Units & measurements

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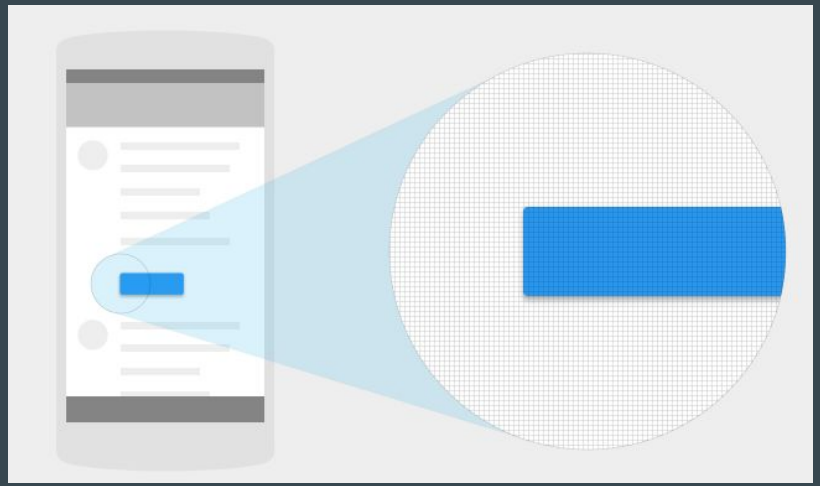
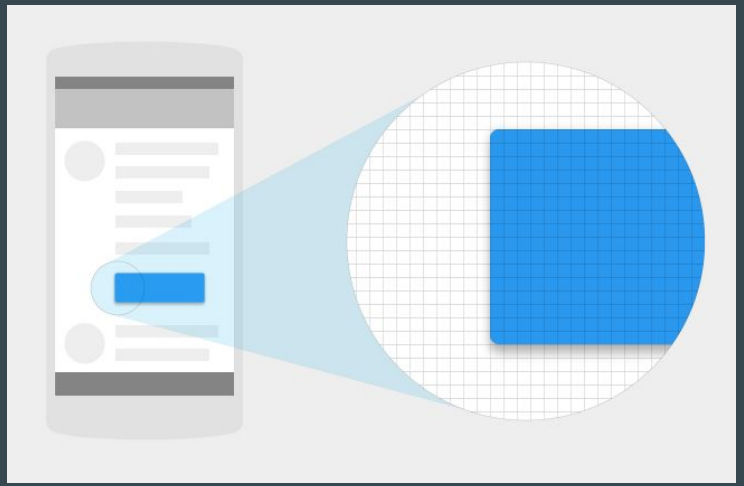
Android

Pixel Density

- The number of pixels that fit into an inch is referred to as “pixel density.”
- High-density screens have more pixels per inch than low-density ones.
- Screen resolution refers to the total number pixels in a display.
- screen density = screen width (or height) in pixels / screen width (or height) in inches

High-Density vs Low-Density

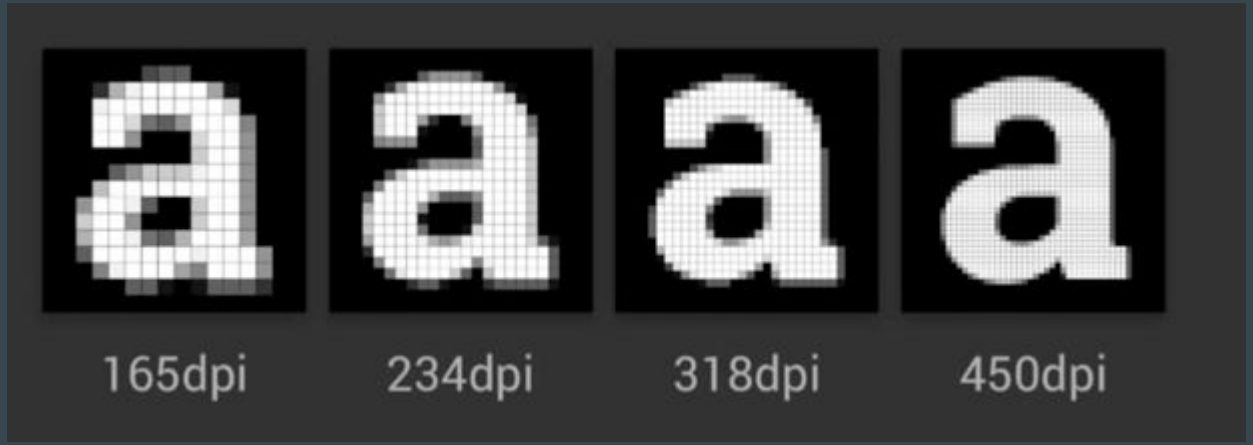




UI elements (such as a button) appear physically larger on low-density screens and smaller on high-density screens.

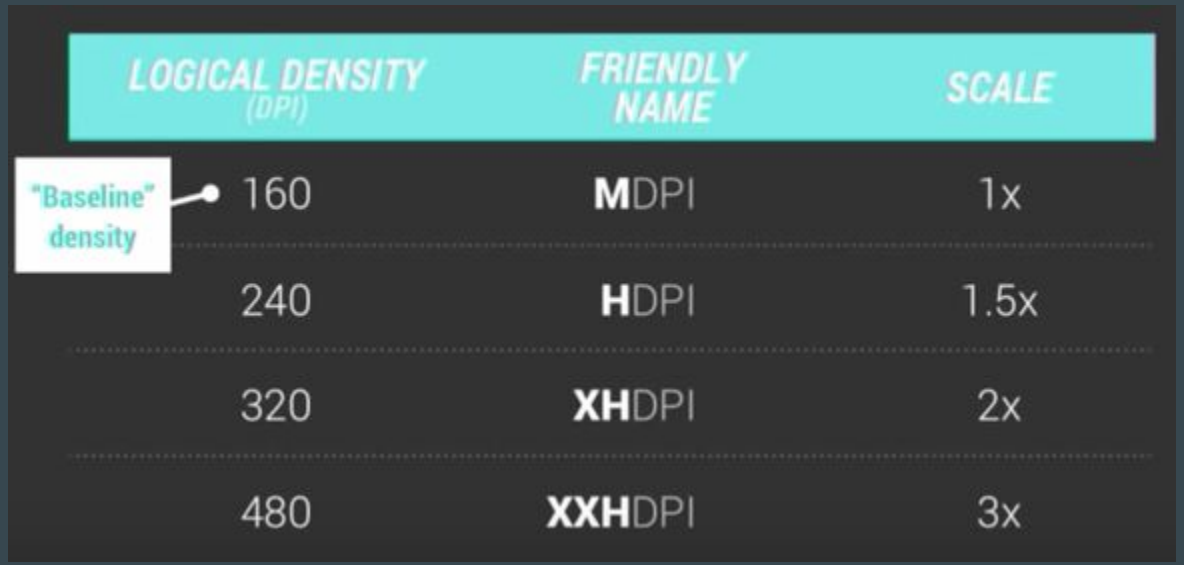
Dots-per-inch (dpi)

Android device screens have different *pixel densities*, measured in *dots-per-inch (dpi)*



Logical pixel densities

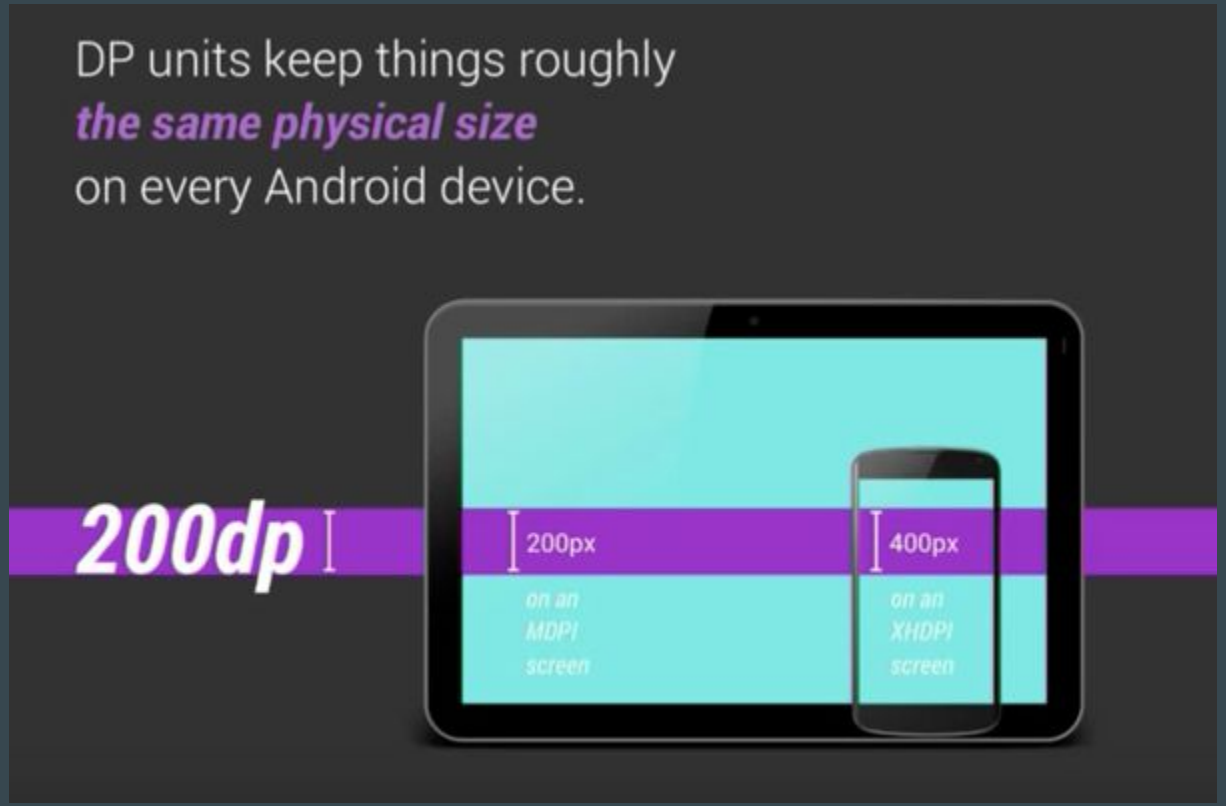
To simplify things, device screens are grouped into buckets known as *logical pixel densities*.



Density-independent pixels

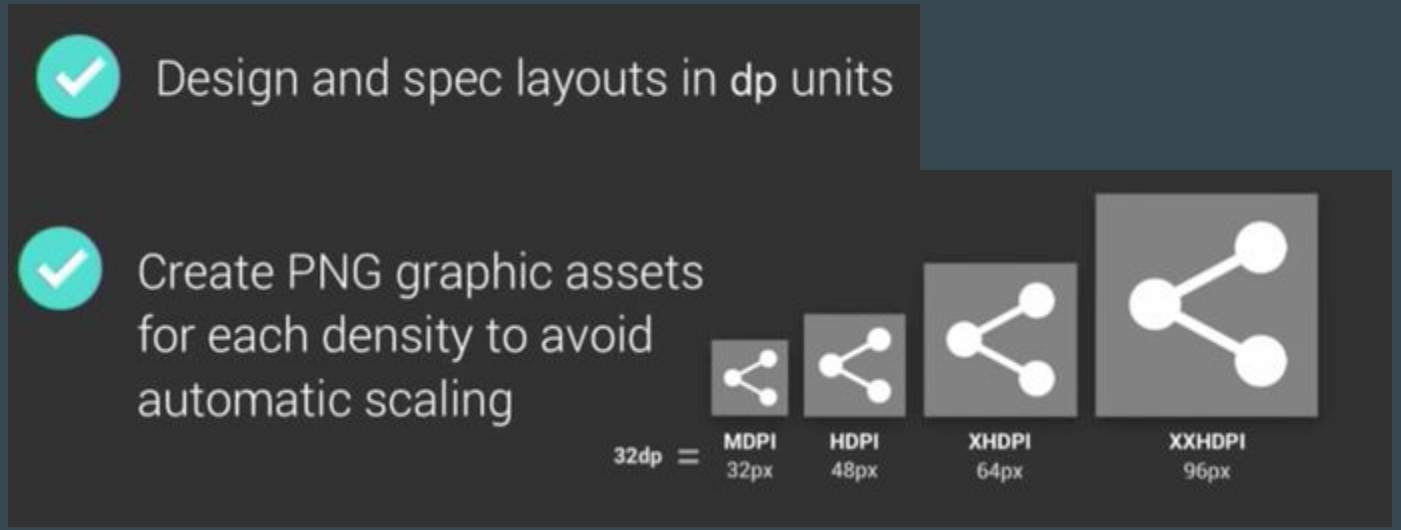
Density-independent pixels (abbreviated `dp` or `dip`) are a virtual pixel unit, **equivalent to one physical pixel on a 160dpi (MDPI) screen**, and scaled proportionally on higher or lower density screens.

dp


DP units keep things roughly
the same physical size
on every Android device.
200dp
200px
on an
MDPI
screen
400px
on an
XHDPI
screen

Tips: Using dp for human interaction widgets

Tips


Design and spec layouts in dp units
Create PNG graphic assets for each density to avoid automatic scaling
32dp =
MDPI
32px
HDPI
48px
XHDPI
64px
XXHDPI
96px

Scalable pixels (sp) - FONT!

When developing for Android scaleable pixels(sp) serve the same function as dp, but for fonts. The default value of an sp is the same as the default value for dp.

The primary difference between an sp and a dp is that sp preserves a user's font settings. Users who have larger text settings for accessibility will see the font size matched to their text size preferences.

Image Scaling

Images can be scaled to look the same across different screen resolution by using these ratio.

Screen resolution	dpi	Pixel ratio	Image size (pixels)
xxxhdpi	640	4.0	400 x 400
xxhdpi	480	3.0	300 x 300
xhdpi	320	2.0	200 x 200
hdpi	240	1.5	150 x 150
mdpi	160	1.0	100 x 100