Sect 10.3 – Subtracting Real Numbers

Objective a & b: Understanding how to subtract real numbers

Simplify the following:

Ex. 1 a)   7 – 3   b)   8 – 3   c)   11 – 5
  Solution:
    a)   7 – 3 = 4   b)   8 – 3 = 5   c)   11 – 5 = 6

Ex. 2 a)   7 + (– 3)   b)   8 + (– 3)   c)   11 + (– 5)
  Solution:
    a)   7 + (– 3) = 4   (Different signs - Difference - Sign of "larger" #)
    b)   8 + (– 3) = 5   (Different signs - Difference - Sign of "larger" #)
    c)   11 + (– 5) = 6 (Different signs - Difference - Sign of "larger" #)

Now, compare examples #1 and #2. Notice that 7 – 3 = 4 = 7 + (– 3), 8 – 3 = 5 = 8 + (– 3), and 11 – 5 = 6 = 11 + (– 5). This says that we can rewrite any subtraction problem as an addition problem so long as we change the sign of the number to the right of the operation. By doing this, we do not have to develop a new set of rules for subtracting real numbers. We simply rewrite it as an addition problem and follow the rules for addition of real numbers.

Subtracting Real Numbers:

When subtracting, change the operation of subtraction to the operation of addition and change the sign of the number to the right of the operation.
$$a - b = a + (- b) \text{ and } a - (- b) = a + b$$

Simplify:

Ex. 3a   9 – 11   Ex. 3e $-\frac{3}{8} + \frac{5}{6}$

Ex. 3b   – 0.2 – (– 1.1)   Ex. 3f $6\frac{1}{5} - \left(- 2\frac{5}{11}\right)$

Ex. 3c   0.4 – (– 0.7)   Ex. 3g   – 1.8 – (– 0.4)

Ex. 3d $-3\frac{2}{5} - 0.8$ Ex. 3h   – 4.5 + (– 5.4)

  Solution:
    a)   9 – 11 = 9 + (– 11) = – 2.
    b)   – 0.2 – (– 1.1) = – 0.2 + 1.1 = 0.9.
    c)   0.4 – (– 0.7) = 0.4 + 0.7 = 1.1.

d) $-3\frac{2}{5} - 0.8 = -3.4 - 0.8 = -3.4 + (-0.8) = -4.2.$

e) $-\frac{3}{8} + \frac{5}{6} = -\frac{9}{24} + \frac{20}{24} = \frac{11}{24}$ (Note, the operation is addition. Do not change the operation).

f) $6\frac{1}{5} - \left(-2\frac{5}{11}\right) = 6\frac{1}{5} + \left(2\frac{5}{11}\right) = 6\frac{11}{55} + 2\frac{25}{55} = 8\frac{36}{55}.$

g) $-1.8 - (-0.4) = -1.8 + 0.4 = -1.4.$

h) $-4.5 + (-5.4) = -9.9$ (Note, the operation is addition. Do not change the operation).

Ex. 4a   The difference of 4 and – 8.
Ex. 4b   – 2.5 subtracted from – 1.4.
Ex. 4c   9 less – 28.
Ex. 4d   9 less than – 28.

     <u>Solution:</u>

a)   Translate "The difference of – 19 and – 8:"
     $-19 - (-8) = -19 + (+8) = -11$

b)   Translate "– 2.5 subtracted from – 1.4:"
     $-1.4 - (-2.5) = -1.4 + 2.5 = 1.1$

c)   Translate "9 less – 28:"
     $9 - (-28) = 9 + 28 = 37$

d)   Translate "9 less than – 28:"
     $-28 - 9 = -28 + (-9) = -37$

Objective c: Order of Operations.

<u>Simplify:</u>

Ex. 5 $-1.2 + 0.8 - (-1.6) - 0.9$

     <u>Solution:</u>
     First, change the subtractions to additions and change the sign of the number to the right of the operation.
     $-1.2 + 0.8 - (-1.6) - 0.9$ (change subtraction to addition
         and change the sign of the number to the right)
     $= -1.2 + 0.8 + (+1.6) + (-0.9)$ (different signs)
     $= -0.4 + 1.6 + (-0.9)$ (different signs)
     $= 1.2 + (-0.9)$ (different signs)
     $= 0.3$

Ex. 6 $6(-\frac{3}{16} - \frac{3}{8} + \frac{1}{4} - (-\frac{1}{3}))$

Solution:

$6(-\frac{3}{16} - \frac{3}{8} + \frac{1}{4} - (-\frac{1}{3}))$ (change subtraction to addition
and change the sign of the number to the right)

$= 6(-\frac{3}{16} + (-\frac{3}{8}) + \frac{1}{4} + \frac{1}{3})$ (L.C.D. = 48)

$= 6(-\frac{9}{48} + (-\frac{18}{48}) + \frac{12}{48} + \frac{16}{48})$ (same signs)

$= 6(-\frac{27}{48} + \frac{12}{48} + \frac{16}{48})$ (different signs)

$= 6(-\frac{15}{48} + \frac{16}{48})$ (different signs)

$= 6(\frac{1}{48}) = \frac{6}{1} \cdot (\frac{1}{48}) = \frac{1}{1} \cdot (\frac{1}{8}) = \frac{1}{8}$

Objective d: Applications of Subtraction of Real Numbers.

Solve the following:

Ex. 7   During an alignment, the caster angle of a car was changed
from 1.25° to – 0.75°. Find the amount of change in the caster angle.
Solution:
The amount of change is equal to the ending angle minus the
beginning angle:
    – 0.75 – 1.25 = – 0.75 + (– 1.25) = – 2
The angles was changed by – 2° or decreased by 2°.