## **Precalculus**

# Conversions between degrees and radians

**Todor Miley** 

2019

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- The relationship between degrees and radians is:

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- In other words, a half-turn is measured by  $\pi$ rad or 180°.
- Degrees are useful because the most frequently encountered fractions of a half turn are measured by a whole number of degrees.
- If a measurement unit is not specified, it is implied to be radians. For example, in sin 5, the number 5 stands for 5 radians.

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

OUTIVE			CS IO IA				
Deg.	45°	36°	_20°	360°	−720°	−225°	2015°
	. •						_0.0
Rad.							

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLLACT	Convert from degrees to radians.												
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°						
Rad.	?												

$$x = \frac{x}{\pi} 180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{3}$		$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.		. 9		·				

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg.	Deg.   45°   36°   -20°   360°   -720°   -225°   2015°										
Rad.	$\frac{\pi}{4}$										

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{-}$	$\frac{\pi}{-}$	$11\pi$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLIVE	convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	?										

$$x = \frac{x}{\pi} 180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{-}$	$\frac{\pi}{-}$	$11\pi$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLIVCI	convert from degrees to radians.												
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°						
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$											

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLIVCI	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	?									

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

#### Convert from degrees to radians.

COLLACT	Convert from degrees to radians.												
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°						
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{\overline{\epsilon}}$	$-\frac{\pi}{2}$										
	□ 4	5	9										

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

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 (radians).

Convert from degrees to radians.

COLLACT	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	?								

$$x = \frac{x}{\pi} 180^{\circ}$$
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# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

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Convert from degrees to radians.

COLIVCI	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$								

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

••••				J J. J.				
Dad	$\pi$	$\pi$	$11\pi$	$7\pi$	$\pi$	$13\pi$	$5\pi$	0
Rad.	3	10	6	4	7	6	<u></u>	
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLLACI	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	?							

$$x = \frac{x}{\pi} 180^{\circ}$$
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# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

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Convert from degrees to radians.

COLLACI	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$							

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Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
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Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	?						

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

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COLLACI	Convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$						

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Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
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Deg.								

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Convert from degrees to radians.

Deg.	Deg.       45°       36°       -20°       360°       -720°       -225°       2015°										
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	?				

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{-}$	$\pi$	$\frac{11\pi}{\pi}$	$7\pi$	$\frac{\pi}{-}$	$13\pi$	$-5\pi$	2
i ida.	3	10	6	4	7	6	4	_
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

0011101	convert from degrees to radiane.											
Deg.	45°	36°	_20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$					

$$x = \frac{x}{\pi} 180^{\circ}$$
.

## Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.								

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

0011101	convert nom adgreed to radiane.												
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°						
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$						

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

Rad.	$\frac{\pi}{2}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	?	10	0	<del>- 4</del> -	,	0	4	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLLACT	convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$					

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°							

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLLACT	convert from degrees to radians.											
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°					
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$					

$$x = \frac{x}{\pi} 180^{\circ}$$
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# Example

Rad.	$\frac{\pi}{2}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	?	<u> </u>	4	1	0	4	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Dod	$\pi$	$\pi$	$11\pi$	$7\pi$	$\pi$	$13\pi$	$5\pi$	0
Rad.	3	10	6	4	7	6	4	
Deg.	60°	18°						

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

			C3 10 14				
Deg.	45°	36°	−20°	360°	−720°	$-225^{\circ}$	2015°
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Dod	$\pi$	$\pi$	$11\pi$	$7\pi$	$\pi$	$ $ 13 $\pi$	$5\pi$	2
Rad.	3	10	6	4	7	6	4	
Deg.	60°	18°	?					

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

COLLACT		acgic	co to ta	aidiio.			
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°					

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°	?	,			

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

#### Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x=\frac{x}{\pi}180^{\circ}.$$

## Example

				44			40		
		$\pi$	$\pi$	$11\pi$	$\prime\pi$	$\pi$	$\mid$ 13 $\pi$	$5\pi$	_
K	≀ad.	_	<del></del>		4	=			2
		3	10	6	4	/	6	4	
⊢ D	eg.	60°	18°	330°	315°				
-	rog.	- 00		000	0.0				

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Daal	$\pi$	$\pi$	$11\pi$	$/\pi$	$\pi$	$\mid$ 13 $\pi$	$5\pi$	_
Rad.	3	10	-6	4	7	6		2
				•	'			
Deg.	60°	18°	330°	315°	?			

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$			

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

000.		409.0	00 to .a.	a.a			
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x=\frac{x}{\pi}180^{\circ}.$$

## Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$	?	•	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$	390°	•	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg.	60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$	390°	?	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

Deg. 45°	36°	−20°	360°	7000	0050	00150
9 -			360	−720°	−225°	2015°
Rad. $\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad.	$\pi$	$\pi$	11 $\pi$	$7\pi$	$\pi$	$13\pi$	$5\pi$	2
	3	10	6	4	7	6	4	
Dog	ഗേ	100	၁၁∩∘	2150	$\frac{180^{\circ}}{7} \approx 25.7^{\circ}$	2000	-225°	
Deg.	00	10	330	313	${7}$ $\approx 25.7$	390	-220	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

0011101		acg. c	oo to ta	aiaiio.			
Deg.	45°	36°	−20°	360°	−720°	−225°	2015°
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$

$$x=\frac{x}{\pi}180^{\circ}.$$

# Example

ſ	Rad.	$\frac{\pi}{}$	$\pi$	$11\pi$	$7\pi$	$\frac{\pi}{}$	$13\pi$	$_{-}$ 5 $\pi$	2	
		3	10	6	4	7	6	4	_	
	Deg.	60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$	390°	−225°	?	

$$t^{\circ} = \frac{t}{180}\pi$$
 (radians).

Convert from degrees to radians.

convert from degrees to radians.											
Deg.	45°	36°	_20°	360°	−720°	−225°	2015°				
Rad.	$\frac{\pi}{4}$	$\frac{\pi}{5}$	$-\frac{\pi}{9}$	$2\pi$	$-4\pi$	$-\frac{5\pi}{4}$	$\frac{403}{36}\pi$				

$$x = \frac{x}{\pi} 180^{\circ}$$
.

# Example

Rad	$\frac{\pi}{3}$	$\frac{\pi}{10}$	$\frac{11\pi}{6}$	$\frac{7\pi}{4}$	$\frac{\pi}{7}$	$\frac{13\pi}{6}$	$-\frac{5\pi}{4}$	2
Deg	. 60°	18°	330°	315°	$\frac{180}{7}^{\circ}\approx25.7^{\circ}$	390°	−225°	$\frac{2}{\pi}$ 180° $\approx$ 114.6°