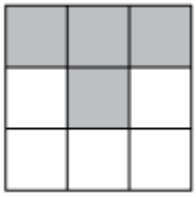
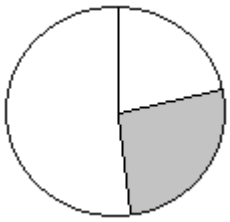
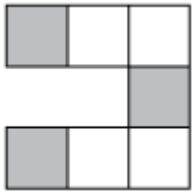
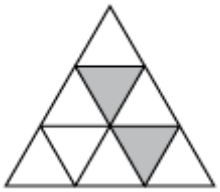
DIY: Fractions-*Identify, Compare and Evaluate*

To review what are "Fractions", watch the following set of YouTube videos explaining working with fractions, starting with basics of fractions and what they represent including basic arithmetic with fractions, followed by several practice problems for you to try, covering all the basic techniques. Following them are answers and detailed solutions. Some additional resources are included for more practice at the end.

1. Introduction to Fractions
2. Fractions Are Division
3. Types of Fractions
4. Comparing and Ordering Fractions - Part I
   Comparing and Ordering Fractions - Part II
5. Simplifying, Reducing –Division Method
6. Simplifying Fractions- factoring method
7. How To Multiply Fractions
8. How to Divide Fractions
9. How to Add and Subtract Fractions

Practice problems: The following problems use the techniques demonstrated in the above videos. The answers are given following the problems. Then detailed solutions, if you need them, are provided after the answer section. For further assistance and help please contact ***Math Assistance Area***.

1. What fraction of each shape is shaded? ($Hint$: $\frac{Shaded\ parts}{Total\ parts}$)

a.  b.  c.  d. 

2. Write each of the following as a fraction

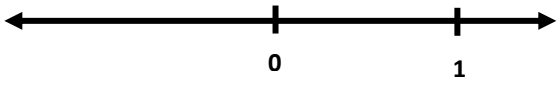
   a. $30\overline{)21}$ b. 23/5 c. 56 over 9 d. $18 \div 4$

3. Classify each fraction as zero, proper, improper or undefined.

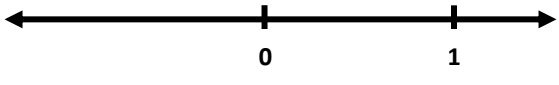
   a. $\frac{25}{9}$ b. $\frac{0}{1000}$ c. $\frac{1}{69}$ d. $\frac{256}{0}$

4. Shade the region of the number line where each f the following fractions belong.

   a. $\frac{1}{14}$



   b. $\frac{37}{11}$



5. Plot the following on a number line.(*Hint: Look for detailed explanation in the solution*)

a. $\frac{3}{4}$ b. $\frac{2}{5}$ c. $-\frac{2}{3}$ d. $\frac{3}{2}$

6. Arrange the following fractions in numerical order (smallest to largest):

a. $\frac{1}{9}, \frac{22}{9}, \frac{0}{9}, \frac{4}{9}, \frac{229}{9}$

b. $\frac{5}{9}, \frac{7}{18}, \frac{2}{9}$

c. $\frac{7}{8}, \frac{3}{4}, \frac{15}{16}, \frac{1}{2}$

d. $\frac{9}{10}, \frac{1}{4}, \frac{3}{8}, \frac{2}{5}$

7. Simplify the following fractions

a) $\frac{33}{36}$ b) $\frac{15}{40}$ c) $\frac{6}{9}$ d) $\frac{5}{60}$

e) $\frac{6}{36}$ f) $\frac{25}{5}$ g) $\frac{2}{12}$ h) $\frac{45}{36}$

8. Evaluate

a. $\frac{1}{3} \times \frac{5}{3}$ b. $\frac{12}{40} \times \frac{5}{9}$ c. $\frac{40}{21} \times \frac{7}{10}$

d. $\frac{1}{2} \div \frac{3}{2}$ e. $\frac{11}{56} \div \frac{33}{8}$ f. $\frac{13}{48} \div \frac{39}{144}$

9. Evaluate

a. $\frac{1}{3} + \frac{5}{3}$ b. $\frac{11}{21} + \frac{2}{3}$

c. $\frac{9}{12} + \frac{3}{4}$ d. $\frac{21}{24} + \frac{5}{16}$

e. $\frac{4}{9} - \frac{4}{3}$ f. $\frac{8}{30} - \frac{1}{27}$

g. $\frac{4}{5} - \frac{1}{5}$ h. $\frac{3}{4} - \frac{1}{16}$

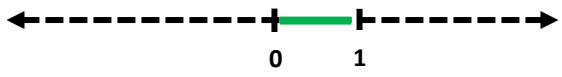
10. A county has 100,000 registered voters, out of which 55,000 are Party A supporters. $\frac{3}{5}$ of the Party A supporters voted for candidate X during this year's election.

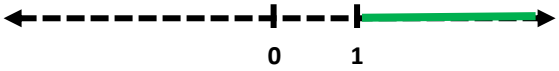
a) What fraction of county's registered voters are ***not*** supporters of Party A?

b) How many voters voted for candidate X?

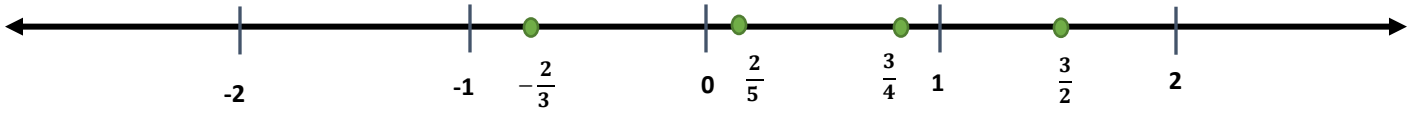
Answers:

1. a) $\frac{4}{9}$ b) Can't be determined c) $\frac{3}{7}$ d) $\frac{2}{9}$
2. a) $\frac{21}{30}$ b) $\frac{23}{5}$ c) $\frac{56}{9}$ d) $\frac{18}{4}$
3. a) Improper Fraction b) Zero c) Proper Fraction d) Undefined
4. a. $0 < \frac{1}{14} < 1$ b. $\frac{37}{11} > 1$





5.



6. a) $\frac{0}{9}, \frac{1}{9}, \frac{4}{9}, \frac{22}{9}, \frac{229}{9}$ b) $\frac{2}{9}, \frac{7}{18}, \frac{5}{9}$ c) $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16}$ d) $\frac{1}{4}, \frac{3}{8}, \frac{2}{5}, \frac{9}{10}$
7. a) $\frac{11}{12}$ b) $\frac{3}{8}$ c) $\frac{2}{3}$ d) $\frac{1}{12}$
   e) $\frac{1}{6}$ f) 5 g) $\frac{1}{6}$ h) $\frac{5}{4}$
8. a) $\frac{5}{9}$ b) $\frac{1}{6}$ c) $\frac{4}{3}$ d) $\frac{1}{3}$
   e) $\frac{1}{21}$ f) 1
9. a) 2 b) $\frac{25}{21}$ c) $\frac{3}{2}$ d) $\frac{19}{16}$
   e) $-\frac{8}{9}$ f) $\frac{31}{135}$ g) $\frac{3}{5}$ h) $\frac{11}{16}$
10. a. $\frac{9}{20}$
    b. 33000

Detailed Solutions to the Fraction Problems

1a) Total equal parts = 9
shaded parts = 4
Fraction = $\frac{\text{shaded parts}}{\text{Total equal parts}}$
= $\boxed{\frac{4}{9}}$

1b) The parts of the circle are not equal hence the fraction
$\boxed{\text{Cannot be determined}}$

1c) Total equal parts = 7
shaded parts = 3
Fraction = $\frac{\text{shaded parts}}{\text{Total equal parts}}$
= $\boxed{\frac{3}{7}}$

1d) Total equal parts = 9
shaded parts = 2
Fraction = $\frac{\text{shaded parts}}{\text{Total equal parts}}$
= $\boxed{\frac{2}{9}}$

2a) $\boxed{\frac{21}{30}}$ 2b) $\boxed{\frac{23}{5}}$ 2c) $\boxed{\frac{56}{9}}$ 2d) $\boxed{\frac{18}{4}}$

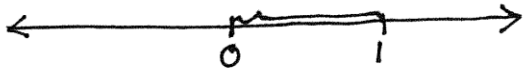
3a) $\boxed{\text{Improper fraction}}$ as the numerator is larger than the denominator

3b) $\boxed{\text{Zero}}$ as the numerator is zero

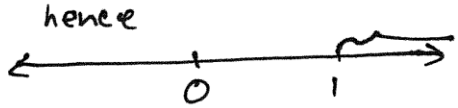
3c) $\boxed{\text{Proper Fraction}}$ as the numerator is smaller than the denominator

3d) $\boxed{\text{Undefined}}$ as the denominator is zero

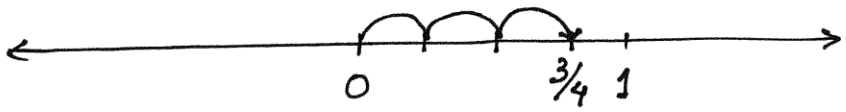
4a) $\frac{1}{14}$ is a proper fraction hence



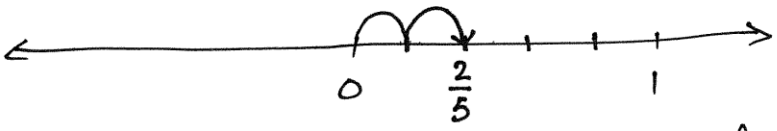
4b) $\frac{37}{11}$ is improper fraction hence



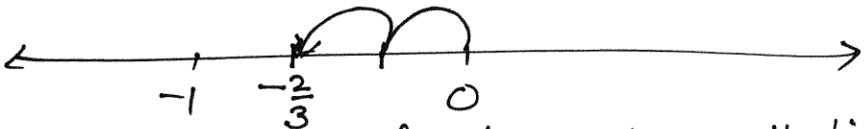
5a) $\frac{3}{4}$ is a proper fraction so it should lie in between 0 and 1.
To locate $\frac{3}{4}$ we divide the region between 0 and 1 into 4 equal parts and plot $\frac{3}{4}$



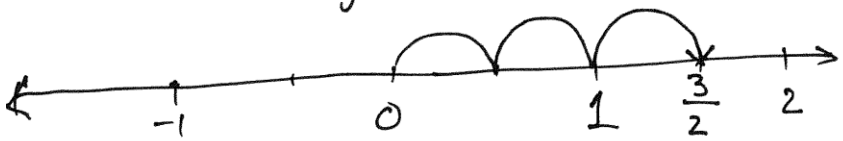
5b) $\frac{2}{5}$ is a proper fraction hence it should lie in between 0 and 1.
To locate $\frac{2}{5}$ we divide the region between 0 and 1 into 5 equal parts and plot $\frac{2}{5}$



5c) $-\frac{2}{3}$ is a negative proper fraction so it should lie in between 0 and -1. To locate $-\frac{2}{3}$ we divide the region between -1 and 0 into three equal parts and plot $-\frac{2}{3}$



5d) $\frac{3}{2}$ is an improper fraction hence it lies beyond 1 in the positive direction. Let us divid each whole length into halves and plot $\frac{3}{2}$



6. a Arrange in numerical order, smallest to largest.

$\frac{1}{9}, \frac{22}{9}, \frac{0}{9}, \frac{4}{9}, \frac{229}{9}$

Since all denominators are the same, numerical order for these fractions is the same as numerical order of the numerators. (1, 22, 0, 4, 229 would arrange to 0, 1, 4, 22, 229).

correct numerical order is $\frac{0}{9}, \frac{1}{9}, \frac{4}{9}, \frac{22}{9}, \frac{229}{9}$

b. $\frac{5}{9}, \frac{7}{18}, \frac{2}{9}$ These fractions need to be written with a common denominator.

To find the least (smallest) common denominator (LCD) look for the smallest number that is a multiple of 9, 18, and 9. Since $18 = 9 \times 2$, 18 = LCD.

Now, convert $\frac{5}{9}$ and $\frac{2}{9}$ to equivalent fractions with 18 as the denominator: $\frac{5 \cdot 2}{9 \cdot 2} = \frac{10}{18}$ and $\frac{2 \cdot 2}{9 \cdot 2} = \frac{4}{18}$

So, $\frac{10}{18}, \frac{7}{18}, \frac{4}{18}$ in numerical order = $\frac{4}{18}, \frac{7}{18}, \frac{10}{18}$

or $\boxed{\frac{2}{9}, \frac{7}{18}, \frac{5}{9}}$

c. $\frac{7}{8}, \frac{3}{4}, \frac{15}{16}, \frac{1}{2}$

We need the LCD for 8, 4, 16, 2 denominators.

Note that 16 is a multiple of the others: $8 \times 2 = 16$, $4 \times 4 = 16$, $16 \times 1 = 16$, $2 \times 8 = 16$

Converting fractions to equivalent fractions with denominator = 16:

$\frac{7 \cdot 2}{8 \cdot 2} = \frac{14}{16}$ $\frac{3 \cdot 4}{4 \cdot 4} = \frac{12}{16}$ $\frac{15}{16}$ (stays same) $\frac{1 \cdot 8}{2 \cdot 8} = \frac{8}{16}$

Fractions are now $\frac{14}{16}, \frac{12}{16}, \frac{15}{16}, \frac{8}{16}$

In numerical order: $\frac{8}{16}, \frac{12}{16}, \frac{14}{16}, \frac{15}{16} = \boxed{\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16}}$

6. d. $\frac{9}{10}, \frac{1}{4}, \frac{3}{8}, \frac{2}{5}$

We must find the smallest number that is a multiple of 10, 4, 8, and 5.

multiples of 10: 10, 20, 30, [40], 50, 60, ...

multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, [40], 44, 48, 52, ...

multiples of 8: 8, 16, 24, 32, [40], 48, 56, 64, ...

multiples of 5: 5, 10, 15, 20, 25, 30, 35, [40], 45, 50, ...

A good way to find the smallest number that appears in each list of multiples is to start with the multiples of the largest number — 10.

10 is not a multiple of 4 or 8
20 is not a multiple of 8
30 is not a multiple of 4 or 8
(40) is on all 4 lists of multiples. → LCD = 40

Converting: $\frac{9 \cdot 4}{10 \cdot 4} = \frac{36}{40}$ $\frac{1 \cdot 10}{4 \cdot 10} = \frac{10}{40}$ $\frac{3 \cdot 5}{8 \cdot 5} = \frac{15}{40}$

and $\frac{2 \cdot 8}{5 \cdot 8} = \frac{16}{40}$

$\frac{36}{40}, \frac{10}{40}, \frac{15}{40}, \frac{16}{40}$ $\xrightarrow{\text{numerical order}}$ $\frac{10}{40}, \frac{15}{40}, \frac{16}{40}, \frac{36}{40}$

$\boxed{\frac{1}{4}, \frac{3}{8}, \frac{2}{5}, \frac{9}{10}}$

7. a simplify $\frac{33}{36} = \frac{3 \cdot 11}{3 \cdot 12} = \boxed{\frac{11}{12}}$

b. $\frac{15}{40} = \frac{3 \cdot 5}{8 \cdot 5} = \boxed{\frac{3}{8}}$

c. $\frac{6}{9} = \frac{2 \cdot 3}{3 \cdot 3} = \boxed{\frac{2}{3}}$

d. $\frac{5}{60} = \frac{5 \cdot 1}{5 \cdot 12} = \boxed{\frac{1}{12}}$

e. $\frac{6}{36} = \frac{6 \cdot 1}{6 \cdot 6} = \frac{1}{6}$

↑

note: the "1" in this step need not be written, but remember that $6 \cdot 6 = 1$ not 0.

$\frac{6}{36} = \frac{6}{6 \cdot 6} = \frac{1}{6}$

f. $\frac{25}{5} = \frac{5 \cdot 5}{5 \cdot 1} = \frac{5}{1} = (5)$

7. g. $\frac{2}{12} = \frac{2 \cdot 1}{2 \cdot 6} = \boxed{\frac{1}{6}}$

h. $\frac{45}{36}$ It isn't easy to see what the largest number is that divides evenly into both 45 and 36. Reducing can be done in steps.

It's easier to see that 3 divides evenly into both 45 and 36, so start with 3.

$$\frac{45}{36} = \frac{15 \cdot 3}{12 \cdot 3} = \frac{15}{12}$$

This can be reduced further by dividing both 15 and 12 by 3 again.

$$\frac{15}{12} = \frac{3 \cdot 5}{3 \cdot 4} = \boxed{\frac{5}{4}}$$ (This can't be reduced more).

Alternative method for reducing $\frac{45}{36}$. Write both numbers as the product of their prime factors

$45 = 5 \cdot 9 = 5 \cdot 3 \cdot 3 = 3 \cdot 3 \cdot 5$

$36 = 6 \cdot 6 = 2 \cdot 3 \cdot 2 \cdot 3 = 2 \cdot 2 \cdot 3 \cdot 3$

$$\frac{45}{36} = \frac{3 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 3} = \frac{5}{2 \cdot 2} = \boxed{\frac{5}{4}}$$

8a) $\frac{1}{3} \times \frac{5}{3} = \frac{1 \times 5}{3 \times 3} = \boxed{\frac{5}{9}}$

8b) $\frac{12}{40} \times \frac{5}{9} = \frac{12 \times 5}{40 \times 9}$

$= \frac{(2 \cdot 2 \cdot 3)(5)}{(2 \cdot 2 \cdot 2 \cdot 5)(3 \cdot 3)} = \boxed{\frac{1}{6}}$

8c) $\frac{40}{21} \times \frac{7}{10} = \frac{(40)(7)}{(21)(10)}$

$= \frac{(2 \cdot 2 \cdot 2 \cdot 5)(7)}{(3 \cdot 7)(2 \cdot 5)} = \boxed{\frac{4}{3}}$

8d) $\frac{1}{2} \div \frac{3}{2}$

$= \frac{1}{2} \times \frac{2}{3}$

$= \frac{1 \cdot 2}{2 \cdot 3} = \boxed{\frac{1}{3}}$

8e) $\frac{11}{56} \div \frac{33}{8} = \frac{11}{56} \times \frac{8}{33}$

$= \frac{11 \times 8}{56 \times 33} = \frac{11 \times (2 \cdot 2 \cdot 2)}{(2 \cdot 2 \cdot 2 \cdot 7) \times (3 \cdot 11)}$

$= \boxed{\frac{1}{21}}$

8f) $\frac{13}{48} \div \frac{39}{144} = \frac{13}{48} \cdot \frac{144}{39} = \frac{(13)(12)(12)}{(4 \cdot 12)(3 \cdot 13)}$

$= \frac{12}{12} = \boxed{1}$

9a) $\frac{1}{3} + \frac{5}{3}$

Alternately

$\frac{1}{3} + \frac{5}{3} = \frac{1+5}{3} = \frac{6}{3} = \boxed{2}$

Re writing

$\frac{1}{3}$

$+ \frac{5}{3}$

$\frac{6 \div 3}{3 \div 3} = \boxed{2}$

9b) $\frac{11}{21} + \frac{2}{3}$

Rewriting

$$\frac{11}{21} = \frac{11}{21}$$
$$+ \frac{2 \times 7}{3 \times 7} \quad + \frac{14}{21}$$
$$\boxed{\frac{25}{21}}$$

Alternately

$\frac{11}{21} + \frac{2}{3}$

$LCD = 21$

$\frac{11}{21} + \frac{2 \times 7}{3 \times 7} = \frac{11}{21} + \frac{14}{21}$

$= \frac{11+14}{21} = \boxed{\frac{25}{21}}$

9c) $\frac{9}{12} + \frac{3}{4}$

Rewriting

$$\frac{9}{12} = \frac{9}{12}$$
$$+ \frac{3 \times 3}{4 \times 3} \quad + \frac{9}{12}$$
$$\frac{18 \div 2}{12 \div 2} = \frac{9 \div 3}{6 \div 3} = \boxed{\frac{3}{2}}$$

Alternately

$\frac{9}{12} + \frac{3}{4}$

$LCD = 12$

$\frac{9}{12} + \frac{3 \times 3}{4 \times 3}$

$= \frac{9}{12} + \frac{9}{12} = \frac{18 \div 6}{12 \div 6}$

$= \boxed{\frac{3}{2}}$

9d) $\frac{21}{24} + \frac{5}{16}$

Rewriting

$$\frac{21 \times 2}{24 \times 2} = \frac{42}{48}$$
$$+ \frac{5 \times 3}{16 \times 3} \quad + \frac{15}{48}$$
$$\frac{57 \div 3}{48 \div 3} = \boxed{\frac{19}{16}}$$

Alternately

$\frac{21}{24} + \frac{5}{16}$

$LCD = 48$

$\frac{21 \times 2}{24 \times 2} + \frac{5 \times 3}{16 \times 3}$

$= \frac{42}{48} + \frac{15}{48} = \frac{42+15}{48}$

$= \frac{57 \div 3}{48 \div 3} = \boxed{\frac{19}{16}}$

9e) $\frac{4}{9} - \frac{4}{3}$

$\frac{4}{9} = \frac{4}{9}$

$- \frac{4 \cdot 3}{3 \cdot 3} = - \frac{12}{9}$ ← bigger

$\boxed{-\frac{8}{9}}$

Alternately

LCD = 9

$\frac{4}{9} - \frac{4 \cdot 3}{3 \cdot 3}$

$\frac{4}{9} - \frac{12}{9} = \frac{4-12}{9}$

$= \boxed{-\frac{8}{9}}$

9f) $\frac{8}{30} - \frac{1}{27}$

Rewriting

$\frac{8}{30} \times 9 = \frac{72}{270}$

$- \frac{1}{27} \times 10 = - \frac{10}{270}$

$\frac{62 \div 2}{270 \div 2} = \boxed{\frac{31}{135}}$

Alternately

$\frac{8}{30} - \frac{1}{27}$

LCD = 270

$\frac{8 \times 9}{30 \times 9} - \frac{1 \times 10}{27 \times 10}$

$\frac{72}{270} - \frac{10}{270}$

$= \frac{72-10}{270} = \frac{62 \div 2}{270 \div 2} = \boxed{\frac{31}{135}}$

9g) $\frac{4}{5} - \frac{1}{5}$

$\frac{4}{5}$

$- \frac{1}{5}$

$\boxed{\frac{3}{5}}$

Alternately

$\frac{4}{5} - \frac{1}{5} = \frac{4-1}{5} = \boxed{\frac{3}{5}}$

9h) $\frac{3}{4} - \frac{1}{16}$

$\frac{3 \times 4}{4 \times 4} = \frac{12}{16}$

$- \frac{1}{16} = - \frac{1}{16}$

$\boxed{\frac{11}{16}}$

Alternately

$\frac{3}{4} - \frac{1}{16}$

LCD = 16

$\frac{3 \cdot 4}{4 \cdot 4} - \frac{1}{16} = \frac{12}{16} - \frac{1}{16} = \boxed{\frac{11}{16}}$

10. Number of registered voters = 100,000

Number of party A supporters = 55000

Number of voters who voted for candidate X $= \frac{3}{8} \times \frac{11000}{1}$

$= \boxed{33000}$

a) Number of voters who donot support party = 100,000 − 55000

= 45,000

Hence fraction of registered voters who do not support party A $= \frac{45000}{100,000} = \frac{45 \div 5}{100 \div 5}$

$= \boxed{\frac{9}{20}}$

b) (see above) $\boxed{33000}$

Additional Resources

1. Go To http://www.onlinemathlearning.com/math-worksheets.html
2. Click on the tile which says "Fractions Worksheet"
3. Select any skill in the tiles provided to practice.
4. These are free online worksheets and once you answer them you click on the "submit" button to check answers.
5. Continue with other skills till you are satisfactorily mastered the skills
6. For further help please contact the ***Math Assistance Area***.