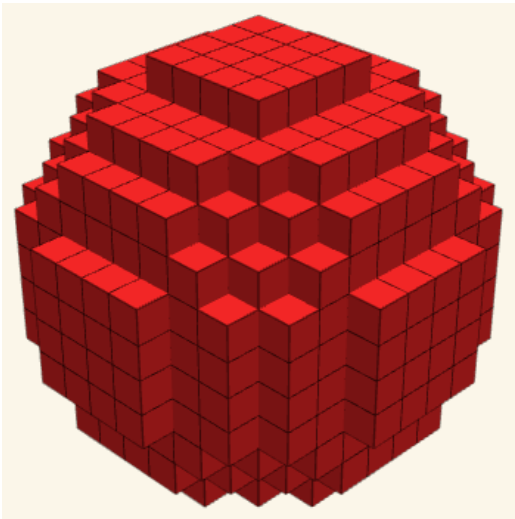


Pixel Round

11 —

11 , *Pixel Round*
:
:



12, Pixel Round.

: . . .
: (12.08.2022 № 732) .

Pixel Round —

10.3.		18
10.4.		19
11.		19
A.	Pixel Round	20
A.1.	2D	20
A.2.		20
A.3.	3D	20
A.4.		20
B.		22
C.		24
C.1.		24
C.2.	()	24
C.3.		24
D.		25

1.

();

11. 10 .

(1, 3), -

(2), (4).

4 45 (180). (

90) §7.

Pixel Round — - ,

, - (PWA).

.

;

.

(, Python); (

); (,).

;

;

;

;

15

Pixel Round;

docs_math/Pixel_Round_Math_ru-RU.pdf.

:

(-)

),

. Pixel Round ,

.

(,)

C.

2.

— Minecraft Stardew Valley (4A Games, Mundfish).

:

$\mathbb{R}$?

,

:

-

3.

3.1

3.2

3.3

The diagram illustrates the flow of data from JavaScript to Python through a series of processing steps. It consists of three horizontal yellow rectangular boxes, each representing a stage in the process. The first box on the left is labeled 'JavaScript;' and contains a small red rectangle with a white horizontal line. The second box in the middle is labeled 'Python' and contains a small red rectangle with a white horizontal line. The third box on the right is labeled 'Python' and contains a small red rectangle with a white horizontal line. Arrows indicate the flow of data from the first box to the second, and from the second box to the third. The flow is represented by a series of small red rectangles with white horizontal lines, connected by arrows. The flow starts with a small red rectangle with a white horizontal line, followed by a small red rectangle with a white horizontal line, then a small red rectangle with a white horizontal line, and finally a small red rectangle with a white horizontal line. The flow ends with a small red rectangle with a white horizontal line.

4.

4.1

- $\mathbb{R}^2 \rightarrow \mathbb{R}^3;$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: x^2 + y^2 = r^2.$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: (x/r_x)^2 + (y/r_y)^2 = 1.$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: \frac{x^2}{r_x^2} + \frac{y^2}{r_y^2} = 1,$ ellipse, $r_x \neq r_y.$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3.$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: V = \frac{4}{3}\pi r_x r_y r_z.$
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: (x/r_x)^2 + (y/r_y)^2 = 1.$ (ellipse).
- $\mathbb{R}^2 \rightarrow \mathbb{R}^3: 4\text{-D} \rightarrow 2\text{D}, 6\text{-D} \rightarrow 3\text{D}.$

4.2

- Pixel Round (, , PNG).
-

- .

5.

:

- .
 - (9).
 - ; , , (10).
 - : , , .
 - .
- 10 () -
(. §8.1).

6.

6.1

- Pixel Round ();
- ;
- / BYOD ().

6.2

- (5), 2 ;
- , , 30 ;
- (#CC2020);
- (B);
- ().

6.3

Pixel Round

- :
1.

GitHub Pages

. URL

QR-

,

-
- .
2.

(

index.html

file://).
3. PWA-

:

,

.

7.

.

.

7.1

- 1.2 (15 10);
- ;
- : , ().

7.2

- : $d_0 = 1 - R$ $F(x, y) = x^2 + y^2 - R^2, (1, R - \frac{1}{2}).$
- : πr^2 $r \rightarrow \infty.$ $: O(r^{2/3})$ (, 2003).
- : 20 Python.

7.3

(90-)

-

:

1+2

,

3+4

,

.

7.4

- Pixel Round (, , *TrueConf*).
, (. ,).

8.

— — — — - 45- :

8.1 1 — “ ?”

; Pixel Round. ;

1.1 — 8

: “ — — ”.

:

1. : Super Mario,

2. , - Google. ? ,
?”

3. (1), (2).

4. : “
— , ?”

1.2 — 12

1. 11×11

2. $10.$

3. $-$

4. $?$

5. $.$

1.3 — 15

$x^2 + y^2 = r^2$

$x^2 + y^2 < r^2.$

$\left(\frac{x}{r_x}\right)^2 + \left(\frac{y}{r_y}\right)^2 = 1$

Pixel Round

- $(i + \frac{1}{2}, j + \frac{1}{2})$
- 1965
- $?$

Pixel Round, 10,

1.4 — 10

10,
(i + 0,5, j + 0,5)

Pixel Round 10.

(2): “ : , “ ” ?”

()

1.4 8 14.

8.2 2 — “ , ”

2.1 — 5

: “ ,

.”

2.2 — 10

(i, j)

$$d_x = \frac{i + \frac{1}{2} - c_x}{r_x}, \quad d_y = \frac{j + \frac{1}{2} - c_y}{r_y}$$

$d_x^2 + d_y^2 \leq 1.$

$c_x = c_y = 5, \quad r_x = r_y = 5, \quad (2, 1).$

$d_x = -0,5, \quad d_y = -0,7, \quad d_x^2 + d_y^2 = 0,74 \leq 1.$

$(0, 0). \quad (: 1,62 > 1, \quad .)$

2.3 — 15

1965 , IBM.

$(x = 0, y = R)$ $d_0 = 1 - R$, 0–45°:

$$\begin{cases} d < 0 : & : (x+1, y), d += 2x + 3 \\ d \geq 0 : & : (x+1, y-1), d += 2(x - y) + 5 \end{cases}$$

$R = 5$, x, y, d .

: 1965 — -6 (,).

1970-

d ,

Pixel_Round_Math_ru-RU.pdf, §5.

2.4 — 8

(i, j) , :

$$n_x = \text{clamp}(c_x, i, i+1), \quad n_y = \text{clamp}(c_y, j, j+1)$$

$\left(\frac{n_x - c_x}{r_x}\right)^2 + \left(\frac{n_y - c_y}{r_y}\right)^2 \leq 0,94$.

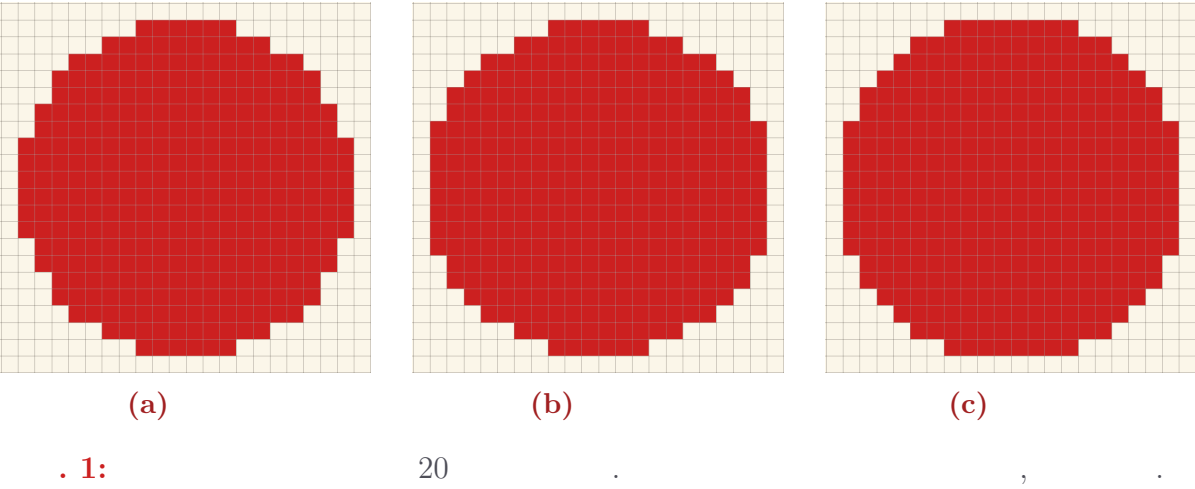
0,94, 1? 1 “ ”

, — , .

2.5 — 7

Pixel Round:

- 16,
-
- $\pi r^2 = 64\pi \approx 201,06.$
- $:\frac{|S - S|}{S} \times 100\%.$
- $1\%;$



8.3 3 — “ :

;

3.1 — 2D 3D 15

$z.$

$:$

$$\left(\frac{x}{r_x}\right)^2 + \left(\frac{y}{r_y}\right)^2 + \left(\frac{z}{r_z}\right)^2 = 1$$

$r_x = r_y = r_z = r$

$x^2 + y^2 + z^2 = r^2.$

$\cdot$

$(volume\ element).$

$,$

$:$

$$a_x^2 + a_y^2 + a_z^2 \leq 1, \quad a_\xi = \frac{\xi + \frac{1}{2} - c_\xi}{r_\xi}$$

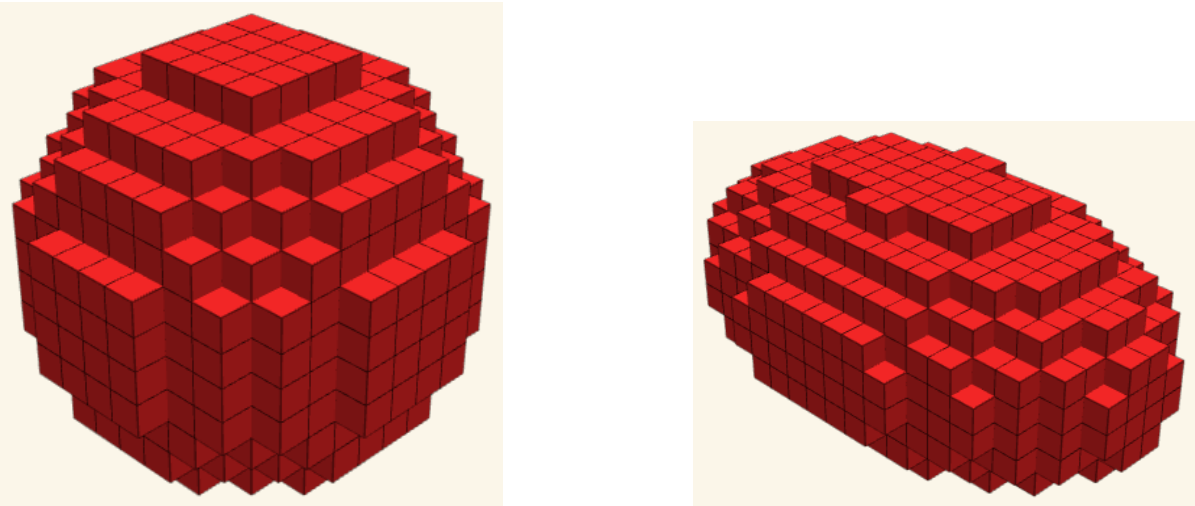
$\cdot$

Pixel Round

3D,

$,$

$(Classic, Smooth, Blocks).$



(a) $D = 12$ ($r_x = r_y = r_z = 6$).

(b) $W = 20, H = 10, D = 12$.

. 2: 3D- . — , .

3.2 — 15

$$V = \frac{4}{3} \pi r_x r_y r_z$$

$$r_x = r_y = r_z = r \quad V = \frac{4}{3} \pi r^3.$$

(13 14).

:

1. 12 ($r = 6$): $V = \frac{4}{3} \pi \cdot 216 \approx 904,78$.

2. Pixel Round $D = 12$.

3. : $V / V \rightarrow 1 \quad D \rightarrow \infty.$ D —

:

.

3.3 — 8

Pixel Round . — ,

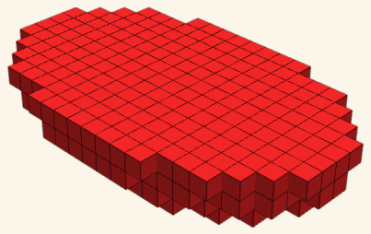
$$\begin{aligned} \text{X: } & x \geq cut \Rightarrow \\ \text{Y: } & y \geq cut \Rightarrow \\ & : x + y \geq cut \Rightarrow \end{aligned}$$

50% — . Y 50%, X 50%.

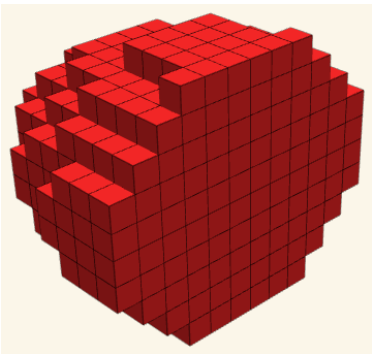
45° xy .

: “ 0 $D_x + D_y$, D_x ?

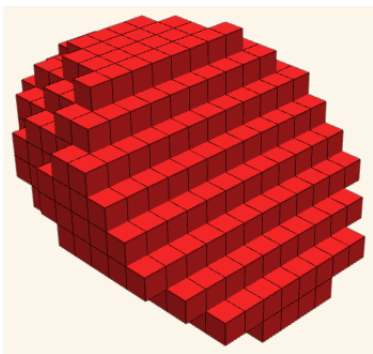
?”



(a) Y 50% ($y \geq 5$)



(b) X 50% ($x \geq 10$)



(c) ($x + y \geq 15$)

. 3: ($W = 20, H = 10, D = 12$), 50% .

3.4 — 7

XX .

• :
— “ ” (1915)

• .
• — 1920-
• “ III ”

: “ . *Pixel Round*,
- , — , “ ”
• , ?”
• .

8.4 4 — “ :

;

4.1 — 5

: “ , *Pixel Round* (, ,).
, , , — .
, ?” : ? ?
: , .

4.2 — 30

• :
• Pixel Round;
• , , ;
• (B, 5).

:

1. .
2. Pixel Round, PNG.
3. ().
4. .
: — “ ?
?”

4.3 — 10

2 .

:

• ;

• () ;

• 3D- .

(3): — “

; — ”.

.

9.

,

.

9.1

1, 1.2. , ,

.

9.2

: , 1.4, 2.2, 2.5 3.2.

9.3

:

1. (B), 5 , 4.

2. (4.2) .

9.4

(4-5)	(3)	(2)
	;	;
	-	.
.		
	Pixel Round	;
2D 3D;	;	2D.
	-	;
(	,	,
)	.	
	;	;
.		.

9.5

- : 40%.
- : 50%.
- : 10%.

10.

10.1

Python. (16–25)

10.2

Pixel Round

10.3

Pixel Round **12-** ($2^{1/12} \approx 1,0595$).

10.4

1965 — -6 , .
: , ,
. 11 .

11.

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A.

Pixel Round

1.3

: 15

A.1

2D

1. Pixel Round.
2. 2D /
3. Size 10.
4. : “ 10, 5, ..., ”.
5. : / / 30

A.2

1.
2. $W = 16, H = 8$.
3. : “ $-(x/8)^2 + (y/4)^2 = 1$. $x \ 8, \ y \ - \ 4?$ ”

A.3

3D

1. 3D / , $D = 12$.
2.
3. :
4. : $W = 20, H = 10, D = 10$.
5. Cut Y , 50%.
6.

A.4

1.

2. PNG.

3. — .

B.

Pixel Round,

1—

$$r = 7.$$

- | | | |
|--------------|---|---------------|
| a) $(3, 4)$ | : | $(25 < 49)$. |
| b) $(5, 5)$ | : | $(50 > 49)$. |
| c) $(0, 7)$ | : | . |
| d) $(-7, 0)$ | : | . |

2 —

•	(5, 5)	5.	(1, 3):
?			
:	(1, 5, 3, 5).	: $\sqrt{14,5} \approx 3,81 < 5$.	.

3 —

Pixel Round	20	
πr^2 .		
$S = 100\pi \approx 314,16$.	$< 2\%$.	5–8%.

4 —

$$\bullet \quad r_x = 4, r_y = 6, r_z = 3.$$

- a) $\dot{Y}$, 50% , y .

: () $V = 96\pi \approx 301,59$. () $\approx 150,80$. () $y < cut, cut = 6$.

5 —

- :
- (1)
- (2) : ? ? · , ?
- (3) 3D- ? , .

C.

... ; ...

C.1

1	Pixel Round (1.3)	$D = 10$
		(A2).
2	(2.5)	$D = 16$;
3	3D- (3.1, 3.2)	($z = 0, 1, 2, \dots$)
4	Pixel Round (4.2)	- (4.3)

C.2 ()

- A3 30×30 ,
- 4 A4 (5).
- $D = 16$, Pixel Round,

C.3

- ... - .
- , :
- - (, - № 239,
№ 131 , № 2): §7.
 - : , .
 - : , .

D.

- — , . Pixel Round — .
- — , 1965 (IBM) , (,). — .
- **Canvas** () — HTML- , .
- — $F(x,y) = 0,$: $(x/r_x)^2 + (y/r_y)^2 - 1 = 0.$
- — *picture element.* ; $1 \times 1.$
- **PWA — Progressive Web App** — - , - . Pixel Round PWA.
- — (2D) (3D).
- — $C:$ C . — $r_x = r_y.$
- **12-** — 12 . : $\sqrt[12]{2} \approx 1,0595.$
- — *volume element.* : $1 \times 1 \times 1.$
- **WebGL** — . Pixel Round *three.js.*