Phi variations

The Greek letter Phi is used throughout Greece, maths, physics, and computing.

The three main versions used in Unicode are:

- 03D5: ϕ
- 03C6: φ
- 0278: ɸ

Every font has its own designs for these three glyphs. The designs above are shown in Pluto's default font, Alegreya.

But in fact there are about 20 different versions of the phi character in the Unicode tables, and every font chooses which designs to show for each one. If you run this code you'll see the versions for the current font.

Remember, though, that font fallbacks are used: ie, if the current font doesn't have a glyph for a character, then other fonts are searched until a suitable glyph is found.

15 rows × 5 columns

	udec	uhex	glyph	lx	desc
	Int64	String	String	String	String
1	632	278	ɸ	\\ltphi	Latin Small Letter Phi
2	966	3c6	φ	\\varphi	Greek Small Letter Phi
3	981	3d5	ϕ	\\phi	Greek Phi Symbol / Greek Small Letter Script Phi
4	7520	1d60	ᵠ	\\^phi	Modifier Letter Small Greek Phi
5	7529	1d69	ᵩ	_phi	Greek Subscript Small Letter Phi
6	120535	1d6d7	𝛗	\\bfvarphi	Mathematical Bold Small Phi
7	120543	1d6df	𝛟	\\bfphi	Mathematical Bold Phi Symbol
8	120593	1d711	𝜑	\\itphi	Mathematical Italic Small Phi
9	120601	1d719	𝜙	\\itvarphi	Mathematical Italic Phi Symbol
10	120651	1d74b	𝝋	\\biphi	Mathematical Bold Italic Small Phi
11	120659	1d753	𝝓	\\bivarphi	Mathematical Bold Italic Phi Symbol
12	120709	1d785	𝞍	\\bsansphi	Mathematical Sans-Serif Bold Small

					Phi
13	120717	1d78d	𝛟	\\bsansvarphi	Mathematical Sans-Serif Bold Phi Symbol
14	120767	1d7bf	𝝋	\\bisansphi	Mathematical Sans-Serif Bold Italic Small Phi
15	120775	1d7c7	𝝓	\\bisansvarphi	Mathematical Sans-Serif Bold Italic Phi Symbol

```
begin
    using DataFrames

    df = DataFrame(udec=Int64[], uhex=String[], glyph=String[], lx=String[], desc=String[])

    for i in (
        [0x00278, "ɸ", "\\ltphi", "Latin Small Letter Phi"] ,
        [0x003C6, "φ", "\\varphi", "Greek Small Letter Phi"] ,
        [0x003D5, "ϕ", "\\phi", "Greek Phi Symbol / Greek Small Letter Script Phi"] ,
        [0x01D60, "ᵠ", "\\^phi", "Modifier Letter Small Greek Phi"] ,
        [0x01D69, "ᵩ", "\\_phi", "Greek Subscript Small Letter Phi"] ,
        [0x1D6D7, "𝛗", "\\bfvarphi", "Mathematical Bold Small Phi"] ,
        [0x1D6DF, "𝛟", "\\bfphi", "Mathematical Bold Phi Symbol"] ,
        [0x1D711, "𝜑", "\\itphi", "Mathematical Italic Small Phi"] ,
        [0x1D719, "𝜙", "\\itvarphi", "Mathematical Italic Phi Symbol"] ,
        [0x1D74B, "𝝋", "\\biphi", "Mathematical Bold Italic Small Phi"] ,
        [0x1D753, "𝝓", "\\bivarphi", "Mathematical Bold Italic Phi Symbol"] ,
        [0x1D785, "𝞅", "\\bsansphi", "Mathematical Sans-Serif Bold Small Phi"] ,
        [0x1D78D, "𝞍", "\\bsansvarphi", "Mathematical Sans-Serif Bold Phi Symbol"] ,
        [0x1D7BF, "𝞿", "\\bisansphi", "Mathematical Sans-Serif Bold Italic Small Phi"] ,
        [0x1D7C7, "𝟇", "\\bisansvarphi", "Mathematical Sans-Serif Bold Italic Phi Symbol"])
        push!(df, (i[1], string(i[1], base=16), string(Char(i[1])), i[3], i[4]))
    end
    df
end
```

In Julia, the Golden Ratio Phi, 1.618... is available as the constant `MathConstants.golden`. It's known as the `varphi` version of phi, and you can type it in the REPL with the LATEX completion `\\varphi`. The Unicode character code of this is `03c6`, φ

```
φ = 1.6180339887498...
```

```
MathConstants.golden
```

Phi and varphi

This \varphi (03C6: φ) version of Phi is called "the loopy" version in the Unicode documentation:

> For mathematical and technical use, the straight form φ of the small phi is an important

> symbol (TEX `\phi` U+03D5) and needs to be consistently distinguishable from the loopy form (TEX `\varphi` U+03C6). The straight form phi glyph 03D5 φ is used as the representative glyph for the phi symbol at U+03D5 to satisfy this distinction.
>
> … U+03C6 … should be reserved for codes or entities that represent the small phi as used in ordinary Greek text.
>
> (http://unicode.org/reports/tr25/)

Most fonts draw the loopy Phi glyph using a loop, but a few fonts don't make the distinction.

Font variations

Let's draw these symbols using some different fonts.

U+03D5 ϕ	U+0278 ɸ	U+03C6 φ	
□	□	φ	Anonymous Pro
□	□	ϕ	CascadiaCode-Regu
φ	ϕ	ϕ	Consolas
ϕ	ɸ	φ	Courier New
☒	☒	☒	CourierPrime-Regu
ϕ	ϕ	φ	Cousine-Regular
ϕ	ɸ	φ	DejaVuSansMono
		φ	EnvyCodeR
ϕ	ɸ	φ	EversonMono
ϕ	?	φ	FiraCode-Regular
□	□	φ	GoMono
□	□	φ	Hack-Regular
□	ϕ	ϕ	Helvetica
□	□	φ	InputMono
ϕ	ɸ	φ	JuliaMono
□	□	ϕ	LucidaConsole
φ	ϕ	ϕ	LucidaSansUnicode
ϕ	ɸ	φ	Menlo
□	ϕ	□	Monaco
□	□	□	OxygenMono-Regula
ϕ	ϕ	φ	Pragmata Pro
▯	▯	▯	RecMonoLinear-Reg
		ϕ	SFMono-Regular
☒	☒	☒	SourceCodePro-Reg
□	□	φ	Ubuntu Mono
□	□	φ	Victor Mono

```
begin
    using Luxor

    fontlist = [
            "Anonymous Pro",
            "CascadiaCode-Regular",
            "Consolas",
            "Courier New",
            "CourierPrime-Regular",
            "Cousine-Regular",
            "DejaVuSansMono",
            "EnvyCodeR",
            "EversonMono",

            "FiraCode-Regular",
            "GoMono",
            "Hack-Regular",
            "Helvetica",
            "InputMono",
            "JuliaMono",

            "LucidaConsole",
            "LucidaSansUnicode",
            "Menlo",
            "Monaco",
            "OxygenMono-Regular",
            "Pragmata Pro",
        "RecMonoLinear-Regular",
            "SFMono-Regular",

        "SourceCodePro-Regular",

            "Ubuntu Mono",
            "Victor Mono"]
    d = Drawing(1200, 1100, :svg)
    origin()
    fontsize(26)
    fontface("JuliaMono")
    table = Table(fill(1100/(1 + length(fontlist)), 1 + length(fontlist)),
fill(900/4, 4))
    text("U+03D5 $(string(Char(0x03D5)))", table[1, 1], halign=:left)
    text("U+0278 $(string(Char(0x0278)))", table[1, 2], halign=:left)
    text("U+03C6 $(string(Char(0x03C6)))", table[1, 3], halign=:left)
    for (i, f) in enumerate(fontlist)
        j = i + 1
        fontface(f)
        text(f, table[j, 4], halign=:left)
        text("$(string(Char(0x03D5)))", table[j, 1])
        text("$(string(Char(0x0278)))", table[j, 2])
        text("$(string(Char(0x03C6)))", table[j, 3])
    end
    finish()
    d
end
```

This version of the Consolas font has swapped the \phi and \varphi characters around. There are quite a few boxes and empty spaces here - Luxor/Cairo doesn't invoke the fallback mehanism that you see (but might not notice) in browsers and editors, so if the font doesn't have the character you'll see a box rather than a replacement from another font.