Using a Scientific Calculator

In this course, we will be using a scientific calculator to do all of our computations. So, in this section, we want to get use to some of the features of a scientific calculator. Although the directions in this section are specifically for a TI-30, you can adapt them to other scientific calculators.

Objective 1:   Using a Scientific Calculator with Whole Numbers.

Simplify:

Ex. 1a	562 + 893	Ex. 1b	2893 + 4562 + 7821
Ex. 1c	5623 + 345 + 7873 + 4	Ex. 1d	7830 − 673
Ex. 1e	9002 − 785	Ex. 1f	319×47
Ex. 1g	603•78	Ex. 1h	$21980 \div 28$
Ex. 1i	$\dfrac{46069}{23}$	Ex. 1j	$93\overline{)14601}$

Solution:

a)   562 $\boxed{+}$ 893 $\boxed{=}$ 1455

b)   2893 $\boxed{+}$ 4562 $\boxed{+}$ 7821 $\boxed{=}$ 15,276

c)   5623 $\boxed{+}$ 345 $\boxed{+}$ 7873 $\boxed{+}$ 4 $\boxed{=}$ 13,845

d)   7830 $\boxed{-}$ 673 $\boxed{=}$ 7157

e)   9002 $\boxed{-}$ 785 $\boxed{=}$ 8217

f)   319 $\boxed{\times}$ 47 $\boxed{=}$ 14,993

g)   603 $\boxed{\times}$ 78 $\boxed{=}$ 47,034

h)   21980 $\boxed{\div}$ 28 $\boxed{=}$ 785

i)   46069 $\boxed{\div}$ 23 $\boxed{=}$ 2003

j)   14601 $\boxed{\div}$ 93 $\boxed{=}$ 157

Ex. 2a	$\dfrac{135 + 36\times99}{62\times21 - 1275}$	Ex. 2b	$18 \div 9 + 8 \div 2•4$

<u>Solution:</u>

a) The order of operations says we need to multiply and divide before we add and subtract. Working the top, we get:

135 + 36×99   (36 ⊠ 99 ⊟ 3564)

= 135 + 3564   (135 ⊞ 3564 ⊟ 3699)

= 3699

We could have done this in one step on our calculator since the scientific calculator knows the order of operations:

135 ⊞ 36 ⊠ 99 ⊟ 3699

Now, let's work the bottom:

62×21 − 1275   (62 ⊠ 21 ⊟ 1302)

= 1302 − 1275   (1302 ⊟ 1275 ⊟ 27)

= 27
We could have done this in one step as well:
62 ⊠ 21 ⊟ 1275 ⊟ 27

Now, divide the answer from the top by the answer on the bottom:
    3699 ⊟ 27 ⊟ 137

b) We have to multiply and divide as they appear from left to right:

18 ÷ 9 + 8 ÷ 2•4   (18 ⊟ 9 ⊟ 2)

= 2 + 8 ÷ 2•4   (8 ⊟ 2 ⊟ 4)

= 2 + 4•4   (4 ⊠ 4 ⊟ 16)

= 2 + 16   (2 ⊞ 16 ⊟ 18)

= 18

Again, we could have done this in one step:
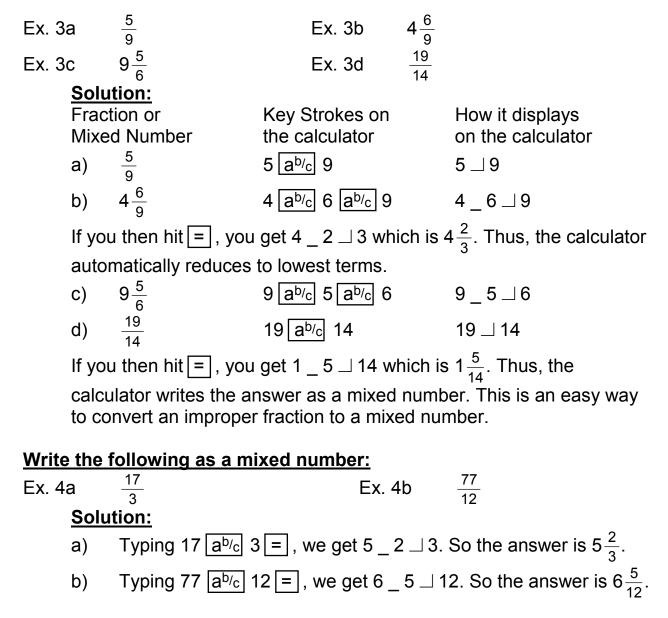
18 ⊟ 9 ⊞ 8 ⊟ 2 ⊠ 4 ⊟ 18

Objective 2:   Using a Scientific Calculator with Fractions.

To enter a fraction or mixed number into a scientific calculator, we will be using this key: $\boxed{a^{b/c}}$

So, to enter $\frac{2}{3}$ on the calculator, we type 2 $\boxed{a^{b/c}}$ 3 and to enter $4\frac{3}{5}$, we type 4 $\boxed{a^{b/c}}$ 3 $\boxed{a^{b/c}}$ 5.
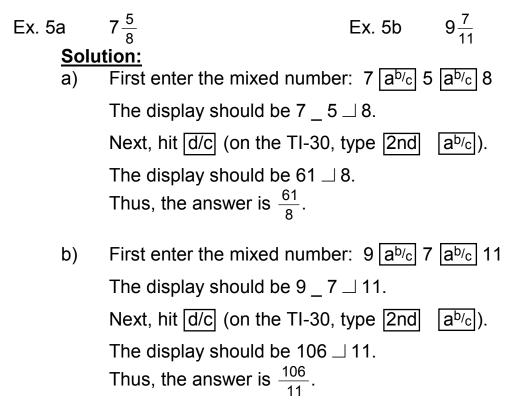
Now, let's try some examples:

Enter the following fractions or mixed numbers in your calculator:

Ex. 3a $\frac{5}{9}$ Ex. 3b $4\frac{6}{9}$

Ex. 3c $9\frac{5}{6}$ Ex. 3d $\frac{19}{14}$

Solution:

Fraction or Mixed Number	Key Strokes on the calculator	How it displays on the calculator
a) $\frac{5}{9}$	5 $\boxed{a^{b/c}}$ 9	5 ⌐ 9
b) $4\frac{6}{9}$	4 $\boxed{a^{b/c}}$ 6 $\boxed{a^{b/c}}$ 9	4 _ 6 ⌐ 9

If you then hit $\boxed{=}$, you get 4 _ 2 ⌐ 3 which is $4\frac{2}{3}$. Thus, the calculator automatically reduces to lowest terms.

| c) $9\frac{5}{6}$ | 9 $\boxed{a^{b/c}}$ 5 $\boxed{a^{b/c}}$ 6 | 9 _ 5 ⌐ 6 |
| d) $\frac{19}{14}$ | 19 $\boxed{a^{b/c}}$ 14 | 19 ⌐ 14 |

If you then hit $\boxed{=}$, you get 1 _ 5 ⌐ 14 which is $1\frac{5}{14}$. Thus, the calculator writes the answer as a mixed number. This is an easy way to convert an improper fraction to a mixed number.

Write the following as a mixed number:

Ex. 4a $\frac{17}{3}$ Ex. 4b $\frac{77}{12}$

Solution:

a)   Typing 17 $\boxed{a^{b/c}}$ 3 $\boxed{=}$, we get 5 _ 2 ⌐ 3. So the answer is $5\frac{2}{3}$.

b)   Typing 77 $\boxed{a^{b/c}}$ 12 $\boxed{=}$, we get 6 _ 5 ⌐ 12. So the answer is $6\frac{5}{12}$.

In order to convert a mixed number to an improper fraction, we will use $\boxed{\text{d/c}}$ key. Notice it is written in yellow direct above the $\boxed{a^{b}/_c}$ key on the TI-30. To access this key, we will type $\boxed{\text{2nd}}$ and then hit $\boxed{a^{b}/_c}$ on the TI-30.

Convert the following into an improper fraction:

Ex. 5a $7\frac{5}{8}$ Ex. 5b $9\frac{7}{11}$

> **Solution:**
>
> a)   First enter the mixed number: 7 $\boxed{a^{b}/_c}$ 5 $\boxed{a^{b}/_c}$ 8
>
> The display should be 7 _ 5 ⌐| 8.
>
> Next, hit $\boxed{\text{d/c}}$ (on the TI-30, type $\boxed{\text{2nd}}$ $\boxed{a^{b}/_c}$).
>
> The display should be 61 ⌐| 8.
>
> Thus, the answer is $\frac{61}{8}$.
>
> b)   First enter the mixed number: 9 $\boxed{a^{b}/_c}$ 7 $\boxed{a^{b}/_c}$ 11
>
> The display should be 9 _ 7 ⌐| 11.
>
> Next, hit $\boxed{\text{d/c}}$ (on the TI-30, type $\boxed{\text{2nd}}$ $\boxed{a^{b}/_c}$).
>
> The display should be 106 ⌐| 11.
>
> Thus, the answer is $\frac{106}{11}$.

Now, we are ready to perform operations with fractions on our calculator.

Simplify the following:

Ex. 6a $7\frac{4}{9} + 5\frac{13}{15}$ Ex. 6b $\frac{11}{12} + 9\frac{3}{14}$

Ex. 6c $3\frac{2}{11} - \frac{15}{16}$ Ex. 6d $15\frac{1}{6} - 8\frac{3}{8}$

Ex. 6e $6\frac{2}{3} \bullet 4\frac{1}{5}$ Ex. 6f $\left(17\frac{4}{9}\right)\left(\frac{15}{8}\right)$

Ex. 6g $\dfrac{4\frac{5}{8}}{9\frac{1}{3}}$ Ex. 6h $3\frac{5}{13} \div 2\frac{1}{2}$

<u>Solution:</u>

a) Typing 7 $\boxed{a^{b}/c}$ 4 $\boxed{a^{b}/c}$ 9 $\boxed{+}$ 5 $\boxed{a^{b}/c}$ 13 $\boxed{a^{b}/c}$ 15 $\boxed{=}$, we get:

13 _ 14 ⌐ 45. So, our answer is $13\frac{14}{45}$.

b) Typing 11 $\boxed{a^{b}/c}$ 12 $\boxed{+}$ 9 $\boxed{a^{b}/c}$ 3 $\boxed{a^{b}/c}$ 15 $\boxed{=}$, we get:

10 _ 11 ⌐ 84. So, our answer is $10\frac{11}{84}$.

c) Typing 3 $\boxed{a^{b}/c}$ 2 $\boxed{a^{b}/c}$ 11 $\boxed{-}$ 15 $\boxed{a^{b}/c}$ 16 $\boxed{=}$, we get:

2 _ 43 ⌐ 176. So, our answer is $2\frac{43}{176}$.

d) Typing 15 $\boxed{a^{b}/c}$ 1 $\boxed{a^{b}/c}$ 6 $\boxed{-}$ 8 $\boxed{a^{b}/c}$ 3 $\boxed{a^{b}/c}$ 8 $\boxed{=}$, we get:

6 _ 19 ⌐ 24. So, our answer is $6\frac{19}{24}$.

e) Typing 6 $\boxed{a^{b}/c}$ 2 $\boxed{a^{b}/c}$ 3 $\boxed{\times}$ 4 $\boxed{a^{b}/c}$ 1 $\boxed{a^{b}/c}$ 5 $\boxed{=}$, we get:

28. So, our answer is 28.

f) Typing 17 $\boxed{a^{b}/c}$ 4 $\boxed{a^{b}/c}$ 9 $\boxed{\times}$ 15 $\boxed{a^{b}/c}$ 8 $\boxed{=}$, we get:

32 _ 17 ⌐ 24. So, our answer is $32\frac{17}{24}$.

g) Typing 4 $\boxed{a^{b}/c}$ 5 $\boxed{a^{b}/c}$ 8 $\boxed{\div}$ 9 $\boxed{a^{b}/c}$ 1 $\boxed{a^{b}/c}$ 3 $\boxed{=}$, we get:

111 ⌐ 224. So, our answer is $\frac{111}{224}$.

h) Typing 3 $\boxed{a^{b}/c}$ 5 $\boxed{a^{b}/c}$ 13 $\boxed{\div}$ 2 $\boxed{a^{b}/c}$ 1 $\boxed{a^{b}/c}$ 2 $\boxed{=}$, we get:

1 _ 23 ⌐ 65. So, our answer is $1\frac{23}{65}$.

Objective 3:   Using a Scientific Calculator with Decimals.

It is easy to convert between fractions and decimal on a scientific calculator. We will use the $\boxed{F \triangleleft\ \triangleright D}$ key on our calculator. On the TI-30, it is written in yellow directly above the $\boxed{\leftarrow}$ at the bottom left. To access the key, we will need to hit $\boxed{2nd}$ $\boxed{\leftarrow}$. When converting a decimal into a fraction, if the denominator is larger than 999, the calculator will not display it as a fraction.

Convert the following:

Ex. 7a $5\frac{3}{8}$ into a decimal.   Ex. 7b $\frac{75}{11}$ into a decimal.

Ex. 7c   3.025 into a fraction.   Ex. 7d   0.516 into a fraction.

Solution:

a) First, enter 5 $\boxed{a^{b}/_{c}}$ 3 $\boxed{a^{b}/_{c}}$ 8. The display should read 5 _ 3 ⌐ 8.
   Next, hit $\boxed{F \triangleleft \triangleright D}$ key ($\boxed{2nd}$ $\boxed{\leftarrow}$). Our answer is 5.375.

b) First, enter 75 $\boxed{a^{b}/_{c}}$ 11. The display should read 75 ⌐ 11.
   Next, hit $\boxed{F \triangleleft \triangleright D}$ key ($\boxed{2nd}$ $\boxed{\leftarrow}$). Our answer is $6.\overline{81}$.

c) Enter 3.025 then hit $\boxed{F \triangleleft \triangleright D}$ key ($\boxed{2nd}$ $\boxed{\leftarrow}$). The display

   should read 3 _ 1 ⌐ 40. So, our answer is $3\frac{1}{40}$.

d) Enter 0.516 then hit $\boxed{F \triangleleft \triangleright D}$ key ($\boxed{2nd}$ $\boxed{\leftarrow}$). The display

   should read 129 ⌐ 250. So, our answer is $\frac{129}{250}$.

Performing operations with decimals is done in a similar fashion to operations with whole numbers on a scientific calculator.

Simplify the following (round to four decimal places if needed):

Ex. 8a   34.65 + 5.67 + 231.2 + 15   Ex. 8b   9.03 − 6.7235

Ex. 8c   6.34•7.9   Ex. 8d   11.23 ÷ 0.536

Ex. 8e $6\frac{5}{8} - 2.4$ Ex. 8f $4.2\left(\frac{3}{7}\right)$

Ex. 8g   4.2×8.7 − 3.4×2.5   Ex. 8h $\frac{0.96(7.2)-3.0066}{31+2.4\times6-1.5}$

Solution:

a) Type: 34.65 $\boxed{+}$ 5.67 $\boxed{+}$ 231.2 $\boxed{+}$ 15 $\boxed{=}$. The result is 286.43

b) Type: 9.03 $\boxed{-}$ 6.7235 $\boxed{=}$. The result is 2.3065

c) Type: 6.34 $\boxed{\times}$ 7.9 $\boxed{=}$. The result is 50.086

d) Type: 11.23 $\boxed{\div}$ 0.536 $\boxed{=}$. The result is 20.95149254…

   Rounding, we get ≈ 20.9515

e) Type: 6 $\boxed{a^{b}/_{c}}$ 5 $\boxed{a^{b}/_{c}}$ 8 $\boxed{-}$ 2.4 $\boxed{=}$. The result is 4.225

f)   Type: 4.2 ☒ 3 ⟦a^b/c⟧ 7 ⟦=⟧ . The result is 1.8

g)   Type: 4.2 ☒ 8.7 ⟦−⟧ 3.4 ☒ 2.5 ⟦=⟧ . The result is 28.04

h)   First, work out the top:

Enter: 9.6 ☒ 7.2 ⟦−⟧ 3.0066 ⟦=⟧ . The result is 66.1134

Next, work out the bottom:

Enter: 31 ⟦+⟧ 2.4 ☒ 6 ⟦−⟧ 1.5 ⟦=⟧ . The result is 43.9

Now, divide the top by the bottom:

66.1134 ⟦÷⟧ 43.9 ⟦=⟧ . The answer is 1.506

Solve the following:

Ex. 9   The resistance of an armature while is cold is 0.304 ohms. After running for several minutes, the resistance increases to 1.705 ohms. Find the change in resistance of the armature.

Solution:
We need to subtract to find the answer:
1.705 ⟦−⟧ 0.304 ⟦=⟧ 1.401
So, the increase was 1.401 ohms.

Ex. 10   How long of a bolt is needed to go through a piece of tubing $3\frac{9}{16}$ in. long, a washer $\frac{1}{8}$ in. thick, and a nut $\frac{1}{4}$ in. thick?

Solution:
We need to add to find the answer:
3 ⟦a^b/c⟧ 9 ⟦a^b/c⟧ 16 ⟦+⟧ 1 ⟦a^b/c⟧ 8 ⟦+⟧ 1 ⟦a^b/c⟧ 4 ⟦=⟧ $3\frac{15}{16}$.

So, the bolt has to be $3\frac{15}{16}$ in. long.

Ex. 11   A blueprint of a house shows the roof has a pitch of $\frac{5}{24}$. A contactor decides to redesign the roof so it will have double the pitch of the blue print. What is the new pitch?

Solution:
We need to multiply to find the answer:
2 ☒ 5 ⟦a^b/c⟧ 24 ⟦=⟧ $\frac{5}{12}$. So, the new pitch is $\frac{5}{12}$.

Ex. 12   If a $4\frac{1}{8}$ ft. long pipe is to be cut into three equal sections, how
long is each piece?

<u>Solution:</u>
We need to take the total length of the pipe and divide by 3:
4 $\boxed{a^{b}/_{c}}$ 1 $\boxed{a^{b}/_{c}}$ 8 $\boxed{\div}$ 3 $\boxed{=}$ $1\frac{3}{8}$. So, each section must be $1\frac{3}{8}$ feet long.

In future sections, we will only write down the keystrokes used on a scientific calculator when introducing new operations or functions on the calculator. It is therefore extremely important that you master how to do the basic operations on your scientific calculator. As this section has shown, it will save you a tremendous amount of time if you know how to use your scientific calculator. In this class, the TI-30 is the recommended calculator for the following reasons.

1)   It is cheap.
2)   It is easy to find.
3)   It is easy to use.
4)   It has been on the market on one form or another for at least 30 years.

If you do not have a scientific calculator, then buy the TI-30. It should be priced at or below $15. If you already have a scientific calculator that is not a TI-30, you will need to learn how to use it (i.e., read the instruction manual). Also, make sure you can enter fractions on you calculator. If you are having trouble using you calculator, please talk to your instructor before class, after class, or during his or her office hours to get help.