# Class 9 Maths Chapter 10: How Quantities Combine: Understanding Data - Notes, Important Questions and MCQs (2026-27)

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These Class 9 Maths Chapter 10 notes (Part II, Chapter 10) cover “How Quantities Combine: Understanding Data” from the new NCERT textbook Ganita Manjari (Part II, 2026-27): the weighted mean, average of averages, adding or removing data values, concentration of mixtures, custom weights in marks and ratings, and visualising data with stacked and 100% stacked bar charts – with tables, solved examples, Q&A, 10 MCQs and a free PDF.

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## Chapter Overview

When groups of different sizes or importance are combined, a simple average of their averages can mislead. The weighted mean gives each value a weight according to its size or importance, producing the correct combined average.

Weighted means also help find the concentration of mixtures and final scores from tests with different importance. To display how totals are made of parts, stacked bar charts show absolute amounts, while 100% stacked bar charts and pie charts show proportions.

## Important Topics and Concepts

### The Weighted Mean

- For values $x_1, x_2, \ldots, x_n$ with weights $w_1, w_2, \ldots, w_n$: $\bar{x} = (w_1x_1 + w_2x_2 + \ldots + w_nx_n) \div (w_1 + w_2 + \ldots + w_n)$.
- When all weights are equal, it becomes the ordinary mean.
- Weights may be counts, quantities, time periods or levels of importance.

### Average of Averages

- Combining group averages: weight each average by its group size.
- Example: 30 students average 60, 20 students average 70 → (30×60 + 20×70)/50 = 64, not 65.
- Adding a value: new mean = (n × old mean + new value) ÷ (n + 1).
- Removing a value works the same way with subtraction.

### Mixtures

- Concentration of a mixture = weighted mean of concentrations, weighted by quantities.
- Example: 2 L of 10% juice + 3 L of 20% juice → (2×10 + 3×20)/5 = 16%.
- Equal quantities give the simple average of concentrations.

### Custom Weights

- Used when parts of data have different importance.
- Final marks: theory 80% weight, practical 20% weight.
- Ratings systems combine scores from different numbers of reviewers.
- Choosing sensible weights is part of good data analysis.

### Visualising Data

- Cluster (grouped) bar charts compare categories side by side.
- Stacked bar charts place parts on top of one another – show both the parts and the total.
- 100% stacked bar charts scale each bar to 100% – compare proportions, not absolute values (like pie charts but easier to compare across groups).
- A 100% chart can be made from a stacked chart, but not the reverse (totals are lost).

## Solved Examples

Board-pattern practice.

- Marks: test A (weight 1) 70, test B (weight 3) 90. Final score? (70 + 270)/4 = 85.
- Mean of 10 numbers is 20. One number 38 is removed. New mean? (200 – 38)/9 = 18.
- Mean of 12 values is 15; a 13th value 28 is added. New mean? (180 + 28)/13 = 16.
- 1 kg of rice at ₹40 mixed with 3 kg at ₹60. Price per kg of mixture? (40 + 180)/4 = ₹55.
- Section A (40 students) average 72, Section B (60 students) average 62. Combined? (2880 + 3720)/100 = 66.

## Choosing the Right Chart

| Chart | Shows | Best when |
|---|---|---|
| Cluster bar chart | Values side by side | Comparing individual categories |
| Stacked bar chart | Parts and total | Totals also matter |

| Chart | Shows | Best when |
|---|---|---|
| 100% stacked bar chart | Proportions of each bar | Comparing shares across groups |
| Pie chart | Proportions of one whole | One group, few categories |

## Important Terms and Formulas

| Term | Meaning |
|---|---|
| Mean | Sum of values ÷ number of values |
| Weighted mean | $\Sigma wx \div \Sigma w$ |
| Weight | Importance or size given to a value |
| Average of averages | Weighted mean using group sizes |
| Concentration | Amount of substance per total quantity |
| Stacked bar chart | Bars made of stacked parts |
| 100% stacked bar chart | Bars scaled to 100% showing shares |
| Pie chart | Circle divided into sectors by proportion |
| Proportion | Part ÷ whole |
| Cluster bar chart | Grouped bars side by side |

## Short Answer Questions

Q1. Write the formula for the weighted mean.

$\bar{x} = \Sigma w_i x_i \div \Sigma w_i$.

Q2. Why can a simple average of averages be wrong?

Because groups may have different sizes; the larger group should count more.

Q3. When is the weighted mean equal to the simple mean?

When all weights are equal.

Q4. Two glasses of equal size have 10% and 20% sugar. Mixture concentration?

15%.

Q5. What does a stacked bar chart show that a 100% stacked chart does not?

The actual totals (absolute values).

Q6. Can a stacked bar chart be made from a 100% stacked chart?

No, because the totals are not available.

Q7. Give two uses of weighted mean.

Combining test marks with different weights; finding concentration of mixtures.

Q8. Mean of 5 numbers is 8. Sum?

40.

## Long Answer Questions

Q1. Class X: 25 students average 80; class Y: 35 students average 68. Find the combined average and explain.

Weighted sum = 25×80 + 35×68 = 2000 + 2380 = 4380.

Total students = 60.

Combined average = 4380/60 = 73.

Simple average of 80 and 68 = 74 – incorrect.

Larger class Y pulls the combined mean down.

Q2. A shop mixes 4 kg of tea at ₹300/kg with 6 kg at ₹200/kg. Find the price of the mixture per kg and the selling price for 10% profit.

Cost = 4×300 + 6×200 = 1200 + 1200 = ₹2400.

Quantity = 10 kg.

Cost per kg = ₹240 (weighted mean).

For 10% profit: 240 × 1.1 = ₹264.

Weighted mean gives the fair average price.

Q3. Compare stacked bar charts and 100% stacked bar charts with an example.

Both show parts of a whole for several groups.

Stacked: bar height = actual total (e.g. weekly spending of two families).

100%: every bar has equal height; segments show shares.

Use stacked when totals matter; 100% when proportions matter.

100% can be derived from stacked, not vice versa.

## MCQs with Answers

1. Weighted mean of 10 (w=2) and 20 (w=3)(a) 15 (b) 16 (c) 14 (d) 17Answer: (b) 16

2. If all weights are equal, weighted mean equals(a) median (b) mode (c) simple mean (d) rangeAnswer: (c) simple mean

3. Combined mean of 10 values (avg 5) and 30 values (avg 9)(a) 7 (b) 8 (c) 6 (d) 9Answer: (b) 8

4. 100% stacked bar charts compare(a) totals (b) proportions (c) ranks (d) modesAnswer: (b) proportions

5. Pie charts show(a) proportions of a whole (b) trends over time (c) exact totals (d) frequencies onlyAnswer: (a) proportions of a whole

6. 1 L of 5% and 1 L of 15% solution mix to(a) 10% (b) 20% (c) 7.5% (d) 5%Answer: (a) 10%

7. Mean of 4 numbers is 10; add 20. New mean(a) 12 (b) 15 (c) 10 (d) 14Answer: (a) 12

8. A chart showing parts and totals is(a) pie (b) stacked bar (c) line (d) 100% stackedAnswer: (b) stacked bar

10. Σwx = 300, Σw = 12, weighted mean(a) 25 (b) 30 (c) 36 (d) 12Answer: (a) 25

## Quick Revision Points

- Weighted mean = Σwx ÷ Σw.
- Average of averages: weight by group sizes.
- Adding/removing a value changes the sum and count.
- Mixture concentration = weighted mean.
- Custom weights in marks and ratings.
- Cluster, stacked, 100% stacked, pie – when to use each.

## Chapter Summary

When quantities combine, the weighted mean gives the correct overall average by weighting each value according to its size or importance. It is used for averages of averages, updating means when data changes, mixture concentrations and combining marks or ratings.

Stacked bar charts show both the parts and the totals of groups, while 100% stacked bar charts and pie charts compare proportions. Choosing the right chart helps interpret data honestly.

## Exam Tips and PYQ Pattern

- Always multiply by weights before adding.
- Check that the weighted mean lies between the smallest and largest values.
- Show the sum of weights in the denominator.
- Read chart titles and axes carefully.
- Know when to use a 100% chart.

## Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the new NCERT Class 9 Maths textbook “Ganita Manjari” (Part II), prescribed for the 2026-27 session.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What is a weighted mean?

An average where each value is multiplied by a weight, divided by the sum of weights: Σwx ÷ Σw.

What is a 100% stacked bar chart?

A bar chart where each bar is scaled to 100% so the segments show proportions.

## Conclusion

How Quantities Combine shows how to average fairly and present data clearly. Learn the formula and chart table, practise the solved examples here and save the free PDF for revision.

More Notes: Class 9 Maths Chapter 9: Propositions and their Converses notes | Class 9 Maths Chapter 11: The World of Algorithms notes | All Class 9 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 9 Maths textbook, Ganita Manjari (Parts I and II, first edition 2026, NCF-SE 2023), and the CBSE syllabus for the 2026-27 session. Last checked on 24 November 2026.