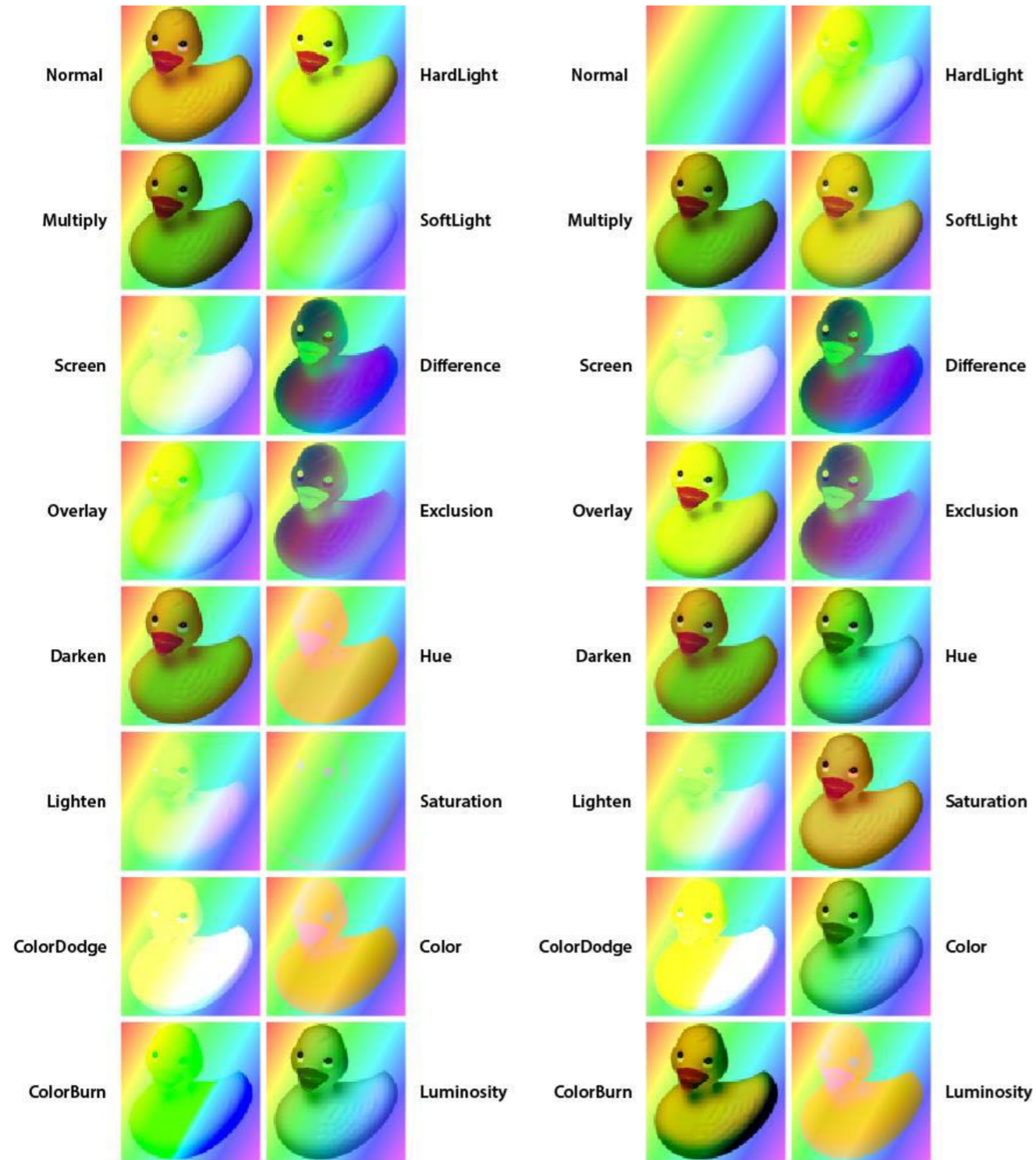


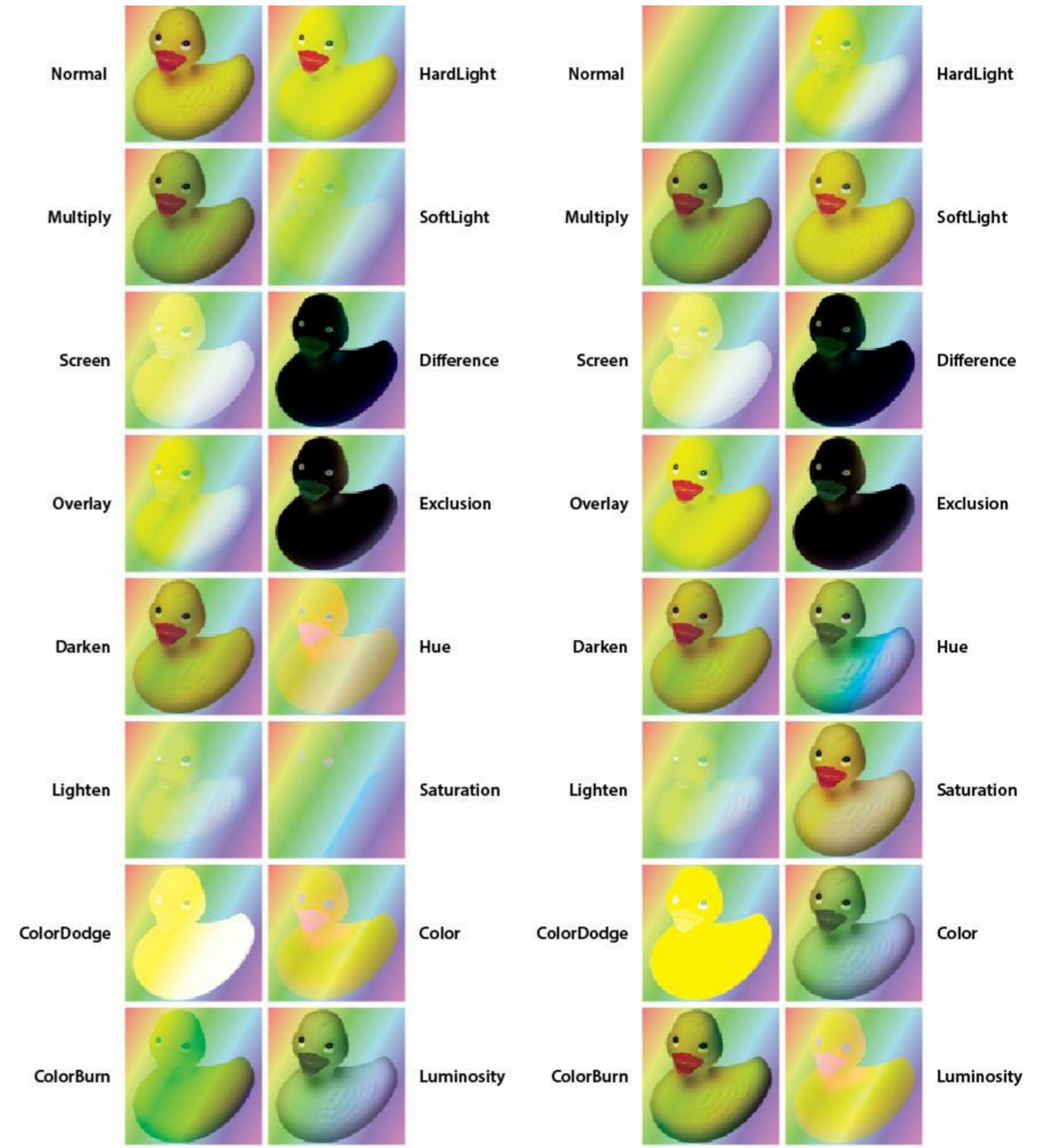
Blend Modes in RGB



Duck in foreground, rainbow in background

Rainbow in foreground, duck in background

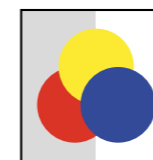
Blend Modes in CMYK



Duck in foreground, rainbow in background

Rainbow in foreground, duck in background

Separable Blend Modes (12)	Non-separable Blend Modes (4)
Normal (or Compatible, <i>deprecated in PDF 2.0</i>), Multiply, Screen, Overlay, Darken, Lighten, ColorDodge, ColorBurn, HardLight, SoftLight, Difference, Exclusion	Hue, Saturation, Color, Luminosity
Only Difference and Exclusion separable Blend Modes are not white-preserving and thus cannot be used for blending spot colors.	–



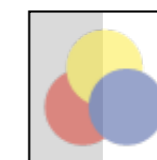
Ungrouped objects
Object opacity = 1.0



Ungrouped objects
Object opacity = 0.5

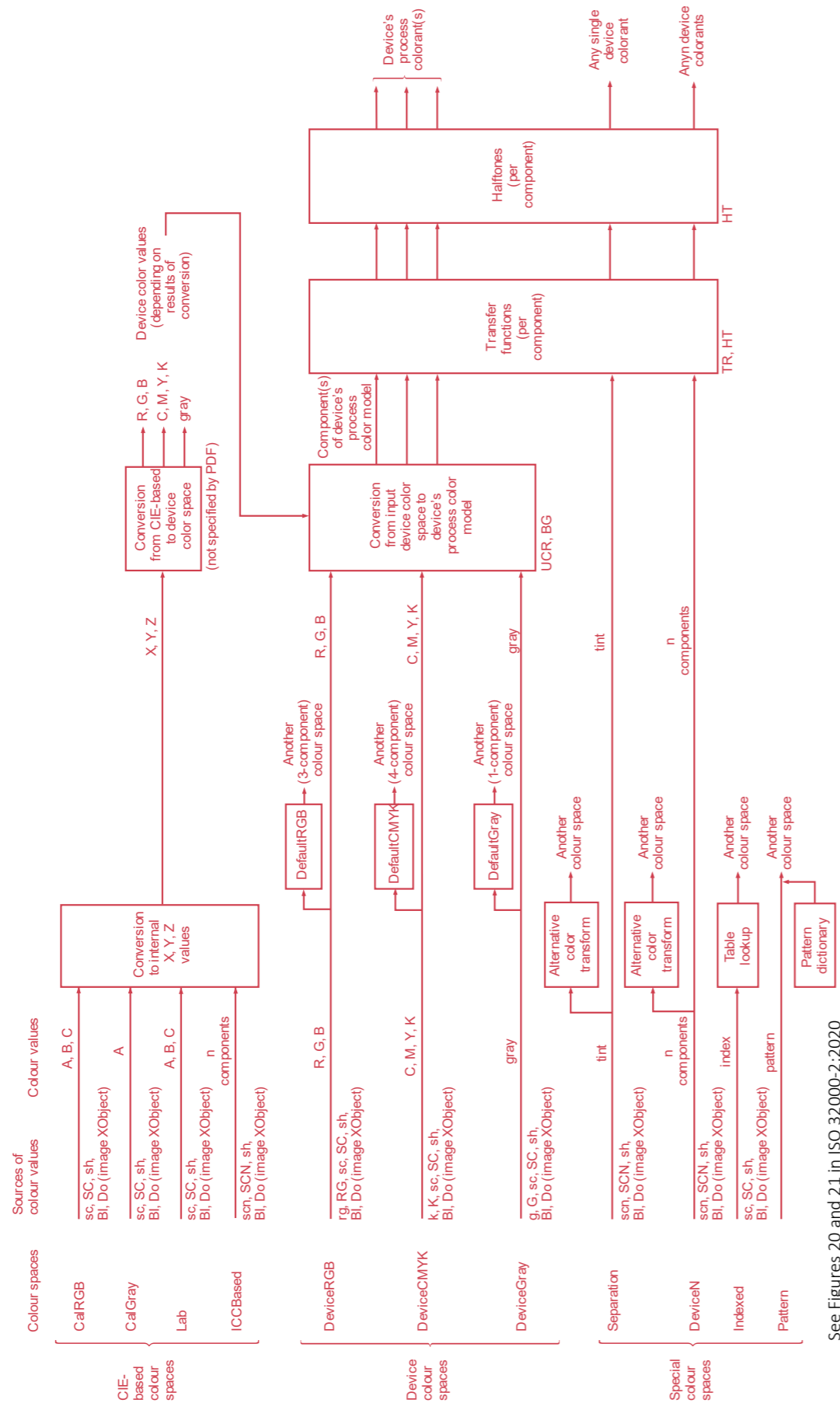


Transparency group
Object opacity = 0.5
Group opacity = 1.0
Blend mode = HardLight



Transparency group
Object opacity = 1.0
Group opacity = 0.5
Blend mode = Normal

PDF Color Processing



See Figures 20 and 21 in ISO 32000-2:2020

Approximating sRGB with CalRGB

```
[ /CalRGB
  <<
    /Matrix [ 0.412384 0.212646 0.0193176
              0.35759 0.715164 0.119171
              0.180496 0.0721893 0.950546 ]
    /WhitePoint [ 0.950455 1.0 1.08905 ]
    /BlackPoint [ 0 0 0 ]
    /Gamma [ 2.2 2.2 2.2 ]
  >>
]
```

See Annex A.8 in ISO 23504-1:2020 (PDF/R)

Fragment Identifiers

<https://labs.pdfa.org/FragmentTest.pdf#page=2&comment=abc&zoom=200>

Object identifiers	
page = <i>pagenum</i>	Open to specified page (≥ 1).
nameddest = <i>name</i>	Open to specified named destination.
structelem = <i>structID</i>	Open to specified ID within StructElem dictionary, or first page.
comment = <i>commentID</i>	Open to specified annotation defined by NM key. Must be <i>after</i> any other object identifier parameters.
ef = <i>name</i>	Open the specified file from the EmbeddedFiles name tree.

Open parameters – processed <i>after</i> object identifiers	
zoom = <i>scale</i> zoom = <i>scale, left, top</i>	Open with specified zoom <i>scale</i> (where 100 = 100%). <i>left</i> and <i>top</i> are optional coordinates from top left corner of page.
view = <i>XYZ, left, top, scale</i> view = <i>Fit</i> view = <i>FitH, top</i> view = <i>FitV, left</i> view = <i>FitR, left, bottom, right, top</i> view = <i>FitB</i> view = <i>FitBH, top</i> view = <i>FitBV, left</i>	Open specified destination as the view, where coordinates are from top left corner of page.
viewrect = <i>left, top, width, height</i>	Open with specified window view rectangle, where coordinates are from top left corner of page.
highlight = <i>left, right, top, bottom</i>	Open with specified rectangle highlighted, where coordinates are from top left corner of page.
search = "wordlist "	Select first matching word in SPACE (%20) separated <i>wordlist</i> . Quotes are required around <i>wordlist</i> .
fdf = <i>uri</i>	Import FDF or XFDF. <i>uri</i> is relative or absolute. Must be last.

See Annex 0 in ISO 32000-2:2020 or RFC 8118.

PDF Function objects

m = number of input values $\rightarrow n$ = number of output values: $\{y_0, y_1, \dots, y_n\} = f(x_1, x_2, \dots, x_m)$

Common Key	Description		
FunctionType	integer	Always required	0, 2, 3 or 4.
Domain	array	Always required	$2 \times m$ numbers, where $\text{Domain}_{2i} \leq \text{Domain}_{2i+1}$. Inputs are clipped to nearest boundary.
Range	array	Required for Type 0 and Type 4. Optional for Type 2 and Type 3.	$2 \times n$ numbers, where $\text{Range}_{2i} \leq \text{Range}_{2i+1}$. Output is clipped to nearest boundary when present.

Type	Description		
Type 0 Sampled function (stream, PDF 1.2, §7.10.2)	m -dimensional lookup table, where each entry has n components.		
	Key	Type	Description
	Size	array	Required. m positive integers. Number of components in each input (m) dimension.
	BitsPerSample	integer	Required. 1, 2, 4, 8, 12, 16, 24, or 32.
	Order	integer	Optional. 1 or 3. Interpolation order. Default = 1.
	Encode	array	Optional. $2 \times m$ numbers. Linear input mapping.
	Decode	array	Optional. $2 \times n$ numbers. Linear output mapping.
Type 2 Exponential function (dictionary, PDF 1.3, §7.10.3)	Exponential interpolation of 1 input value to n output values: $y_j = \text{C0}_j + x^N \times (\text{C1}_j - \text{C0}_j) \text{ for } 0 \leq j \leq n$		
	Key	Type	Description
	C0	array	Optional. n numbers for y_j when $x = 0.0$. Default = [0 . 0]
	C1	array	Optional. n numbers for y_j when $x = 1.0$. Default = [1 . 0]
	N	number	Required. Interpolation exponent.
Type 3 Stitching function (dictionary, PDF 1.3, §7.10.4)	Stitching of subdomains of k 1-input functions to produce a single new 1-input function. Since resulting stitching function is a 1-input function, the domain is [Domain ₀ Domain ₁].		
	Key	Type	Description
	Functions	array	Required. k 1-input functions
	Bounds	array	Required. $(k - 1)$ numbers, ordered by increasing value.
	Encode	array	Required. $2 \times k$ numbers
Type 4 PostScript calculator function (stream, PDF 1.3, §7.10.5)	Stream contains code written in a small subset of PostScript™. Nesting depth for {...} limited to 255.		
	Arithmetic	abs add atan ceiling cos cvi cvr div exp floor idiv ln log mod mul neg round sin sqrt sub truncate	
	Relational, Boolean, bitwise	and bitshift eq false ge gt le lt ne not or true xor	
	Conditional	if ifelse	
	Stack	copy exch dup index pop roll	

References to ISO 32000-2:2020 including resolved errata at <https://pdf-issues.pdfa.org>

Patterns and Shadings

PatternType	Description		
1 Tiling pattern (stream, Table 74)	Repeating <i>pattern cell</i> using PDF graphic operators in a content stream.		
	Key	Type	Value (required unless stated)
	Type	name	Pattern
	PatternType	Integer	1
	PaintType	integer	1 = Colored tiling pattern. In a content stream, reference via a named Pattern resource: /Pattern cs /P1 scn 2 = Uncolored tiling pattern. Define as a ColorSpace resource such as: [/Pattern colorspace]
	TilingType	integer	1 = Constant spacing. 2 = No distortion. 3 = Constant spacing and faster tiling.
	BBox	rectangle	Bounding box (clipped).
	XStep	number	Horizontal spacing in pattern space.
	YStep	number	Vertical spacing in pattern space.
	Resources	dictionary	Resources needed by pattern cell content.
	Matrix	matrix	Optional. Pattern matrix. Default: identity.
	Overlapping tiles are implementation dependent.		
2 Shading pattern (dictionary, PDF 1.3, Table 75)	Smooth gradient fills painted with the sh operator.		
	Key	Type	Value (required unless stated)
	Type	name	Pattern
	PatternType	integer	2
	Shading	dictionary or stream	Shading object.
	Matrix	matrix	Optional. Pattern matrix. Default: identity.
	ExtGState	dictionary	Optional. Graphics state parameter dictionary.

Shading Types			
Type 1	Function-based	dictionary	
Type 2	Axial	dictionary	
Type 3	Radial	dictionary	
Type 4	Free-form Gouraud-shaded triangle mesh	stream	
Type 5	Lattice-form Gouraud-shaded triangle mesh	stream	
Type 6	Coons patch mesh	stream	
Type 7	Tensor-product patch mesh	stream	

See §8.7.4.5 in ISO 32000-2:2020