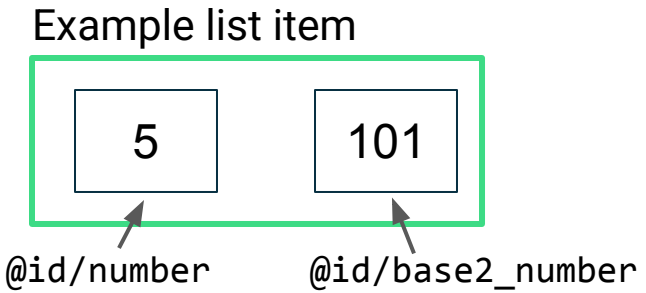
Let you map a function to an attribute in your XML

- Override existing framework behavior:
  `android:text = "foo"` → `TextView.setText("foo")` is called
- Create your own custom attributes:
  `app:base2Number = "5"` → `TextView.setBase2Number("5")` is called

# Custom attribute

Add another `TextView` in the list item layout that uses a custom attribute:

```
<TextView
    android:id="@+id/base2_number"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:textSize="24sp"
    app:base2Number="@{num}"/>
```



# Add a binding adapter

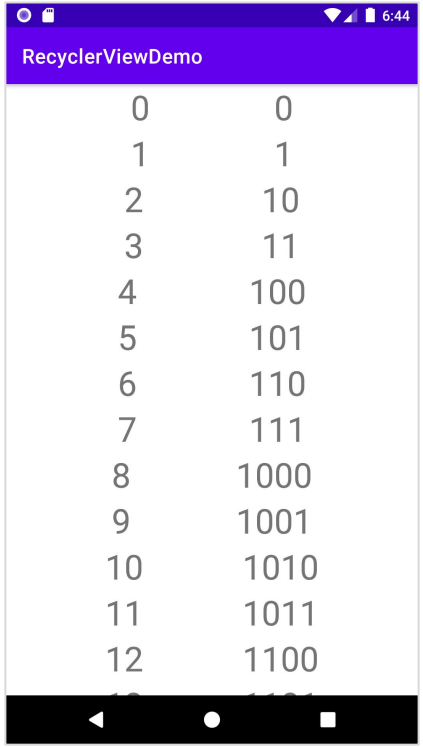
Declare binding adapter:

```
@BindingAdapter("base2Number")
fun TextView.setBase2Number(item: Int) {
    text = Integer.toBinaryString(item)
}
```

In `NumberListAdapter.kt`:

```
override fun onBindViewHolder(holder: NumberListAdapter.IntViewHolder,
        position: Int) {
    holder.binding.num = getItem(position)
    holder.binding.executePendingBindings()
}
```

# Updated RecyclerViewDemo app



# Multiple item view types

# Add a new item view type

1. Create a new list item layout XML file.
2. Modify underlying adapter to hold the new type.
3. Override `getItemViewType` in adapter.
4. Create a new `ViewHolder` class.
5. Add conditional code in `onCreateViewHolder` and `onBindViewHolder` to handle the new type.

# Declare new color item layout

```
<layout ...>
    <data>
        <variable
            name="color"
            type="android.graphics.Color" />
    </data>
    <androidx.constraintlayout.widget.ConstraintLayout ...>
        <TextView
            ...
            android:backgroundColor="@{color.toArgb()}" />
        <TextView
            ...
            android:text="@{color.toString()}" />
    </androidx.constraintlayout.widget.ConstraintLayout>
</layout>
```

# New view type

- Adapter should know about two item view types:
  - Item that displays a number
  - Item that displays a color

```
enum class ITEM_VIEW_TYPE { NUMBER, COLOR }
```

- Modify `getItemViewType()` to return the appropriate type (as `Int`):

```
override fun getItemViewType(position: Int): Int
```

# Override getItemViewType

In `NumberListAdapter.kt`:

```
override fun getItemViewType(position: Int): Int {
    return when(getItem(position)) {
        is Int -> ITEM_VIEW_TYPE.NUMBER.ordinal
        else -> ITEM_VIEW_TYPE.COLOR.ordinal
    }
}
```

# Define new ViewHolder

```
class ColorViewHolder private constructor(val binding: ColorItemViewBinding):
      RecyclerView.ViewHolder(binding.root) {

    companion object {
        fun from(parent: ViewGroup): ColorViewHolder {
            val layoutInflater = LayoutInflater.from(parent.context)
            val binding = ColorItemViewBinding.inflate(layoutInflater,
                parent, false)
            return ColorViewHolder(binding)
        }
    }
}
```

# Update onCreateViewHolder()

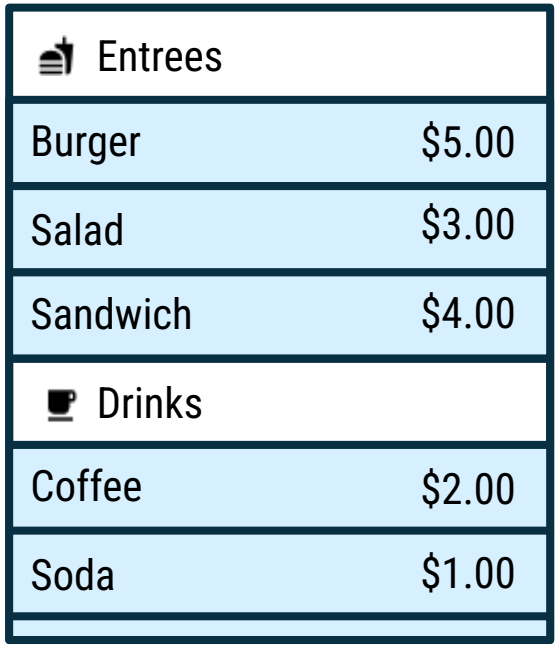
```
override fun onCreateViewHolder(parent: ViewGroup, viewType: Int):
        RecyclerView.ViewHolder {

    return when(viewType) {
        ITEM_VIEW_TYPE.NUMBER.ordinal -> IntViewHolder.from(parent)
        else -> ColorViewHolder.from(parent)
    }
}
```

# Update onBindViewHolder()

```
override fun onBindViewHolder(holder: RecyclerView.ViewHolder, position: Int) {
    when (holder) {
        is IntViewHolder -> {
            holder.binding.num = getItem(position) as Int
            holder.binding.executePendingBindings()
        }
        is ColorViewHolder -> {
            holder.binding.color = getItem(position) as Color
            holder.binding.executePendingBindings()
        }
    }
}
```

# Headers

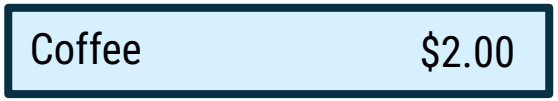
# Headers Example




- 2 item view types:
  - header item

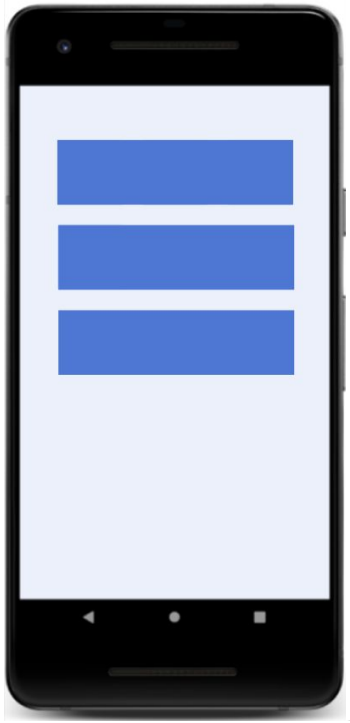
    
    

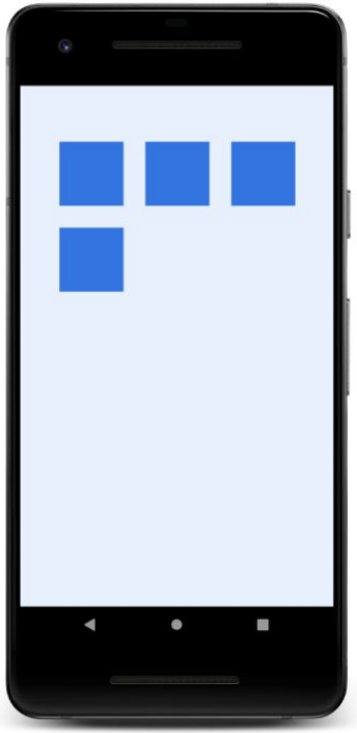
  - food menu item

# Grid layout

# List versus grid





# Specifying a LayoutManager

In `MainActivity` `onCreate()`, once you have a reference to the `RecyclerView`

- Display a list with `LinearLayoutManager`:

```
recyclerView.layoutManager = LinearLayoutManager(this)
```

- Display a grid with `GridLayoutManager`:

```
recyclerView.layoutManager = GridLayoutManager(this, 2)
```

- Use a different layout manager (or create your own)

# GridLayoutManager

- Arranges items in a grid as a table of rows and columns.
- Orientation can be vertically or horizontally scrollable.
- By default, each item occupies 1 span.
- You can vary the number of spans an item takes up (span size).

# Set span size for an item

Create `SpanSizeLookup` instance and override `getSpanSize(position)`:

```
val manager = GridLayoutManager(this, 2)
manager.spanSizeLookup = object : GridLayoutManager.SpanSizeLookup() {
    override fun getSpanSize(position: Int): Int {
        return when (position) {
            0,1,2 -> 2
            else -> 1
        }
    }
}
```

# Summary

# Summary

In Lesson 10, you learned how to:

- Use `ListAdapter` to make `RecyclerView` more efficient at updating lists
- Create a binding adapter with custom logic to set View values from an XML attribute
- Handle multiple `ViewHolders` in the same `RecyclerView` to show multiple item types
- Use `GridLayoutManager` to display items as a grid
- Specify span size for an item in a grid with `SpanSizeLookup`

# Learn More

- Create a List with RecyclerView
- RecyclerView
- ListAdapter
- Binding adapters
- GridLayoutManager
- DiffUtil and ItemCallback

# Pathway

Practice what you've learned by completing the pathway:

Lesson 10: Advanced RecyclerView use cases