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# A method for finding Logarithms and Antilogarithms.

#### And

# A method for finding Trigonometric values and Inverse values

by

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## A method for finding Logarithms and Antilogarithms.

I have an idea for finding logarithms and antilogarithms values. This method is an easy one. I hope you like this method. Your suggestions are welcome. Email id; <a href="mailto:emmaths@gmail.com">emmaths@gmail.com</a>. Please visit <a href="https://www.rkmath.yolasite.com">www.rkmath.yolasite.com</a>. Thank you.

#### **Example-1**

Find logarithm of the number17 of base 10.

 $17 = 1.7 \times 10$ 

Square the number 1.7 continuously for 16 times as shown below.

- 1) 1.7
- 2) 2.89
- 3) 8.3521
- 4) 6.97575744×10
- 5) 4.86611918×10<sup>3</sup>
- 6) 2.36791158×10<sup>7</sup>
- 7) 5.60700525×10<sup>14</sup>
- 8) 3.14385078×10<sup>29</sup>
- 9) 9.88379772×10<sup>58</sup>
- 10) 9.76894573×10<sup>117</sup>
- 11) 9.54323006×10<sup>235</sup>
- 12) 9.10732399×10<sup>471</sup>
- 13) 8.29433502×10<sup>943</sup>
- 14) 6.87959934×10<sup>1887</sup>
- 15) 4.73288870×10<sup>3775</sup>
- 16)  $2.24002354 \times 10^{7551}$
- 17)  $5.01770545 \times 10^{15102}$

$$1.7^{2^{16}} = 5.01770545 \times 10^{15102}$$
$$= 10^{10} \times 10^{15102}$$

Substitute n with any value between 0 and 1.

Take n = 0.5

$$5.01770545 \times 10^{15102} = 10^{0.5} \times 10^{15102} \pm error$$

$$1.7^{2^{16}} = 10^{15102.5} \pm error$$

1.7 = 
$$10^{15102.5/2^{16}}$$
 (approximately)

$$(2^{16} = 256 \times 256 = 65536)$$

1.7 = 
$$10^{15102.5/(256\times256)}$$
 (approximately)

1.7 = 
$$10^{0.230445861}$$
(approximately)

Logarithm of 1.7 (base10) = 0.2304 (correct up to 4 decimal)

#### Logarithm of 17 (base10) = 1.2304 (correct up to 4 decimal)

#### Increasing number of steps gives more accuracy.

The all steps can be written as

$$1.7^{2^{16}} = 5.01770545 \times 10^{15102}$$

$$1.7^{2^{16}}$$
 --  $10^{15102+0.5}$ 

1.7 = 
$$10^{15102.5/2^{16}}$$
 (approximately)

1.7 = 
$$10^{0.230445861}$$
(approximately)

Logarithm of 17 (base10) = 1.2304(correct up to 4 decimal)

#### **Basic behind this method**.

When we assume a value, the error is not more than 100%.

Answer = correct value  $\pm$  error 100%.

When we divide the above value by 2<sup>16</sup> (=65536), the error becomes too small and the answer now is correct up to 4 decimals.

If we are able to give very close value, the number of steps will decrease accordingly.

So 7 or 8 steps are enough to get correct answer up to 4 decimals.

#### Example - 2

Find antilogarithm of 0.1234 (base 10)

Multiply the power by  $2^{16}$  times ( $2^{16}$  times =256×256=65536)

$$10^{0.1234 \times 2^{16}} = 10^{0.1234 \times 256 \times 256}$$

$$10^{8087.1424} = 10^{8087} \times 10^{0.1424} = 10^{8087} \times n$$

Substitute n by any value between 1 and 10.

Take n as 4.

$$10^{8087} \times 10^{0.1424} = 10^{8087} \times 4 \pm error$$

$$10^{8087} \times 4.0 = 10^{8086} \times 40 \pm \text{error}$$

Take square root continuously for 16 times as shown.

- 1) 10<sup>8086</sup>×40
- 2) 10<sup>4043</sup>×6.32455532
- 3) 10<sup>2021</sup>×7.95270728
- 4) 10<sup>1010</sup>×8.91779528
- 5) 10<sup>505</sup>×2.98626778
- 6) 10<sup>252</sup>×5.46467545
- 7) 10<sup>126</sup>×2.33766452
- 8) 10<sup>63</sup>×1.52894228
- 9) 10<sup>31</sup>×3.91016915
- 10)10<sup>15</sup>×6.25313453
- 11)10<sup>7</sup>×7.90767635
- 12)10<sup>3</sup>×8.89251165
- 13)10<sup>1</sup>×9.43001147
- 14)9.71082461
- 15)3.11621960
- 16)1.76528173
- 17)1.32863905

Antilogarithm of 0.1234 = 1.3286 (correct up to 4degits.)

All steps can be written as;

$$10^{0.1234 \times 2^{16}} - 10^{8087.1424}$$

$$10^{0.1234} = (10^{8086} \times 40)^{1/2^{16}}$$
 (approximately) = 1.32863905 (approximately)

Antilogarithm of 0.1234 = 1.3286 (correct up to 4 decimals.)

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#### Example-3

Find the logarithm of 9 of base 2.

$$9 = 2^3 \times 1.125$$

Finding logarithm of 1.125

Square 1.125 continuously for 16 times.

- 1) 1.125
- 2) 1.265625
- 3) 1.60180664
- 4) 2.56578451
- 5) 6.58325015
- 6) 4.3339825×10
- 7) 1.87828473×10<sup>3</sup>
- 8) 3.52795352×10<sup>6</sup>
- 9)1.24464560×10<sup>13</sup>
- 10)1.54914266×10<sup>26</sup>

$$1.125^{2^{16}} = 2.14635157 \times 10^{3352}$$

$$10^{3352} = 2^{3352} \times 3.322$$
 (since  $10 = 2^{3.322}$ )

$$10^{3352} = 2^{11135.344}$$

$$2.14635157 \times 10^{3352} = 2 \times 2^{n} \times 2^{11135.344}$$

Substitute n with any value between 0 and 1.

Assume 
$$n = 0.5$$

$$2.14635157 \times 10^{3352} = 2 \times 2^{0.5} \times 2^{11135.344} \pm error$$
  
= $2^{11136.844} \pm error$ 

$$1.125^{2^{16}} = 2^{11136.844} \pm error$$

$$1.125 = 2^{11136.844/2^{16}}$$
 (approximately)

1.125 = 
$$2^{11136.844/256 \times 256}$$
 (approximately)  
=  $2^{0.16995764}$  (approximately)

$$1.125 = 2^{0.1700}$$
 (correct up to 4 decimals)

$$9 = 2^3 \times 1.125$$

$$=2^3 \times 2^{0.1700}$$

#### Logarithms of 9 (base 2) = 3.1700 (correct up to 4 decimals.)

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#### Example -4

Find antilogarithm of 0.7172 of base 2.

Multiply the power by  $2^{16}$  times ( $2^{16}$  times =256×256=65536)

$$2^{0.7172 \times 2^{16}} = 2^{47002.4192}$$

$$2^{47002.4192} = 2^{47002} \times 2^{0.4192}$$

$$2^{47002} \times 2^{0.4192} = 2^{47002} \times n$$

n must be between 1 to 2.

Assume any number between 1 and 2.

Take it as 1.414

$$2^{47002.4192} = 2^{47002} \times 1.414 \pm error$$

Take square root for 16 times continuously.

- 1)  $2^{47002} \times 1.4142$
- 2) 2<sup>23501</sup>×1.18920141
- 3) 2<sup>11750</sup>×1.54220712
- 4) 2<sup>5875</sup>×1.24185632
- 5) 2<sup>2937</sup>×1.57597989
- 6) 2<sup>1468</sup>×1.77537595
- 7) 2<sup>734</sup>×1.33243234
- 8) 2<sup>367</sup>×1.15431033
- 9) 2<sup>183</sup>×1.51941457
- 10) 2<sup>91</sup>×1.74322377
- 11) 2<sup>45</sup>×1.86720313

- 12) 2<sup>22</sup>×1.93246119 13) 2<sup>11</sup>×1.39012991
- 14) 2<sup>5</sup>×1.66741111
- 15) 2<sup>2</sup>×1.82614956
- 16) 2×1.35135101
- 17) 1.64398966

So,

 $2^{0.7172}$ =1.64398966(approximately)

Antilogarithm of 0.7172 (base 2) = 1.6440 (correct up to 4 decimals.)

To get more accuracy increase number of steps.

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### **A method**

### for finding Trigonometric and Inverse values

This is a new way of finding trigonometric values. This is an easy method. I hope it is useful. Your suggestions are welcome. Email id; <a href="mailto:emmaths@gmail.com">emmaths@gmail.com</a>. Please visit <a href="mailto:www.rkmath.yolasite.com">www.rkmath.yolasite.com</a>. Thank you.

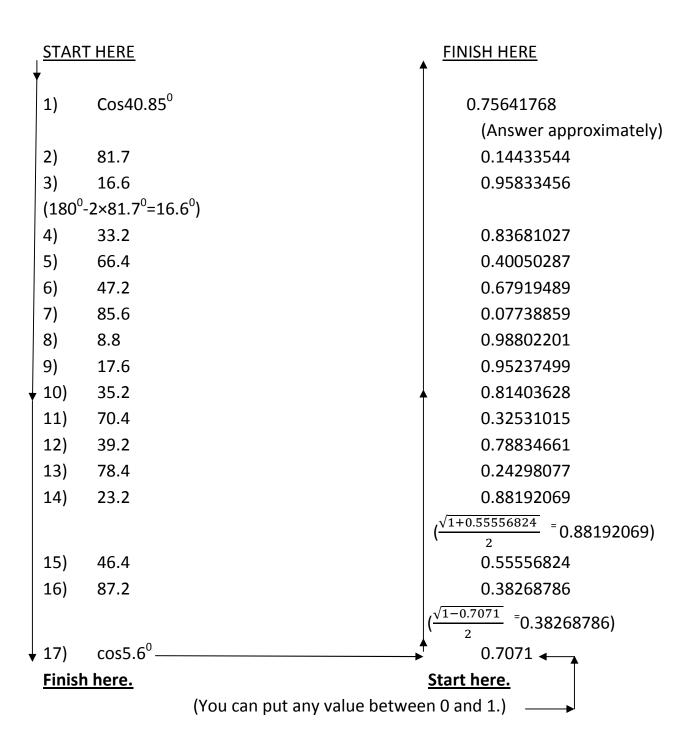
#### Example -1

Find the value of sin49.15degree. Sin49.15 degree = cos40.85 degree

Double the cos40.85 degree continuously for16 times as shown below. If the degree exceeds  $90^{\circ}$ , use this formula, **180-2×A**°. After 16 times, cos40.85 becomes cos5.6°. Give any value to cos5.6° between 0 and 1. Take it as 0.7071.

Now halve the values continuously for 16 times, corresponding to their degree values using the formula  $\frac{\sqrt{1\pm\cos A/2}}{2}$ . Use + sign below 45°. Use – sign above 45°.

# (At the end the answer is arrived, correct up to 4 decimal.Cos $40.85^{\circ}$ = 0.7564.So Sin49.15 = 0.7564. To get more accuracy increase number of steps.)



#### Basic behind this method.

When we assume a value, the error is not more than 100%.

Answer = correct value  $\pm$  error 100%.

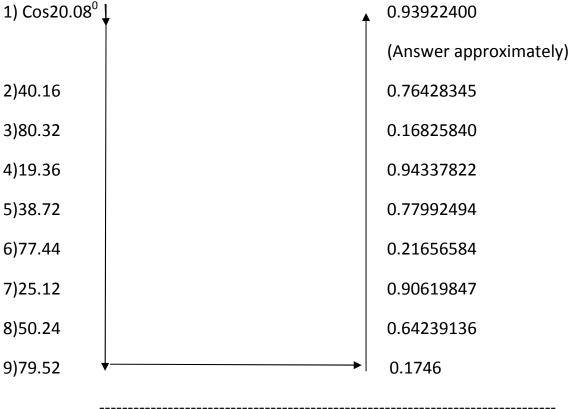
When we divide the above value by 2<sup>16</sup> (=65536), the error becomes too small and the answer now is correct up to 4 decimals. If we are able to give a close value, the number of steps will decrease accordingly. So 7 or 8 steps are enough to get correct answer up to 4 decimals.

For example,  $Cos20.08^0 = ?$ 

 $Cos79.52^{\circ} = 0.1746(approximately)$ 

(This is calculated by an easy approximate method and the error is always less than 0.5°. You can use your own easy method.)

(At the end the answer is  $\cos 20.08^{\circ} = 0.9392$  correct answer up to 4 decimals.)



#### Example -2

Find the degree of cos<sup>-1</sup> 0.2585.

Double the given value continuously for 16 times, using the formula  $2\cos^2 A - 1$ . Neglect minus sign.

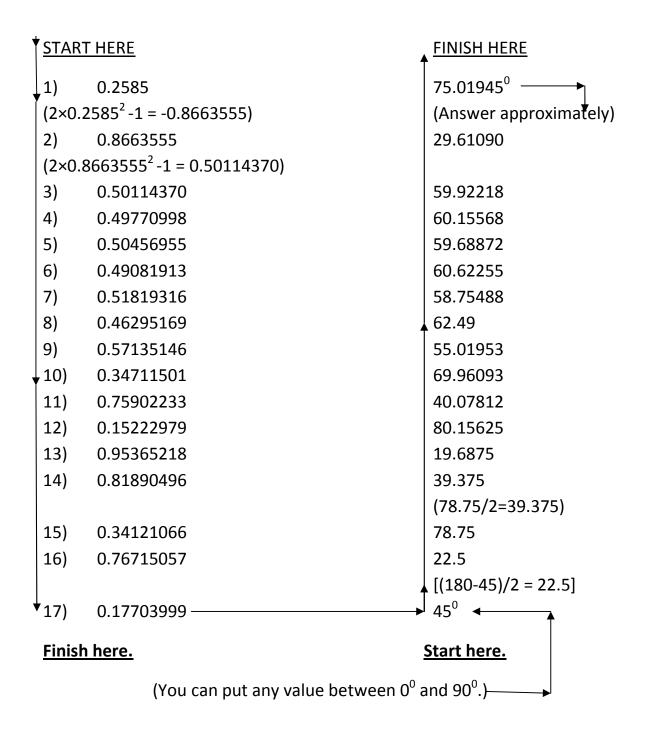
Now the value becomes 0.17703999. Assume any degree between 0 and 90 for 0.17703999. Take it as  $45^{\circ}$ .

Now halve the degree continuously for 16 times.

If the corresponding degree value is less than 0.7071(=1/ $\sqrt{2}$ ), Use this formula (180-A°)/2.

If the corresponding degree value is more than 0.7071(1/ $\sqrt{2}$ ), simply divide by 2.

(At last we get the answer which is correct up to 4 integers.Cos<sup>-1</sup>0.2585 = 75.02°)



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