

ANDROID USER INTERFACE ELEMENTS & LAYOUTS

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Introduction of Material Design

- **Material Design Components (MDC Android)** help developers create apps with a **modern, clean, and consistent look**.
- Developed by **Google**, it ensures apps are **visually appealing, smoothly animated**, and **easy to use**.
- Used widely to give Android apps a **polished and professional** appearance.
- Provides **ready-made UI elements** (buttons, cards, toolbars, etc.) for faster and uniform design.

Material Design Principles include:

- **Colors and Theming** (Choosing the right colors and styles for your app)
- **Typography** (Selecting appropriate fonts)
- **Material Design Components** (Using pre-built elements like buttons, cards, etc.)
- **Shaping Material Design Components** (Customizing the look of these components to match your app's design)

1. Colors and Theming

COLORS IN MATERIAL DESIGN

1 Primary Color

The main color used most frequently in the app.

- Appears on important buttons (Save, Submit), navigation bars, and ripple effects
- Defines the app's overall look and feel

2 Secondary Color

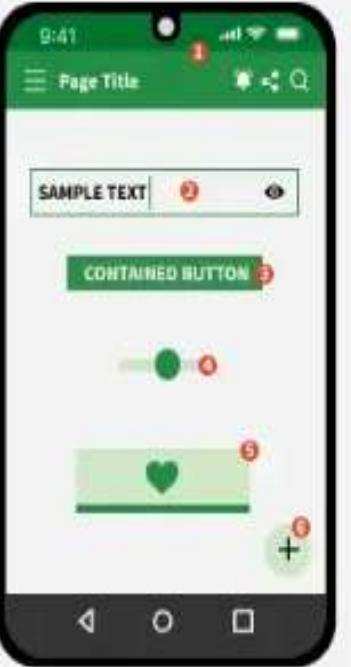
Used for less prominent elements.

- Commonly applied to Floating Action Buttons (FABs), sliders, toggle buttons, and progress bars
- Adds a highlight effect without distraction

3 Light & Dark Variants

Light variant: Used for FABs, borders, and backgrounds

Dark variant: Used in status bars and navigation bars



The image shows a smartphone screen with a white background. At the top, there is a green header bar with the text "Page Title". Below the header, there is a white input field containing the text "SAMPLE TEXT". To the right of the input field are two small red circular icons. Below the input field is a green button labeled "CONTAINED BUTTON". Underneath the button is a switch control with a green slider and a red track. Further down is a tab bar with a green tab selected, featuring a heart icon. To the right of the tab bar is a floating action button with a green plus sign. On the far left of the screen, there are three navigation icons: a triangle pointing left, a circle, and a square.

- ① The status bar is set for dark variant of primary color
- ② The elements of edit text are set for primary color
- ③ The background color for Contained button is set for primary color
- ④ The switch button is set for primary color and the background of the switch is set for light variant of primary color
- ⑤ In tab opened button the icon is set for primary color, and the background is set for light variant of primary color
- ⑥ The background color of the Floating action button is set for light variant of primary color.

UI & UX

❖ User Interface (UI)

- It is defined in an XML File.
- Visual design of the app.
- Layouts: LinearLayout, ConstraintLayout, etc.
- Widgets: Button, TextView, EditText.
- Colors, Fonts, Icons, Themes.
- Animation & Transitions.

❖ User Experience (UX)

- How the app feels to the user.
- Easy navigation & logical flow.
- Responsiveness & feedback.
- Accessibility & Consistency.
- Improves user satisfaction.

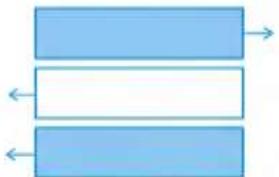
❖ Relationship Between UI & UX

UI = LOOKS , UX = FEEL
GOOD UI + GOOD UX =*SUCCESSFUL APP*

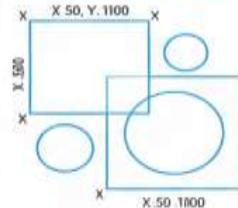
LAYOUTS

- Layouts define how UI elements are arranged on the screen.
- They control position, size & alignment of components.

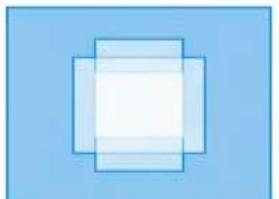
TYPES OF LAYOUTS



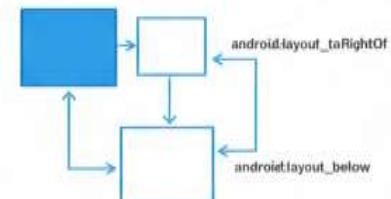
LINEAR LAYOUT



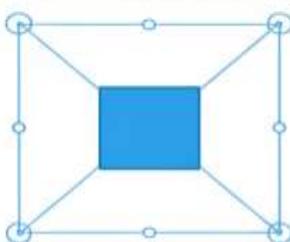
ABSOLUTE LAYOUT



FRAME LAYOUT



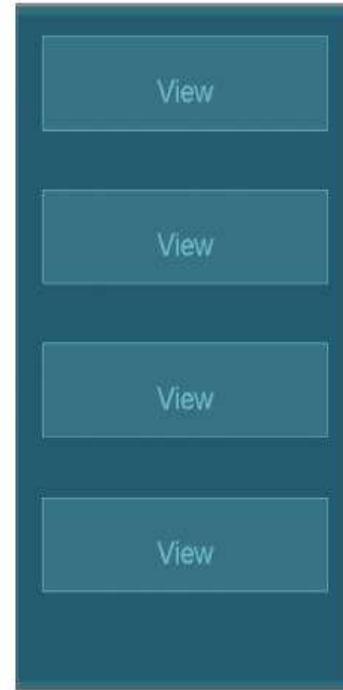
RELATIVE LAYOUT



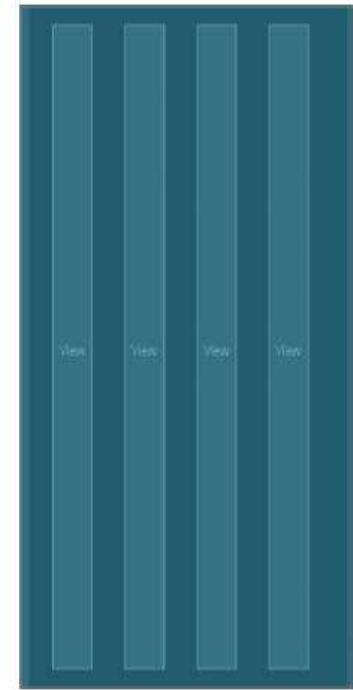
CONSTRAINT LAYOUT

1. Linear Layout

- Arrange views in a single direction
 - Vertical : single column of views
 - Horizontal : single row of views
- It Supports weight attribute to control relative size of views.
- It is best for simple layouts with few elements.
- Avoid excessive nesting to prevent performance issues.



android:orientation="vertical"



android:orientation="horizontal"

EXAMPLE:

```
<LinearLayout  
    xmlns:android="http://schemas.android.com/apk/res/android"  
        android:layout_width="match_parent"  
        android:layout_height="match_parent"  
        android:orientation="horizontal"  
        android:padding="16dp"  
        android:background="@android:color/white">  
  
<View  
    android:layout_width="0dp"  
    android:layout_height="match_parent"  
    android:layout_weight="1"  
    android:background="#A5D6A7"/>
```

<View

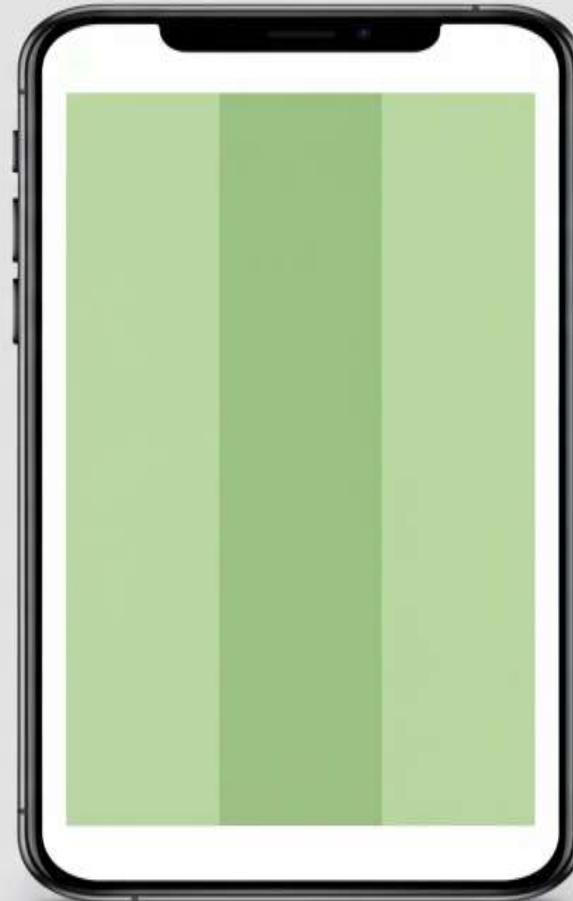
```
    android:layout_width="0dp"  
    android:layout_height="match_parent"  
    android:layout_weight="1"  
    android:background="#81C784"/>
```

<View

```
    android:layout_width="0dp"  
    android:layout_height="match_parent"  
    android:layout_weight="1"  
    android:background="#A5D6A7"/>
```

</LinearLayout>

OUTPUT:

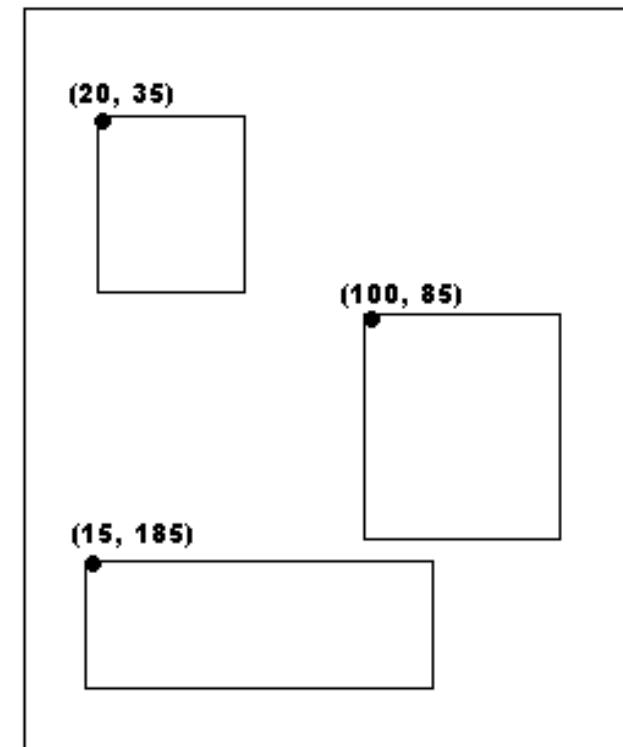


LINEAR LAYOUT

2. ABSOLUTE LAYOUT

- Positions views using **exact X and Y coordinates** on the screen.
- Provides full control over where each view appears.
- Not recommended for different screen sizes (poor responsiveness.)
- Best for simple , fixed layouts with few elements.

Absolute Layout



- **EXAMPLE:**

```
<?xml version="1.0" encoding="utf-8"?>
<AbsoluteLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent">
    <View android:layout_width="100dp"
        android:layout_height="80dp"
        android:layout_x="20dp"
        android:layout_y="30dp"
        android:background="#FF5722" />
```

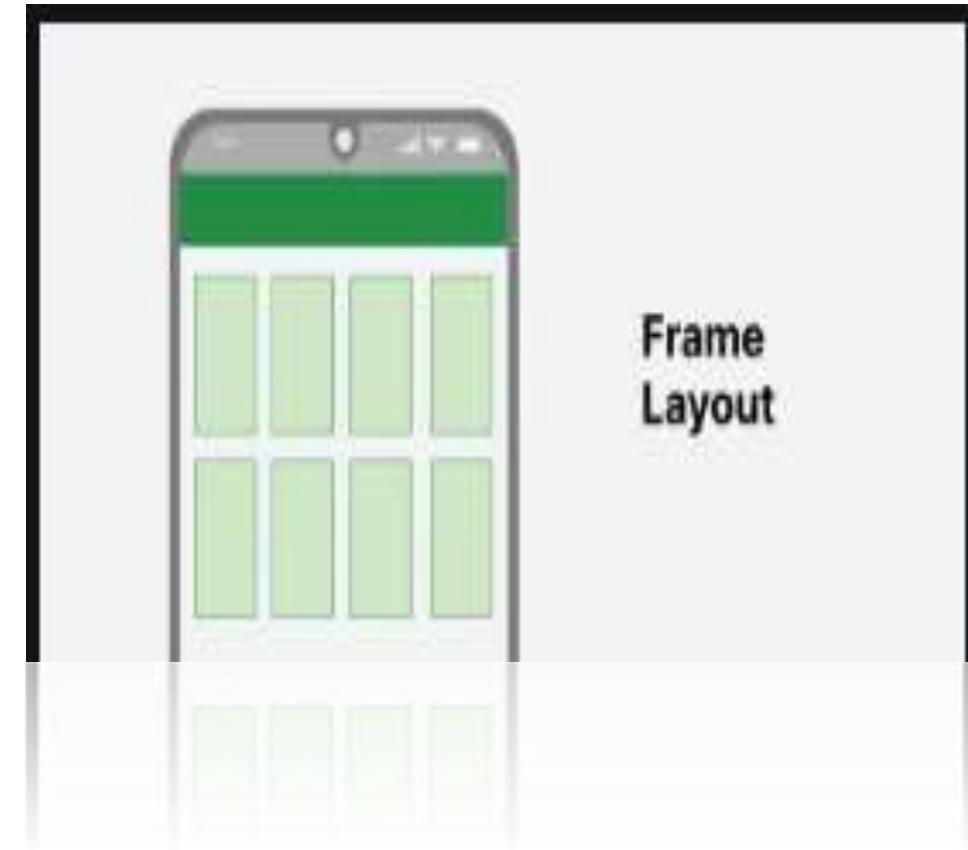
```
<View android:layout_width="120dp"
    android:layout_height="100dp"
    android:layout_x="80dp"
    android:layout_y="100dp"
    android:background="#2196F3" />
    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_x="150dp"
        android:layout_y="50dp"
        android:text="Absolute Text"
        android:textColor="#FFFFFF"
        android:textSize="18sp"
        android:background="#4CAF50"
        android:padding="8dp"/>
    </AbsoluteLayout>
```

OUTPUT:



3. FRAME LAYOUT

- A simple layout designed to hold **one child view**.
- Multiple views can be **stacked on top of each other**.
- Commonly used for **overlays, fragments, and image views**.
- Ideal for **simple UI components** where layering is required.



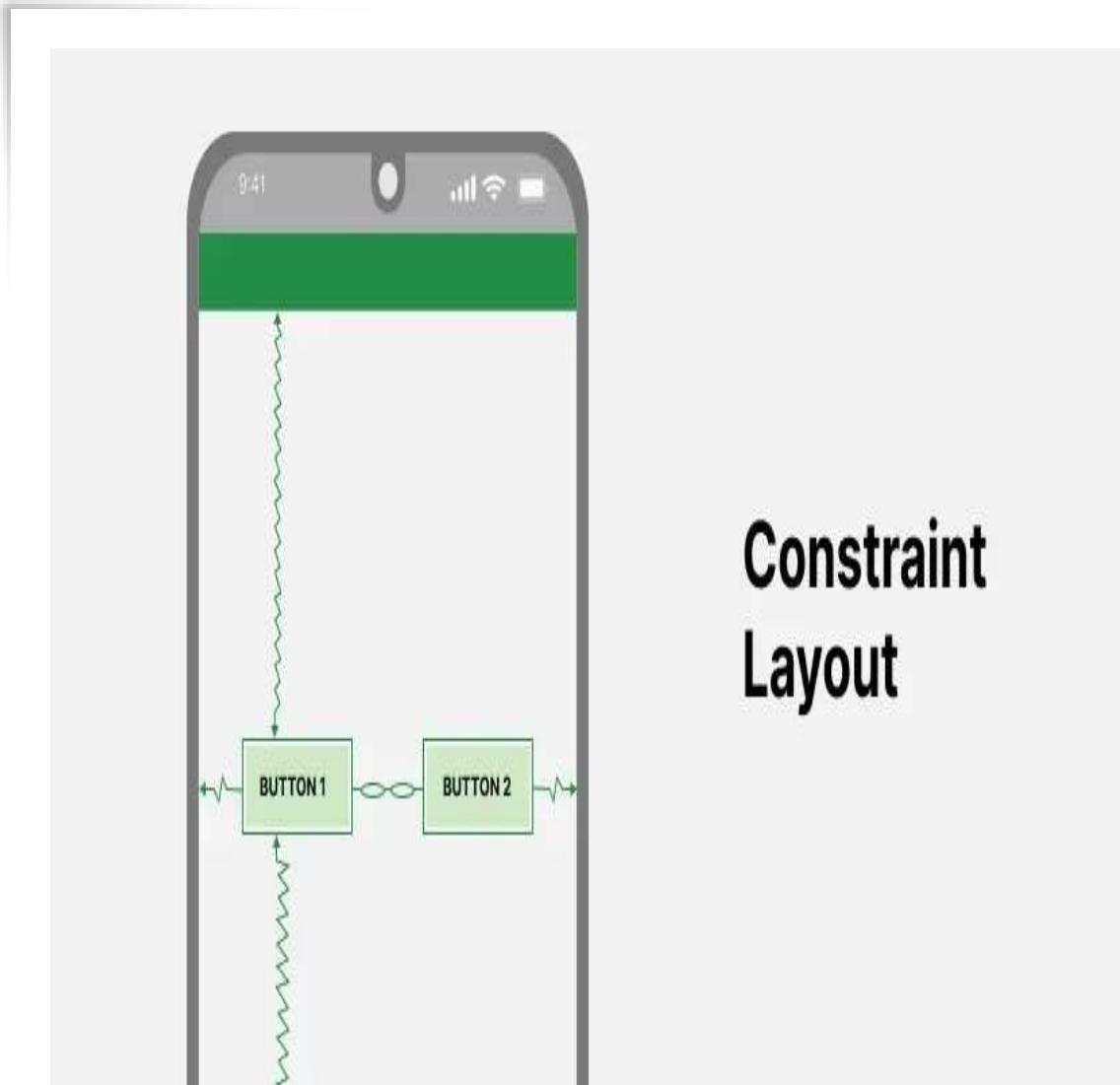
4. RELATIVE LAYOUT

- It Arranges **child views relative to each other or the parent.**
- It Views can be positioned **above, below, to the left, or right** of other views.
- It Useful for **flexible and dynamic UI designs.**
- It Allows **precise control over view placement** without nesting multiple layouts.



5.CONSTRAINT LAYOUT

- It is Flexible layout for Android UI design.
- Positions views using **constraints**, not nested layouts.
- It Reduces **view hierarchy**, improving performance.
- It Supports **complex and responsive designs**.
- It is most **recommended layout** for modern applications.



DYNAMIC IMPLEMENTATION OF LAYOUT

- UI created or modified **programmatically at runtime**.
- Flexible; can change based on user input, data, or events.
- Requires more code and logic to implement.
- Can be slightly heavier if many views are added dynamically.
- Dynamic content like lists, forms, or user-driven UI.

EXAMPLE:

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
    xmlns:android="http://schemas.android.com/apk
    /res/android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:padding="16dp"
    android:background="@android:color/white"
    tools:context=".MainActivity">

    <TextView android:id="@+id/tv_dynamic_center"
        android:layout_width="120dp"
        android:layout_height="80dp"
        android:layout_centerInParent="true"
        android:background="#66BB6A"
        android:text="DYNAMIC"
        android:textColor="#FFFFFF"
        android:textSize="18sp" android:textStyle="bold"
        android:gravity="center" />
```

```
<TextView android:id="@+id/tv_left"
    android:layout_width="80dp" android:layout_height="80dp"
    android:layout_toStartOf="@+id/tv_dynamic_center"
    android:layout_centerVertical="true"
    android:layout_marginEnd="10dp"
    android:background="#9CCC65" android:text="LEFT"
    android:textColor="#FFFFFF" android:textSize="16sp"
    android:textStyle="bold" android:gravity="center" />

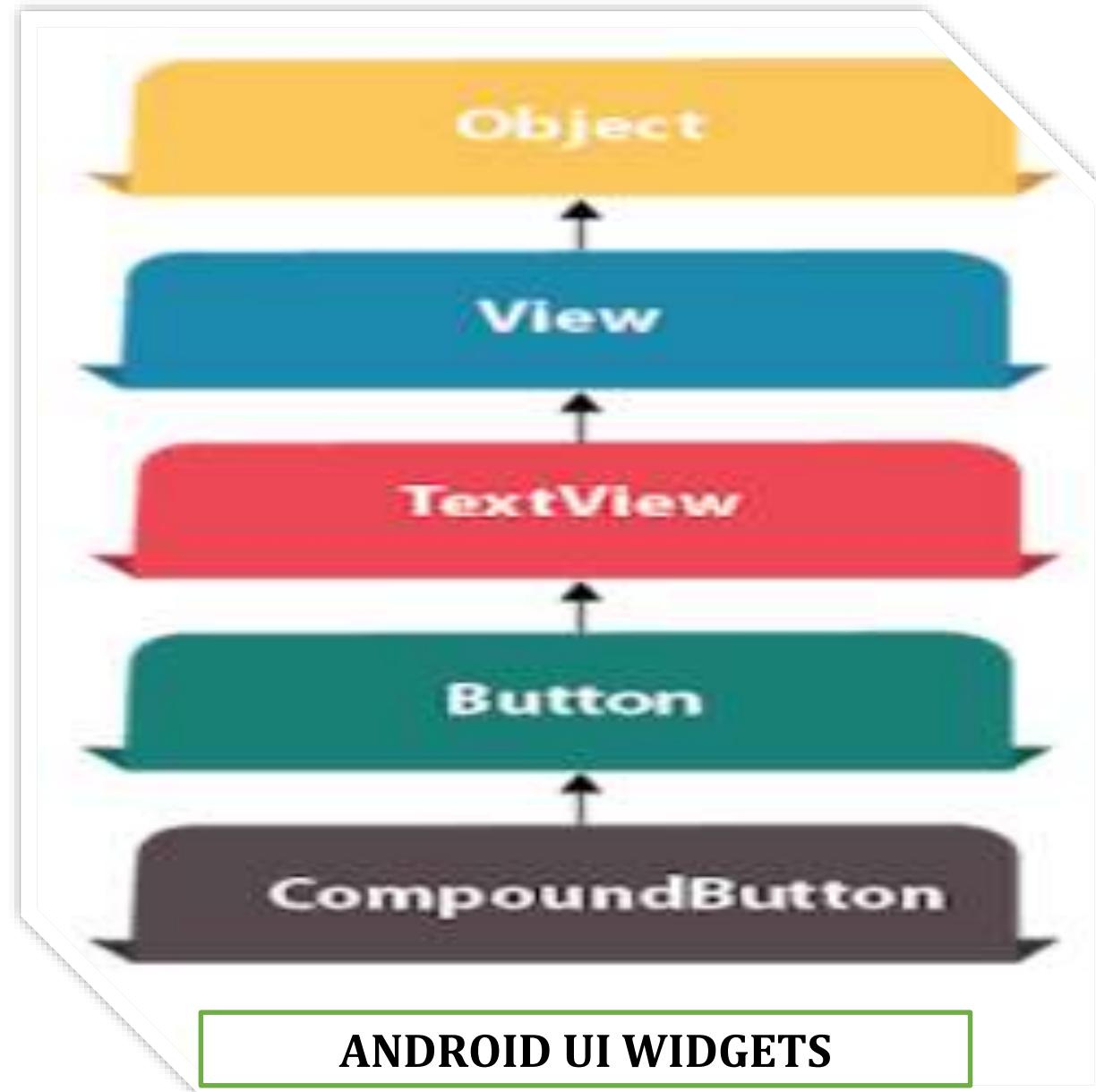
    <TextView android:id="@+id/tv_right"
        android:layout_width="80dp" android:layout_height="80dp"
        android:layout_toEndOf="@+id/tv_dynamic_center"
        android:layout_centerVertical="true"
        android:layout_marginStart="10dp"
        android:background="#9CCC65" android:text="RIGHT"
        android:textColor="#FFFFFF" android:textSize="16sp"
        android:textStyle="bold" android:gravity="center" />

    <TextView android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@+id/tv_dynamic_center"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="60dp" android:text="Relative Layout
Example" android:textColor="#388E3C" android:textSize="22sp"
        android:textStyle="bold" />
</RelativeLayout>
```

OUTPUT:



UI WIDGETS WITH PROPERTIES



UI Widgets & Properties in Android

UI Widget	Purpose	Key Properties
TextView	Displays text	text, textSize, textColor, gravity, fontFamily
EditText	User input	hint, inputType, textColor, maxLength
Button	Triggers actions	text, background, onClick, enabled
ImageView	Displays images	src, scaleType, contentDescription
CheckBox	Select/deselect options	checked, text, onCheckedChangeListener
RadioButton	Single choice selection	checked, text, onClick
Switch	Toggle ON/OFF	checked, textOn, textOff, onCheckedChangeListener
Spinner	Dropdown selection	entries, onItemSelectedListener, prompt
ProgressBar	Shows loading/progress	max, progress, indeterminate, visibility
SeekBar	Sliding selection	max, progress, onSeekBarChangeListener

Android Events & Methods

- Events are actions triggered by **user interactions** or **system changes** in an app.
- Methods are **functions that handle these events**, like clicks, touches, or text changes.
- Common events include **Click, Touch, Long Click, Key, Focus, Text Change, Item Selection, and Lifecycle events**.
- Handling events properly ensures a **responsive and interactive Android app UI**.

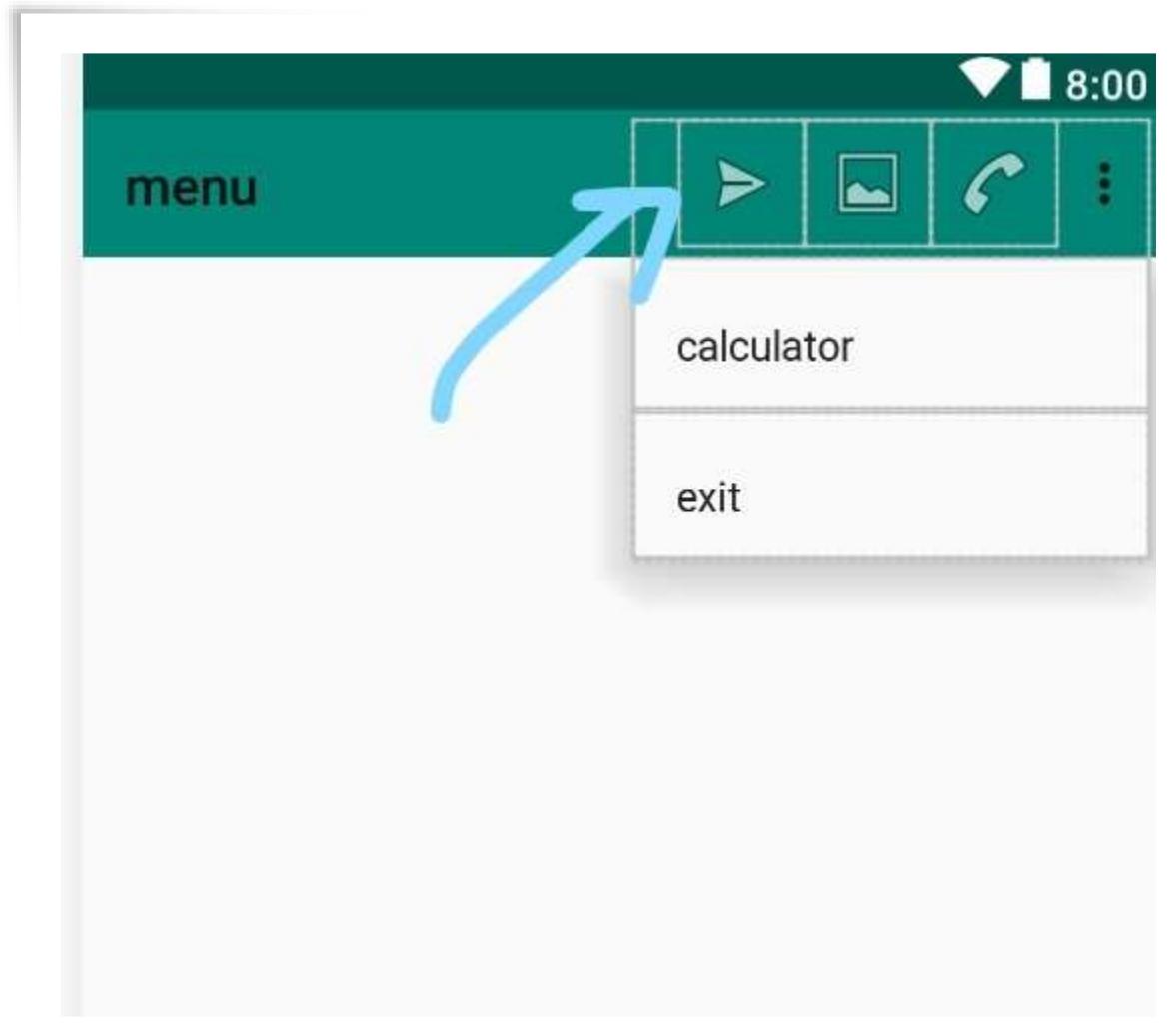
Event Type	Description	Key Methods
Click Events	Triggered when a user taps a view (e.g., Button)	<code>setOnClickListener()</code>
Touch Events	Triggered on touch interactions	<code>onTouch(), MotionEvent (ACTION_DOWN, ACTION_UP)</code>
Long Click Events	Triggered on long press	<code>setOnLongClickListener()</code>
Key Events	Triggered when hardware keys are pressed	<code>onKeyDown(), onKeyDown()</code>
Focus Events	Triggered when a view gains or loses focus	<code>onFocusChange(), setOnFocusChangeListener()</code>
Text Change Events	Triggered when text in EditText changes	<code>addTextChangedListener()</code>
Item Selection Events	Triggered for ListView, Spinner, or RecyclerView item selection	<code>setOnItemSelectedListener(), setOnItemClickListener()</code>
Lifecycle Events	Triggered during Activity/Fragment lifecycle changes	<code>onCreate(), onStart(), onResume(), onPause(), onStop(), onDestroy()</code>

Dialog Boxes in Android

- Dialog boxes are **small windows** that prompt the user to make decisions or enter information without leaving the current activity.
- Used for **alerts, confirmations, inputs, or choices**.
- **Common Types:**
- **AlertDialog:** Shows alerts with buttons (OK, Cancel).
- **ProgressDialog:** Displays progress while a task is running. (*Deprecated in newer APIs*)
- **Custom Dialog:** Fully customizable layout for specific needs.
- **Key Methods :** show(), dismiss(), setMessage(), setTitle()

Menus: Option and Context

- Android Option Menus are the primary menus of android. They can be used for settings, search, delete item etc.
- To inflating the menu by calling the inflate() method of MenuInflater class.
- To perform event handling on menu items, you need to override onOptionsItemSelected() method of Activity class.



Android Context Menu

- Android context menu appears when user press long click on the element.
- It is also known as floating menu.
- It affects the selected content while doing action on it.
- It doesn't support item shortcuts and icons.

