MTH 23.5 LECTURE NOTES (Ojakian)

Topic 8: Arithmetic with Fractions

OUTLINE

References (**Algebra Book**: pages 14-17; **Statistics Book**: None)

1. Multiplying and Dividing Fractions/Decimals

2. Adding and Subtracting Fractions/Decimals

3. Least Common Multiple (LCM)

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1. <u>Conversion: Mixed Fractions</u>

   (a) Fraction → Mixed

   Divide - Use quotient as integer part and use remainder as the top

   PROBLEM 1. *Convert 13/3 to a mixed number (use both methods).*

   (b) Mixed → Fraction

      i. Find the product of the integer part and the bottom

      ii. Add to the top

      PROBLEM 2. *Write $3\frac{2}{7}$ as an improper fraction.*
   What happens if it were negative?

2. <u>Multiplication of Fractions</u>

   (a) Multiply tops

   (b) Multiply bottoms

   (c) Simplify

   PROBLEM 3.

      i. Compute the following: $\dfrac{1}{2} \cdot \dfrac{1}{5}$

      ii. Convert the fractions to decimal and then try the calculation.

      iii. Does the answer make sense? (it should!)

   PROBLEM 4. *Compute the following:*

      i. $\dfrac{2}{3} \cdot \left(-\dfrac{1}{5}\right)$

      ii. $\dfrac{-2}{-3} \cdot \left(\dfrac{-1}{5}\right)$

      iii. $\dfrac{2}{5} \cdot \dfrac{15}{8}$

      iv. $\dfrac{49}{88} \cdot \dfrac{-11}{7}$

3. <u>Dividing Fractions</u>

   (a) Find reciprocal of second fraction

   (b) Then multiply

   PROBLEM 5.

      i. Compute the following: $\dfrac{3}{2} \cdot \dfrac{1}{4}$

      ii. Convert the fractions to decimal and then try the calculation.

      iii. Does the answer make sense? (it should!)

   PROBLEM 6. *Compute the following:*

      i. $-\dfrac{50}{12} \div \dfrac{-5}{3}$ *(Simplify before calculating!)*

      ii. $\dfrac{1}{5} \div \dfrac{10}{7}$ *(Be careful on simplifing!)*

4. <u>Adding and Subtracting Fractions</u>

   (a) When denominators are the same.

   Recall interpretation: A/B means to take A steps of size $1/B$ each.

   PROBLEM 7. *By* **counting on the number line** *compute the following:*

      i. $\dfrac{3}{4} + \dfrac{2}{4}$

      ii. $-\dfrac{3}{4} + \dfrac{-1}{4} + \dfrac{5}{4}$

      iii. Convert the fractions to decimals and try it. Make sense? (it should!)

5. <u>Denominators NOT the same when Adding and Subtracting Fractions</u>

   (a) Method.

      i. Make the denominators the same! (i.e. find a **common denominator**)

      ii. Then add or subtract tops

      iii. Leave the bottom the same

   PROBLEM 8. *Compute the following:*

      A. $\dfrac{7}{20} + \dfrac{2}{5}$

      B. $\dfrac{1}{-2} - \dfrac{-2}{3} + -\dfrac{2}{5}$

6. <u>Quick way to get a common denominator</u>

   (a) Just multiple all the bottoms together to get the new bottom! (may get large numbers!)

   (b) Thus: Multiply each fraction's top and bottom by the *other* bottoms

7. <u>To find LEAST common denominator</u>

(a) Least Common Multiple

Definition. *The **Least Common Multiple (L.C.M.)** of a group of integers is the smallest integer that all the integers in the group divide into evenly.*

Way to find LCM: Count by multiples till the first common multiple is reached.

PROBLEM 9. *Find the LCM for each group of integers.*

   i. 3, 10

   ii. 4, 6

   iii. 120, 10, 5

(b) Addition/Subtraction with large denominators

Definition. *Given a group of fractions, the **Least Common Denominator (L.C.D.)** is the LCM of the denominators.*

The LCD is the smallest common denominator that can be used for the addition and subtraction of fractions.

PROBLEM 10.

   i. $\frac{5}{6} + \frac{1}{4}$ *ii.* $\frac{2}{7} + \frac{3}{14}$

8. <u>Fractions and Order Of Operations</u>

PROBLEM 11.

   (a) $\frac{1}{3} + \frac{1}{2} \cdot \frac{2}{3}$ *(b)* $\frac{2}{7} \cdot \frac{14}{6} + \frac{2}{4} \div \frac{3}{8}$

9. <u>Fractions and Algebra</u>

PROBLEM 12.

   (a) $4x$ if $x = \dfrac{1}{2}$ *(f)* x^2 if $x = \dfrac{2}{5}$

   (b) $4x$ if $x = 0.5$

   (c) $4x$ if $x = -\dfrac{1}{2}$ *(g)* x^2 if $x = -\dfrac{2}{5}$

   (d) $2a - b$ if $a = \dfrac{1}{4}$, $b = \dfrac{3}{2}$ *(h)* $x^2 + y^2$ if $x = \dfrac{3}{2}$, $y = 1$

   (e) $2a - b$ if $a = -1$, $b = -\dfrac{3}{2}$ *(i)* $x^2 - y^2 + \dfrac{7}{10}$ if $x = -\dfrac{3}{4}$, $y = \dfrac{1}{2}$

10. <u>Applications</u>

PROBLEM 13. *Find the area and perimeter of a rectangle of width 7 amd height 3/14.*

PROBLEM 14. *If I pay every student in class 5.25 to study, how much do I lose? And if I only have 30 dollars, how many students can I pay?*