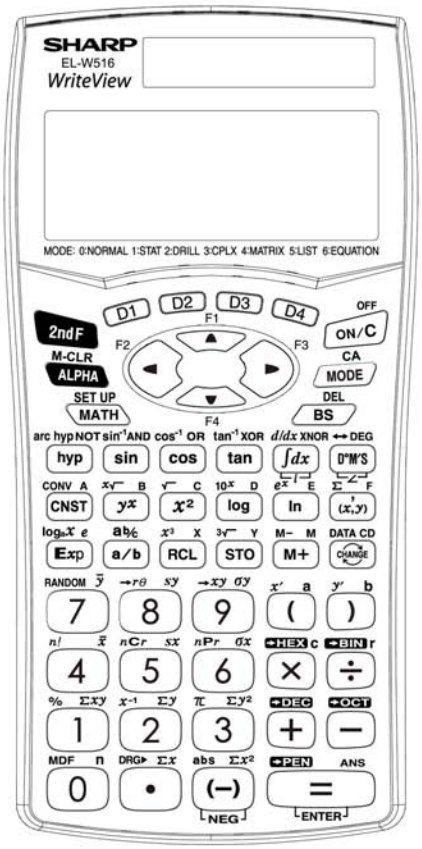
SHARP®

EL-W516B Calculator

Teaching Activities For The Classroom



Jeremy Ross

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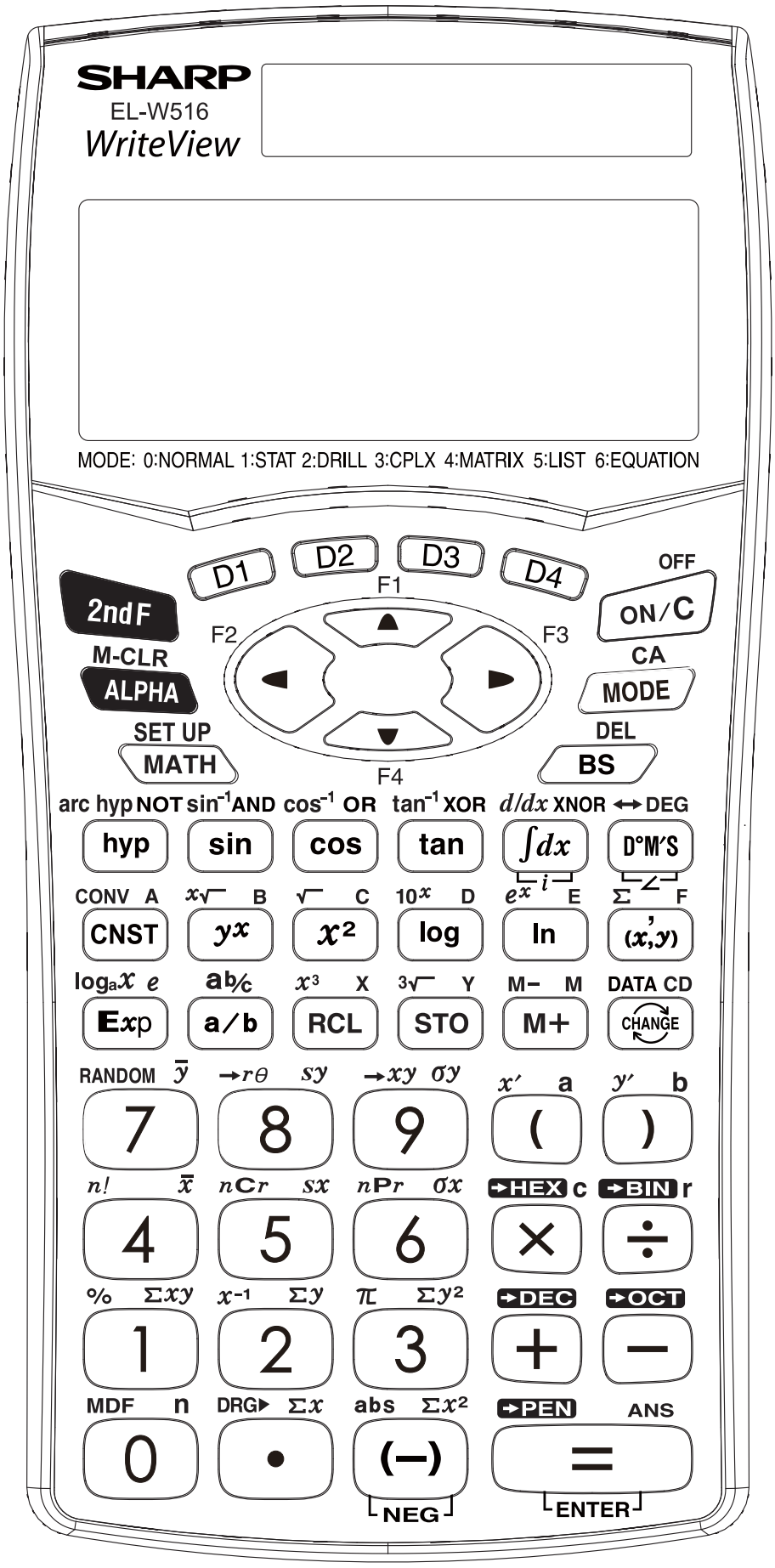

SHARP
EL-W516
WriteView
MODE: 0:NORMAL 1:STAT 2:DRILL 3:CPLX 4:MATRIX 5:LIST 6:EQUATION
D1
D2
D3
D4
F1
F2
F3
F4
2nd F
M-CLR
ALPHA
SET UP
MATH
OFF
ON/C
CA
MODE
DEL
BS
arc hyp NOT sin-1 AND cos-1 OR tan-1 XOR d/dx XNOR ↔ DEG
hyp
sin
cos
tan
∫dx
D°M′S
CONV A
CNST
B
yx
C
x2
10x D
log
ex i E
ln
Σ F
(x,y)
logax e
Exp
ab/c
a/b
x3 X
RCL
3√ Y
STO
M− M
M+
DATA CD
CHANGE
RANDOM ȳ
7
→rθ sy
8
→xy σy
9
x′ a
(
y′ b
)
n! x̄
4
nCr sx
5
nPr σx
6
→HEX c
×
→BIN r
÷
% Σxy
1
x-1 Σy
2
π Σy2
3
→DEC
+
→OCT
−
MDF n
0
DRG▶ Σx
•
abs Σx2
(−)
NEG
→PEN
ANS
=
ENTER

Special Functions of the Sharp EL-W516B Calculator

- *Modes.* This calculator has seven modes: NORMAL, STAT, DRILL, CPLX, MATRIX, LIST, and EQUATION mode. To access these modes press [MODE] followed by [0] for NORMAL, [1] for STAT, [2] for DRILL, [3] for CPLX, [4] for MATRIX, [5] for LIST, and [6] for EQUATION.

- *Degrees.* The EL-W516B can be set to degrees, radians, or grads. Press [2ndF] [SET UP] and enter [0] for DRG. Then press [0] for degrees, [1] for radians, and [2] for grads.

- *Math.* The math menu has different contents that can be accessed for each mode. To access the math menu for any mode press [MATH]. Then choose the desired tab.

- *Display.* There are five display notation systems. To set the number of decimals places press [2ndF] [SET UP] [1] for FSE. For fixed decimal type [0] and then choose your TAB or decimal setting. To set the calculator for scientific notation press [1]. Now enter the number of significant figures. To set the calculator for engineering notation press [2] and then enter the desired TAB setting. To set the floating-point number system in scientific notation press either [3] or [4] to choose NORM1 or NORM2. To choose WriteView, which displays formulas and equations just like textbooks, press [2ndF] [SET UP] followed by [2]. Then press [0]. For Line Editor press [2ndF] [SET UP] followed by [2]. Then press [1]. If in Line Editor you can choose an entry mode by pressing [2ndF] [SET UP] [4] and then [0] for insert and [1] for overwrite. To name your calculator press [2ndF] [SET UP] [5]. Use [▲] [▼] to select your characters, [◄] [►] to move the cursor, and press [=] to finish your entry.

- *Hyperbolic Functions.* Press [hyp] and the function key, [sin], [cos], or [tan]. Enter the angle. Then press [=].

- *Trigonometric Functions.* Press the trigonometric function key, [sin], [cos], or [tan]. Enter the angle. Then press [=].

- *Inverse Hyperbolic Functions.* Press [2nd F] followed by [arc hyp] and the inverse trigonometric function key [sin⁻¹], [cos⁻¹], [tan⁻¹]. Enter the value. Then press [=].

- *Inverse Trigonometric Functions.* Press [2nd F] followed by the inverse trigonometric function key [sin⁻¹], [cos⁻¹], [tan⁻¹]. Enter the value, then press [=].

- *Integral.* Press [∫dx]. Enter the lower bound. Then press [▲] and enter the upper bound. Then press [▶] and enter the integrand. Press [=] for the solution.

- *Derivative.* Press [2nd F] [d/dx]. Enter the function. Then press [▶] and enter the value, which the function is being evaluated at.

- *Constant.* Press [CNST] and then enter the corresponding value for the constant you want.

- *Conversion.* Enter the number you wish to convert. Press [2nd F] [CONV] and then enter the corresponding value for the conversion. Then press [=].

- *Pi.* Press [2nd F] [π].

- *Imaginary Numbers.* When in CPLX mode press [i].

- *Summation.* Press [2nd F] [Σ]. Enter the lower bound. Press [▲] and enter the upper bound. Press [▶] and enter the expression. Then press [=].

- *Degrees-Minutes-Seconds.* Enter the degrees. Press [D°M'S]. Enter the minutes. Press [D°M'S]. Enter the seconds. Press [D°M'S]. Press [2nd F] [↔DEG] to convert to decimal degrees.

- *Exponents.* Enter the base. Press [yx]. Enter the exponent. Press [=].

- *Square roots.* Press [2nd F] [√‾]. Enter the radicand. Then press [=].

- *Squares.* Enter the number to be squared. Press [x²]. Then press [=].

- *Base 10 Logarithms.* Press [log]. Enter the number. Then press [=].
- *Base e Logarithms.* Press [ln]. Enter the number. Then press [=].
- *Base Logarithms.* If in WriteView mode press [2ndF] [$\log_a x$]. Enter the base. Then press [▶] and enter the number. Then press [=]. If in Line Editor press [2ndF] [$\log_a x$]. Enter the base. Then press [(x,y)]. Enter the number. Then Press [=].
- *Higher roots.* Enter the index. Press [2ndF] followed by [$x\sqrt{\ }$]. Enter the radicand. Then press [=].
- *Cube roots.* Press [2ndF] [$\sqrt[3]{\ }$]. Enter the radicand. Then press [=].
- *Reciprocals.* Enter the number. Press [2ndF] followed by [x^{-1}]. Then press [=].
- *Antilogarithms.* Press [2ndF] [10^x]. Enter the exponent. Then press [=].
- *Exponentials.* Press [2ndF] followed by [e^x]. Enter the exponent. Then press [=].
- *Cubes.* Enter the number to be cubed. Press [2ndF] [x^3]. Then press [=].
- *Scientific Notation.* Enter the number. Press [Exp]. Enter the power. Then press [=].
- *Euler's Number.* To enter e press [ALPHA] followed by [e].
- *Fractions.* Enter the numerator. Press [a/b]. Enter the denominator. Then press [=].
- *Mixed Numbers.* Enter the whole number. Press [2ndF] [$a\frac{b}{c}$]. Enter the numerator. Press [▼]. Enter the denominator. Then press [=].

- *Memory.* The calculator has 9 memories. Memory calculations can be performed in NORMAL and STAT modes. Enter the value to be stored. Press STO. Press the location you wish to store the value A-F, M, X, or Y.
- *Recall Memory.* Press RCL. Press the location you wish to access A-F, M, X, or Y.
- *Last Answer Recall.* Perform a calculation. Press the operation key. The last answer will be recalled. Enter the number. Then press =.
- *Definable Memories.* You can store functions or operations in definable memories (D1-D4). Press STO. Press the location you wish to store your function D1, D2, D3, D4. Press the operation you want to store.
- *Formula Memories.* You can store expressions in formula memories (F1-F4). Enter the expression you wish to store. Press STO. Press the location you wish to store your function F1, F2, F3, F4.
- *Change.* You can change your answer from decimals to mixed numbers to fractions by pressing CHANGE. Also, you can change your answer from decimals or fractions to answer containing the pi symbol or square root symbol by pressing CHANGE.
- *Random.* You can generate random numbers, dice, coin flips, or integers. Press 2ndF RANDOM. Press 0 for random numbers between 0 and 1. Press 1 for random dice rolls from 1 to 6. Press 2 for random coin flips where 0 is heads and 1 is tails. Press 3 for random integers between 0 and 99.
- *P<->R Conversion.* To convert to polar coordinates enter your x-coordinate first. Then press (x,y). Then enter the y-coordinate. Press 2ndF →rθ. To convert to rectangular coordinates enter your r-value. Press (x,y). Then enter your theta. Press 2ndF →xy.
- *Factorial.* Enter the number. Press 2ndF followed by n!. Then press =.
- *Combinations.* Enter the larger number. Press 2ndF nCr. Enter the smaller number. Then press =.

- *Permutations.* Enter the larger number. Press 2ndF followed by nPr. Enter the smaller number. Then press =.
- *Signed Numbers.* Enter (–). Enter the number.
- *Absolute Value.* Press 2ndF abs. Enter the expression. Press =.
- *Binary.* To convert from one of the supported base systems into binary enter the number. Then press 2ndF →BIN.
- *Hexadecimal.* To convert from one of the supported base systems into hexadecimal enter the number. Then press 2ndF →HEX.
- *Octadecimal.* To convert from one of the supported base systems into octadecimal enter the number. Then press 2ndF →OCT.
- *Decimal.* To convert from one of the supported base systems into decimal enter the number. Then press 2ndF →DEC.
- *Pentadecimal.* To convert from one of the supported base systems into pentadecimal enter the number. Then press 2ndF →PEN.

Examples:

Please refer to the following examples and the keystrokes required to enter each problem. From these simple examples more complicated expressions can be easily entered.

$\frac{1}{2}\times 9$	1 a/b 2 ▶ × 9 =
$2\frac{3}{4}-\frac{1}{3}$	2 2ndF ab/c 3 ▼ 4 ▶ − 1 a/b 3 =
$\sqrt{17}+\sqrt[3]{2}$	2ndF √ 1 7 ▶ + 2ndF ∛ 2 =
$1^2+2^3+3^4$	1 x^2 + 2 2ndF x^3 + 3 y^x 4 =
$153+33\%$	1 5 3 + 3 3 2ndF %
$\log 10-\ln e$	log 1 0 − ln ALPHA e =
$\log_2 4+\pi$	2ndF $\log_a x$ 2 ▶ 4 ▶ + 2ndF π =
$10^3\times e^2$	2ndF 10^x 3 ▶ × 2ndF e^x 2 =
$\sin 30$	sin 3 0 =
$\cos^{-1}0$	2ndF $\cos^{-1}$ 0 =
$\tanh 78$	hyp tan 7 8 =
$3!$	3 2ndF $n!$ =
$10C5$	1 0 2ndF nCr 5 =
$6P1$	6 2ndF nPr 1 =
$\frac{d}{dx}x\Big\|_{x=5}$	2ndF d/dx ALPHA X ▶ 5 =
$\int_1^2 x^2dx$	∫dx 1 ▲ 2 ▶ ALPHA X x^2 =

Using the Sharp EL-W516B Calculator

GETTING STARTED

The National Council of Teachers of Mathematics and many other organizations with a commitment to the mathematics education of our youth have all given their support to the ongoing and appropriate use of calculators. In this document, convincing arguments for the ongoing use of calculators to enhance the mathematical capabilities of students at all grade levels are presented as well as a description of the features expected to be available on calculators. The EL-W516B uses WriteView™ technology and allows students to enter equations as they are seen in their textbooks.

ACTIVITY AND PRACTICE SHEETS

The twenty-four calculator activities and practice sheets found in this book have been designed to be used with the Sharp EL-W516B calculator. The activities have been written and developed for students in grades nine through twelve. Some of the activities will be more appropriate for students in a particular grade, while others could be used at any grade level. Of course, the classroom teacher can and should make the decision as the appropriateness of each activity.

Each activity page has an objective statement and some practice key strokes. The activity page does not attempt to teach mathematics. It only identifies the mathematics being used and demonstrates the calculator key strokes necessary to conduct a calculation. The practice page provides activities for the students to practice using the key strokes presented on the activity page. Answers to the activity and practice sheets are provided at the end of this booklet.

TEACHING ACTIVITIES
FOR THE CLASSROOM

The Sharp EL-W516B was designed with you and your students in mind. The following activities have been written to provide the practice students need to succeed in mathematics, as they become familiar with the wonderful features of this exciting and powerful mathematical tool.

Calculator Activity
BASIC ARITHMETIC

OBJECTIVE: To perform basic operations by developing a sequence of numbers.

Performing a specified operation repeatedly can generate a sequence of numbers. For example, if you start with the number 4 and add 2 repeatedly you will generate the sequence $4,6,8,10\ldots$

1. Add 13 to 54 twice:

STEP 1: Enter 13 by pressing [1] [3].
STEP 2: Add by pressing [+].
STEP 3: Enter 54 by pressing [5] [4].
STEP 4: Find the first sum by pressing [=].
STEP 5: Add 13 again by pressing [+] [1] [3] [=].

2. Subtract 9 from 32 once.

STEP 1: Enter 32 by pressing [3] [2].
STEP 2: Subtract by pressing [−].
STEP 3: Enter 9 by pressing [9].
STEP 4: Find the difference by pressing [=].

3. Multiply -2 by 5 three times.

STEP 1: Enter –2 by pressing [(-)] followed by [2].
STEP 2: Multiply by pressing [×].
STEP 3: Enter 5 by pressing [5].
STEP 4: Find the first product by pressing [=].
STEP 5: Multiply by 5 again by pressing [×] [5] [=].
STEP 6: Multiply by 5 a third time by pressing [×] [5] [=].

NAME _____ DATE_____

BASIC ARITHMETIC

Use your EL-W516B to develop a series of sequences.

1. Find the first seven numbers of the sequence starting with –3 where each additional term is found by adding 4.

   -3, ___, ___, ___, ___, ___, ___, …

2. Find the first four numbers of the sequence starting with 2 where each additional term is found by adding 1.

   2, ___, ___, ___, …

3. Find the first five numbers of the sequence starting with 6 where each additional term is by adding 3.

   6, ___, ___, ___, ___, …

4. Find the first three numbers of the sequence starting with 144 where each additional term is found by dividing by 2.

   144, ___, ___, …

5. Find the first six terms of the sequence starting with 729 where each additional term is found by dividing by –3.

   729, ___, ___, ___, ___, ___, …

6. Find the first three terms of the sequence starting with 1 where each additional term is found by multiplying by 45.

   1, ___, ___, …

7. Find the first five terms of the sequence starting with 100 where each additional term is found by subtracting 10.

   100, ___, ___, ___, ___, …

8. Find the first four terms of the sequence starting with 1 where each additional term is found by adding 20.

   1, ___, ___, ___, …

Calculator Activity
FRACTIONS

OBJECTIVE: To perform basic operations with fractions.

1. Simplify $\frac{1}{7}+\frac{3}{8}$

STEP 1: Enter $\frac{1}{7}$ by pressing [1] [a/b] [7] [►].

STEP 2: Add by pressing [+].

STEP 3: Enter $\frac{3}{8}$ by pressing [3] [a/b] [8].

STEP 4: Find the sum by pressing [=].

2. Simplify $\frac{1}{2}-\frac{5}{13}$. Then convert to a decimal

STEP 1: Enter $\frac{1}{2}$ by pressing [1] [a/b] [2] [►].

STEP 2: Subtract by pressing [−].

STEP 3: Enter $\frac{5}{13}$ by pressing [5] [a/b] [1] [3].

STEP 4: Find the difference by pressing [=].

STEP 5: Convert to a decimal by pressing [CHANGE].

3. Simplify $1\frac{3}{4}\times 6\frac{2}{3}$. Then convert to an improper fraction.

STEP 1: Enter $1\frac{3}{4}$ by pressing [1] [2ndF] [ab/c] [3] [▼] [4] [►].

STEP 2: Multiply by pressing [×].

STEP 3: Enter $6\frac{2}{3}$ by pressing [6] [2ndF] [ab/c] [2] [▼] [3].

STEP 4: Find the product by pressing [=].

STEP 5: Convert to an improper fraction by pressing [CHANGE].

NAME _____ DATE_____

FRACTIONS

Perform the indicated operations with fractions using your EL-W516B.

1. Find the arithmetic mean of the following fractions $\frac{1}{2}, \frac{1}{4}, \frac{1}{16}$.

2. Find the arithmetic mean of the following fractions and convert to a decimal $\frac{1}{8}, \frac{2}{9}, \frac{3}{10}, \frac{4}{11}, \frac{5}{12}$.

3. Simplify $1\frac{1}{20} + \frac{6}{7} + 9\frac{1}{5}$.

4. Simplify $\frac{1}{2} - \frac{3}{4} + \frac{5}{6} - \frac{7}{8}$.

5. Simplify $1 + \frac{1}{2} + \frac{1}{3} - 1 - \frac{1}{2} + \frac{1}{3}$.

6. Simplify $\frac{4}{3} + 3\frac{5}{8} - \frac{1}{2} \times \frac{6}{11} - \frac{1}{2} \div \frac{6}{11}$ and convert to an improper fraction.

7. Simplify $8 \times 5\frac{3}{2} - 6\frac{1}{6}$.

8. Simplify $\frac{-5}{4} + \frac{\sqrt{5^2 - 4 \times 2}}{2 \times 2}$.

Calculator Activity
POWERS AND ROOTS

OBJECTIVE: To perform basic operations with powers and roots.

1. Calculate 3^{2^3}

STEP 1: Enter 3^2 by pressing [3] [x^2].

STEP 2: Cube it by pressing [2ndF] [x^3].

STEP 3: Calculate the answer by pressing [=].

2. Calculate $(\sqrt[5]{3})^6$.

STEP 1: Enter $\sqrt[5]{3}$ by pressing [5] [2ndF] [$x\sqrt{}$] [3] [▶].

STEP 2: Raise the expression to the 6th power by pressing [y^x] [6].

STEP 3: Calculate the answer by pressing [=].

3. Calculate $\sqrt[3]{\sqrt{5^{-1}}}$

STEP 1: Enter $\sqrt[3]{\sqrt{\ }}$ by pressing [2ndF] [$\sqrt[3]{}$] [2ndF] [$\sqrt{}$].

STEP 2: Enter 5^{-1} by pressing [5] [2ndF] [x^{-1}].

STEP 3: Calculate the answer by pressing [=].

4. Evaluate $\sqrt{2^4}$

STEP 1: Enter $\sqrt{2^4}$ by pressing [2ndF] [$\sqrt{}$] [2] [y^x] [4].

STEP 2: Calculate the answer by pressing [=].

NAME _____ DATE_____

POWERS AND ROOTS

Use your EL-W516B to perform the indicated operations with the following equations that contain powers and roots.

1. Simplify $1^2 + 2^2 + 3^2 + 4^2 + 5^2$

   _____

2. Simplify $\sqrt{1} + \sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{5}$

   _____

3. Is $(\sqrt{3} - \sqrt{7})^2 = \sqrt{3}^2 - \sqrt{7}^2$? Explain your answer.

   _____
   _____
   _____

4. Simplify 2^{3^3}

   _____

5. Simplify $\sqrt[3]{2^{33}}$

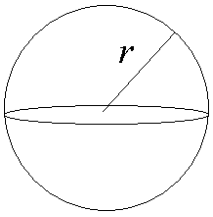
   _____

6. Simplify $\frac{-5 + \sqrt{5^2 - 4 \times 2}}{2 \times 2} \times \frac{-5 - \sqrt{5^2 - 4 \times 2}}{2 \times 2}$

   _____

Calculator Activity
PARENTHESES AND EDITING

OBJECTIVE: To perform basic operations with parentheses by finding the volume of a sphere, by recalling the expressions, and editing them to perform a new calculation.



The volume of a sphere is defined to be Volume $= \frac{4}{3}\pi r^3$, where *r* is the radius of the sphere.

1. Given the radius is $\sqrt{2}$ find the volume of the sphere.

STEP 1: Enter $\left(\frac{4}{3}\right)$ by pressing [( ] [4] [a/b] [3] [▶] [ )].

STEP 2: Insert the pi symbol by pressing [2nd F] [π].

STEP 3: Enter $\sqrt{2}$ by pressing [2nd F] [√] [2] [▶].

STEP 4: Raise $\sqrt{2}$ to the third power by pressing [2nd F] and then [x^3].

STEP 5: Calculate the answer by pressing [=].

2. Edit the previous equation and solve the volume of the sphere given the radius is 1. Then convert the answer to a decimal

STEP 1: Recall the previous equation by pressing [◀] or [▶].

STEP 2: Move the cursor so it is to the immediate right of the third power.

STEP 3: Delete the power, the parenthesis, the 2, and the square root by pressing [BS] five times.

STEP 4: Enter the number 1 by pressing [1] followed by [ )].

STEP 5: Raise 1 to the third power by pressing [2nd F] [x^3].

STEP 6: Calculate the answer by pressing [=].

STEP 7: Press [CHANGE] to convert it to an improper fraction. Press [CHANGE] one more time to convert it to a decimal.

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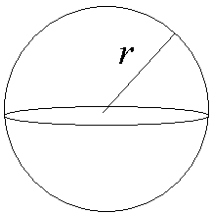
PARENTHESES AND EDITING

Use your EL-W516B and the formula to find the volume of a sphere. Recall and edit previous equation to prevent typing the whole expression over and over again.

$$\text{Volume} = \frac{4}{3}\pi r^3$$



1. Find the volume of the sphere whose radius is 6.

_____

2. Find the volume of the sphere whose radius is 5.

_____

3. Find the volume of the sphere whose radius is 9.

_____

4. Find the volume of the sphere whose radius is 10.

_____

5. Find the volume of the sphere whose diameter is 10.

_____

6. Find the volume of a sphere whose diameter is 12.

_____

Calculator Activity
ANGLE CONVERSIONS

OBJECTIVE: To make angle conversions by finding the missing angle of a polygon.

Angles can be expressed in degrees, radians and grads. Degrees can be expressed in either decimal degrees or degrees-minutes-seconds. Remember 180° = π radians = 200 grads. The formula for the sum of the angles of an n-side polygon in degrees is 180(n-2). Before inputting an angle for conversion, press [2nd F] [SET UP] [0] and then choose the appropriate angular units.

1. Convert 45° to radians and grads.

STEP 1: Set the angular units to degrees by pressing [2nd F] [SET UP] [0] [0].

STEP 2: Enter 45 by pressing [4] [5].

STEP 3: Convert to radians by pressing [2nd F] [DRG▸].

STEP 4: Convert to grads by pressing [2nd F] [DRG▸].

2. Convert 11°23'58" to decimal degrees.

STEP 1: Enter 11°23'58" by pressing [1] [1] [D°M'S] [2] [3] [D°M'S] [5] [8] [D°M'S].

STEP 2: Calculate decimal degrees by pressing [2nd F] [↔DEG].

STEP 3: Convert to a decimal by pressing [CHANGE].

3. Convert 2.718° to degrees-minutes-seconds.

STEP 1: Set the angular units to degrees by pressing [2nd F] [SET UP] [0] [0].

STEP 2: Enter 2.718° by pressing [2] [•] [7] [1] [8].

STEP 3: Calculate degrees-minutes-seconds by pressing [2nd F] [↔DEG].

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ANGLE CONVERSIONS

The sum of the angles in degrees of an n-side polygon is 180(n-2). Remember $180° = \pi$ radians $= 200$ grads. Before inputting an angle for conversion press [2nd F] [SET UP] [0] and then choose the corresponding angular units. Use your EL-W516B to find the missing angle in the specified units.

1. A triangle has two angles, which are 45° and 60 °. Find the missing angle and express your answer in radians.

   _____

2. A pentagon has four angles, which are 30°, 30 °, 60°, and 100°. Find the missing angle and express your answer in grads.

   _____

3. A triangle has two angles, which are 100 grads and 20 grads. Find the missing angle and express your answer in radians.

   _____

4. A hexagon has five angles, which are 1.5π radians, $.3\pi$ radians, $.4\pi$ radians, $.5\pi$ radians, and π radians. Find the missing angle and express your answer in degrees.

   _____

5. A four-sided figure has three angles, which are 16.3°, 22.1°, and 45°. Find the missing angle and express your answer in degrees-minutes-seconds.

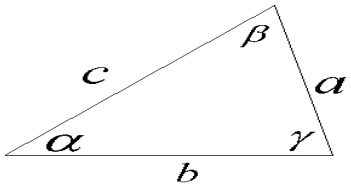
   _____

Calculator Activity
TRIGONOMETRIC FUNCTIONS

OBJECTIVE: To find the distance between points by using trigonometric functions.

The law of sines and the law of cosines can help determine the sides and angles of triangles. The law of sines is as follows $\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$.

The law of cosines is as follows $c^2 = a^2 + b^2 - 2ab\cos\gamma$.



1. Using the law of sines find the length of side a given $\alpha = 37°, \beta = 53°, b = 4$.

STEP 1: Set the angular units to degrees by pressing [2nd F] [SET UP] [0] [0].

STEP 2: Multiply 4 by $\sin(37)$ by pressing [4] [×] [sin] [3] [7] [=].

STEP 3: Divide by $\sin(53)$ by pressing [÷] [sin] [5] [3] [=].

2. Using the law of cosines fine the length of c given $a = 5, b = 12, \gamma = \frac{\pi}{2} radians$.

STEP 1: Set the angular units to radians by pressing [2nd F] [SET UP] [0] [1].

STEP 2: Add 5^2 and 12^2 by pressing [5] [x^2] [+] [1] [2] [x^2].

STEP 3: Subtract $2\times5\times12\times\cos(\frac{\pi}{2})$ by pressing [−] [2] [×] [5] [×] [1] [2] [×] [cos] [2nd F] [π] [a/b] [2] [=].

STEP 4: Take the square root by pressing [2nd F] [√] [ALPHA] [ANS] [=].

Note: Tangent can be used in a similar manner as sine as cosine.

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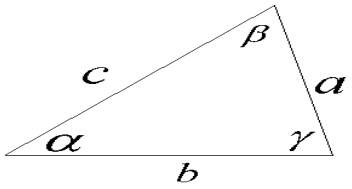
TRIGONOMETRIC FUNCTIONS

Use your EL-W516B together with the law of sines and the law of cosines to find the distance of the missing side



The law of sines is $\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$.

The law of cosines is $c^2 = a^2 + b^2 - 2ab\cos\gamma$.

1. Given $\alpha = 30°, \gamma = 63°, a = 11$ determine the length of side c.

   _____

2. Given $\alpha = 16$ grads, $\beta = 69$ grads, $b = 123$ find the length of side a.

   _____

3. Given $a = 30, b = 40, \gamma = 1.5$ radians find the length of side c.

   _____

4. Given $a = 15, c = 30, \beta = 45°$ find the length of side b.

   _____

5. Given $b = 13, c = 23, \gamma = 100$ grads find the length of side a using the law of sines.

   _____

Calculator Activity
INVERSE TRIGONOMETRIC FUNCTIONS

OBJECTIVE: To perform operations with inverse trigonometric functions.

1. Find θ in degrees when $\tan\theta = 1$

STEP 1: Set the angular units to degrees by pressing [2ndF] [SET UP] [0] [0].

STEP 2: Enter $\tan^{-1}(1)$ by pressing [2ndF] [tan⁻¹] [(] [1] [)].

STEP 3: Calculate the answer by pressing [=].

2. Find θ in degrees when $\cos\theta = 0$

STEP 1: Set the angular units to degrees by pressing [2ndF] [SET UP] [0] [0].

STEP 2: Enter $\cos^{-1}(1)$ by pressing [2ndF] [cos⁻¹] [(] [0] [)].

STEP 3: Calculate the answer by pressing [=].

3. Find θ in radians when $\sin\theta = \frac{\sqrt{2}}{2}$

STEP 1: Set the angular units to radians by pressing [2ndF] [SET UP] [0] [1].

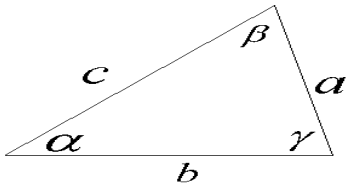
STEP 2: Enter $\sin^{-1}(\frac{\sqrt{2}}{2})$ by pressing [2ndF] [sin⁻¹] [(] [2ndF] [√‾] [2] [▶] [a/b] [2] [▶] [)].

STEP 3: Calculate the answer by pressing [=].

NAME _____ DATE_____

INVERSE TRIGONMETRIC FUNCTIONS

Use your EL-W516B and the law of sines and the law of cosines to find the missing angle.



The law of sines is $\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$.

The law of cosines is $c^2 = a^2 + b^2 - 2ab\cos\gamma$.

1. Given $a = 2, b = 7, \beta = 23°$ find α in grads.

_____

2. Given $a = 34, c = 21, \alpha = 94$ grads, find γ in radians.

_____

3. Given $a = 3, b = 4, c = 5$ find γ in degrees.

_____

4. Given $a = 40, b = 24, c = 17$ find α in radians

_____

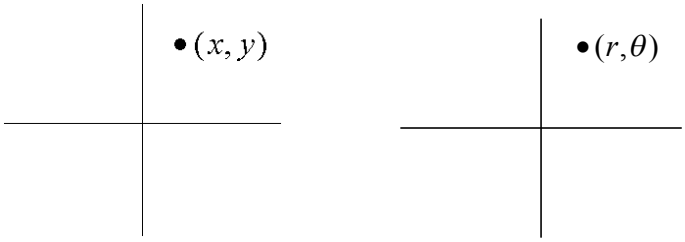
5. Given $a = 5, b = 12, c = 13$ find α in degrees.

_____

Calculator Activity
COORDINATE CONVERSIONS

OBJECTIVE: To convert from polar coordinates to rectangular coordinates and vice versa.

A point on a circle can be described with rectangular coordinates (x, y) or polar coordinates (r, θ), where r is the radius of the circle and θ is the angle counterclockwise from the positive x-axis.



1. While in degrees convert the rectangular coordinates (1,1) to polar coordinates.

STEP 1: Set the angular units to degrees by pressing [2nd F] [SET UP] [0] [0].

STEP 2: Enter 1,1 by pressing [1] [(x,y)] [1].

STEP 3: Convert to polar coordinates by pressing [2nd F] [→rθ].

2. While in radians convert the polar coordinates of $(2\sqrt{2}, 60)$ to rectangular coordinates.

STEP 1: Set the angular units to radians by pressing [2nd F] [SET UP] [0] [1].

STEP 2: Enter $2\sqrt{2}, 60$ by pressing [2] [√] [2] [▶] [(x,y)] [6] [0].

STEP 3: Convert to rectangular coordinates by pressing [2nd F] [→xy].

NAME _____ DATE_____

COORDINATE CONVERSIONS

A point on a circle can be described with rectangular coordinates (x, y) or polar coordinates (r, θ), where r is the radius of the circle and θ is the angle counterclockwise for the positive x-axis.

Before converting, press 2nd F SET UP 0 and then choose degrees, radians, or grads. Use your EL-W516B to find the corresponding point on the circle.

1. While in degrees convert the rectangular coordinates (2,2) to polar coordinates (r, θ).

   $r =$ _____ $\theta =$ _____

2. While in radians convert the rectangular coordinates $(2\sqrt{3}, 3)$ to polar coordinates (r, θ).

   $r =$ _____ $\theta =$ _____

3. While in degrees convert the polar coordinates $(4, 3\sqrt{5})$ to rectangular coordinates (x, y).

   $x =$ _____ $y =$ _____

4. While in degrees convert the polar coordinates (1,1.5) to rectangular coordinates (x, y).

   $x =$ _____ $y =$ _____

5. While in grads convert the rectangular coordinates $(-1, 1)$ to polar coordinates (r, θ).

   $r =$ _____ $\theta =$ _____

Calculator Activity
LOGARITHMS

OBJECTIVE: To get a basic understanding of logarithms base 10, base e, and other bases by solving equations.

1. Find $\log 1000$.

STEP 1: Enter log by pressing [log].
STEP 2: Enter 1000 by pressing [1] [0] [0] [0].
STEP 3: Calculate the answer by pressing [=].

2. Find $\log 10$.

STEP 1: Enter log by pressing [log].
STEP 2: Enter 10 by pressing [1] [0].
STEP 3: Calculate the answer by pressing [=].

3. Find $\ln e$.

STEP 1: Enter ln by pressing [ln]
STEP 2: Enter e by pressing [ALPHA] [e].
STEP 3: Calculate the answer by pressing [=].

4. Find $\ln e^2$.

STEP 1: Enter ln by pressing [ln]
STEP 2: Enter e^2 by pressing [ALPHA] [e] [x^2].
STEP 3: Calculate the answer by pressing [=].

5. Find $\log_2 4$

STEP 1: To enter $\log_2$ press [2nd F] [$\log_a x$] [2].
STEP 2: Enter 4 by pressing [▶] [4].
STEP 3: Calculate the answer by pressing [=].

NAME _____ DATE_____

LOGARITHMS

Use your EL-W516B to solve to following equations for the unknown.

1. Solve for x . $x = 5 + 2\log 123$

_____

2. Solve for y . $y = 21 - 5(1 + \ln 3)$

_____

3. Solve for z . $z = 54 + \dfrac{\log_6 36}{2}$

_____

4. Solve for x . $x = \log 100 - \ln e + \dfrac{1}{\sqrt{2}}$

_____

5. Solve for y . $y = \log_{21} 100 - \ln \pi^2$

_____

6. Solve for z . $z = \log_2 32 \div \dfrac{\log 25}{\ln 200}$

_____

Calculator Activity
INVERSE LOGARITHMS

OBJECTIVE: To perform antilogarithmic operations.

1. Calculate $10^{2\times3}$

STEP 1: Enter 10^ by pressing [2nd F] [10^x].
STEP 2: Enter 2×3 by pressing [2] [×] [3].
STEP 3: Calculate the answer by pressing [=].

2. Find $10^{6\times3}$ in scientific notation with three significant figures.

STEP 1: Set the calculator to scientific notation with three significant figures by pressing [2nd F] [SET UP] [1] [1] [3].
STEP 2: Press [2nd F] [10^x].
STEP 3: Enter 6x3 by pressing [6] [×] [3]
STEP 4: Calculate the answer by pressing [=].

3. Find $e^{((7-4)\div3)}$

STEP 1: Enter e^ by pressing [2nd F] [e^x].
STEP 2: Enter $((7-4)\div3)$ by pressing [(] [(] [7] [−] [4] [)] [÷] [3] [)]
STEP 3: Calculate the answer by pressing [=].

NAME _____ DATE_____

INVERSE LOGARITHMS

Use your EL-W516B to solve the following equations for the given unknown.

1. Solve for x. $x = 2 + 10^{5+6*2}$

_____

2. Solve for y. $y = \frac{5}{e^2}$

_____

3. Solve for z. $z = 1 - 3 \times 10^{\frac{2}{3}}$

_____

4. Solve for x. $x = 10^{2 \div 5} \frac{5}{e^4}$

_____

5. Solve for y. $y = e^3 \sqrt{2} - 2 \times 10^1$

_____

6. Solve for z. $z = e^{2 \div 3} - \frac{10^6}{10^{2(3-1)}}$

_____

Calculator Activity
BASE CONVERSIONS

OBJECTIVE: To convert to and from binary, decimal, hexadecimal, octadecimal, and pentadecimal base systems.

Before converting press [2nd F] followed by either [→BIN], [→DEC], [→HEX], [→OCT], [→PEN].

1. Convert the binary number 10011001 to decimal.

STEP 1: Set the calculator to binary by pressing [2nd F] [→BIN].
STEP 2: Enter 10011001 by pressing [1] [0] [0] [1] [1] [0] [0] [1].
STEP 3: Convert to decimal by pressing [2nd F] [→DEC].

2. Convert the hexadecimal number 16841601 to octadecimal.

STEP 1: Set the calculator to hexadecimal by pressing [2nd F] [→HEX].
STEP 2: Enter 16841601 by pressing [1] [6] [8] [4] [1] [6] [0] [1].
STEP 3: Convert to octadecimal by pressing [2nd F] [→OCT].

3. Convert the decimal number 144169 to pentadecimal.

STEP 1: Set the calculator to decimal by pressing [2nd F] [→DEC].
STEP 2: Enter the number 144169 by pressing [1] [4] [4] [1] [6] [9].
STEP 3: Convert to pentadecimal by pressing [2nd F] [→PEN].

NAME _____ DATE_____

BASE CONVERSIONS

Use your EL-W516B to convert to and from binary, decimal, hexadecimal, octadecimal, and pentadecimal base systems.

Before converting make sure you are in the right base system by pressing 2nd F followed by either →BIN, →DEC, →HEX, →OCT, →PEN.

1. Convert the octadecimal number 161033 to pentadecimal.

   _____

2. Convert the hexadecimal number 123 to binary.

   _____

3. Perform the indicated operations in hexadecimal and then convert your answer to octadecimal. $8 \times 2 + (2 \times 3 - 12)$

   _____

4. Perform the indicated operations in decimal and then convert your answer to binary. $15 \div 3 + \frac{1}{6}\left(\sqrt{36} - 24\right)$

   _____

5. Convert the binary number 10101010 to decimal, octadecimal, and pentadecimal.

   _____
   _____
   _____

Calculator Activity
CONSTANTS AND CONVERSIONS

OBJECTIVE: To use constants to aid in solving $E = mc^2$ and to perform conversions.

Use Einstein's equation to solve for energy: $E = mc^2$.

1. What is the energy of an object given the mass of that object is 100 kilograms?

STEP 1: Enter 100 by pressing [1] [0] [0].
STEP 2: To multiply by the constant c press [×] [CNST] [0] [1].
STEP 3: Square c by pressing [x^2].
STEP 4: Solve for E by pressing [=].

2. What is the energy of an object given the mass of that object is 123 kilograms?

STEP 1: Enter 123 by pressing [1] [2] [3].
STEP 2: To multiply by the constant c press [×] [CNST] [0] [1].
STEP 3: Square c by pressing [x^2].
STEP 4: Solve for E by pressing [=].

3. What is $95°F$ equal to in Celsius?

STEP 1: Enter 95 by pressing [9] [5].
STEP 2: To select to convert to Celsius press [2nd F] [CONV] [1] [7].
STEP 3: To convert press [=].

4. How many inches are in 1 centimeter?

STEP 1: Enter 1 by pressing [1].
STEP 2: Choose convert to inches by pressing [2nd F] [CONV] [0] [2].
STEP 3: To convert press [=].

NAME _____ DATE_____

CONSTANTS AND CONVERSIONS

Use your EL-W516B to use constants and to convert when necessary.

Use Einstein's equation to help solve some of the questions: $E = mc^2$.

1. How much energy does a particle whose mass is 10 kilograms have?

   _____

2. How much energy does a particle whose mass is 5 kilograms have?

   _____

3. How many feet are in 3 meters?

   _____

4. How many yards in are 5 meters?

   _____

5. How much energy does a particle whose weight is 200 pounds have?

   _____

6. How much energy does an object whose weight is 16 pounds have?

   _____

Calculator Activity
RANDOM NUMBERS, DIE, COINS, AND INTEGERS

OBEJCTIVE: To generate random numbers, dice throws, coin tosses, and integers.

1. Generate 4 random numbers.

STEP 1: Press 2nd F RANDOM.
STEP 2: To generate random numbers press 0.
STEP 3: Generate the first random number by pressing =.
STEP 4: Generate the second random number by pressing =.
STEP 5: Generate the third random number by pressing =.
STEP 6: Generate the fourth random number by pressing =.

2. Generate 3 random dice throws.

STEP 1: Press 2nd F RANDOM.
STEP 2: To generate random dice throws press 1.
STEP 3: Generate the first random dice throw by pressing =.
STEP 4: Generate the second random dice throw by pressing =.
STEP 5: Generate the third random dice throw by pressing =.

3. Generate 3 random coin tosses.

STEP 1: Press 2nd F RANDOM.
STEP 2: To generate random coin flips press 2.
STEP 3: Generate the first random coin flip by pressing =.
STEP 4: Generate the second random coin flip by pressing =.
STEP 5: Generate the third random coin flip by pressing =.

4. Generate 2 random integers.

STEP 1: Press 2nd F RANDOM.
STEP 2: To generate random integers press 3.
STEP 3: Generate the first random integer by pressing =.
STEP 4: Generate the second random integer by pressing =.

NAME _____ DATE_____

RANDOM NUMBERS, DIE, COINS, AND INTEGERS

Use your EL-W516B to help generated a sequence of random numbers, dice, coins, and integers.

1. Generate a sequence of 4 random integers.

   ___, ___, ___, ___

2. Generate a sequence of 5 random dice throws.

   ___, ___, ___, ___, ___

3. Generate a sequence of 10 random coin flips.

   ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

4. Generate a sequence of 3 random integers.

   ___, ___, ___

5. Generate a sequence of 12 dice throws and based on that sequence what is the probability of rolling a 6?

   ___, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

   _____

6. Generate a sequence of 10 random coin flips and based on that sequence what is the probability of getting heads?

   ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

   _____

Calculator Activity
PROBABILITY

OBJECTIVE: To get a basic understanding factorials, combinations, and permutations.

A combination is used when order does not matter. A permutation is used when order does matter.

1. Find $10!$.

STEP 1: Enter $10!$ by pressing [1] [0] [2nd F] [$n!$].
STEP 2: Calculate by pressing [=].

2. How many different ways can you choose 1 from a group of 6?

STEP 1: Enter the larger number, 6, by pressing [6].
STEP 2: Enter the combination symbol by pressing [2nd F] [nCr].
STEP 3: Enter the smaller number, 1, by pressing [1].
STEP 4: Calculate the answer by pressing [=].

3. Find the number of permutations of 4 things taken 2 at a time.

STEP 1: Enter the larger number, 4, by pressing [4].
STEP 2: Enter the permutation symbol by pressing [2nd F] [nPr].
STEP 3: Enter the smaller number, 2, by pressing [2].
STEP 4: Calculate the answer by pressing [=].

NAME _____ DATE_____

PROBABILITY

Use your EL-W516B to find the following number of combinations and permutations and to evaluate factorials.

1. How many groups or 4 can be formed from a class of 10 where order does not matter?

   _____

2. How many groups of 4 can be formed from a class of 10 where order does matter?

   _____

3. How many sets of 3 officers can be formed from a group of 15 where order does not mater?

   _____

4. How many sets of 3 officers can be formed from a group of 15 where order does matter?

   _____

5. Evaluate $5!$

   _____

6. What is $0!$? What is $1!$? Explain why the answer is so.

   _____
   _____
   _____

Calculator Activity
1 VARIABLE STATISTICS

OBJECTIVE: To perform 1 variable statistics.

1. Analyze the set $\{15,25,35,35,50\}$ using 1 variable statistics.

STEP 1: Set the calculator to single variable statistics by pressing

MODE 1 0.

STEP 2: Enter 15 by pressing 1 5 DATA.

STEP 3: Enter 25 by pressing 2 5 DATA.

STEP 4: Enter 35 two times by pressing 3 5 (x,y) 2 DATA.

STEP 5: Enter 50 by pressing 5 0 DATA.

STEP 6: To determine the mean of the sample press RCL $\bar{x}$.

STEP 7: To determine the sample mean standard deviation press

RCL sx.

STEP 8: To determine the population standard deviation press

RCL σx.

STEP 9: To determine the number of samples press RCL n.

STEP 10: To determine the sum of the samples press RCL Σx.

STEP 11: To determine the sum of squares of samples press

RCL Σx^2.

NAME _____ DATE_____

1 VARIABLE STATISTICS

Use your EL-W516B to analyze the following sets using 1 variable statistics.

1. Analyze the set $\{1,1,2,2,2,3,3,3,3\}$

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____

2. Analyze the set $\{10,15,20,25,25\}$

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____

3. Analyze the set $\{1,1,2,3,5,8\}$

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____

4. Analyze the set $\{1,2,4,8,16,32\}$

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____

Calculator Activity
2 VARIABLE STATISTICS & LINEAR REGRESSION

OBJECTIVE: To perform 2 variable statistics and run a linear regression

Analyze the data set using 2 variable statistics and perform a linear regression.

X	1	1	2	3	10
Y	2	2	4	7	10

STEP 1: Set the calculator to 2 variable statistics by pressing MODE 1 1.

STEP 2: Enter 1,2 two times by pressing 1 (x,y) 2 (x,y) 2 DATA.

STEP 3: Enter 2,4 by pressing 2 (x,y) 4 DATA.

STEP 4: Enter 3,7 by pressing 3 (x,y) 7 DATA.

STEP 5: Enter 10,10 by pressing 1 0 (x,y) 1 0 DATA.

STEP 6: To determine the mean of the sample press RCL $\bar{x}$.

STEP 7: To determine the sample mean standard deviation for x press RCL sx.

STEP 8: To determine the population standard deviation for x press RCL σx.

STEP 9: To determine the number of samples for x press RCL n.

STEP 10: To determine the sum of the samples for x press RCL Σx.

STEP 11: To determine the sum of squares of samples for x press RCL Σx^2.

STEP 12: To determine the mean of the samples for y press RCL $\bar{y}$.

STEP 13: To determine the sample mean standard deviation for y press RCL sy

STEP 14: To determine the population standard deviation for y press RCL σy.

STEP 15: To determine the sum of the samples for y press RCL Σy.

STEP 16: To determine the sum of squares of samples for y press RCL Σy^2.

STEP 17: To determine a press RCL a.

STEP 18: To determine b press RCL b.

NOTE: Other regressions can be done in a similar manner by just setting your EL-W516B to the proper STATS Mode.

NAME _____ DATE_____

2 VARIABLE STATISTICS & LINEAR REGRESSION

Use your EL-W516B to analyze the following sets using 2 variable statistics and to perform a linear regression.

1. Analyze the set and run a linear regression.

X	1	2	3	4
Y	1	2	4	8

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____
$\bar{y} =$ _____
$sy =$ _____
$\sigma y =$ _____
$\sum y =$ _____
$\sum y^2 =$ _____
$a =$ _____
$b =$ _____

2. Analyze the set and run a linear regression.

X	1	2	3	4	5	6
Y	2	7	1	8	2	8

$\bar{x} =$ _____
$sx =$ _____
$\sigma x =$ _____
$n =$ _____
$\sum x =$ _____
$\sum x^2 =$ _____
$\bar{y} =$ _____
$sy =$ _____
$\sigma y =$ _____
$\sum y =$ _____
$\sum y^2 =$ _____
$a =$ _____
$b =$ _____

Calculator Activity
COMPLEX NUMBERS

OBJECTIVE: To calculate the modulus, the complex conjugate, and to simplify complex expressions.

The absolute value or modulus of a complex numbers is defined as $|x+iy| = \sqrt{x^2+y^2}$.

Before starting put your calculator in CPLX mode by pressing [MODE] [3].

1. What is the modulus of $\sqrt{2}+i$?

STEP 1: To start the absolute value press [2ndF] [abs] [(].
STEP 2: To enter $\sqrt{2}+$ press [2ndF] [$\sqrt{\ }$] [2] [+].
STEP 3: To enter i press [i] and then press [)].
STEP 4: To determine the modulus press [=].

2. What is the complex conjugate of $1+2i$?

STEP 1: Press [MATH] [1].
STEP 2: To enter $1+2i$ press [(] [1] [+] [2] [i] [)].
STEP3: Press [=] to get the complex conjugate.

3. Simplify $1+2i\sqrt{3}-6+i$

STEP 1: To enter $1+2i\sqrt{3}$ press [1] [+] [2] [i] [2ndF] [$\sqrt{\ }$] [3].
STEP 2: To subtract press [−].
STEP 3: To enter $6+i$ press [6] [+] [i].
STEP 4: To solve press [=].

NAME _____ DATE_____

COMPLEX NUMBERS

Use your EL-W516B to find the modulus, the complex conjugate, and to simplify complex expressions.

1. What is the modulus of i?

   _____

2. What is the modulus of $3 - i\sqrt{2}$?

   _____

3. What is the complex conjugate of i?

   _____

4. Simplify $(1+i) \div (1-i)$

   _____

5. Simplify $(2+2i)(i)$

   _____

6. What is i^0, i^1, i^2, i^3?

   _____

7. Simplify $\cos\pi + i\sin\pi$

   _____

Calculator Activity
MATRIX CALCULATIONS

OBJECTIVE: To perform calculations, take inverses, augment, and calculate the determinant of matrices.

To set your calculator to Matrix mode press [MODE] [4].

For the following examples there will be two matrices: A and B

$A = \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$ and $B = \begin{vmatrix} 5 & 6 \\ 7 & 8 \end{vmatrix}$.

To enter matrix A press [MATH] [2] [2] [2] [=]. Then press [1] [=] [2] [=] [3] [=] [4] [=]. Then press [ON/C] [MATH] [4] [0].

To enter matrix B press [MATH] [2] [2] [2] [=]. Then press [5] [=] [6] [=] [7] [=] [8] [=]. Then press [ON/C] [MATH] [4] [1].

Now matrix A and B are stored.

1. Evaluate AxB

STEP 1: To enter A x Press [MATH] [1] [0] [×].

STEP 2: To enter B press [MATH] [1] [1].

STEP 3: To solve press [=].

2. What is the inverse of A?

STEP 1: To enter A press [MATH] [1] [0].

STEP 2: To take the inverse press [2ndF] [x^{-1}].

STEP 3: To solve press [=].

3. Augment A with B.

STEP 1: To augment press [MATH] [5] [3].

STEP 2: To enter A press [MATH] [1] [0] [(x,y)].

STEP 3: To enter B press [MATH] [1] [1] [)].

STEP 4: Press [=] to see the augmented matrix.

NAME _____ DATE_____

MATRIX CALCULATIONS

Use your EL-W516B to perform calculations with matrices.

For the following problems use: $A = \begin{vmatrix} 2 & 4 \\ 6 & 8 \end{vmatrix}$, $B = \begin{vmatrix} 1 & 3 \\ 5 & 7 \end{vmatrix}$,

$C = \begin{vmatrix} 1 & 1 & 2 \\ 3 & 5 & 8 \\ 13 & 21 & 34 \end{vmatrix}$, $D = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$.

1. Calculate D^{-1}

   _____

2. Evaluate CD

   _____

3. Evaluate DC

   _____

4. Augment matrix A with matrix B

   _____

5. What is the determinant of matrix A? The determinant is done by entering MATH 6 0.

   _____

Calculator Activity
LIST CALCULATIONS

OBJECTIVE: To perform calculations and to determine statistical information with lists.

To set your calculator to Matrix mode press [MODE] [5].

For the following examples L1={1,2,3} and L2={5,10,15}.
To enter the data into L1 press [MATH] [2] [3] [=]. Then press [1] [=] [2] [=] [3] [=]. After this press [ON/C] [MATH] [4] [0].
To enter the data into L2 press [MATH] [2] [3] [=]. Then press [5] [=] [1] [0] [=] [1] [5] [=]. After this press [ON/C] [MATH] [4] [1].
Now L1 and L2 are stored.

1. Evaluate L1+L2

STEP 1: Press [MATH] [1] [0] to enter L1.
STEP 2: To add L2 press [+] [MATH] [1] [1].
STEP 3: To calculate the sum of the lists press [=].

2. Sort L2 descending

STEP 1: To bring up sort press [MATH] [5] [0].
STEP 2: To enter L2 press [MATH] [1] [1].
STEP 3: To sort press [=].

NOTE: To sort ascending can be done in a similar manner.

3. Calculate the min L1

STEP 1: For min press [MATH] [6] [0].
STEP 2: To enter L1 press [MATH] [1] [0].
STEP 3: To calculate the min press [=].

NOTE: max, mean, median, sum, product, standard deviation, and variance can be calculated in a similar way to min.

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LIST CALCULATIONS

Use your EL-W516B to perform the necessary calculations.

1. Put {1,3,5} in L1 and {2,4,6} in L2. Multiply L1 and L2 and put this new list into L3. Then determine the min, max, mean, median, sum, product, standard deviation, and variance of L3.

Min = _____

Max = _____

Mean = _____

Median = _____

Sum = _____

Product = _____

Standard Deviation = _____

Variance = _____

2. Put {3,1,4,1,5,9} in L1 and {2,7,1,8,2,8} in L2. Add L1 and L2 and put this new list into L3. Then determine the min, max, mean, median, sum, product, standard deviation, and variance of L3.

Min = _____

Max = _____

Mean = _____

Median = _____

Sum = _____

Product = _____

Standard Deviation = _____

Variance = _____

Calculator Activity
LINEAR, QUADRATIC, AND CUBIC EQUATIONS

OBJECTIVE: To solve linear, quadratic, and cubic equations.

For EQUATION mode press [MODE] [6].

1. Solve the two equations for x and y: $\begin{aligned} 1x + 2y &= 5 \\ 3x - 4y &= 7 \end{aligned}$

   STEP 1: Choose 2-VLE by pressing [0].
   STEP 2: Enter the coefficients for the first equation by pressing [1] [=] [2] [=] [5] [=].
   STEP 3: Enter the coefficients for the second equation by pressing [3] [=] [(-)] [4] [=] [7] [=].

   NOTE: 3 simultaneous equations can be done by choosing 3-VLE and entered in a simlar fashion as 2-VLE.

2. Solve the following quadratic equation $x^2 - x - 6 = 0$

   STEP 1: Chose QUAD by pressing [2].
   STEP 2: Enter the coefficients by pressing [1] [=] [(-)] [1] [=] [(-)] [6] [=].

3. Solve the following cubic equation and express the answer in factored form: $x^3 - 6x^2 + 11x - 6 = 0$

   STEP 1: Choose CUBIC by pressing [3].
   STEP 2: Enter the coefficients by pressing [1] [=] [(-)] [6] [=] [1] [1] [=] [(-)] [6].

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LINEAR, QUADRATIC, AND CUBIC EQUATIONS

Use your EL-W516B to solve the following linear, quadratic, and cubic equations.

Set your calculator to EQUATION mode by pressing MODE 6.

1. Solve the two linear equations for x and y:

$$x + 2y = -10$$
$$3x - 5y = 0$$

_____

2. Solve the three linear equations for x, y, and z:

$$x - y = 5$$
$$x + y - z = 6$$
$$y + z = 0$$

_____

3. Solve the following quadratic equation:

$$x^2 - x - 1 = 0$$

_____

4. Solve the following cubic equation and express the answer in factored form: $x^3 + x^2 + x + 1 = 0$

_____

_____

Calculator Activity
SUMMATION

OBJECTIVE: To calculate the sum of a series.

1. Evaluate $\sum_{0}^{5} x!$

   STEP 1: Bring up the summation symbol by pressing [2ndF] [Σ].
   STEP 2: Enter the lower bound 0 by pressing [0].
   STEP 3: Enter the upper bound 5 by pressing [▲] [5].
   STEP 4: Enter $x!$ by pressing [▶] [ALPHA] [X] [2ndF] [n!].
   STEP 5: To determine the sum of the series press [=].

2. Evaluate $\sum_{1}^{20} (-1)^x$

   STEP 1: Bring up the summation symbol by pressing [2ndF] [Σ].
   STEP 2: Enter the lower bound 1 by pressing [1].
   STEP 3: Enter the upper bound of 20 by pressing [▲] [2] [0].
   STEP 4: Enter $(-1)^x$ by pressing [▶] [(] [(-)] [1] [)] [y^x] [ALPHA] [X].
   STEP 5: To determine the sum of the series press [=].

3. Evaluate $\sum_{0}^{10} (-1)^{x+1} x^2$

   STEP 1: Bring up the summation symbol by pressing [2ndF] [Σ].
   STEP 2: Enter the lower bound 0 by pressing [0].
   STEP 3: Enter the upper bound of 10 by pressing [▲] [1] [0].
   STEP 4: Enter $(-1)^{x+1}$ by pressing [▶] [(] [(-)] [1] [)] [y^x] [ALPHA] [X] [+] [1].
   STEP 5: Enter x^2 by pressing [▶] [ALPHA] [X] [x^2].
   STEP 6: To determine the sum of the series press [=].

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SUMMATION

Use your EL-W516B to calculate the sum of the series.

1. Evaluate $\sum_{1}^{5} 2^{x}$

_____

2. Evaluate $\sqrt{2}\sum_{3}^{10} \frac{1}{x^{3}}$

_____

3. Evaluate $\sum_{0}^{4} e^{2x}$

_____

4. Evaluate $\sum_{1}^{9} x \ln x - x$

_____

5. Evaluate $\sum_{10}^{20} x^{x}$

_____

6. Evaluate $\sum_{1}^{100} \frac{1}{x}$

_____

Calculator Activity
DERIVATIVES

OBJECTIVE: To calculate the derivative at a given point.

1. Evaluate $\frac{d}{dx}x^3$ where $x = 5$

STEP 1: Press [2nd F] [d/dx].
STEP 2: Enter x^3 by pressing [ALPHA] [X] [2nd F] [x^3] [▶].
STEP 3: Enter 5 by pressing [5].
STEP 4: To solve press [=].

2. Evaluate $\frac{d}{dx}\sin x$ where $x = \pi$ radians

STEP 1: Set the calculator to radians by pressing [2nd F] [SET UP] [0] [1].
STEP 2: Press [2nd F] [d/dx].
STEP 3: Enter $\sin x$ by pressing [sin] [ALPHA] [X] [▶].
STEP 4: Enter π by pressing [2nd F] [π].
STEP 5: To solve press [=].

3. Evaluate $\frac{d}{dx}\ln x$ when $x = 2$

STEP 1: Press [2nd F] [d/dx].
STEP 2: Enter $\ln x$ by pressing [ln] [ALPHA] [X] [▶].
STEP 3: Enter 2 by pressing [2].
STEP 4: To solve press [=].

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DERIVATIVES

Use your EL-W516B to calculate the derivative.

1. Evaluate $\frac{d}{dx}x$ when $x = 2$

_____

2. Evaluate $\frac{d}{dx}x^x$ when $x = 5$

_____

3. Evaluate $\frac{d}{dx}x^3 - 2x$ when $x = 3.1$

_____

4. Evaluate $\frac{d}{dx}e^x$ when $x = 4$

_____

5. Evaluate $\frac{d}{dx}e^{-x}\ln x$ when $x = 5$

_____

6. Evaluate $\frac{d}{dx}\sin^{-1} x$ when $x = 0$ grads

_____

Calculator Activity
INTEGRALS

OBJECTIVE: To find the area under a curve by evaluating integrals.

1. Find the area under the curve of x given the lower bound is 1 and the upper bound is 2.

STEP 1: Press $\int dx$.
STEP 2: Enter the lower bound of 1 by pressing 1.
STEP 3: Enter the upper bound of 2 by pressing ▲ 2.
STEP 4: Enter x by pressing ▶ ALPHA X.
STEP 5: Evaluate the integral by pressing =.

2. Find the area under the curve of x^2 given the lower bound is 1 and the upper bound is 2.

STEP 1: Press $\int dx$.
STEP 2: Enter the lower bound of 1 by pressing 1.
STEP 3: Enter the upper bound of 2 by pressing ▲ 2.
STEP 4: Enter x^2 by pressing ▶ ALPHA X x^2.
STEP 5: Evaluate the integral by pressing =.

3. Find the area under the curve of x^3 given the lower bound is 1 and the upper bound is 2.

STEP 1: Press $\int dx$.
STEP 2: Enter the lower bound of 1 by pressing 1.
STEP 3: Enter the upper bound of 2 by pressing ▲ 2.
STEP 4: Enter x^3 by pressing ▶ ALPHA X 2nd F x^3.
STEP 5: Evaluate the integral by pressing =.

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INTEGRALS

Use your EL-W516B to find the area under the given curve using integration.

1. Find the area under the curve of x given the lower bound is -1 and the upper bound is 1

   _____

2. Find the area under of x^2 given the lower bound is -1 and the upper bound is 1

   _____

3. Find the area under the curve of x^3 given the lower bound is –1 and the upper bound is 1

   _____

4. Find the area of $x + x^2$ given the lower bound is -1 and the upper bound is 1

   _____

5. Find the area under the curve of $y = 100$ given the lower bound is -1 and the upper bound is 1

   _____

6. Find the area under the curve of $-x$ given the lower bound is 0 and the upper bound is 1

   _____

ANSWERS

Basic Arithmetic

p. 10: 1. 67, 80 **2.** 23 **3.** –10, -50, -250

p. 11: 1. $-3,1,5,9,13,17,21$ **2.** $2,3,4,5$

3. $6,9,12,15,18$ 4. $144,72,36$ 5. $729,-243,81,-27,9,-3$ 6. $1,45,2025$

7. $100,90,80,70,60$ **8.** $1,21,41,61$

Fractions

p. 12: 1. $\frac{29}{56}$ **2.** .115 **3.** $\frac{35}{3}$

p. 13: 1. $\frac{13}{48}$ **2.** 0.286 **3.** $11\frac{3}{28}$ **4.** $-\frac{7}{24}$

5. $\frac{2}{3}$ **6.** $\frac{995}{264}$ **7.** $45\frac{5}{6}$ **8.** $\frac{-5+\sqrt{17}}{4}$

Powers and Roots

p. 14: 1. 729 **2.** 3.737 **3.** 0.765 **4.** 4

p. 15: 1. 55 **2.** 8.382 **3.** No **4.** 512

5. 2048 **6.** $\frac{1}{2}$

Parentheses and Editing

p. 16: 1. 11.848 **2.** 4.189

p. 17: 1. 288π **2.** $166\frac{2}{3}\pi$ **3.** 972π

4. $1333\frac{1}{3}\pi$ **5.** $166\frac{2}{3}\pi$ **6.** 288π

Angle Conversions

p. 18: 1. $\frac{\pi}{4}$, 50 **2.** 11.399 **3.** $2°43'4.8''$

p. 19: 1. $\frac{5}{12}\pi$ **2.** $355\frac{5}{9}$ **3.** $\frac{2}{5}\pi$ **4.** 54

5. $276°36'0''$

Trigonometric Functions

p. 20: 1. 3.014 **2.** 13

p. 21: 1. 19.602 **2.** 34.611 **3.** 48.272

4. 22.104 **5.** 18.974

Inverse Trigonometric Functions

p. 22: 1. $45°$ **2.** $90°$ **3.** $\frac{\pi}{4}$

p. 23: 1. 7.12 **2.** 0.662 **3.** $90°$

4. 2.692 **5.** 22.620

Coordinate Conversions

p. 24: 1. 1.414, 45 **2.** -2.694, -0.862

p. 25: 1. 2.828, 45 **2.** 4.583, 0.714

3. 3.973, 0.467 **4.** 1.000, 0.026

5. 1.414, 150

Logarithms

p. 26: 1. 3 **2.** 1 **3.** 1 **4.** 2 **5.** 2

p. 27: 1. 9.180 **2.** 10.507 **3.** 55

4. $\frac{2+\sqrt{2}}{2}$ **5.** -0.777 **6.** 18.950

Inverse Logarithms

p. 28: 1. 1000000 **2.** 1.00×10^{18} **3.** 2.718

p. 29: 1. 1×10^{17} **2.** 0.677 **3.** -12.925

4. 0.230 **5.** 8.405 **6.** -98.052

Base Conversion

p. 30: 1. 153 **2.** 2641013001

3. 14103134

p. 31: 1. 3323013 **2.** 100100011 **3.** 4

4. 10 **5.** 170, 252, 1140

Constants and Conversions

p. 32: 1. 8.988×10^{18} **2.** 1.105×10^{19}

3. 35 **4.** 0.394

p. 33: 1. 8.988×10^{17} **2.** 4.494×10^{17}

3. 9.843 **4.** 5.468 **5.** 8.153×10^{18}

6. 6.523×10^{17}

ANSWERS

Random
p. 34: Answers will vary
p. 35: Answers will vary

Probability
p. 36: 1. 3628800 **2.** 6 **3.** 12
p. 37: 1. 210 **2.** 5040 **3.** 455
4. 2730 **5.** 120 **6.** 1, 1

1 Variable Statistics
p. 38: 1. 32,13.038, 11.662, 5, 160, 5800
p. 39: 1. 2.222, 0.833, 0.786, 9, 20, 50
2. 19, 6.519, 5.831, 5, 95, 1975 **3.** 3.333, 2.733, 2.494, 6, 20, 104 **4.** 10.5, 11.862, 10.828, 6, 63, 1365

2 Variable Statistics
p. 40: 1. 3.4, 3.782, 3.382, 5, 17, 115, 5, 3.464, 3.382, 25, 173, 2.147, 0.839
p. 41: 1. 2.5, 1.291, 1.118, 4, 10, 30, 3.75, 3.096, 2.681, 15, 85, -2, 2.3 **2.** 3.5, 1.871, 1.708, 6, 21, 91, 4.667, 3.327, 3.037, 28, 186, 2.467, 0.629

Complex Numbers
p. 42: 1. 1.732 **2.** $1-2i$ **3.** $-5+4.464i$
p. 43: 1. 1 **2.** 3.317 **3.** $-i$ **4.** i
5. $-2+2i$ **6.** $1,i,-1,-i$ **7.** -1

Matrix Calculations
p. 44: 1. $\begin{vmatrix} 19 & 22 \\ 43 & 50 \end{vmatrix}$ **2.** $\begin{vmatrix} -2 & 1 \\ 1.5 & -0.5 \end{vmatrix}$
3. $\begin{vmatrix} 1 & 2 & 5 & 6 \\ 3 & 4 & 7 & 8 \end{vmatrix}$
p. 45: 1. $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ **2.** $\begin{vmatrix} 1 & 1 & 2 \\ 3 & 5 & 8 \\ 13 & 21 & 34 \end{vmatrix}$
3. $\begin{vmatrix} 1 & 1 & 2 \\ 3 & 5 & 8 \\ 13 & 21 & 34 \end{vmatrix}$ **4.** $\begin{vmatrix} 2 & 4 & 1 & 3 \\ 6 & 8 & 5 & 7 \end{vmatrix}$ **5.** –8

List Calculations
p. 46: 1. $6,12,18$ **2.** $15,10,5$ **3.** 1
p. 47: 1. $2,30,14.67,12,44,720,14.189,201.333$
2. $5,17,8.5,7.5,51,214200,4.461,19.9$

Linear, Quadratic, and Cubic Equations
p. 48: 1. $x=3.4, y=0.8$ **2.** $x=-2,3$
3. $x=1,2,3$, $(x-1)(x-2)(x-3)=0$
p. 49: 1. $x=-4.545, y=-2.727$
2. $x=5.333, y=0.333, z=-0.333$
3. $x=-0.618,1.618$
4. $x=-1,-i,i$, $(x+i)(x-i)(x+1)=0$

Summation
p. 50: 1. 154 **2.** 0 **3.** –55
p. 51: 1. 62 **2.** 0.103 **3.** 3447.374
4. 34.057 **5.** 1.069×10^{26} **6.** 5.187

Derivatives
p. 52: 1. 75 **2.** –1 **3.** 0.5
p. 53: 1. 1 **2.** 8154.493 **3.** 26.83
4. 54.598 **5.** –0.009 **6.** 63.662

Integrals
p. 54: 1. $1\frac{1}{2}$ **2.** $2\frac{1}{3}$ **3.** $3\frac{3}{4}$
p. 55: 1. 0 **2.** $\frac{2}{3}$ **3.** 0 **4.** $\frac{2}{3}$ **5.** 200 **6.** $-\frac{1}{2}$