CHAPTER – 3

Fractions and Percentages

While solving questions on simplification, sometimes, we may come across simplification of fractions. Simplification of fractions may involve Addition, Subtraction, Multiplication and Division. In Addition as well as Subtraction of fractions, we may come across fractions with different denominators. In such cases, the denominators are to be made equal by converting the denominators to their LCM. Following are some examples on the simplification of fractions.

ADDITION / SUBTRACTION OF FRACTIONS:

3.01. $\frac{4}{9}+\frac{13}{18}+\frac{7}{54}$ =?

Sol. The LCM of the denominators 9, 18 and 54 is 54. [The students should calculate LCM mentally. As 54 is divisible by 9, 18 and 54 the LCM is 54]. After finding the LCM, the students should concentrate on calculating the numerators.
As 9 has to be multiplied by 6 to get 54, the numerator 4 is multiplied by 6 i.e., 4 x 6 = 24.
Similarly 13 x 3 = 39 and 7 x 1 = 7.

$$\therefore \frac{4}{9}+\frac{13}{18}+\frac{7}{54} = \frac{24}{54}+\frac{39}{54}+\frac{7}{54}$$
$$= \frac{24+39+7}{54} = \frac{70}{54} = \frac{35}{27}$$

3.02. $\frac{7}{18}-\frac{11}{24}+\frac{13}{36}$ =?

Sol. The LCM of the denominators 18, 24 and 36 is 72. 36 is divisible by 18, so the LCM of 18 and 36 is 36. To find the LCM of 24 and 36, take the larger number i.e. 36 and its multiples 72, 108, etc. 36 is not divisible by 24. So, LCM is not 36. 72 is divisible by 24. So the LCM is 72. The denominator of the resultant fraction is 72.

$$\frac{7}{18}-\frac{11}{24}+\frac{13}{36} = \frac{28}{72}-\frac{33}{72}+\frac{26}{72} = \frac{21}{72} = \frac{7}{24}$$

RECIPROCALS AND ITS MULTIPLES:

We come across a number of calculations of percentages in data interpretation and in some parts of quant. To do the calculations faster, if we can remember the reciprocals and its multiples, then we can do the calculations at a faster rate. For example, if we want to calculate 37.5 % of 896, we can do it faster if we remember 37.5 % (as 3/8) = 3/8 x 896 = 3 x 112 = 336.

The important reciprocals are from 1/2 to 1/12 and their multiples. Once we memorize these, upto 12, remembering its multiples is not that difficult. For example,

1/ 8 = 12.5 %; 2/8 => 2 x 1/8 = 2 x 12.5 = 25%; 3/8 => 3 x 1/8 = 3 x 12.5 = 37.5%; 4/8 => 4 x 1/8 = 4 x 12.5 = 50% or 4/8 = 1/2 = 50%; 5/8 => 5 x 1/8 = 5 x 12.5 = 62.5%; 6/8 => 3/4 = 75%; 7/8 => 7 x 1/8 = 7 x 12.5 = 87.5%;

Similarly we can remember the all the multiples of reciprocals upto 12.

Conversion of fractions to percentage

1/2 = 50%,	1/3 = 33.33%,	1/4 = 25%,
	2/3 = 66.66%,	3/4 = 75%,
1/5 = 20%,	1/6 = 16.66%,	1/7 = 14.28%
2/5 = 40%,	5/6 = 83.33%,	2/7 = 28.57%,
3/5 = 60%,		3/7 = 42.85%,
4/5 = 80%,		4/7 = 57.13%,
		5/7 = 71.42%,
		6/7 = 85.72%,
1/8 = 12.5%,	1/9 = 11.11%,	1/11 = 9.09%,
3/8 = 37.5%,	2/9 = 22.22%,	2/11 = 18.18%,
5/8 = 62.5%,	4/9 = 44.44%,	3/11 = 27.27%,
7/8 = 87.5%,	5/9 = 55.55%,	4/11 = 36.36%,
	7/9 = 77.77%,	5/11 = 45.45%,
	8/9 = 88.88%,	6/11 = 54.54%,
		7/11 = 63.63%,
		8/11 = 72.72%,
		9/11 = 81.81%,
		10/11 = 90.9%,

1/12 = 8.33%,
5/12 = 41.66%,
7/12 = 58.33%,
10/12 = 83.33%,
11/12 = 91.66%

It will be very useful to memorize all the above values as it will help us to do the calculations very fast.

3.03. 37.5 % of 1248

Sol. 37.5% = $3/8$
$\therefore$ 37.5% of 1248 = $3/8 \times 1248$
$= 3 \times 156 = 468$

3.04. 42.85% of 2114

Sol. 42.85% = $3/7$
$\therefore$ 42.85% of 2114 = $3/7 \times 2114 = 3 \times 302 = 906$

3.05. 63.33% of 2233

Sol. 63.63% = $7/11$
$\therefore$ 63.63% of 2233 = $7/11 \times 2233 = 7 \times 203 = 1421$

3.06. 58.33% of 2184

Sol. 58.33% = $7/12$
$\therefore$ 58.33% of 2184 = $7/12 \times 2184 = 7 \times 182 = 1274$

3.07. 44.44% of 8127

Sol. 44.44% = $4/9$
$\therefore$ 44.44% of 8127 = $4/9 \times 8127 = 4 \times 903 = 3612$

Percentage calculations

In calculating the percentage value of a number, we usually go for multiplication. But that does not give the answer easily and quickly in most cases. Hence an easier method called 10% concept, is suggested. In this approach, we take 10% of the denominator. To get close to the answer take further values like 1% and 0.1%.

For example: $23\% = 10\% \times 2 + 1\% \times 3$

$$43.2\% = 10\% \times 4 + 1\% \times 3 + 0.1\% \times 2.$$

The following is the illustration of the same.

How to calculate the value of 36% of 1325?

Here, explain the concept of 10% and 1%. i.e, for any value, say 1264, 10% of the value is obtained by simply shifting the decimal point by one place (or digit) to the left. Note that 1264 = 1264.0

10% of 1264.0 = 126.40 (i.e. the decimal point moves to the left by one place (or digit)). Similarly, 1% of 1264.0 will be obtained by shifting the decimal point by two places to the left. Hence, 1% of 1264.0 = 12.640.

Hence 36% of 1325 = (40% – 4%) of 1325 = ($4 \times 10\% - 4 \times 1\%$) of 1325 = ($4 \times 132.5 - 4 \times 13.25$) = 530 – 53 = 477.

Similarly consider another example, say, 18% of 3250 = (20% – 2%) of 3250

= ($2 \times 10\% - 2 \times 1\%$) of 3250 = ($2 \times 325 - 2 \times 32.5$) = 585.

If there is a 10% increase then the new value will become 1.1 times the old value and in general if there is an increase of p%, the new value will become 1.p times the old value. But sometimes converting the percentage into fraction maybe easier than this if there is an increase of 33.33% then the new value will become 4/3 times the old value. Calculating in this way i.e. converting $33^1/_3$ into a fraction and simplifying is faster.

Whenever percentage increase cannot easily be converted into a convenient fraction, then the approximate percentage increase p, in integer form, must be found and then 1.p has to be used.

3.08. What is 20% of 1205

Sol. **Method 1**

20% = 1/5
20% of 1205 = 1/5 of 1205 = 241

Method 2

$10\% = \frac{10}{100} = 0.1$
10% of 1205 = 1205
∴ 20% of 1205 = 1205 x 2 = 241

3.09. Find 22% of 4568

Sol. 20% (10% x 2) = 456.8 x 2 = 913.6
+ 2% = 1/10 x 20% = 91.36
22% = 1004.96

3.10. Find 36% of 1835

Sol. **Method 1**

30% (10% x 3) = 1835 x 3 = 550.5
+ 6% = 1/5 x 30% = 110.1
36% = 1004.96

Method 2

40% (10% x 4) = 183.5 x 4 = 734
– 4% = 1/10 of 40% = – 73.4
36% = 660.6

3.11. Find the value of 26% of 496.

Sol. 26% = 25% + 1%
25% of 496 = 1/4 of 496 = 124
1% of 496 = 4.96
26% of 496 = 128.96

3.12. Find the value of 35.6% of 928.

Sol. 10% of 928 = 92.8
30% of 928 = 92.8 x 3 = 278.4
5% of 928 = 46.4
0.1% of 928 = 0.928
35.6% = 30% = 278.4
+5% = 46.4
+0.5% = 4.6
+0.1% = 0.9
330.3

0% + 5% + 0.5% + 0.1%
278.8 + 46.4 + 4.6 + 0.9 = 330.3

3.13. 39 is what percent of 186?

Sol. The number that follows 'of' should always come in the denominator.

So, $\frac{39}{186}$ x 100 is to be calculated.

10% of the denominator is 18.6
20% of the denominator is 18.6 x 2 = 37.2
1% of the denominator is 1.86
21% of the denominator is 37.2+ 1.86 ~ 39

$\therefore \frac{39}{186} = 21\%$

3.14. 457 is what percent of 1382?

Sol. 1/3 x 1382 ≅ 461 = 33.33%
461 – 457 = 4 ≅ 3 x 1.38 = 0.3%

$\therefore \frac{457}{1382} = 33.33\% - 0.3\% = 33.03\%$

Exercise – 3(a)

Questions 1 to 45: Percentages/Fractions

1. 63.52% of 968 = ?

2. 14.28% of 322 = ?

3. 28.28% of 420 = ?

4. 88.5% of 885 = ?

5. 63.666% of 936 = ?

6. 78% of 240 = ?

7. 42.85% of 455 = ? (to the nearest integer)

8. 60.55% of 1440 = ? (to the nearest integer)

9. 33.75% of 368 = ?

10. 17.5% of 720 = ?

11. 18.18% of 726 = ? (to the nearest integer)

12. 6.25% of 384 = ?

13. 38.46% of 286 = ? (to the nearest integer)

14. 63% of 1818 = ?

15. 369 is what percentage of 1440?

16. 20.83% of 360 = ? (to the nearest integer)

17. 90.9% of 1331 = ? (to the nearest integer)

18. 35.2% of 1560 = ?

19. 67.5% of 4848 = ?

20. 927 is what percentage of 3672?

21. 433 is what percentage of 1444?

22. 65% of 8888 = ?

23. 57.14% of 1351 = ? (to the nearest integer)

24. 97 is what percentage of 7272 ?

25. What percentage of 751 is 362?

26. What percentage of 872 is 203?

27. What percentage of 643 is 182?

28. What percentage of 682 is 341?

29. What percentage of 631 is 131?

30. 17·9% of 1087 = ?

31. 250·25% of 548 = ?

32. 12·625% of 74 = ?

33. 28·9% of 361 = ?

34. 92·5 is what percent of 222?

35. $69\frac{3}{8}\%$ of 6568

36. 63983·28 is what percentage of 25360?

37. Find the value of $18\frac{18}{19}\%$ of 9709.

38. Find the value of 21·63% of 1296.

39. $\frac{37}{72}+\frac{20}{27}+\frac{8}{45}+\frac{11}{144}=?$

40. $\frac{29}{48}+\frac{37}{64}+\frac{17}{24}+\frac{11}{16}=?$

41. $\frac{5}{7}+\frac{9}{10}+\frac{11}{14}+\frac{8}{35}=?$

42. $\frac{9}{16}+\frac{7}{24}+\frac{13}{48}+\frac{17}{80}=?$

43. $\frac{5}{24}+\frac{7}{36}+\frac{11}{48}=?$

44. $\frac{12}{17}-\frac{11}{15}+\frac{18}{19}=?$

45. $\frac{9}{14}+\frac{5}{21}+\frac{11}{35}=?$

Exercise – 3(b)

Questions 1 to 38: Percentages

1. 87.5% of 784 =

2. 31.5% of 1960 =

3. 128.57% of 1694 = (to the nearest integer)

4. 58 is what percentage of 490?

5. What percentage of 875 is 624? (upto one place of decimal)

6. 71.42% of 434 = ? (to the nearest integer)

7. 54.16% of 1824 = ? (to the nearest integer)

8. 46.2% of 4880 = ?

9. 334 is what percentage of 927?

10. 75 is what percentage of 728?

11. 63.5% of 382 = ?

12. 72.9% of 780 = ?

13. 16.8% of 915 = ?

14. What percentage of 637 is 241?

15. What percentage of 6751 is 2432?

16. 980 is what percentage 1080?

17. 741 is what percentage of 941?

18. 230 is what percentage of 430?

19. 209 in what percentage of 409?

20. 437 is what percentage of 567?

21. What is 15.8% of 480?

22. What is 25.2% of 728?

23. What is 19.8% of 320?

24. What is 45% of 630?

25. What is 67.5% of 820?

26. 38.5% of 680 = ?

27. 84.71% of 742 = ?

28. 63% of 1023 = ?

29. 13.5 is what percentage of 67.5?

30. 24 is what percentage of 360?

31. 632·835 is what percentage of 2009?

32. 4·504% of 9·08 = ?

33. 84% of 564 = ?

34. 11·4% of 18·2 is what percentage more than 14·1% of 12·8?

35. Evaluate 4·2857% of 168 to the nearest integer

36. 4·3% of 16·1 = ?

37. 106·812 is what percent of 464·4?

38. $345\frac{5}{9}$ is what percent of 622?

Questions 39 to 45: Add the following fractions.

39. $\frac{17}{35}+\frac{12}{49}+\frac{8}{70}$

40. $\frac{19}{30}+\frac{11}{24}+\frac{7}{36}$

41. $\frac{17}{40}+\frac{13}{25}+\frac{11}{60}=?$

42. $\frac{18}{77}+\frac{23}{66}+\frac{31}{88}=?$

43. $\frac{17}{24}-\frac{7}{18}-\frac{5}{36}=?$

44. $4\frac{2}{7}+3\frac{4}{5}-2\frac{1}{3}+5\cdot5=?$

45. $\frac{5}{54}+\frac{7}{72}+\frac{11}{180}=?$

Key

Exercise – 3(a)

1. 614.87
2. 45.98
3. 118.78
4. 783.23
5. 595.91
6. 187.2
7. 195
8. 872
9. 124.2
10. 126
11. 132
12. 24
13. 110
14. 1145.34
15. 25.625%
16. 75
17. 1210
18. 549.12
19. 3272.4
20. 25.245%
21. 29.98%
22. 5777.2
23. 772
24. 1.32%
25. 48.20%
26. 23.27%
27. 28.30%
28. 50%
29. 20.76%
30. 194·573
31. 1371.37
32. 9.34%
33. 104·329
34. $41\frac{2}{3}\%$
35. 4556.55
36. 252. 3%
37. 1839·6
38. 280.32
39. $\frac{3259}{2160}$
40. $\frac{165}{64}$
41. 92/35
42. $\frac{107}{80}$
43. $\frac{91}{144}$
44. $\frac{4457}{4845}$
45. $\frac{251}{210}$

Exercise – 3(b)

1. 686
2. 617.4
3. 2178
4. 11.84%
5. 71.3%
6. 310
7. 988
8. 2254.56
9. 36.02%
10. 10.3%.
11. 242.57
12. 568.62
13. 153.72
14. 37.83
15. 36.02
16. 90.74%
17. 78.75%
18. 53.49%
19. 51.10%
20. 77.07%
21. 75.84
22. 183.46
23. 63.36
24. 283.50
25. 553.5
26. 261.80
27. 628.55
28. 644.49
29. 20%
30. $6^2/_3\%$
31. 31·5%
32. 0·412232.
33. 473·76
34. 15%
35. 7
36. 0·6923
37. 23%
38. 55·55%
39. $\frac{207}{245}$
40. $\frac{463}{360}$
41. $\frac{677}{600}$
42. $\frac{157}{168}$
43. $\frac{13}{72}$
44. $\frac{2363}{210}$
45. $\frac{271}{1080}$