Android Layout Managers Avoiding Most XML

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LayoutManagers

How things get put on the screen

- Every Activity and Fragment has a layout manager
- Everything goes into a layout manager
  - including other layout managers!
- Note hierarchy View -> ViewGroup -> [LayoutManager]
  - a view is any viewable thing in android
    - every interface element
  - ViewGroup is a container of a collection of Views
- Since LayoutManagers inherit from View they are visible on screen
- Since they inherit from ViewGroup they can hold other Views

Layout Managers

- AbsoluteLayout
  - Do not use — deprecated since Android v3
- RelativeLayout
  - Fairly similar to CSS positions. Everything follows from everything else
- LinearLayout
  - One row (or one column at a time)
- FrameLayout — think picture frame
  - designed to block out an area on the screen to display a single item.
- ConstraintLayout
  - Allows better control than relative layout
- CoordinatorLayout
  - “Frame layout on steroids” —- I actually have no idea what this means!

Relative Layout

Just using Java

```
public View onCreateView(LayoutInflater inflater, ViewGroup container,  Bundle savedInstanceState ) {
    // set up the initial layout
    RelativeLayout ll = new RelativeLayout(getContext());
    ll.setId(View.generateViewId());
    ll.setLayoutParams(new ViewGroup.LayoutParams(ViewGroup.LayoutParams.MATCH_PARENT, ViewGroup.LayoutParams.MATCH_PARENT));
    return ll;
 }

 private int randomColor() {
    Random r = new Random();
    return Color.rgb(r.nextInt(255), r.nextInt(255), r.nextInt(255));
 }

public void onViewCreated(@NonNull View view, Bundle savedInstanceState) {
    super.onViewCreated(view, savedInstanceState);
    doRL((RelativeLayout)view);
}
private void doRL(RelativeLayout ll) {
    do1(ll);
    //do1i(ll);
    //doN(ll, 20);
    //doNRule(ll,20);
    //doTurn(ll, 20);
}

void do1(RelativeLayout ll) {
    float density = getResources().getDisplayMetrics().density;
    TextView v = new TextView(getContext());
    v.setBackgroundColor(randomColor());
    v.setText("" + 0);
    v.setGravity(Gravity.CENTER);
    v.setId(View.generateViewId());
    RelativeLayout.LayoutParams lp = new RelativeLayout.LayoutParams((int) (100 * density), (int) (100 * density));
    ll.addView(v, lp);
}
```

Make this layout the same size as its parent

Create the RelativeLayout

pixel density. Needed to do dp calcs

Create a single TextView which has its text centered

Make the size of 100dp x 100dp

Add the textView to the layout

What went wrong

- My square is not square and the o did not appear
- Problem, the layout goes behind the menu bar, so either need to get rid of menu bar or ensure that top of layout is below menu bar

```
void do1i(RelativeLayout ll) {
    float density = getResources().getDisplayMetrics().density;
    TypedValue tv = new TypedValue();
    if (getContext().getTheme().resolveAttribute(android.R.attr.actionBarSize, tv, true)) {
        int actionBarHeight = TypedValue.complexToDimensionPixelSize(tv.data, getResources().getDisplayMetrics());
        ll.setPadding(0, actionBarHeight, 0, 0);
    }
    TextView v = new TextView(getContext());
    v.setBackgroundColor(randomColor());
    v.setText("" + 0);
    v.setGravity(Gravity.CENTER);
    v.setId(View.generateViewId());
    RelativeLayout.LayoutParams lp = new RelativeLayout.LayoutParams((int) (100 * density), (int) (100 * density));
    ll.addView(v, lp);
}
```

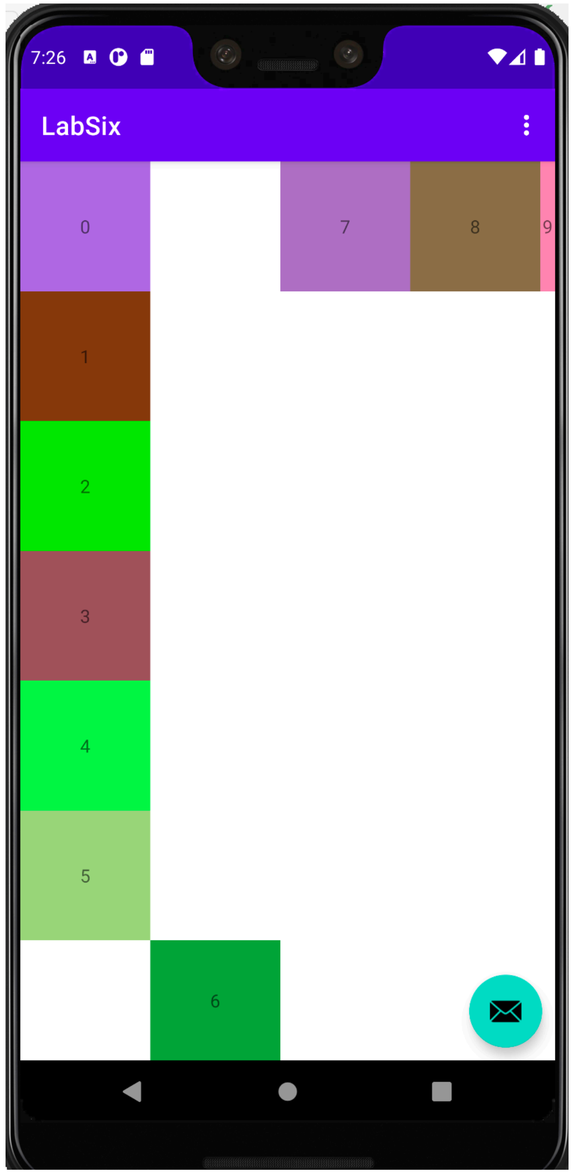
Put many items

```
void doN(RelativeLayout rl, int maxx) {
    // unchanged code not shown
    for (int i = 0; i < maxx; i++) {
        TextView v = new TextView(getContext());
        v.setBackgroundColor(randomColor());
        v.setText("" + i);
        v.setGravity(Gravity.CENTER);
        v.setId(View.generateViewId());
        RelativeLayout.LayoutParams lp = new
RelativeLayout.LayoutParams((int) (100 * density),
(int) (100 * density));
        rl.addView(v, lp);
   }
}
```

- Why are the 20 items not showing?
- They are, they are just stacked on top of each other
- By default, relative layout put everything in top corner
- Can be very useful — if you want to stack interface elements

Getting Creative

```
void doTurn(RelativeLayout rl, int maxx) {
    float density = getResources().getDisplayMetrics().density;
    TypedValue tv = new TypedValue();
    if
(getContext().getTheme().resolveAttribute(android.R.attr.actionBarSiz
e, tv, true)) {
        int actionBarHeight =
TypedValue.complexToDimensionPixelSize(tv.data,
getResources().getDisplayMetrics());
        rl.setPadding(0, actionBarHeight, 0, 0);
    }
    View pp = null;
    for (int i = 0; i < maxx; i++) {
        TextView v = new TextView(getContext());
        v.setBackgroundColor(randomColor());
        v.setText("" + i);
        v.setGravity(Gravity.CENTER);
        v.setId(View.generateViewId());
        RelativeLayout.LayoutParams lp = new
RelativeLayout.LayoutParams((int) (100 * density), (int) (100 *
density));
        if (pp != null) {
            if (i < 6)
                lp.addRule(RelativeLayout.BELOW, pp.getId());
            else {
                lp.addRule(RelativeLayout.END_OF, pp.getId());
                if (i == 6) lp.addRule(RelativeLayout.BELOW,
pp.getId());
            }
        }
        rl.addView(v, lp);
        pp = v;
    }
}
```

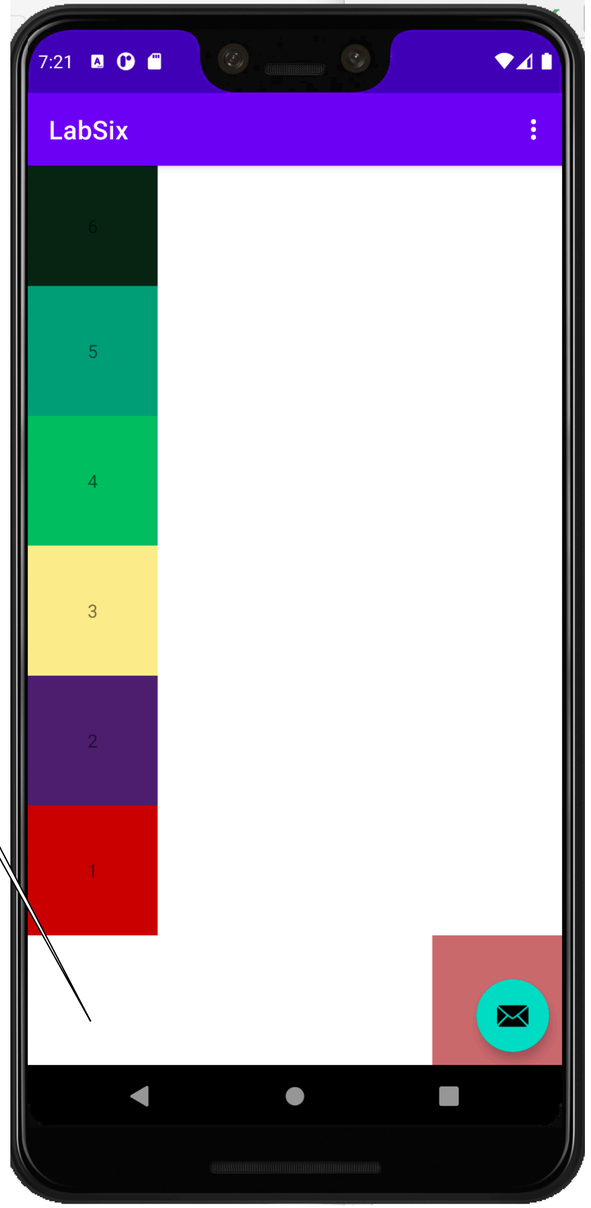


Show Many items

- Rules
  - define where things should appear either
    - with respect to the entire layout (e.g. top-right)
    - some previously positioned element
      - hence the name RelativeLayout

```
…
RelativeLayout.LayoutParams lp = new
RelativeLayout.LayoutParams((int) (100 * density),
(int) (100 * density));
if (pp!=null) {
    lp.addRule(RelativeLayout.ABOVE, pp.getId());
} else {
    lp.addRule(RelativeLayout.ALIGN_PARENT_BOTTOM);
    lp.addRule(RelativeLayout.ALIGN_PARENT_RIGHT);
}
rl.addView(v, lp);
…
```

What Happened???

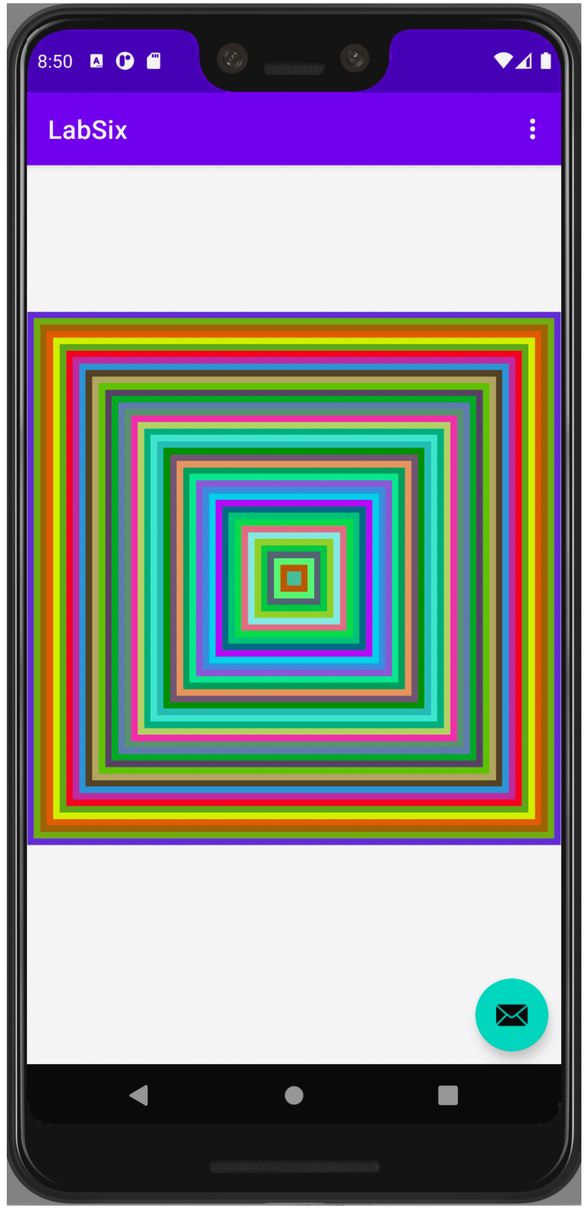


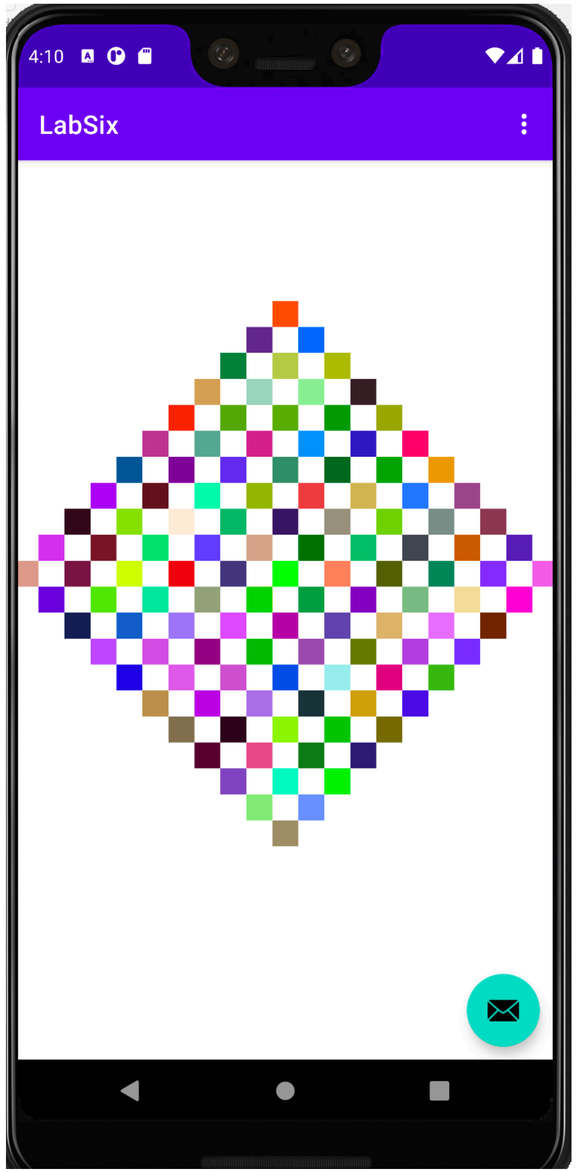
Going Wild

- Most of previous examples could have been done in XML. These, not so much
- How do you do the one on left?
  - Only rule you need is

```
lp.addRule(RelativeLayout.CENTER_IN_PARENT);
```

  - Consider just putting in the innermost square with one surrounding square.

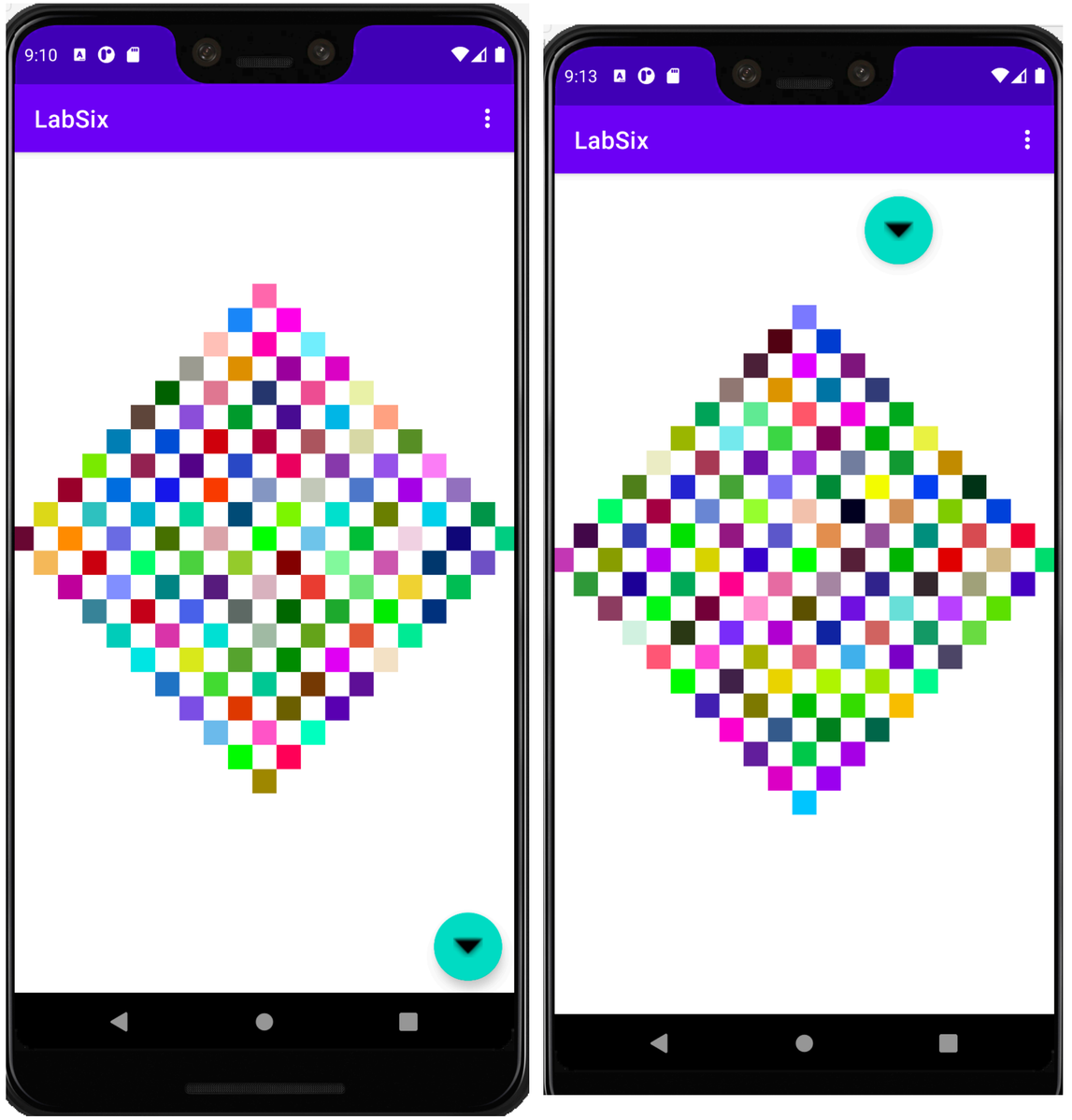




If you absolutely must

- AbsoluteLayout was deprecated because using it is normally a bad idea.
  - But sometimes needs must
  - for instance, the button on all of the previous slides
  - By manipulating margins and rules in relative layout you get absolute positioning

```
FloatingActionButton fab = new FloatingActionButton(this);
fab.setImageResource(android.R.drawable.arrow_down_float);
fab.show();
RelativeLayout.LayoutParams clp = new
RelativeLayout.LayoutParams(ViewGroup.LayoutParams.WRAP_CO
NTENT, ViewGroup.LayoutParams.WRAP_CONTENT);
clp.addRule(RelativeLayout.ALIGN_PARENT_BOTTOM);
clp.addRule(RelativeLayout.ALIGN_PARENT_END);
float density= getResources().getDisplayMetrics().density;
clp.setMargins(0,0,(int)(10*density), (int)(10*density));
vv.addView(fab, clp);
```



LinearLayout

Because relative layouts can be a pain

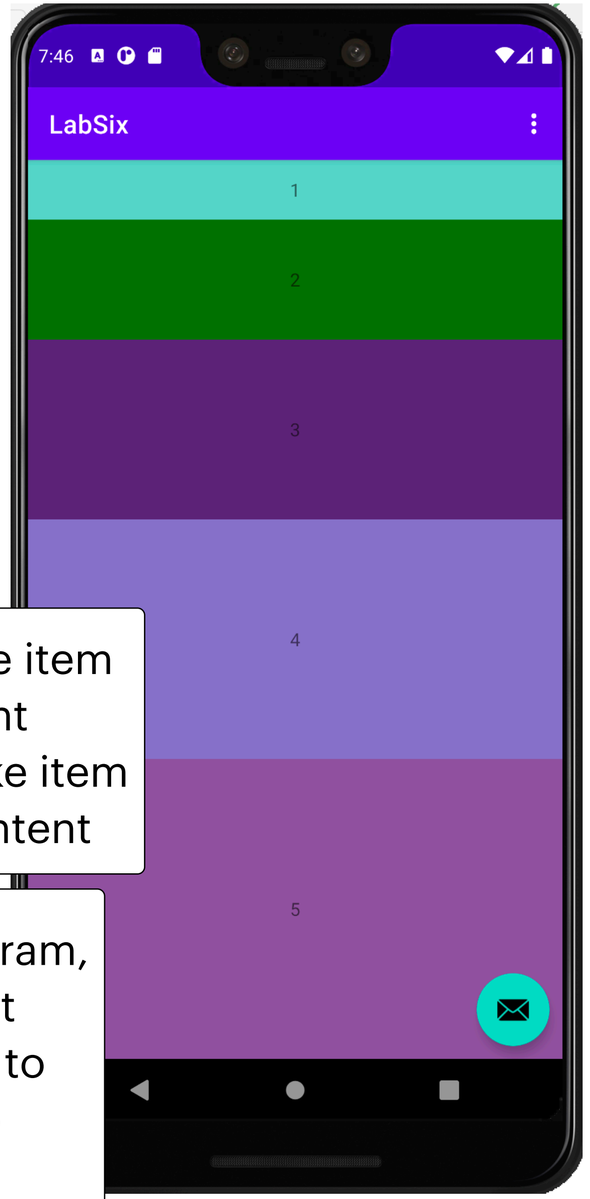
- Align in a row or a column
- Items are added left to right or top to bottom

```
public View onCreateView(LayoutInflater inflater, ViewGroup container, Bundle
savedInstanceState) {
    System.out.println("Linear Create");
    LinearLayout ll = new LinearLayout(getContext());
    ll.setId(View.generateViewId());
    ll.setOrientation(LinearLayout.VERTICAL);
    ll.setLayoutParams(new ViewGroup.LayoutParams(ViewGroup.LayoutParams.MATCH_PARENT,
ViewGroup.LayoutParams.MATCH_PARENT));
    return ll;
}
public void onViewCreated(@NonNull View view, Bundle savedInstanceState) {
    super.onViewCreated(view, savedInstanceState);
    LinearLayout ll = (LinearLayout) view;
    TypedValue tv = new TypedValue();
    if (getContext().getTheme().resolveAttribute(android.R.attr.actionBarSi
        int actionBarHeight = TypedValue.complexToDimensionPixelSize(tv.dat
getResources().getDisplayMetrics());
        ll.setPadding(0, actionBarHeight, 0, 0);
    }
    doVertical(ll, 5);
}
public void doVertical(LinearLayout ll, int numComponents) {
    ll.setOrientation(LinearLayout.VERTICAL);
    for (int i = 1; i <= numComponents; i++) {
        TextView v = new TextView(getContext());
        v.setBackgroundColor(randomColor());
        v.setText("" + i);
        v.setGravity(Gravity.CENTER);
        v.setId(View.generateViewId());
        LinearLayout.LayoutParams lp = new
LinearLayout.LayoutParams(ViewGroup.LayoutParams.MATCH_PARENT, 0, i);
        ll.addView(v, lp);
```

Set L-to-R or T-to-B.
Here T-to-B

MATCH_PARENT means make item the same dimension as parent
WRAP_CONTENT means make item as small as possible to fit content

LinearLayout allows third param, the weight. In vertical layout this allows layout to expand to fill vertical space; sharing to items according to relative



LinearLayout

Horizontally

- Can mix & match weights and absolutes

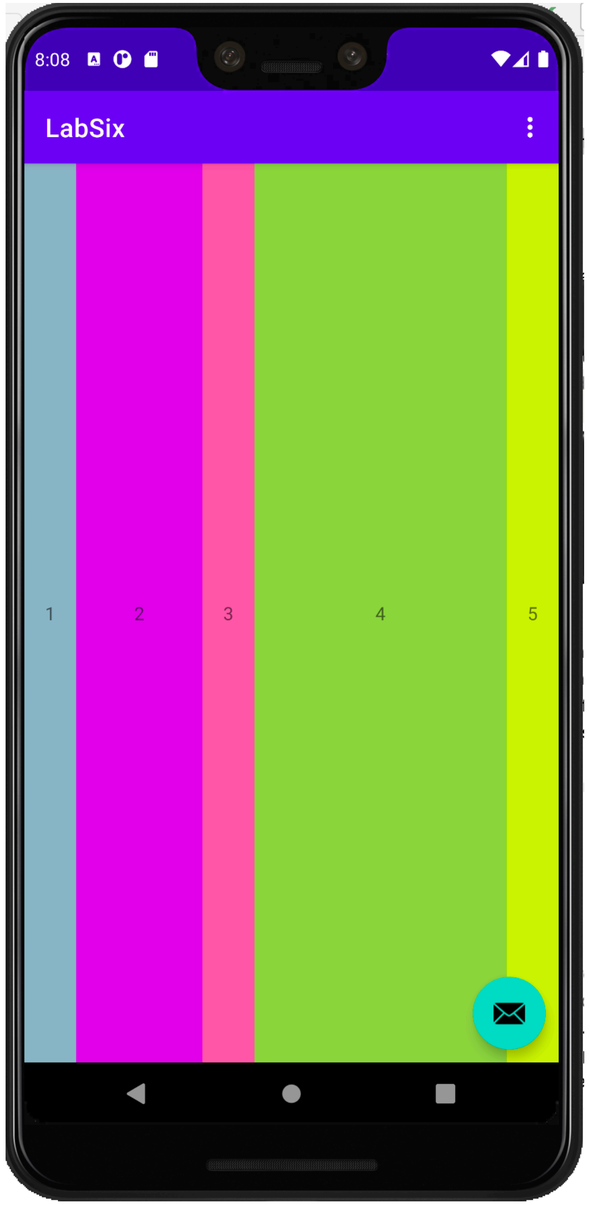
```
public void doHorizontal(LinearLayout ll, int numComponents) {
    ll.setOrientation(LinearLayout.HORIZONTAL);
    float density = getResources().getDisplayMetrics().density;
    for (int i = 1; i <= numComponents; i++) {
        TextView v = new TextView(getContext());
        v.setBackgroundColor(randomColor());
        v.setText("" + i);
        v.setGravity(Gravity.CENTER);
        v.setId(View.generateViewId());
        LinearLayout.LayoutParams lp;
        if (i%2==0)
            lp = new LinearLayout.LayoutParams(0, ViewGroup.LayoutParams.MATCH_PARENT, i);
        else
            lp = new LinearLayout.LayoutParams((int)(40*density), ViewGroup.LayoutParams.MATCH_PARENT, 0);
        ll.addView(v, lp);
    }

}
```

Set R2L or T2B. Here L2R

Since L2R, and using weights to determine widths, need to set width to 0, and height to MATCH_PARENT.

What would this look like if WRAP_CONTENT rather than MATCH_PARENT?

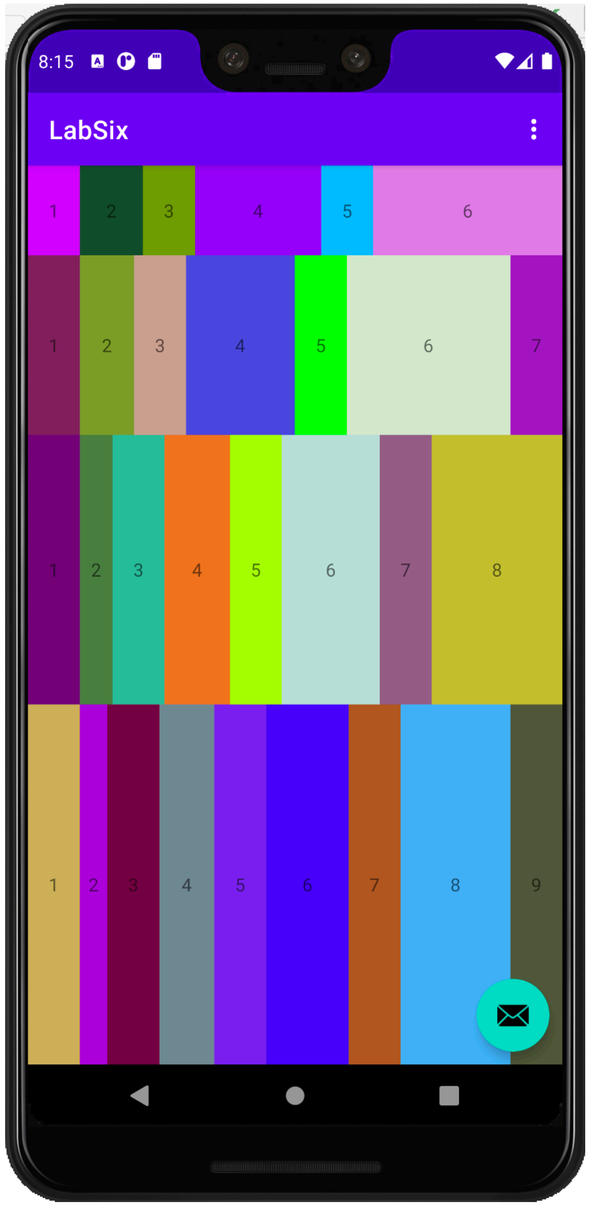


Getting Really Ugly

Use both Horizontal and Vertical layouts

```
public void doVandH(LinearLayout ll, int rowws) {
    ll.setOrientation(LinearLayout.VERTICAL);
    for (int i=1; i<rowws+1; i++) {
        LinearLayout hll = new LinearLayout(getContext());
        ll.addView(hll, new LinearLayout.LayoutParams(ViewGroup.LayoutParams.MATCH_PARENT, 0, i));
        doHorizontal(hll, 5+i);
    }
}
```

- Another interface design not practical to write in XML
- But should this ever be used?
  - Probably not.



Doing everything in Code

- Why Not?
  - can slow development as you have to restart process and navigate to screen
  - can make for difficult to read code
  - difficult to hand off to a someone who expects XML layouts
- But
  - some interfaces cannot easily be rendered in XML
  - In small shops you only have to learn one thing
  - dynamic / user-defined interfaces pretty much require it.

From LabSix base to all code

- Everything in the fragments we have already discussed.
- FloatingActionButton is in Main Activity .. discussed how to do that .. mostly
- So
  - Initialize
  - Add Toolbar

```
public static int MAIN_ACTIVITY_ID = 22346;
public static int MAIN_ACTIVITY_TOOLBAR = 22347;

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    RelativeLayout vv = new RelativeLayout(this);
    vv.setId(MAIN_ACTIVITY_ID);
    vv.setLayoutParams(new
ViewGroup.LayoutParams(getResources().getDisplayMetrics().widthPixels,
getResources().getDisplayMetrics().heightPixels));
    setContentView(vv);

    TypedValue tv = new TypedValue();
    int actionBarHeight=40;
    if (this.getTheme().resolveAttribute(android.R.attr.actionBarSize, tv,
true)) {
        actionBarHeight = TypedValue.complexToDimensionPixelSize(tv.data,
getResources().getDisplayMetrics());
    }
    Toolbar toolbar = new Toolbar(this);
    toolbar.setId(MAIN_ACTIVITY_TOOLBAR);
    ViewGroup.LayoutParams layoutParams = new ViewGroup.LayoutParams(
            LinearLayout.LayoutParams.MATCH_PARENT, actionBarHeight);
    toolbar.setLayoutParams(layoutParams);
    toolbar.setBackgroundColor(ContextCompat.getColor(this,
R.color.purple_200));

    toolbar.setTitle(R.string.app_name+"!!!");
    toolbar.setVisibility(View.VISIBLE);

    vv.addView(toolbar, 0);
    setSupportActionBar(toolbar);
```

Use XML in values directory. Could even get rid of this by defining a “constants” class

All Code

- Navigation
- Handling the Android Back Button
- Items in the action bar

```
FragmentManager fragmentManager = this.getSupportFragmentManager();
FragmentTransaction transaction = fragmentManager.beginTransaction();
transaction.replace(MAIN_ACTIVITY_ID, new RelativeFragment(), null);
transaction.addToBackStack(null);
transaction.commit();
int tt = fragmentManager.getBackStackEntryCount();
for(int i = 0; i < tt; ++i) {
    fragmentManager.popBackStack();
}
```

```
public void onBackPressed() {
    FragmentManager fragmentManager = this.getSupportFragmentManager();
    int tt = fragmentManager.getBackStackEntryCount();
    Log.i("THISs", "Back stack " + tt);
    if (tt>1)
        super.onBackPressed();
}
```

```
public boolean onCreateOptionsMenu(Menu menu){

    MenuItem edit_item = menu.add(0, 1, 1, "Hello");
    edit_item.setShowAsActionFlags(MenuItem.SHOW_AS_ACTION_ALWAYS);

    MenuItem delete_item = menu.add(0, 2, 2, "Geoff");
    delete_item.setShowAsActionFlags(MenuItem.SHOW_AS_ACTION_ALWAYS);

    return super.onCreateOptionsMenu(menu);
}
```