Unit 5 · Fraction

STUDY NOTES

Key terms

Fraction: equal parts of a whole, or of a group, as a number: 2/8.

Denominator (bottom): how many equal parts the whole is cut into.

Numerator (top): how many of those parts we take.

Proper fraction: less than one whole; numerator smaller: 2/5, 5/6.

Improper fraction: one whole or more; numerator as big or bigger: 4/4, 11/4.

Mixed number: a whole number and a proper fraction together: 2 3/4, "two and three quarters".

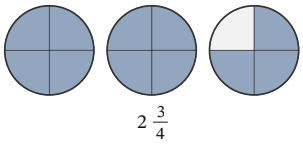
Like fractions: the same denominator: 1/8, 3/8, 7/8.

Unlike fractions: different denominators: 1/2, 1/3.

Equivalent fractions: look different, show the same amount: 4/16 = 2/8.

- in 3/4: **4** = the equal parts in the whole; **3** = the parts taken
- the parts must be **equal**: a roti torn into one big piece and three small ones is not quarters
- like fractions compare easily: same-size parts, so more parts = more (7/8 > 3/8)
- order like fractions by their numerators
  - **ascending** (smallest first): 2/9, 3/9, 7/9, 9/9
  - **descending** (biggest first): 9/13, 7/13, 3/13, 2/13

Two names for one amount



11 quarters = 2 whole circles and 3 quarters.

$$\frac{11}{4} = 2\frac{3}{4}$$

Mixed number → improper fraction

- denominator × whole number + numerator, over the **same denominator**
- 2 wholes = 8 quarters; + 3 quarters = 11 quarters

$$2\frac{3}{4} = \frac{4 \times 2 + 3}{4} = \frac{11}{4}$$

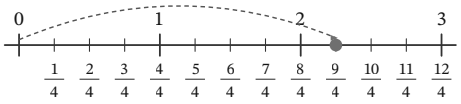
- 2 1/4 = 9/4; 4 2/5 = 22/5

Improper fraction → mixed number

- divide numerator by denominator
- quotient = the whole number; remainder = the new numerator; same denominator
- 29/8: 29 ÷ 8 = 3, remainder 5 (8 × 3 = 24, 29 − 24 = 5)

$$\frac{29}{8} = 3\frac{5}{8}$$

- 17/3 = 5 2/3; 13/5 = 2 3/5
- remainder 0 → a whole number: 8/4 = 2
- check by changing back: 5 2/3 = (3 × 5 + 2)/3 = 17/3 ✓



On a number line: 9 quarters from 0 lands on 2 1/4.

A fraction of a group

- 25 teachers, 15 women: women 15/25; men 25 − 15 = 10, so 10/25
- one bar of 25 equal parts, one for each teacher
- both proper fractions
- a fraction **of an amount**: 1/5 of Rs 1,000 = 1,000 ÷ 5 = Rs 200; 3/5 → 3 × 200 = **Rs 600**
- spent 3/5 → saved 5/5 − 3/5 = 2/5 = Rs 400; check 600 + 400 = 1,000 ✓

Adding and taking away like fractions

- **add the numerators, keep the denominator**
- **subtract the numerators, keep the denominator**

$$\frac{1}{8} + \frac{2}{8} = \frac{1+2}{8} = \frac{3}{8} \qquad \frac{3}{8} - \frac{1}{8} = \frac{3-1}{8} = \frac{2}{8}$$

- why: the denominator is the **size of a piece**; putting eighths together doesn't change it
- "how much more" → take away: 3/7 − 2/7 = 1/7

- dug 2/5 and 1/5 of a field: 3/5 together; 2/5 still to dig
- the whole = 8/8: cake left = 8/8 − 5/8 = 3/8
- check: gone + left = 5/8 + 3/8 = 8/8, the whole ✓

Mixed numbers

Way 1: wholes with wholes, fractions with fractions

$$2\frac{2}{5} + 1\frac{1}{5} = (2+1) + \left(\frac{2}{5} + \frac{1}{5}\right) = 3\frac{3}{5}$$

- 5 2/5 − 2 1/5 = 3 + 1/5 = 3 1/5
- 13 1/3 − 5 1/3 + 7 1/3: wholes 13 − 5 + 7 = 15; thirds 1/3 → 15 1/3

Way 2: improper fractions first

$$2\frac{2}{5} + 1\frac{1}{5} = \frac{12}{5} + \frac{6}{5} = \frac{18}{5} = 3\frac{3}{5}$$

- 5 2/5 − 2 1/5 = 27/5 − 11/5 = 16/5 = 3 1/5
- both ways give the same answer

Fraction part more than a whole

- 6 3/4 + 1 2/4: wholes 7; quarters 5/4 = 1 1/4 → 8 1/4
- 3 4/5 + 2 3/5: 5 and 7/5 = 1 2/5 → 6 2/5
- a mixed number's fraction must be **proper**: 7 5/4 isn't finished

Fractions in everyday Nepali

Word	Meaning	Example
सवा	a quarter more	सवा पाँच = 5 1/4
साढे	a half more	साढे पाँच = 5 1/2
पौने	a quarter less	पौने पाँच = 4 3/4
डेढ	one and a half	1 1/2
अढाई	two and a half	2 1/2

- आधा किलो = half a kilo; पाउ = a quarter kilo, 250 grams
- 1 ropani = 16 aana: 1 aana = 1/16 ropani; 8 aana = half a ropani
- Egypt, the Rhind papyrus: 3/4 written 1/2 + 1/4

COMMON MISTAKES

✗ 1/8 + 2/8 = 3/16
✓ add only the numerators: 3/8; the piece size stays.

✗ 2 3/4 → 2 × 3 + 4 = 10
✓ multiply the whole by the denominator: 4 × 2 + 3 = 11.

✗ 13/5 = 2 5/13
✓ remainder over the same denominator: 2 3/5.

✗ 7 5/4 left as the answer
✓ take out the whole: 8 1/4.

✗ parts of different sizes called quarters
✓ a fraction needs equal parts.

✗ more pieces of a smaller size means more cake
✓ 4/16 is the same as 2/8.