

## LESSON 14

- [FUNCTION NAMES AND THEIR ABBREVIATED FORMS](#)

*Spatial Arrangements, continued*

- [SQUARE ROOT DIVISION](#)
- [OTHER PRINT LAYOUTS SHOWING DIVISION](#)

[Answers to Practice Material](#)

### LESSON PREVIEW

Rules regarding function names and their abbreviated forms are presented. Many examples are shown. The study of spatial arrangements continues with other forms of division problems: square root division, partial quotient layout, synthetic division, and others.

**FUNCTION NAMES AND THEIR ABBREVIATED FORMS****[NC Rule 18]****14.1 List of Common Function Names and Their Abbreviated Forms**

The most common function names and their abbreviated forms are listed below. Function names that do not appear in this list are subject to the same rules taught in this lesson. Note that abbreviated function names are printed in regular type.

<u>Function Name</u>	<u>Abbreviated Form</u>
amplitude	amp
antilogarithm	antilog
arc	arc
argument	arg
cologarithm	colog
cosine	cos
hyperbolic cosine	cosh
cotangent	cot
hyperbolic cotangent	coth
coversine	covers
cosecant	csc
hyperbolic cosecant	csch
cotangent	ctn
hyperbolic cotangent	ctnh
determinant	det
error function	erf
exponential	exp
exsecant	exsec
gradient	grad
haversine	hav
imaginary part	im
infimum	inf
limit	lim
upper limit	$\overline{\text{lim}}$ or $\overline{\text{limit}}$
lower limit	$\underline{\text{lim}}$ or $\underline{\text{limit}}$
natural logarithm	ln
logarithm	log
maximum	max
minimum	min
modulo	mod
real part	re
secant	sec













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**PRACTICE 14B**

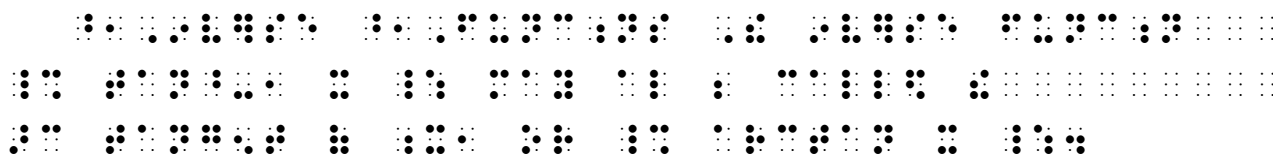
- (1)  $\sin \theta / \cos \theta$
  - (2)  $\sin 2\alpha = 2 \sin \alpha \cos \alpha$
  - (3)  $\frac{\tan 90^\circ}{\cot 90^\circ}$
  - (4)  $r[3 \cos \theta + 4 \sin \theta] = 5$
  - (5)  $7(\cos 20^\circ + i \sin 20^\circ)$
  - (6)  $\frac{1}{2} \ln |\sec 2t + \tan 2t| + C$
  - (7)  $a \sin \frac{x}{a} \cdot \frac{1}{a} = \sin \frac{x}{a}$
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Example 14-16

**Inverse Functions** The inverse function  $\tan^{-1} x$  may also be called the arc tangent of  $x$ , or  $\arctan x$ .



*"arc tangent" is not divided between lines even though "arc" fits on the previous line.*

**14.6 Clarification—Function Names in an Enclosed List**

A function name and the item which follows it are regarded as a single item. Although the numeric indicator is not used at the beginning of an item in an enclosed list, it must be used before a numeral (or decimal point and a numeral) following a function name.

➤ (2 sin 30°, 3 cos 60°)

**PRACTICE 14C**

- (A)  $\sin x - \sin y$
- (B)  $2 \sin x + 3 \cos y$
- (C)  $\frac{1+\cos x}{\sin x} + \frac{\sin x}{1+\cos x}$
- (D) The logarithm of sine  $18^\circ$  is written  $\log \sin 18^\circ$ .
- (E)  $\cos 225^\circ = -\sqrt{\frac{1+\cos 450^\circ}{2}}$
- (F) ArcTan[x, y] gives the arc tangent of  $\frac{y}{x}$ , taking into account in which quadrant the point (x, y) lies.
- (G) The arc tangent of the complex number q is written "ArcTan[q]".
- (H) Consider the ordered pair (cos .8000, 2 cos .8000).

















Example 14-22

1	⠠⠠⠠	
2	⠠⠠⠠⠠⠠⠠⠠⠠	406
3	⠠⠠⠠⠠⠠⠠⠠	√164836
4	⠠⠠	16
5	⠠⠠⠠⠠⠠⠠	80   48
6	⠠⠠⠠ ⠠⠠	0   00
7	⠠⠠⠠ ⠠⠠	806   4836
8	⠠⠠⠠⠠⠠⠠⠠⠠	6   4836
9	⠠⠠⠠⠠⠠ ⠠⠠⠠⠠	
10	⠠⠠ ⠠⠠⠠⠠	

*Line 5: The separation line is shorter than the others, as printed.*  
*Lines 6-7: This vertical line is aligned beneath the radical symbol, as printed. It is unspaced from the number to its left.*  
*Lines 9-10: This vertical line is situated in the same column as some digits. It is unspaced from the number to its left.*

**14.11 Placement of Identifiers with Spatial Radical Expressions**

An identifier, if present, is placed on the line with the radicand. One blank space is left between the last symbol in the identifier and the symbol furthest left in the overall arrangement, including separation lines.

Example 14-23

1	⠠⠠ ⠠⠠⠠	
2	⠠⠠⠠⠠⠠⠠⠠⠠	4. 7 4.
3	⠠⠠⠠⠠⠠⠠⠠⠠	√5476.
4	⠠⠠	49
5	⠠⠠⠠⠠⠠⠠⠠⠠	144   576
6	⠠⠠⠠⠠⠠⠠ ⠠⠠⠠	576
7	⠠⠠⠠⠠⠠	
8	⠠⠠⠠⠠⠠⠠⠠⠠	

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**PRACTICE 14F**

(A)  $\sqrt{33.0000}$

$$\begin{array}{r} 5.74 \\ \hline 25 \\ \hline 107 \overline{) 800} \\ \times 7 \quad \underline{749} \\ 1144 \overline{) 5100} \\ \times 4 \quad \underline{4576} \\ 524 \end{array}$$

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## OTHER PRINT LAYOUTS SHOWING DIVISION

In the next two layouts, note that the rules regarding placement of the vertical line differ from each other, and also differ from the vertical line rules in a square root problem in [Section 14.10.a](#). Before transcribing, analyze the print and refer to the appropriate rules.

### 14.12 Partial Quotients [NC Rule 25.5.8]

*Print Observations:* This layout shows partial quotients printed to the right of the division problem. A vertical line separates the partial quotients from the rest of the problem. The partial quotients may or may not be aligned by place value.

*Braille Rules:* The vertical line may be either drawn as a tactile graphic or it may be represented by dots 456. The partial quotients are aligned as printed. Space is left between the vertical line and any digit preceding or following it. More than one space may be needed if the partial quotients are aligned by place value.

No space is inserted between a separation line and the vertical line. If a vertical line and a horizontal line cross, the vertical line is kept intact, as shown in [Example 14-24](#).

#### Example 14-24

1	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	
2	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	7) 539
3	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	70   10
4	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	469
5	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	140   20
6	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	329
7	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	210   30
8	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	119
9	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	119   17
10	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	77
11	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	
12	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	
13	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	
14	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	
15	⠠⠠⠠⠠⠠⠠⠠⠠⠠⠠	

*Notice the comparative lengths of the separation lines as well as their vertical alignment.*

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**PRACTICE 14G**

*Instructions:* Review Section 10.13.6.d in Lesson 10 regarding alignment of the minus signs.

$$\begin{array}{r|l} 132 & \\ 6 \overline{)792} & \\ \underline{-600} & 100 \\ 192 & \\ \underline{-60} & 10 \\ 132 & \\ \underline{-60} & 10 \\ 72 & \\ \underline{-60} & 10 \\ 12 & \\ \underline{-12} & 2 \\ 0 & \end{array}$$

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**PRACTICE 14H****Dividing Polynomials Using Synthetic Division**Divide  $2x^3 + 6x^2 + 29$  by  $x + 4$ .

$$\begin{array}{r|rrrr} -4 & 2 & 6 & 0 & 29 \\ & & -8 & 8 & -32 \\ \hline & 2 & -2 & 8 & -3 \end{array}$$

*Answer*  $2x^2 - 2x + 8 - \frac{3}{x+4}$ 

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*For further practice, see Addendum 1—Reading Practice.*

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Submit Exercise 14 to your instructor.
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