

**A KEY TO THE NEW AND
PREVIOUS EDITIONS OF A
MANUAL OF PLANE
TRIGONOMETRY**

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A Key to the New and Previous Editions of a Manual of Plane Trigonometry by Joseph A. Galbraith & Samuel Haughton & James McDowell

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JOSEPH A. GALBRAITH & SAMUEL HAUGHTON & JAMES MCDOWELL

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A MANUAL OF PLANE TRIGONOMETRY.

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NOTICE.



THE solutions of the examples numbered 7 to 12 in pages 5 and 6 of the Fourth Edition of the Manual will be found at pages 6 and 7 of this New Edition of the "Key," numbered 1 to 6 respectively.

The new examples introduced into the Fourth Edition of the Manual are—

Page.	Examples.
5, 6	1 to 6
16	7 to 12
70 to 88	All examples in these pages.

The solutions of these new examples will be found at the end of this New Edition of the "Key," beginning at p. 72.

Page 6.

(1.) By equation (3)

$$\begin{aligned} N'' &= 206265'' \times \frac{a}{r} = 206265 \times \frac{9}{100} \\ &= 2062.65 \times 9 = 18563.85'' \\ &= 5^\circ 9' 23''.85. \quad \text{Ans.} \end{aligned}$$

(2.)
by equation (3)

$$\begin{aligned} 3' 28'' &= 208'' = N'' \\ N'' &= 206265'' \times \frac{a}{r} \\ \therefore r &= \frac{206265 \times a}{N} = \frac{206265 \times 6}{208} \\ &= \frac{1237590}{208} = 5949.9519 \text{ ft.} = 1983.3173 \text{ yds.} \\ &\approx 1 \text{ mile } 223.3173 \text{ yds.} \quad \text{Ans.} \end{aligned}$$

(3.) $a = 7926$ miles, $r = 237638$ miles;
by equation (3)

$$\begin{aligned} N'' &= 206265'' \times \frac{a}{r} \\ &= 206265'' \times \frac{7926}{237638} = \frac{1634856390}{237638} \\ &= 6879''.608 = 1^\circ 54' 39''.608. \quad \text{Ans.} \end{aligned}$$

(4.) $31' 7'' = 1867'' = N''$, $r = 237638$ miles;
by equation (3)

$$\begin{aligned} N'' &= 206265'' \times \frac{a}{r} \\ \therefore a &= \frac{N \times r}{206265} = \frac{1867 \times 237638}{206265} \\ &= \frac{443670146}{206265} = 2150.97 \text{ miles.} \quad \text{Ans.} \end{aligned}$$

(5.) $N'' = 17''.2$, $a = 7926$ miles;
by equation (3)

$$N'' = 206265'' \times \frac{a}{r}$$

$$\therefore r = \frac{206265 \times a}{N''} = \frac{206265 \times 7926}{17.2}$$

$$= \frac{1634856390}{17.2} = \frac{16348563900}{172}$$

$$= 95049790.1 \text{ miles. } \text{Ans.}$$

(6) $32' 3'' = 1923'' = N''$,
 $r = 95049790$ miles (by the answer to the last example).
By equation (3)

$$N'' = 206265'' \times \frac{a}{r}$$

$$\therefore a = \frac{N'' \times r}{206265} = \frac{1923 \times 95049790}{206265}$$

$$= \frac{182780746170}{206265} = 886145.2 \text{ miles. } \text{Ans.}$$

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(3.) By equation (6)

$$\cos A = \frac{1}{\sec A}$$

and by equation (2)

$$\sec A = \sqrt{(1 + \tan^2 A)},$$

$$\therefore \cos A = \frac{1}{\sqrt{(1 + \tan^2 A)}} \text{ Ans.}$$

(4.) By equation (8)

$$\operatorname{cosec} A = \frac{1}{\sin A}$$

and by example (1)

$$\sin A = \sqrt{1 - \cos^2 A},$$

$$\therefore \operatorname{cosec} A = \frac{1}{\sqrt{1 - \cos^2 A}}. \quad \text{Ans.}$$

(5.) By example (1)

$$\sin A = \sqrt{1 - \cos^2 A}$$

and by equation (6)

$$\cos A = \frac{1}{\sec A}$$

$$\therefore 1 - \cos^2 A = 1 - \frac{1}{\sec^2 A} = \frac{\sec^2 A - 1}{\sec^2 A}$$

$$\begin{aligned} \text{and } \therefore \sin A &= \sqrt{1 - \cos^2 A} = \sqrt{\frac{\sec^2 A - 1}{\sec^2 A}} \\ &= \frac{\sqrt{(\sec^2 A - 1)}}{\sec A}. \quad \text{Ans.} \end{aligned}$$

Page 14.

(3.) $\sin 30^\circ = .50000$, and

$\cos 30^\circ = .86602$ (by page 13)

$$\therefore \tan 30^\circ = \frac{\sin 30^\circ}{\cos 30^\circ} = \frac{.50000}{.86602} = .57735. \quad \text{Ans.}$$

(6.) Let x = greater part of 1 cut in extreme and mean ratio, then $1 - x$ = less part, but product of whole and less part = square of greater part (Euclid, Book VI. p. 30),

$$\therefore 1 \times (1 - x) = x^2 \text{ or } x^2 + x = 1$$

$$\therefore x^2 + x + \frac{1}{4} = \frac{5}{4}$$

$$\text{and } \therefore x + \frac{1}{2} = \frac{\sqrt{5}}{2} \text{ and } x = \frac{\sqrt{5}-1}{2}$$

$$(7.) \cos 18^\circ = \sqrt{(1 - \sin^2 18^\circ)} = \sqrt{\left\{ 1 - \left(\frac{\sqrt{5}-1}{4} \right)^2 \right\}}$$

by last example

$$= \sqrt{\left(1 - \frac{6-2\sqrt{5}}{16} \right)} = \sqrt{\left(\frac{10+2\sqrt{5}}{16} \right)}$$

$$= \frac{\sqrt{(10+2\sqrt{5})}}{4} = \frac{\sqrt{(10+4.47213595)}}{4}$$

$$= \frac{3.80422}{4} = .95105. \text{ Ans.}$$

$$(8) \sin 18^\circ = \frac{\sqrt{5}-1}{4} \text{ and } \cos 18^\circ = \frac{\sqrt{(10+2\sqrt{5})}}{4}$$

$$\therefore \tan 18^\circ = \frac{\sin 18^\circ}{\cos 18^\circ} = \frac{\sqrt{5}-1}{\sqrt{(10+2\sqrt{5})}}$$

$$= \frac{1.236067977}{3.80422} = .32492. \text{ Ans.}$$

Page 15.

$$(9) \sin 72^\circ = \cos 18^\circ = .95105$$

by example (7);

$$\cos 72^\circ = \sin 18^\circ = .30901$$

by example (6),

$$\therefore \tan 72^\circ = \frac{.95105}{.30901} = 3.07773. \text{ Ans.}$$