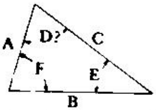
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	D	B-A-E	12	$\frac{B \times \text{SIN } E}{A} = \text{SIN } D$	The product of Side B multiplied by the Sine of E, divided by Side A = the Sine of D $\frac{10.0 \times .6000}{6.0827} = \frac{6.000}{6.0827} = .9864$ (which is the Sine of 80°-32′-24″)

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SIMPLE-FYER

INSTRUCTIONS AND PROBLEM GUIDE

HOW TO USE THE SIMPLE-FYER. In the science of Trigonometry, we deal with the measurement of triangles. Because various parts always bear the same relation to other parts of the same triangle, numerous equations have been worked out, giving the values of parts of triangles (angles and sides) in terms of each other.

By the use of these equations, it is possible to learn the measurements of all parts of any Right triangle if we know the length of one of the three sides and the measurement of one ***other*** side ***or*** one of the angles (besides the right angle). It is also possible to learn the measurements of an Oblique triangle if we know the length of one side and the value of two of the angles or if the two sides and the angle opposite one of them are known.

The formulas for finding unknown parts are diagrammed in the following pages; formula numbers refer to the equations that appear in the windows of the Simple-Fyer when the dial is turned to the proper number.

For example, if you want to know the length of the base of a Right triangle, look for the section where the question mark appears at that point. There you will find three formulas listed, each using values of ***different*** parts of the triangle. Select the one which uses the parts you have measured and then turn the Simple-Fyer to the proper equation number. The next step is to substitute for the values in the equation and perform the arithmetical problem as indicated.

HOW TO SUBSTITUTE IN EQUATIONS. First try to position your work in similar relation to the diagram on the Simple-Fyer; it will help you avoid wrong substitutions. Also, decide whether your triangle is Right or Oblique, so that you will not use an incorrect equation for your problem. (Right triangles have one 90° angle).

Before going any further with our explanation, let us first review the "Functions of Angles." Each angle from 0° to 90° has six functions called:*

Sine (Abbreviated SIN)	Cosecant (Abbreviated COSEC)
Cosine (Abbreviated COS)	Secant (Abbreviated SEC)
Tangent (Abbreviated TAN)	Cotangent (Abbreviated COT)

These functions are given as decimal values in all trigonometric tables. As the make-up of the Simple-Fyer tables is standard, we shall refer to their contents in the balance of the explanation.

Trigonometric functions are given by degrees and minutes of an angle. Each degree is composed of 60 minutes—if minutes must be divided into seconds, this may be done by interpolation, but is rarely necessary for practical problems.

Note that tables are used as follows: For angles from 0° to 44°, read the angle at top of page and minutes down left hand side (O-minutes is the value of the angle alone); for angles from 45° to 90°, read angle at ***bottom*** of page (starting at back of table and going forward) and read minutes ***up*** right hand side of page. The column headings that apply to the values are those following the angle, reading either up or down. In other words, column headings at top of pages apply for angles 0° to 44°, and those at the bottom for angles 45° to 90°.

---

* Two other minor functions are sometimes used:
  Versed Sine (Abbreviated VERS) which is 1 minus the Cosine (1—COS)
  Coversed Sine (Abbreviated COVERS) which is 1 minus the Sine (1—SIN)

Values of sides should always be written as decimal figures to simplify multiplications, etc. Be sure to use the same kind of units for all measurements, don't state one side in terms of inches and the other in terms of feet, otherwise your answer will be meaningless. Convert feet to inches and fractions of inches to decimals, and your answer will be in inches and decimal parts (if you are solving for a side).

With these points in mind, let us take a few examples of different types:

EXAMPLE: We know the length of side C in a right triangle to be 64" and side B to be 36", but we want to know the angle D. By referring to charts for right triangles, we find the triangle pictured with a question mark at D, and that there are three formulas given for finding D in terms of only C and B. Selecting No. 19 as being the simplest for our purpose, we find on the Simple-Fyer that:

$$\frac{C}{B} = \text{SEC D}$$

Substituting:

$$\frac{64}{36} = \text{SEC D}$$

Performing division indicated, $36\overline{)64}$, we get the result of 1.7777. Now we turn to a table of Secants and look for this figure in the column of the proper heading. It is not listed up to 44°. Now we start at 45° and read forward, using the column heading that appears at the bottom of the page. Reading upward in this column we finally come to the figure 1.7776 as the secant of an angle of 55° 46'. For purposes of our problem then, angle D is equal to 55 degrees 46 minutes. NOTE: If we want to know angle E for check purposes, we know that the sum of the angles of any triangle is always 180°, so we merely add angle D and the right angle.

$$\begin{array}{r} 90°\text{-}\ 0' \\ 55°\text{-}46' \\ \hline 145°\text{-}46' \end{array}$$

and subtract from 180°

$$\begin{array}{r} 179°\text{-}60' \\ 145°\text{-}46' \\ \hline 34°\text{-}14' \end{array}$$

179°-60′ (borrowing 1 degree of 60 minutes)

34°-14′ is the value of angle E

EXAMPLE: We know the length of side A and the angle D, but want to find the length of side C. By again referring to charts, we find two equations for C in terms of A and D. Selecting No. 17 which reads:

$$C = A \times \text{COSEC } D$$

we give A the value of 23.5 (inches), but we must look up the cosecant of angle D, which measures 30°-30′. This we find by locating 30° at the top of the page and 30′ at the left hand side; following across under the heading COSEC, namely 1.9703. Now we have

$$C = 23.5 \times 1.9703$$

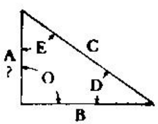
and after performing the multiplication and pointing off the result a total of five decimals, we get as the length of C

$$C = 46.30205 \text{ (inches)}$$

NOTE: These equations can also be used by substituting logarithmic values of functions and logarithms of numbers, observing the rules of characteristic and mantissa.

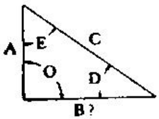
PROBLEM GUIDE

Right Triangles

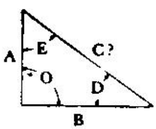


Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	A	**C & D**	1	C × SIN D = A	Side C multiplied by the Sine of D = Side A 10.0 × .6000 = 6.0
	A	**C & E**	2	C × COS E = A	Side C multiplied by the Cosine of E = Side A 10.0 × .6000 = 6.0
	A	**B & D**	3	B × TAN D = A	Side B multiplied by the Tangent of D = Side A 8.0 × .7500 = 6.0
	A	**B & E**	4	B × COT E = A	Side B multiplied by the Cotangent of E = Side A 8.0 × .7500 = 6.0
	A	**C & B**	5	$\sqrt{C^2 - B^2} = A$	Subtracting the square of Side B from the square of Side C and extracting the square root of the remainder = Side A $\sqrt{100.0 - 64.0} = \sqrt{36.0} = 6.0$

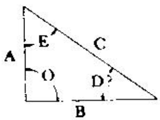
* For purposes of these illustrations, arbitrary values have been given to the parts of an imaginary triangle as follows: Side A is 6.0; Side B is 8.0; Side C is 10.0; Angle D is 36°-52′-12″; Angle E is 53°-7′-48″; the remaining angle O is of course 90°. Substitute your own measurements in a similar manner.



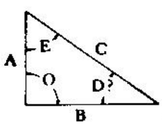
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	B	C & D	6	$C \times COS\ D = B$	Side C multiplied by the Cosine of D = Side B $10.0 \times .8000 = 8.0$
	B	C & E	7	$C \times SIN\ E = B$	Side C multiplied by the Sine of E = Side B $10.0 \times .8000 = 8.0$
	B	A & D	8	$A \times COT\ D = B$	Side A multiplied by the Cotangent of D = Side B $6.0 \times 1.3333 = 8.0$
	B	A & E	9	$A \times TAN\ E = B$	Side A multiplied by the Tangent of E = Side B $6.0 \times 1.3333 = 8.0$
	B	C & D	10	$\frac{C}{SEC\ D} = B$	Side C divided by the Secant of D = Side B $\frac{10.0}{1.2500} = 8.0$
	B	C & A	11	$\sqrt{C^2 - A^2} = B$	Subtracting the square of Side A from the square of Side C and extracting the square root of the remainder = Side B $\sqrt{100.0 - 36.0} = \sqrt{64.0} = 8.0$



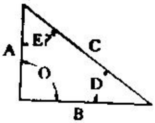
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	C	A & D	12	$\frac{A}{SIN\ D} = C$	Side A divided by the Sine of D = Side C $\frac{6.0}{.6000} = 10.0$
	C	A & E	13	$\frac{A}{COS\ E} = C$	Side A divided by the Cosine of E = Side C $\frac{6.0}{.6000} = 10.0$
	C	B & E	14	$\frac{B}{SIN\ E} = C$	Side B divided by the Sine of E = Side C $\frac{8.0}{.8000} = 10.0$
	C	B & D	15	$\frac{B}{COS\ D} = C$	Side B divided by the Cosine of D = Side C $\frac{8.0}{.8000} = 10.0$
	C	B & D	16	$B \times SEC\ D = C$	Side B multiplied by the Secant of D = Side C $8.0 \times 1.2500 = 10.0$
	C	A & D	17	$A \times COSEC\ D = C$	Side A multiplied by the Cosecant of D = Side C $6.0 \times 1.6666 = 10.0$
	C	A & B	18	$\sqrt{A^2 + B^2} = C$	Adding the square of Side A to the square of side B and extracting the square root of the sum = Side C $\sqrt{36.0 + 64.0} = \sqrt{100.0} = 10.0$

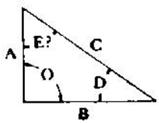
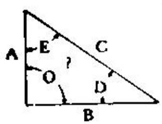


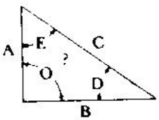
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	D	C & B	19	$\frac{C}{B}$ = SEC D	Side C divided by Side B = the Secant of Angle D $\frac{10.0}{8.0}$ = 1.2500 (which is the Secant of 36°-52′-12″)
	D	C & A	20	$\frac{C}{A}$ = COSEC D	Side C divided by Side A = the Cosecant of Angle D $\frac{10.0}{6.0}$ = 1.6666 (which is the Cosecant of 36°-52′-12″)
	D	C & B	21	$\frac{C - B}{C}$ = VERS D	The remainder of Side B subtracted from Side C divided by Side C = the Versed Sine of Angle D (Note: The versed sine is: 1 minus the Cosine) $\frac{10.0 - 8.0}{10.0} = \frac{2.0}{10.0}$ = .2000 (Versed Sine of Angle) 1 — .2000 = .8000 (Cosine of 36°-52′-12″)



Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	D	A & C	22	$\frac{A}{C}$ = SIN D	Side A divided by Side C = the Sine of Angle D $\frac{6.0}{10.0}$ = .6000 (which is the Sine of 36°-52′-12″)
	D	B & C	23	$\frac{B}{C}$ = COS D	Side B divided by Side C = the Cosine of Angle D $\frac{8.0}{10.0}$ = .8000 (which is the Cosine of 36°-52′-12″)
	D	A & B	24	$\frac{A}{B}$ = TAN D	Side A divided by side B = the Tangent of Angle D $\frac{6.0}{8.0}$ = .7500 (which is the Tangent of 36°-52′-12″)
	D	B & A	25	$\frac{B}{A}$ = COTAN D	Side B divided by Side A = the Cotangent of Angle D $\frac{8.0}{6.0}$ = 1.3333 (which is the Cotangent of 36°-52′-12″)

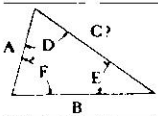
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	E	A & C	26	$\frac{A}{C} = \text{COS E}$	Side A divided by Side C = the Consine of E $\frac{6.0}{10.0}$ = .6000 (which is the Cosine of 53°-7′-48″)
	E	B & C	27	$\frac{B}{C} = \text{SIN E}$	Side B divided by Side C = the Sine of E $\frac{8.0}{10.0}$ = .8000 (which is the Sine of 53°-7′-48″)
	E	A & B	28	$\frac{A}{B} = \text{COT E}$	Side A divided by Side B = the Cotangent of E $\frac{6.0}{8.0}$ = .7500 (which is the Cotangent of 53°-7′-48″)
	E	B & A	29	$\frac{B}{A} = \text{TAN E}$	Side B divided by Side A = the Tangent of E $\frac{8.0}{6.0}$ = 1.3333 (which is the Tangent of 53°-7′-48″)

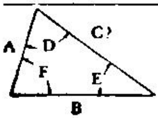
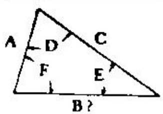
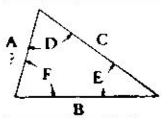
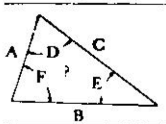
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	E	O & D	30	O° — D° = E°	Angle D subtracted from Angle O = Angle E° 90°- 0′- 0″ —36°-52′-12″ { or borrowing 1° from 90° and then borrowing 1′ from the 60′ thus obtained } 89°-59′-60″ —36°-52′-12″ = 53°- 7′-48″
	Area	A & B	31	$\frac{A \times B}{2}$ = AREA	One-half of the product of Side A multiplied by Side B = Area $\frac{6.0 \times 8.0}{2} = \frac{48.0}{2}$ = 24.0 sq. in.
	Area	A & D	32	$\frac{A^2 \times \text{COT D}}{2}$ = AR.	One-half the product of the square of Side A and the Cotangent of D = Area $\frac{6.0^2 \times 1.3333}{2} = \frac{36.0 \times 1.3333}{2} = \frac{48.0}{2}$ = 24 sq. in.
	Area	B & D	33	$\frac{B^2 \times \text{TAN D}}{2}$ = AR.	One-half the product of the square of Side B and the Tangent of D = Area $\frac{8.0^2 \times .7500}{2} = \frac{64.0 \times 7500}{2} = \frac{48.0}{2}$ = 24 sq. in.

Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	Area	C & D	34	$\frac{C^2 \times \text{SIN } 2D}{4} = \text{AR.}$	One-fourth the product of the square of Side C multiplied by the Sine of an angle twice as large as D = Area $\frac{10.0^2 \times .9600}{4} = \frac{100.0 \times .9600}{4} = \frac{96.0}{4} =$ 24 sq. in.

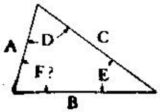
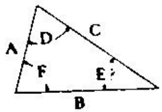
PROBLEM GUIDE

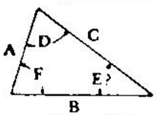
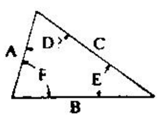
Oblique Triangles

Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	C	A-F-E	1	$\frac{A \times \text{SIN } F}{\text{SIN } E} = C$	The product of Side A multiplied by the Sine of F divided by the Sine of E = Side C $\frac{6.0827 \times .88776}{.6000} = \frac{5.400}{.6000} = 9.0$

Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	C	B-F-D	2	$\frac{B \times \text{SIN } F}{\text{SIN } D} = C$	The product of Side B multiplied by the Sine of F divided by the Sine of D = Side C $\frac{10.0 \times .88776}{.9864} = \frac{8.8776}{.9864} = 9.0$
	B	A-D-E	3	$\frac{A \times \text{SIN } D}{\text{SIN } E} = B$	The product of Side A multiplied by the Sine of D divided by the Sine of E = Side B $\frac{6.0827 \times .9864}{6.000} = \frac{6.000}{.6000} = 10.0$
	A	B-E-D	4	$\frac{B \times \text{SIN } E}{\text{SIN } D} = A$	The product of Side B multiplied by the Sine of E divided by the Sine of D = Side A $\frac{10.0 \times .6000}{.9864} = \frac{6.000}{.9864} = 6.0827$
	Area	A-B-F	5	$\frac{A \times B \times \text{SIN } F}{2} = \text{AR.}$	One half the product of A times B times the Sine of F = Area $\frac{6.0827 \times 10.0 \times .88776}{2} = \frac{54.0}{2} = 27$ sq. in.

* For purposes of these illustrations, arbitrary values have been given to the parts of an imaginary triangle as follows: Side A is 6.0827; Side B is 10.0; Side C is 9.0; Angle F is 62°-35′-24″; Angle D is 80°-32′-24″; Angle E is 36°-52′-12″.

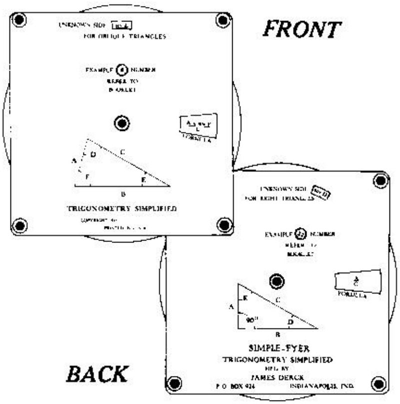
Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	F	D & E	6	$180° - (D° + E°) = F°$	Subtracting the sum of Angles D and E from 180° = Angle F 80°-32′-24″ + 36°-52′-12″ = 116°-84′-36″ or 117°-24′-36″ 180°- 0′- 0″ or 179°-59′-60″ —117°-24′-36″ = 62°-35′-24″
	F	C-B-D	7	$\frac{C \times SIN\ D}{B} = SIN\ F$	The product of Side C multiplied by the Sine of D divided by Side B = the Sine of F $\frac{9.0 \times .9864}{10.0} = \frac{8.8776}{10.0} = .88776$ (which is the Sine of 62°-35′-24″)
	E	A-C-F	8	$\frac{A \times SIN\ F}{C} = SIN\ E$	The product of Side A multiplied by the Sine of F divided by Side C = the Sine of E $\frac{6.0827 \times .88776}{9.0} = \frac{5.400}{9.0} = .6000$ (which is the Sine of 36°-52′-12″)

Problem Figure	Unknown Part	Known Parts	Example No.	Formula Given	Rule and illustration* for substitution in formula shown on dial
	E	A-B-D	9	$\frac{A \times SIN\ D}{B} = SIN\ E$	The product of Side A multiplied by the Sine of D divided by Side B = the Sine of E $\frac{6.0827 \times .9864}{10.0} = \frac{6.0}{10.0} = .6000$ (which is the Sine of 36°-52′-12″)
	D	A-B-C	10	$\frac{B^2 - (C - A)^2}{2 \times C \times A} = VERS\ D$	The square of the remainder of Side C minus Side A, subtracted from the square of Side B, divided by the product of 2 times C times A = the Versed Sine of D $\frac{10.0^2 - (9.0 - 6.0827)^2}{2 \times 9.0 \times 6.0827} = \frac{100.0 - 8.511}{109.49}$ $= \frac{91.489}{109.49} = .83560$ (which is the Versed Sine of Angle D) The Versed Sine being 1 — COS; .83560 + .1644 = 1 ∴ .1644 = the Cosine of an angle of 80°-32′-24″
	D	A-B-C	11	$\frac{C^2 + A^2 - B^2}{2 \times C \times A} = COS\ D$	The square of Side B subtracted from the sum of the squares of Sides C and A divided by the product of 2 times C times A = the Cosine of Angle D $\frac{81.0 + 37.0 - 100.0}{2 \times 9.0 \times 6.0827} = \frac{18.0}{109.49} = .1644$ (which is the Cosine of 80°-32′-24″)

TRIGONOMETRY SIMPLIFIED

46 Formulas at your finger tips

FRONT



BACK

Illustration Is ⅓ Actual Size

If you use trigonometric solutions regularly, you cannot afford to be without this quick-reference dial. Formulas for finding sides, angles, or area can be selected by the flick of your finger for either right or oblique triangles.

Furnished with complete instructions and a detailed problem guide, the Simple-Fyer can help those whose trigonometry is "rusty" as well as those who use it daily.

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TRIGONOMETRY SIMPLIFIED

46 Formulas at your finger tips

FRONT

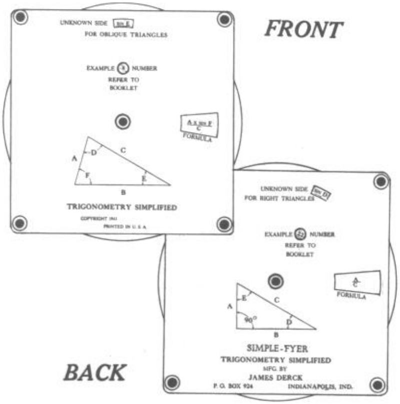

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Illustration Is ⅓ Actual Size

If you use trigonometric solutions regularly, you cannot afford to be without this quick-reference dial. Formulas for finding sides, angles, or area can be selected by the flick of your finger for either right or oblique triangles.

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Simple-Fyer

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