

Chapter 21: Percentages

Comprehensive Practice Set for CUET UG

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Key Concepts

1. Percentage increase/decrease: Change = $\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$
 2. Successive percentage changes: If $a\%$ increase followed by $b\%$ increase \rightarrow net = $a + b + \frac{ab}{100}\%$
 3. If price increases by $x\%$ and consumption must be reduced to keep expenditure same: reduction $= \frac{x}{100 + x} \times 100\%$
 4. If price decreases by $x\%$ and more quantity can be bought: increase in quantity $= \frac{x}{100 - x} \times 100\%$
 5. Reverse percentage: Original value $= \frac{\text{new value}}{1 + \frac{r}{100}}$ (for increase) or $\frac{\text{new value}}{1 - \frac{r}{100}}$ (for decrease)
 6. Population growth/decay (compound): $P' = P \left(1 + \frac{r}{100}\right)^n$
 7. Depreciation: Value after n years $= P \left(1 - \frac{r}{100}\right)^n$
 8. In exams: % marks, pass/fail margin, comparison of performance
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Part 1: Basic Calculations and Single Percentage Changes

1. What is 18% of 450?
2. 72 is what percent of 240?
3. Express $\frac{5}{12}$ as a percentage (correct to one decimal place).
4. A number is increased by 25% and becomes 375. Find the original number.
5. The salary of an employee is decreased by 15% to 34,000. What was the original salary?

6. If 40% of a number is 96, find 65% of that number.
7. In a class of 180 students, 65% are boys. How many girls are there?
8. A shopkeeper sells an article for 960 and makes 20% profit. What is the cost price?
9. The price of petrol increases by 30%. By what percent should consumption be reduced so that expenditure remains the same?
10. If the price of sugar falls by 20%, by what percent can a family buy more sugar with the same budget?
11. A candidate scores 384 marks out of 600 in an exam. What is his percentage?
12. 35% of the students in a school are girls and the number of girls is 420. Find the total number of students.
13. A number is decreased by 12% and becomes 616. Find the original number.
14. If 55% of students passed and 180 failed, how many students appeared for the exam?
15. The marked price of an article is 1250. After giving 20% discount, it is sold. Find the selling price.

Part 2: Successive Percentage Changes and Net Effects

16. A number is first increased by 20% and then decreased by 20%. Find the net percentage change.
17. The price of an article is successively increased by 10% and then by 15%. Find the net percentage increase.
18. A salary is increased by 25% and then decreased by 10%. What is the net percentage change?
19. If a number is increased successively by 8% and 12%, it becomes 1344. Find the original number.
20. Population of a town increases by 5% in first year and 10% in second year. If present population is 41,580, find population two years ago.
21. A car depreciates by 12% every year. If present value is 3,74,220, find its value two years ago.
22. A number is first decreased by 30% and then increased by 40%. What is the net percentage change?
23. If $(1 + 15\%) \times (1 + x\%) = 1.495$, find x (nearest integer).
24. Price of a commodity is increased by 20% and then again by 20%. Find the overall percentage increase.
25. A value is successively decreased by 10% and then by 15%. If final value is 6,120, find original value.
26. Successive discounts of 10% and 15% are given on an article. Find the single equivalent discount.
27. A student's marks are first increased by 25% and then decreased by 20%. If final marks are 360, find original marks.
28. If population grows at 8% per year for two years and becomes 11,664, find population two years

ago.

29. A product price is raised by 12% and then reduced by 12%. Find net percentage change.
30. If two successive increases of 10% and $x\%$ give net 33.1% increase, find x .

Part 3: Reverse Percentages, Depreciation, and Population

31. After 20% increase, a man's salary becomes 48,000. Find original salary.
32. A town's population decreased by 15% and became 25,500. Find original population.
33. After giving 25% discount, an article is sold for 900. Find marked price.
34. A machine depreciates 10% per year. Its value after 2 years is 40,500. Find original cost.
35. After 12% reduction in price, a customer buys 17 kg rice for 714. Find original price per kg.
36. A number becomes 84% of itself after a decrease. Find the percentage decrease.
37. After 40% increase in salary followed by 10% decrease, salary is 39,600. Find original salary.
38. Population of a village decreases by 8% every year. After 2 years it is 8464. Find population two years ago.
39. If a number is increased by 25%, it becomes 15 more than when increased by 20%. Find the number.
40. After 15% hike and then 15% cut, salary becomes 29,580. Find original salary.
41. A car's value after 3 years at 10% annual depreciation is 5,83,200. Find original price.
42. A student scores 20% more than last year and this year's score is 384. Find last year's score.
43. Price of sugar is reduced by 25%. How many percent more kg can be bought with same money?
44. After 30% increase, population becomes 18,200. Find original population.
45. A man's income increases by 18% to 70,800. Find original income.

Part 4: Competitive Exam Scenarios and Mixture Problems

46. In an election, candidate A gets 58% of votes and wins by 360 votes. Find total valid votes.
47. A student needs 40% marks to pass. He gets 225 marks and fails by 35 marks. Find maximum marks.
48. Ashok scores 336 out of 500 and Reena scores 378 out of 600. Who performed better and by how much percent?
49. If price of petrol rises by 25%, a person reduces consumption by 16%. Does expenditure increase or decrease? By how much percent?
50. 35% students passed in a test of 800 students. How many students failed?
51. A number is first increased by 40% and then decreased by 25%. If net increase is 80, find original

number.

52. In a mixture, milk is 75% of 40 litres. How much water should be added to make milk 40%?
53. After successive discounts of 20% and 10%, an article is sold for 810. Find marked price.
54. A population increases by 10% every year. After 3 years it is 66,550. Find population 3 years ago.
55. If 20% of A is equal to 30% of B and $B = 750$, find A.
56. A book's price is increased by 20% and sales decrease by 15%. Find net percent change in revenue.
57. If $f(x) = x$ increased by 12% then decreased by 10%, net % change is:
58. A candidate fails by 45 marks and scores 35%. If pass mark is 40%, find maximum marks.
59. After 15% increase in price and 10% decrease in consumption, expenditure increases by 3.5%. Verify.
60. A number is 25% less than another. If the larger is increased by 20%, find percentage by which smaller must be increased to become equal.

Part 5: Ratios, Comparisons, and Dimensional Changes

61. If A is 25% more than B , then B is what percent less than A ?
62. If x is 20% less than y , then find the value of $\frac{y-x}{y}$.
63. 20% of $A = 30\%$ of $B = 40\%$ of C . Find $A : B : C$.
64. If 10% of x is the same as 20% of y , then $x : y$ is?
65. Income of P is 50% more than Q . Income of Q is 20% less than R . By what % is P 's income more than R ?
66. A 's weight is 20% more than B 's, whose weight is 30% more than C 's. By how much percent is A 's weight more than C 's?
67. If 60% of $(x - y) = 40\%$ of $(x + y)$, then what percent of x is y ?
68. A 's salary is 40% of B 's salary and B 's salary is 25% of C 's salary. What percentage of C 's salary is A 's salary?
69. If the radius of a circle is increased by 10%, find the percentage increase in its area.
70. If the side of a square is increased by 20%, find the percentage increase in its perimeter.
71. The length of a rectangle increases by 20% and breadth decreases by 10%. Find the % change in area.
72. If the radius of a sphere is doubled, what is the percentage increase in its volume?
73. If the height of a triangle is increased by 30% and base is decreased by 20%, find the net change in area.
74. The price of sugar is increased by 25%. If a family wants to keep their expenses same, they must

reduce consumption by?

75. A number is divided into two parts such that 80% of the first part exceeds 60% of the second part by 3. Find the parts if the sum is 100.
76. If $p\%$ of p is 36, find p .
77. $x\%$ of y is $y\%$ of ____?
78. In a library, 20% books are in Hindi, 50% of the remaining are in English. If remaining 9000 are in regional languages, find total books.
79. 40% of a number is equal to $3/5$ th of another number. What is the ratio between them?
80. A's income is 10% more than B's. B's income is 20% less than C's. Find ratio of A:C.
81. If 8% of x is the same as 4% of y , then 20% of x is the same as?
82. If x is 80% of y , what percent of x is y ?
83. 60% of a number is added to 60, the result is the number itself. Find the number.
84. If the numerator of a fraction is increased by 200% and denominator by 350%, the resultant fraction is $5/12$. Find original fraction.
85. Difference between 78% of a number and 59% of the same number is 323. What is 62% of that number?

Part 6: Examination Pass Rates and Voting Analytics

86. In an exam, 35% students failed in Hindi, 45% failed in English and 20% failed in both. Find pass percentage.
87. A student has to secure 40% marks to pass. He gets 178 marks and fails by 22 marks. Find maximum marks.
88. In an election between two candidates, the winner got 64% votes and won by 2240 votes. Find total votes.
89. In a test, A scored 10% more than B and B scored 5% more than C. If C scored 300, find A's marks.
90. 1100 boys and 900 girls appeared in an exam. 50% boys and 40% girls passed. Find the failed percentage.
91. In a school, 70% students are boys and the number of girls is 504. Find number of boys.
92. A candidate who gets 20% marks fails by 30 marks, but another who gets 32% marks gets 42 marks more than pass marks. Find pass %.
93. In an election, 10% voters did not vote. Winner got 54% of casted votes and won by 1620 votes. Find total voters.
94. Out of 2500 people, only 60% have a saving habit. If 30% save with bank and 32% with post office, find number of other savers.

95. If $15\% \text{ of } (A + B) = 25\% \text{ of } (A - B)$, find what % of B is equal to A ?
96. A man spends 75% of his income. His income increases by 20% and expenditure by 10%. Find % increase in savings.
97. If x is 10% more than y , then y is $k\%$ less than x . Find k .
98. In an office, 40% staff is female. 40% of females and 60% of males voted for me. What % of votes did I get?
99. A fruit seller had some apples. He sells 40% and still has 420 apples. How many had he originally?
100. What is 25% of 25%?
101. A student multiplied a number by $3/5$ instead of $5/3$. Find the percentage error.
102. 0.01 is what percent of 0.1?
103. If the price of a book is first decreased by 25% and then increased by 20%, the net change in price is?
104. In an alloy, there is 12% copper. To get 69 kg of copper, how much alloy is required?
105. A number exceeds 20% of itself by 40. The number is?
106. 5% of income of A is equal to 15% of income of B. 10% of income of B is equal to 20% of income of C. If C's income is 2000, find total income.
107. In an exam, 70% candidates passed in English, 80% in Maths and 10% failed in both. If 144 passed in both, find total candidates.
108. The population of a town is 1,76,400. If it increases at 5% per annum, what will be it after 2 years?
109. The value of a machine depreciates 10% annually. If present value is 1,62,000, what was it 2 years ago?
110. A man spends 35% of income on food and 25% on children's education. 80% of remaining is spent on rent. What % is left?
111. A basket contains 300 mangoes. 75 mangoes were distributed. Find the percentage of mangoes left.
112. If 10% of x is same as 20% of y , then $x : y$ is?
113. If the price of coffee increases by 20%, by how much % should a housewife reduce her consumption so as not to increase expenditure?
114. $40\% \text{ of } (A + B) = 60\% \text{ of } (A - B)$. Find $\frac{2A - 3B}{A + B}$.
115. Two numbers are respectively 20% and 50% more than a third number. Find the ratio of the two numbers.

Part 7: Applied Geometry and Business Commissions

116. If side of a cube is increased by 10%, find % increase in surface area.

117. If side of a cube is increased by 10%, find % increase in volume.
118. Radius of a cylinder is increased by 20% and height decreased by 20%. Find % change in volume.
119. If the diagonal of a square is decreased by 15%, find % decrease in area.
120. The tax on a commodity is diminished by 20% and its consumption increases by 15%. Find % change in revenue.
121. A person gives 20% of his income to elder son, 30% of remaining to younger son and 10% of balance to trust. He is left with 10080. Find income.
122. A salesman gets 5% commission on total sales. If he is given 1500 salary plus 2% commission on sales above 10000, find his sales if he earns 3500.
123. Fresh fruit contains 68% water and dry fruit contains 20% water. How much dry fruit can be obtained from 100 kg fresh fruit?
124. Due to a 25% price hike of eggs, 2 eggs less are available for 24. Find the present rate per dozen.
125. The price of an item is reduced by 20%. As a result, customers can buy 2 kg more for 360. Find original price per kg.
126. A's income is 25% more than B's. By how much % is B's income less than A's?
127. If A's height is 10% more than B's, B's height is what % less than A's? (Round to 2 decimal places).
128. In an expression xy^2 , the values of both variables x and y are decreased by 20%. Find % decrease in the value of the expression.
129. A man's wages were decreased by 50%. Again the reduced wages were increased by 50%. Find his loss percent.
130. If the price of tea falls by 10%, a man can buy 5kg more for 270. Find the reduced price.
131. 25% of a number is less than 18% of 650 by 19. Find the number.
132. A clerk's salary was increased by 7% and then decreased by 7%. What is the change in his salary?
133. A number is increased by 20% and then reduced by 20%. Find the net change.
134. If 30% of a number is 12.6, find the number.
135. Which is largest: 16%, $2/15$, or 0.17?
136. What % of 7.2 kg is 18 grams?
137. A team won 40 games and lost 10. What percent of games did it win?
138. A number increased by 37.5% gives 33. Find the number.
139. 0.05 is what percent of 20?
140. If $x\%$ of 500 = $y\%$ of 300 and $x\%$ of $y\%$ of 200 = 60, find x .
141. A's salary is 20% lower than B's. By how much percent is B's salary higher than A's?
142. In a class, 60% passed in English and 70% in Maths. If 20% failed in both, find pass percentage.
143. If the radius of a circle is decreased by 50%, its area is decreased by?

144. The length of a rectangle is increased by 60%. By what % should the width be decreased to maintain same area?
145. An agent gets 5% commission on all sales up to 10000 and 4% on all sales exceeding this. He remits 31100 to company. Find total sales.
146. A number is first increased by 10% and then decreased by 10%. The number so obtained is 10 less than original. Find original number.
147. 8% of the people in a town are above 60 years. If there are 4000 such people, find total population.
148. If 25% of a number is 75, what will be 45% of that number?
149. A man saves 20% of his income. If his income increases by 25% and he saves 25% of his new income, find % increase in savings.
150. 10% of 20% of 30% of 1000 is?

Part 8: Advanced Scenarios and Profit-Loss Integration

151. If 20% of $(x + y) = 50\%$ of $(x - y)$, then find $x : y$.
152. If A is 40% more than B and B is 20% less than C , then $A : C$ is?
153. A number is increased by $x\%$ and then decreased by $x\%$. The final value is 1. Find the original number.
154. The population of a town is 10,000. It increases by 10% in 1st year and decreases by 10% in 2nd year. Population after 2 years?
155. A scored 30% marks and failed by 15 marks. B scored 40% marks and got 35 marks more than pass marks. Find pass marks.
156. In a container, there is 80 liters of milk. 8 liters is replaced by water. This is done two more times. Find final milk quantity.
157. A man spends 40% on food, 20% on rent, 10% on entertainment. If savings are 1500, find total income.
158. What percent of 1 day is 36 minutes?
159. A student has to get 33% to pass. He gets 125 marks and fails by 40 marks. Max marks are?
160. If P is 6 times as large as Q , by how much % is Q less than P ?
161. 12.5% of a number is 80. Find the number.
162. A's salary is 50% more than B's. How much % is B's salary less than A's?
163. Price of an item is increased by 10%, then 20%, then 30%. Find total increase.
164. Radius of a cone is increased by 10% and height decreased by 10%. Find % change in volume.
165. If $x\%$ of y is 100 and $y\%$ of z is 200, find relation between x and z .
166. In a city, 45% of men and 25% of women are married. What % of total population is married? (Assume 1 man marries 1 woman).

167. 20% of a number is added to 20, the result is the number. Find number.
168. Difference between 40% of a number and 30% of the same number is 70. Find the number.
169. A shopkeeper marks his goods 20% above cost and allows 10% discount. Find profit %.
170. Population of a city triples in 10 years. What is the percentage increase?
171. A number is first increased by 10% and then reduced by 10%. Find net change.
172. If the cost of 10 articles equals the selling price of 8 articles, find profit %.
173. If price of sugar increases by 20%, a person buys 2kg less for 120. Find original price.
174. A is 25% older than B . B is what % younger than A ?
175. If side of a cube is doubled, its volume increases by?
176. 0.15% of 33.33% of 10,000 is?
177. x is what percent of y if $y = 5x$?
178. If A 's income is 10% more than B 's, then B 's income is what % of A 's?
179. 40% of A = 50% of B . Then B is what % of A ?
180. If y exceeds x by 20%, then x is less than y by?
181. A number is increased by 20%. To get back to original, it must be reduced by?
182. In a class, 15% students are absent. If 34 students are present, find total strength.
183. If 75% of a number is added to 75, result is the number. Find number.
184. Percentage of 2 hours in a day?
185. If $x\%$ of x is 49, find x .
186. A is 50% of B . B is 50% of C . What % of C is A ?
187. 10% of 10% of 10% is?
188. If 20% of A = B , then $B\%$ of 20 is same as?
189. A man earns 2,000 and spends 1,500. Find his saving %.
190. Find x if 8% of x = 4% of 20.
191. If 60% of students are boys and girls are 120, find total students.
192. A 's income is 25% more than B 's. A 's savings is 10% of income, B 's savings is 15% of income. Find ratio of savings.
193. Ratio 5:4 expressed as percent?
194. If 80% of A = 50% of B and $B = x\%$ of A , find x .
195. If 15% of x = 20% of y , then $x : y$ is?
196. If A 's salary is 30% more than B 's, B 's is what % of A 's?
197. A number is increased by 10% then decreased by 10%. Change is?

198. If p is 50% of q , then q is what % of p ?
199. If side of a square increases by 100%, area increases by?
200. 5% of 5% of 100 is?

Data Interpretation (DI) Section

Focused Percentage-Based Analysis

Set 1: Corporate Sales Performance Analysis (Table)

Year	Co. A	Co. B	Co. C	Co. D	Co. E
2021	120	150	100	80	200
2022	150	135	120	100	180
2023	180	160	150	140	210

- What is the percentage increase in sales of Company A from 2021 to 2022?
- Which company showed the maximum percentage growth in sales from 2022 to 2023?
- Sales of Company C in 2021 is what percent of Company E's sales in 2021?
- Find the average percentage growth of Company D over the two-year period.
- If Company B's sales in 2024 are expected to rise by 20% over 2023, what will be the sales?
- What is the ratio of the percentage increase of Co. A (2021–22) to Co. C (2021–22)?
- Total sales of all companies in 2023 is what percent more than total sales in 2021?
- Which company saw a percentage decrease in sales at any point?
- By what percent are the sales of Co. E in 2023 higher than Co. B in 2022?
- If profit is 10% of sales, find the percentage increase in profit for Co. D from 2021 to 2023.

Set 2: Household Economy and Budget Allocation (Pie Chart)

Note: Total Budget = 50,000

- How much money is spent on Food and Rent combined?
- What is the central angle (in degrees) for the 'Savings' sector?
- If the budget for Education increases by 20%, what will be the new percentage for Education?
- Expenditure on 'Others' is what percent more than expenditure on 'Savings'?
- If the total budget increases to 60,000 but the percentage of 'Rent' remains 20%, find the new Rent amount.
- Ratio of expenditure on Food to Education is?

17. If 50% of Savings are invested in stocks, what percent of the total budget goes to stocks?
18. Difference between Food expenditure and Education expenditure is what % of total budget?
19. If 'Rent' increases by 10% and 'Food' decreases by 10%, find the net change in total amount.
20. What is the percentage ratio of Savings to Others?

Set 3: Global Trade and Category Deficits (Bar Graph)

Category	Electronics	Textiles	Chemicals	Agriculture
Export (\$bn)	45	30	25	50
Import (\$bn)	55	20	35	40

21. For which category is the percentage of Export to Import the highest?
22. Electronics Export is what percent of total Exports?
23. Total Import is what percent more or less than total Export?
24. If Agriculture Export increases by 10%, find the new Export value.
25. Textiles Import is what percent of Textiles Export?
26. What is the percentage of 'Trade Deficit' (Import - Export) in the Chemicals sector?
27. By what percent should Textile Export increase to equal Agriculture Export?
28. Export of Chemicals is what percent of total Electronics trade (Export + Import)?
29. If next year Imports grow by 5%, what will be the total Import value?
30. Which sector has the smallest percentage difference between Export and Import?

Set 4: Urban Expansion and Population Projections (Line Graph)

City	2010	2015	2020	2025 (Proj)
City X (Lakhs)	10.0	12.5	15.0	18.0
City Y (Lakhs)	8.0	10.0	13.0	16.9

31. Find the percentage growth of City X from 2010 to 2015.
32. Which city had a higher growth rate between 2015 and 2020?
33. Population of City Y in 2020 is what percent of City X in 2020?
34. What is the projected percentage increase for City Y from 2020 to 2025?

35. Total population growth (in %) for City X from 2010 to 2020 is?
36. If City X growth rate doubles in 2025–2030, find the 2030 population.
37. Ratio of 2010 population (X+Y) to 2020 population (X+Y) in percentage?
38. In which period did City Y show exactly 25% growth?
39. What percent of City X's 2025 population is City Y's 2010 population?
40. If growth continues at the same rate, which city will reach 20 Lakhs first?

Set 5: Academic Assessment and Student Performance (Matrix)

Student	Maths	Science	English
Rahul	80	70	90
Sneha	95	85	80
Amit	60	75	65
Priya	85	90	95

41. What is the overall percentage of marks obtained by Rahul?
42. Who obtained the highest aggregate percentage?
43. Amit's Maths marks are what percent of Priya's Maths marks?
44. Sneha's marks in Science are what percent more than Rahul's Science marks?
45. If passing marks are 40% in each subject, did anyone fail?
46. What is the average percentage of the class in Maths?
47. Marks of Priya in English are what percent of total marks in English for all 4 students?
48. If Maths marks are given 50% weightage, find Rahul's weighted percentage.
49. By what percent is Sneha's total score more than Amit's total score?
50. If Science marks are increased by 10% for everyone, who gains the most marks?