Fractions in Disguise NCERT Solutions | Mathematics Class 8

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Figure it Out

Q1: Express the following fractions as percentages.

(i) $\frac{3}{5}$

Ans: To convert a fraction to percentage, multiply it by 100.

$\frac{3}{5} = (\frac{3}{5}) \times 100\%$

$= (3 \times 100)/5\ \%$

$= \frac{300}{5}\ \%$

$= 60\%$

Therefore, $\frac{3}{5} = 60\%$.

(ii) $\frac{7}{14}$

Ans: First, let's simplify the fraction:

$\frac{7}{14} = \frac{1}{2}$

Now, converting to percentage:

$\frac{1}{2} = (\frac{1}{2}) \times 100\%$

$= \frac{100}{2}\ \%$

$= 50\%$

Therefore, $\frac{7}{14} = 50\%$.

(iii) $\frac{9}{20}$

Ans: Converting to percentage:

$\frac{9}{20} = (\frac{9}{20}) \times 100\%$

$= (9 \times 100)/20\ \%$

= $\frac{900}{20}$ %

= 45%

Therefore, $\frac{9}{20}$ = 45%.

(iv) $\frac{72}{150}$

Ans: Converting to percentage:

$\frac{72}{150}$ = ($\frac{72}{150}$) × 100%

= $(72 \times 100)/150$ %

= $\frac{7200}{150}$ %

= 48%

Therefore, $\frac{72}{150}$ = 48%.

(v) $\frac{1}{3}$

Ans: Converting to percentage:

$\frac{1}{3}$ = ($\frac{1}{3}$) × 100%

= $\frac{100}{3}$ %

= 33.33% (or 33⅓%)

(vi) $\frac{5}{11}$

Ans: Converting to percentage:

$\frac{5}{11}$ = ($\frac{5}{11}$) × 100%

= $\frac{500}{11}$ %

Q2: Nandini has 25 marbles, of which 15 are white. What percentage of her marbles are white?

(i) 10% (ii) 15% (iii) 25% (iv) 60% (v) 40% (vi) None of these

Ans: Total marbles = 25

White marbles = 15

Fraction of white marbles = $\frac{15}{25}$ = $\frac{3}{5}$

Converting to percentage:

$(\frac{3}{5}) \times 100\% = (3 \times 100)/5\ \% = \frac{300}{5}\ \% = 60\%$

Therefore, the correct answer is **(iv) 60%**.

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Q3: In a school, 15 of the 80 students come to school by walking. What percentage of the students come by walking?

Ans: Total students = 80

Students who walk = 15

Fraction of students who walk = $\frac{15}{80}$

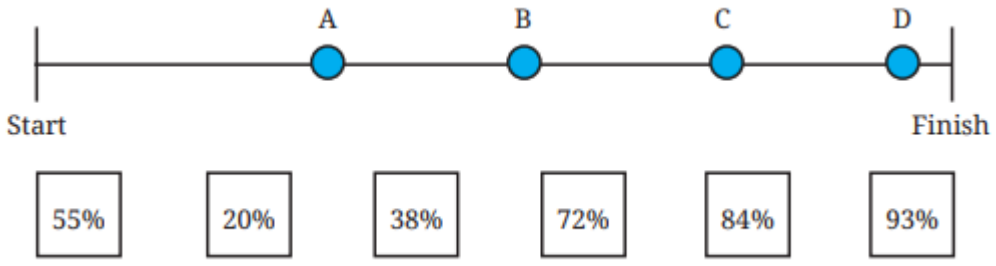
Simplifying: $\frac{15}{80} = \frac{3}{16}$

Converting to percentage:

$(\frac{3}{16}) \times 100\% = (3 \times 100)/16\ \% = \frac{300}{16}\ \% = 18.75\%$

Therefore, 18.75% of students come to school by walking.

Q4: A group of friends is participating in a long-distance run. The positions of each of them after 15 minutes are shown in the following picture. Match (among the given options) what percentage of the race each of them has approximately completed.



Given options: 55%, 20%, 38%, 72%, 84%, 93%

Ans: A = 20%
B = 38%
C = 72%
D = 93%

Q5: Pairs of quantities are shown below. Identify and write appropriate symbols '>', '<', '=' in the blanks. Try to do it without calculations.

(i) 50% ____ 5%

Ans: 50% **>** 5%

(50% means 50 out of 100, while 5% means 5 out of 100. Clearly 50 is greater than 5.)

(ii) $\frac{5}{10}$ **____ 50%**

Ans: $\frac{5}{10}$ **=** 50%

($\frac{5}{10} = \frac{1}{2}$ = 50%)

(iii) $\frac{3}{11}$ **_____ 61%**

Ans: $\frac{3}{11}$ **<** 61%

($\frac{3}{11} \approx 27.27\%$, which is less than 61%)

(iv) 30% ____ $\frac{1}{3}$

Ans: 30% **<** $\frac{1}{3}$

(30% = $\frac{30}{100}$ = 0.3)

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Math Talk

Q: Suppose you have to mentally calculate the following percentages of some value: 75%, 90%, 70%, 55%. How would you do it? Discuss.

Ans: Mental calculation strategies:

- **75%** = 50% + 25% (or $\frac{3}{4}$)
- **90%** = 100% - 10%
- **70%** = 100% - 30% (or 10% × 7)
- **55%** = 50% + 5%

Q: Complete the following table:

Per cent	50%	100%	25%	75%	10%	1%	5%	43%
Fraction	$\frac{50}{100}$							
Decimal	0.5							

Ans: Completed table:

Percent	50%	100%	25%	75%	10%	1%	5%	43%
Fraction	50/100 = 1/2	100/100 = 1	25/100 = 1/4	75/100 = 3/4	10/100 = 1/10	1/100	5/100 = 1/20	43/100
Decimal	0.5	1.0	0.25	0.75	0.1	0.01	0.05	0.43

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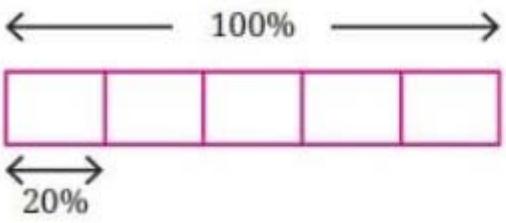
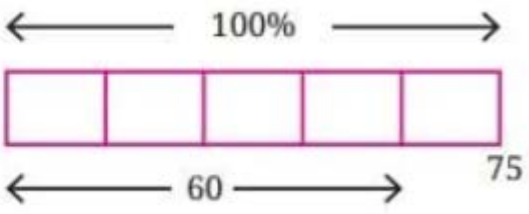
Figure it Out

Q1: Find the missing numbers. The first problem has been worked out.

(i) 20% of some number is 75. Find 100% of that number.





Ans: Given: 20% of a number = 75

Let the number be x.

20% of x = 75

$(\frac{20}{100})$ × x = 75

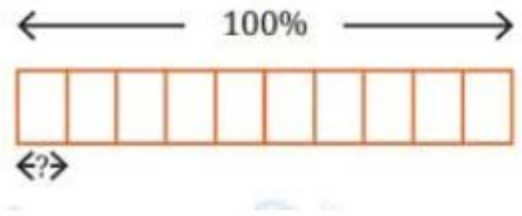
x = 75 × $(\frac{100}{20})$

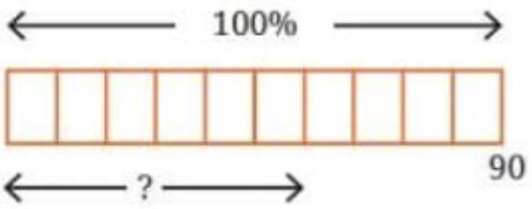
x = 75×5

x = 375

Therefore, 100% of the number = **375**.

(ii) Find the missing values where 60% of some number is 90.





Ans: Given: 60% of a number = 90

Let the number be x.

60% of x = 90

$(\frac{60}{100}) \times x = 90$

$x = 90 \times (\frac{100}{60})$

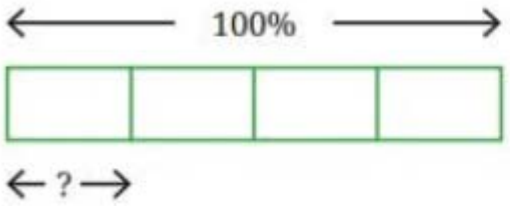
$x = 90 \times (\frac{10}{6})$

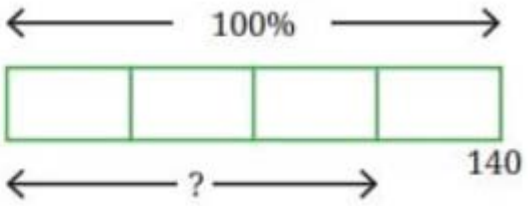
$x = \frac{900}{6}$

x = 150

Therefore, 100% of the number = **150**.

(iii) Find the missing values where some percentage of 140 gives a certain value.





Ans: 25%; 105

Q2: Find the value of the following and also draw their bar models.

(i) 25% of 160

Ans: 25% of 160 = $(\frac{25}{100}) \times 160$

$= (\frac{1}{4}) \times 160$

$= \frac{160}{4}$

= 40

(ii) 16% of 250

Ans: 16% of 250 = $(\frac{16}{100}) \times 250$

= $(16 \times 250)/100$

= $\frac{4000}{100}$

= 40

(iii) 62% of 360

Ans: 62% of 360 = $(\frac{62}{100}) \times 360$

= $(62 \times 360)/100$

= $22\frac{320}{100}$

= 223.2

(iv) 140% of 40

Ans: 140% of 40 = $(\frac{140}{100}) \times 40$

= $(140 \times 40)/100$

= $\frac{5600}{100}$

= 56

(v) 1% of 1 hour

Ans: 1 hour = 60 minutes

1% of 60 minutes = $(\frac{1}{100}) \times 60$

= $\frac{60}{100}$

= 0.6 minutes

= 0.6×60 seconds

= 36 seconds

Therefore, 1% of 1 hour = **0.6 minutes** or **36 seconds**.

(vi) 7% of 10 kg

Ans: 7% of 10 kg = $(\frac{7}{100}) \times 10$

= $\frac{70}{100}$

= 0.7 kg

= 700 grams

Therefore, 7% of 10 kg = **0.7 kg** or **700 grams**.

Q3: Surya made 60 ml of deep orange paint, how much red paint did he use if red paint made up $\frac{3}{4}$ of the deep orange paint?

Ans: Total deep orange paint = 60 ml

Red paint = $\frac{3}{4}$ of total paint

Red paint = $(\frac{3}{4}) \times 60$ ml

= $(3 \times 60)/4$ ml

= $\frac{180}{4}$ ml

= 45 ml

Therefore, Surya used **45 ml** of red paint.

Q4: Pairs of quantities are shown below. Identify and write appropriate symbols '>', '<', '=' in the boxes. Visualising or estimating can help. Compute only if necessary or for verification.

(i) 50% of 510 ☐ 50% of 515

Ans: 50% of 510 = $(\frac{50}{100}) \times 510 = 255$

50% of 515 = $(\frac{50}{100}) \times 515 = 257.5$

255 < 257.5

Therefore, 50% of 510 **<** 50% of 515

(ii) 37% of 148 ☐ 73% of 148

Ans: Since the base value (148) is the same, we can directly compare the percentages.

37% < 73%

Therefore, 37% of 148 **<** 73% of 148

(iii) 29% of 43 ☐ 92% of 110

Ans: 29% of 43 ≈ 0.29×43 ≈ 12.47

92% of 110 = 0.92×110 = 101.2

12.47 < 101.2

Therefore, 29% of 43 **<** 92% of 110

(iv) 30% of 40 ☐ 40% of 50

Ans: 30% of 40 = $(\frac{30}{100})$ × 40 = 12

40% of 50 = $(\frac{40}{100})$ × 50 = 20

12 < 20

Therefore, 30% of 40 **<** 40% of 50

(v) 45% of 200 ☐ 10% of 490

Ans: 45% of 200 = $(\frac{45}{100})$ × 200 = 90

10% of 490 = $(\frac{10}{100})$ × 490 = 49

90 > 49

Therefore, 45% of 200 **>** 10% of 490

(vi) 30% of 80 ☐ 24% of 64

Ans: 30% of 80 = $(\frac{30}{100})$ × 80 = 24

24% of 64 = $(\frac{24}{100})$ × 64 = 15.36

24 > 15.36

Therefore, 30% of 80 **>** 24% of 64

Q5: Fill in the blanks appropriately:

(i) 30% of k is 70, 60% of k is _____, 90% of k is _____, 120% of k is _____.

Ans: Given: 30% of k = 70

First, let's find k:

$(\frac{30}{100})$ × k = 70

k = 70 × $(\frac{100}{30})$

k = $\frac{7000}{30}$

k = $\frac{700}{3}$ = 233.33

Now finding the required values:

60% of k = 60% is double of 30%

So, 60% of k = 2×70 = **140**

90% of k = 90% is three times of 30%

So, 90% of k = 3×70 = **210**

120% of k = 120% is four times of 30%

So, 120% of k = 4×70 = **280**

(ii) 100% of m is 215, 10% of m is _____, 1% of m is _____, 6% of m is _____.

Ans: Given: 100% of m = 215

This means m = 215

10% of m = $(\frac{10}{100}) \times 215 = \frac{215}{10}$ = **21.5**

1% of m = $(\frac{1}{100}) \times 215 = \frac{215}{100}$ = **2.15**

6% of m = 6 × (1% of m) = 6×2.15 = **12.9**

(iii) 90% of n is 270, 9% of n is _____, 18% of n is _____, 100% of n is _____.

Ans: Given: 90% of n = 270

9% of n = 9% is one-tenth of 90%

So, 9% of n = $\frac{270}{10}$ = **30**

18% of n = 18% is double of 9%

So, 18% of n = 2×30 = **60**

100% of n = First find n:

$(\frac{90}{100}) \times n = 270$

$n = 270 \times (\frac{100}{90})$

$n = \frac{27000}{90}$

n = 300

Therefore, 100% of n = **300**

(iv) Make 2 more such questions and challenge your peers.

Question 1: 25% of p is 50, find 50% of p, 75% of p, and 100% of p.

Ans:

- 50% of p = 100
- 75% of p = 150
- 100% of p = 200

Question 2: 20% of q is 40, find 10% of q, 40% of q, and 60% of q.

Ans:

- 10% of q = 20
- 40% of q = 80
- 60% of q = 120

Q6: Fill in the blanks:

(i) 3 is ____ % of 300.

Ans: Let the percentage be x%.

x% of 300 = 3

(x/100) × 300 = 3

3x = 3

x = $\frac{3}{3}$ = 1

Therefore, 3 is **1%** of 300.

(ii) _____ is 40% of 4.

Ans: Let the number be y.

y = 40% of 4

y = ($\frac{40}{100}$) × 4

y = $\frac{160}{100}$

y = 1.6

Therefore, **1.6** is 40% of 4.

(iii) 40 is 80% of _____.

Ans: Let the number be z.

40 = 80% of z

40 = ($\frac{80}{100}$) × z

$40 = (\frac{4}{5}) \times z$

$z = 40 \times (\frac{5}{4})$

$z = \frac{200}{4}$

$z = 50$

Therefore, 40 is 80% of **50**.

Q7: Is 10% of a day longer than 1% of a week? Create such questions and challenge your peers.

Ans: Yes, 10% of a day = $\frac{10}{100} \times 24$ hrs = 2.4 hr

1% of week = $\frac{1}{100} \times (24 \times 7)$ hrs = 1.68 hrs

10% of a day > 1% of a week.

Is 10% of a month (30 days) < 50% of a week?

Is 50% of a dozen (12) > 10% of a score (20)?

Is 80% of a century < 45% of a double century?

Math Talk

Q8: Mariam's farm has a peculiar bull. One day she gave the bull 2 units of fodder and the bull ate 1 unit. The next day, she gave the bull 3 units of fodder and the bull ate 2 units. The day after, she gave the bull 4 units and the bull ate 3 units. This continued, and on the 99th day she gave the bull 100 units and the bull ate 99 units. Represent these quantities as percentages. This task can be distributed among the class. What do you observe?

Ans: Let's calculate the percentage eaten each day:

Day 1: Ate 1 out of 2 = $(\frac{1}{2}) \times 100\% = 50\%$

Day 2: Ate 2 out of 3 = $(\frac{2}{3}) \times 100\% = 66.67\%$

Day 3: Ate 3 out of 4 = $(\frac{3}{4}) \times 100\% = 75\%$

Day 4: Ate 4 out of 5 = $(\frac{4}{5}) \times 100\% = 80\%$

Day 5: Ate 5 out of 6 = $(\frac{5}{6}) \times 100\% = 83.33\%$

...continuing this pattern...

Day 10: Ate 10 out of 11 = $(\frac{10}{11}) \times 100\% = 90.91\%$

Day 20: Ate 20 out of 21 = $(\frac{20}{21}) \times 100\% = 95.24\%$

Day 50: Ate 50 out of 51 = $(\frac{50}{51}) \times 100\% = 98.04\%$

Day 99: Ate 99 out of 100 = $(\frac{99}{100}) \times 100\% = 99\%$

Observation: The percentage of fodder eaten by the bull increases each day and approaches 100% as the days progress. The bull's eating percentage follows the pattern: (n/(n+1)) × 100%, where n is the day number. As n increases, the percentage gets closer and closer to 100%, but never quite reaches it.

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Q9: Workers in a coffee plantation take 18 days to pick coffee berries in 20% of the plantation. How many days will they take to complete the picking work for the entire plantation, assuming the rate of work stays the same? Why is this assumption necessary?

Ans: (20% work in 18 days) × 5 = 100% work in 90 days.
The work will be completed in 90 days.
Necessary Assumptions

- Weather conditions might change.
- Workers might get tired over time. This reduces their efficiency.
- Some workers might take leave or breaks.

Q10: The badminton coach has planned the training sessions such that the ratio of warm up : play : cool down is 10% : 80% : 10%. If he wants to conduct a training of 90 minutes. How long should each activity be done?

Ans: Warm-up time = 10% of 90 min

= $\frac{10}{100} \times 90$

= 9 min

Play time = 80% of 90 min

= $\frac{80}{100} \times 90$

= 72 min

Cool down time = 10% of 90 min = 9 min.

Q11: An estimated 90% of the world's population lives in the Northern Hemisphere. Find the (approximate) number of people living in the Northern Hemisphere based on this year's worldwide population.

Ans: Current world population (2024) ≈ 8 billion (8,000,000,000)

Population in Northern Hemisphere = 90% of world population

= $(\frac{90}{100})$ × 8,000,000,000

= $(\frac{9}{10})$ × 8,000,000,000

= 72,000,000,$\frac{000}{10}$

= 7,200,000,000

= 7.2 billion

Therefore, approximately **7.2 billion people** (or **7,200 million people**) live in the Northern Hemisphere.

Q12: A recipe for the dish, halwa, for 4 people has the following ingredients in the given proportions - Rava: 40%, Sugar: 40%, and Ghee: 20%.

(i) If you want to make halwa for 8 people, what is the proportion of each of the above ingredients?

Ans: The proportions remain the same regardless of the number of people.

When we increase the quantity from 4 people to 8 people, we double the amounts, but the **proportions (percentages) stay constant**.

Therefore:

- Rava: 40%
- Sugar: 40%
- Ghee: 20%

The proportions do not change when scaling the recipe.

(ii) If the total weight of the ingredients is 2 kg, how much rava, sugar and ghee are present?

Ans: Total weight = 2 kg = 2000 grams

Rava:40% of 2000 g = $(\frac{40}{100})$ × 2000 = 800 grams = 0.8 kg

Sugar:40% of 2000 g = $(\frac{40}{100})$ × 2000 = 800 grams = 0.8 kg

Ghee:20% of 2000 g = $(\frac{20}{100})$ × 2000 = 400 grams = 0.4 kg

Verification: 800 + 800 + 400 = 2000 grams

Therefore:

- Rava = 800 grams (0.8 kg)
- Sugar = 800 grams (0.8 kg)
- Ghee = 400 grams (0.4 kg)

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Profit and Loss Examples

Q: Shambhavi owns a stationery shop. She procures 200-page notebooks at ₹36 per book. She sells them with a profit margin of 20%. Find the selling price.

Ans: Given:

- Cost Price (CP) = ₹36 per book
- Profit margin = 20%

Step 1: Calculate the profit amount Profit = 20% of CP Profit = $(\frac{20}{100})$ × 36 Profit = 0.20×36 Profit = ₹7.20

Step 2: Calculate Selling Price Selling Price (SP) = CP + Profit SP = 36 + 7.20 SP = ₹43.20

Therefore, Shambhavi sells each notebook at ₹43.20.

Q: She sells crayon boxes at ₹50 per box with a profit margin of 25%. How much did Shambhavi buy them from the wholesaler?

Ans: Given:

- Selling Price (SP) = ₹50
- Profit margin = 25%

We need to find Cost Price (CP).

Step 1: Understanding the relationship SP = CP + 25% of CP SP = CP × (1 + 0.25) 50 = CP × 1.25

Step 2: Calculate CP CP = 50/1.25 CP = 50 ÷ 1.25 CP = ₹40

Therefore, Shambhavi bought the crayon boxes from the wholesaler at ₹40 per box.

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Figure it Out

Q1: If a shopkeeper buys a geometry box for ₹75 and sells it for ₹110, what is his profit margin with respect to the cost?

Ans: Profit = ₹ 110 - ₹ 75 = ₹ 35

Profit % = $\frac{35}{75} \times 100$

= 0.4667 × 100

= 46.67%

Q2: I am a carpenter and I make chairs. The cost of materials for a chair is ₹475 and I want to have a profit margin of 50%. At what price should I sell a chair?

Ans: Cost of material = ₹ 475

Profit = 50% of 475

= $\frac{50}{100} \times 475$

= ₹ 237.50

Sale price = ₹ 475 + ₹ 237.50 = ₹ 712.50

Q3: The total sales of a company (also called revenue) was ₹2.5 crore last year. They had a healthy profit margin of 25%. What was the total expenditure (costs) of the company last year?

Ans: Let the cost be ₹ x

Then profit = ₹ $\frac{25x}{100}$ or ₹ 0.25x

∴ Revenue = x + 0.25x = 2.5 crores

⇒ 1.25x = 2.5

⇒ x = $\frac{2.5}{1.25} = \frac{250}{125} = 2$

∴ Cost is ₹ 2 crore

Q4: A clothing shop offers a 25% discount on all shirts. If the original price of a shirt is ₹300, how much will Anwar have to pay to buy this shirt?

Ans: Discount Calculation

Marked price = ₹ 300

Discount = ₹ $\frac{25}{100} \times 300$ = ₹ 75

Sale price = ₹ 300 - ₹ 75 = ₹ 225

Q5: The petrol price in 2015 was ₹60 and ₹100 in 2025. What is the percentage increase in the price of petrol?

(i) 50% (ii) 40% (iii) 60% (iv) 66.66% (v) 140% (vi) 160.66%

Ans: Increase Percentage

Increase in price = ₹ 100 - ₹ 60 = ₹ 40

Increase % = $\frac{40}{60} \times 100\%$ = 66 $\frac{2}{3}$ % or 66.66%

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Figure it Out

Q3: Samson bought a car for ₹4,40,000 after getting a 15% discount from the car dealer. What was the original price of the car?

Ans: Let the marked price of the car be ₹ x

Discount = $\frac{15}{100}x = 0.15x$

Sale price = x - 0.15x = 0.85x

Now 0.85x = 4,40,000

x = $\frac{4,40,000}{0.85} = 517647$

Marked price of the car is ₹ 5,17,647.

Q4: 1600 people voted in an election and the winner got 500 votes. What percent of the total votes did the winner get? Can you guess the minimum number of candidates who stood for the election?

Ans: Vote% (winner) = 500/1600 × 100% = 31.25%
and 100 ÷ 31.25 = 3.2
∴ In all, there were at least 4 candidates.
This means at least 3 more candidates.

Q5: The price of 1 kg of rice was ₹38 in 2024. It is ₹42 in 2025. What is the rate of inflation? (Inflation is the percentage increase in prices.)

Ans: Increase in price = ₹ 42 - ₹ 38 = ₹ 4

Rate of inflation = $\frac{4}{38} \times 100\% = 10.52\%$

Q6: A number increased by 20% becomes 90. What is the number?

Ans: 120% of a number is 90

∴ 1% of the number is $\frac{90}{120}$

100% of the number = $\frac{90}{120} \times 100 = 75$

or the number was 75.

Q7: A milkman sold two buffaloes for ₹80,000 each. On one of them, he made a profit of 5% and on the other a loss of 10%. Find his overall profit or loss.

Ans: SP of 1 st buffalo = ₹ 80,000

Profit% = 5%

∴ CP = ₹ $\frac{100}{100+5} \times 80,000$ = ₹ 76,190

SP of 2nd buffalo = ₹ 80,000

Loss % = 10%

∴ CP = ₹ $\frac{100}{100-10} \times 80,000$ = ₹ 88,889

Total CP = ₹ 76,190 + ₹ 88,889 = ₹ 1,65,079

Total SP = ₹ 80,000 + ₹ 80,000 = ₹ 1,60,000

Loss = ₹ 1,65,079 - ₹ 1,60,000 = ₹ 5,079

Loss% = $\frac{5079}{165079} \times 100\% = 3\%$

Q8: The population of elephants in a national park increased by 5% in the last decade. If the population of the elephants last decade is p, the population now is:

(i) p × 0.5 (ii) p × 0.05 (iii) p × 1.5 (iv) p × 1.05 (v) p + 1.50

Ans:(iv) p × 1.05

Population 10 years ago = p

Increase in population = $\frac{5}{100}p = 0.05p$

∴ Current population = p + 0.05p = 1.05p

Q9: Which of the following statement(s) mean the same as - "The demand for cameras has fallen by 85% in the last decade"?

(i) The demand now is 85% of the demand a decade ago.

(ii) The demand a decade ago was 85% of the demand now.

(iii) The demand now is 15% of the demand a decade ago.

(iv) The demand a decade ago was 15% of the demand now.

(v) The demand a decade ago was 185% of the demand now.

(vi) The demand now is 185% of the demand a decade ago.

Ans: Statement: The demand for cameras has fallen by 85% in last decade.
Only (iii) means the same.

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Figure it Out

Q1: Bank of Yahapur offers an interest of 10% p.a. Compare how much one gets if they deposit ₹20,000 for a period of 2 years with compounding and without compounding annually.

Ans: Without compounding

Amount = $P\left(1+\frac{rt}{100}\right)$

= 20,000 × $\left(1+\frac{10\times 2}{100}\right)$

= 20,000(1 + 0.20)

= 20,000 × 1.20

= ₹ 24, 000

With compounding

Amount = $P\left(1+r\right)^{t}$

= 20,000 × $\left(1+\frac{10}{100}\right)^{2}$

= 20,000 × 1.21

= 24,200

Comparison:

Without compounding = ₹ 24,000

With compounding = ₹ 24,200

Difference = ₹ 24,200 - ₹ 24,000 = ₹ 200

Hence, with compounding, one gets ₹ 200 more than without compounding.

Q2: Bank of Wahapur offers an interest of 5% p.a. Compare how much one gets if one deposits ₹20,000 for a period of 4 years with compounding and without compounding annually.

Ans: P = ₹ 20,000; t = 4, r = 5

SI = $\frac{20,000 \times 5 \times 4}{100}$ = ₹ 4,000

A = ₹ 20,000 × $\left(1 + \frac{5}{100}\right)^4$

= ₹ 20,000 × $\left(\frac{21}{20}\right)^4$

= ₹ 20,000 × $\frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$

= ₹ 24310.13

CI = ₹ 24,310.13 - ₹ 20,000 = ₹ 4,310.13

SI (without compounding) < CI (with compounding)

Q3: Do you observe anything interesting in the solutions of the two questions above? Share and discuss.

Ans: If the rate percent and time is same, the interest received with compounding is more than the interest received without compounding.

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Math Talk

Q: Suppose we want to know the expression/formula to find the total interest amount gained at the end of the maturity period. What would be the formula for each of the two options?

Ans: For Simple Interest (Without Compounding):

Total Amount = P(1 + rt)

Therefore, Interest = Total Amount - Principal

Interest = P(1 + rt) - $P_{Interest}$ = P + Prt - $P_{Interest}$ = Prt

where:

- P = Principal
- r = Rate of interest (in decimal form)

- t = Time period

For Compound Interest (With Compounding):

Total Amount = P(1 + r)^t

Therefore, Interest = Total Amount - PrincipalInterest = $P(1 + r)^t$ - PInterest = $P[(1 + r)^t - 1]$

where:

- P = Principal
- r = Rate of interest (in decimal form)
- t = Time period

Summary:

- Simple Interest formula: I = Prt
- Compound Interest formula: I = $P[(1 + r)^t - 1]$

Figure it Out

Q4: Jasmine invests amount 'p' for 4 years at an interest of 6% p.a. Which of the following expression(s) describe the total amount she will get after 4 years when compounding is not done?

(i) p × 6×4

(ii) p × 0.6×4

(iii) p × 0.6/100×4

(iv) p × 0.06/100×4

(v) p × 1.6×4

(vi) p × 1.06×4

(vii) p + (p × 0.06×4**)**

Ans: P = p, R = 6, T = 4

Amount = p + I

= p + $\frac{p \times 6 \times 4}{100}$

= p + p × 0.06 × 4

= p + 0.24p

= 1.24 p

= p × 1.06 × 4

Hence (vi) and (vii) are correct.

Q5: The post office offers an interest of 7% p.a. How much interest would one get if one invests ₹50,000 for 3 years without compounding? How much more would one get if it was compounded?

Ans: Without compounding

P = ₹ 50,000; R = 7% pa; T = 3 years

I = $\frac{50,000 \times 7 \times 3}{100}$ = ₹ 10,500

Amount = ₹ 50,000 + ₹ 10, 500 = ₹ 60,500

With compounding

A = $50,000(1.07)^3$ = 61252.15

Difference = 61252.15 - 50,000 = 11252.15

Extra interest = 11252.15 - 10500 = ₹ 752.15

Q6: Giridhar borrows a loan of ₹12,500 at 12% per annum for 3 years without compounding and Raghava borrows the same amount for the same time period at 10% per annum, compounded annually. Who pays more interest and by how much?

Ans: I (Giridhar) = $\frac{12,500 \times 12 \times 3}{100}$ = ₹ 4,500

For Raghava

A = 12,500 $\left(1 + \frac{10}{100}\right)^3$

= 12,500 × $\frac{1331}{1000}$

= ₹ 16637.5

I (Raghava) = ₹ 16,637.5 - ₹ 12,500 = ₹ 4137.50

₹ 4500 - ₹ 4137.50 = ₹ 362.50

Giridhar pays ₹ 362.5 more than Raghava.

Q7: Consider an amount ₹1000. If this grows at 10% p.a., how long will it take to double when compounding is done vs. when compounding is not done? Is compounding an example of exponential growth and not-compounding an example of linear growth?

Ans: Time for Amount to Double

₹ 1000 becomes ₹ 2,000

Interest = ₹ 1000

Without compounding

$1000 = \frac{1000 \times 10 \times t}{100}$

t = 10 years

With compounding

$1000 \ (1 + \frac{10}{100})^{n} = 2000$

$(1.1)^n = 2$

This can be done by hit and trial

$1.1^2 = 1.21$

$1.1^3 = 1.331$

$1.1^4 = 1.4641$

$1.1^5 = 1.6$

$1.1^6 = 1.77$

$1.1^7 = 1.94$

$1.1^8 = 2.14$

$1.94 < 2 < 2.14$

Time would be between 7 and 8 years (The nearest answer is 7.2 years)

Q8: The population of a city is rising by about 3% every year. If the current population is 1.5 crore, what is the expected population after 3 years?

Ans: Population After 3 Years

Population after 3 years = $1.5 \times (1 + \frac{3}{100})^{3}$ crores

$= 1.5 \times (1.03)^3$ crores

= 1.639 crores

Q9: In a laboratory, the number of bacteria in a certain experiment increases at the rate of 2.5% per hour. Find the number of bacteria at the end of 2 hours if the initial count is 5,06,000.

Ans: No of bacteria after 2 hours = 5,06,000 $\left(1+\frac{2.5}{100}\right)^2$

= 506000 × $(1.025)^2$

= 5,31,616

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Math Talk: Would You Rather?

Q: You have won a contest. The organisers offer you two options to choose from:

Option A: You deposit ₹100 and you get back ₹300.

Option B: You deposit ₹1000 and you get back ₹1500.

What is the percentage gain each option gives? You can choose any option only once. Which option would you choose? Why?

Ans: For Option A:

Amount deposited = ₹100 Amount received = ₹300 Gain = 300 - 100 = ₹200

Percentage gain = (Gain/Amount deposited) × 100% Percentage gain = $(\frac{200}{100})$ × 100%
Percentage gain = 200%

For Option B:

Amount deposited = ₹1,000 Amount received = ₹1,500 Gain = 1,500 - 1,000 = ₹500

Percentage gain = (Gain/Amount deposited) × 100% Percentage gain = $(\frac{500}{1000})$ × 100%
Percentage gain = 50%

Comparison:

- Option A: 200% gain, absolute profit = ₹200
- Option B: 50% gain, absolute profit = ₹500

Which option to choose?

This depends on what matters more to you:

If you care about percentage gain (efficiency): Choose Option A (200% gain)

If you care about absolute profit (total money): Choose Option B (₹500 profit vs ₹200 profit)

My choice: I would choose Option B because:

1. The absolute profit is higher (₹500 vs ₹200)

2. I get ₹300 more in total profit
3. Even though the percentage is lower, the actual money I gain is more substantial

However, if I have limited capital and can't afford ₹1,000, then Option A would be the practical choice.

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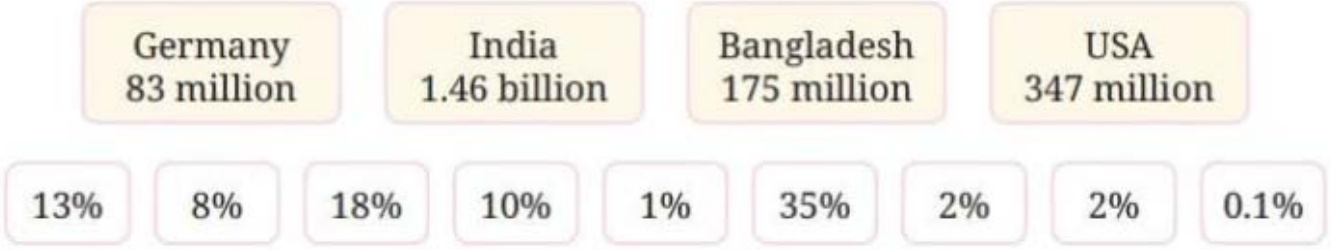
Figure it Out

Q1: The population of Bengaluru in 2025 is about 250% of its population in 2000. If the population in 2000 was 50 lakhs, what is the population in 2025?

Ans: Population in 2000 = 50 Lakhs

Population in 2025 = $\frac{250}{100} \times 50$ L = 125 L or 1 crore 25 L

Q2: The population of the world in 2025 is about 8.2 billion. The populations of some countries in 2025 are given. Match them with their approximate percentage share of the worldwide population. [Hint: *Writing these numbers in the standard form and estimating can help.*]



Ans: World population = 8.2 billion = 8,200 million

For Germany (83 million):Percentage = $(\frac{83}{8200})$ × 100% = $0.0101 \times 100\%$ = 1.01% ≈ 1%

For India (1.46 billion = 1,460 million):Percentage = $(\frac{1460}{8200})$ × 100% = $0.178 \times 100\%$ = 17.8% ≈ 18%

For Bangladesh (175 million):Percentage = $(\frac{175}{8200})$ × 100% = $0.0213 \times 100\%$ = 2.13% ≈ 2%

For USA (347 million):Percentage = $(\frac{347}{8200})$ × 100% = $0.0423 \times 100\%$ = 4.23% ≈ Approximately 4%

Q3: The price of a mobile phone is ₹8,250. A GST of 18% is added to the price. Which of the following gives the final price of the phone including the GST?

(i) 8250 + 18

(ii) 8250 + 1800

(iii) 8250 + $\frac{18}{100}$

(iv) 8250×18

(v) 8250×1**.18**

(vi) 8250 + 8250×0**.18**

(vii) 1.8×8250

Ans: Price of mobile phone = ₹ 8,250

GST @ 18% = $\frac{8250 \times 18}{100}$ = ₹ 8250 × 0.18

Total cost = ₹ (8250 + 8250 × 0.18)

Options (v) and (vi) are correct.

Q4: The monthly percentage change in population (compared to the previous month) of mice in a lab is given: Month 1 change was +5%, Month 2 change was -2%, and Month 3 change was -3%. Which of the following statement(s) are true? The initial population is p.

(i) The population after three months was p × $0.05 \times 0.02 \times 0$**.03.**

(ii) The population after three months was p × $1.05 \times 0.98 \times 0$**.97.**

(iii) The population after three months was p + 0.05 - 0.02 - 0.03.

(iv) The population after three months was p.

(v) The population after three months was more than p.

(vi) The population after three months was less than p.

Ans: Population after 3 months = $p\left(1+\frac{5}{100}\right)\left(1-\frac{2}{100}\right)\left(1-\frac{3}{100}\right)$

= p × 1.05 × 0.98 × 0.97

= 0.99813p

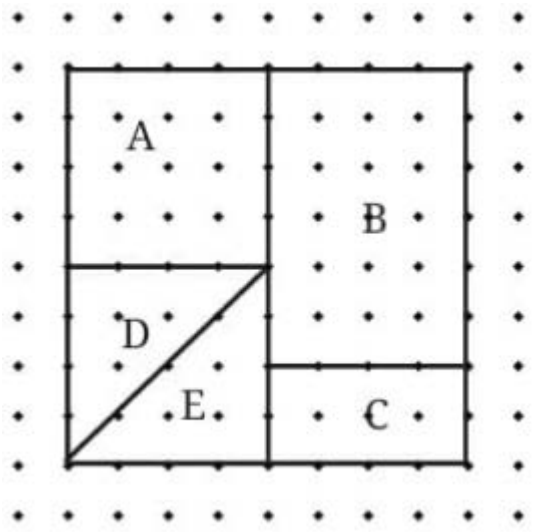
Options (ii) and (vi) are correct.

Q5: A shopkeeper initially set the price of a product with a 35% profit margin. Due to poor sales, he decided to offer a 30% discount on the selling price. Will he make a profit or a loss? Give reasons for your answer.

Ans: Let CP be ₹ 100.
P% = 35%
P = ₹ 35

MP = ₹ 135
Discount = 30% of 135 = ₹ 40.50
New MP = ₹ 135 - ₹ 40.50 = ₹ 94.50
New MP < CP
∴ Loss
Reason: Although he initially added a 35% profit margin, the 30% discount is calculated on the increased selling price (not the cost price), which results in a larger absolute discount amount that exceeds the original profit.

Q6: What percentage of area is occupied by the region marked 'E' in the figure?



Ans: Total area = 8 × 8 = 64 sq. units
And area of E = 8 sq. units
∴ Required % = 8/64 × 100% = 12.5%

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Q7: What is 5% of 40? What is 40% of 5? What is 25% of 12? What is 12% of 25? What is 15% of 60? What is 60% of 15? What do you notice? Can you make a general statement and justify it using algebra, comparing x% of y and y% of x?

Ans: 5% of 40 = $\frac{5}{100} \times 40$ = 2

40% of 5 = $\frac{40}{100} \times 5$ = 2

25% of 12 = $\frac{25}{100} \times 12$ = 3

12% of 25 = $\frac{12}{100} \times 25$ = 3

15% of 60 = $\frac{15}{100} \times 60$ = 9

60% of 15 = $\frac{60}{100} \times 15$ = 9

x% of y = y% of x

Q8: A school is organising an excursion for its students. 40% of them are Grade 8 students and the rest are Grade 9 students. Among these Grade 8 students, 60% are girls. [Hint: *Drawing a rough diagram can help.*]

(i) What percentage of the students going to the excursion are Grade 8 girls?

(ii) If the total number of students going to the excursion is 160, how many of them are Grade 8 girls?

Ans: Let no. of students be 100.

Then, no. of students of grade 8 = $\frac{40}{100} \times 100 = 40$

No. of students of grade 9 = 100 - 40 = 60

(i) No.of grade 8 girls = $\frac{60}{100} \times 40 = 24$

(ii) 100 : 24 :: 160 : x

100x = 24 × 160

⇒ x = 38.4

No. of grade 8 girls is 38.4

Q9: A shopkeeper sells pencils at a price such that the selling price of 3 pencils is equal to the cost of 5 pencils. Does he make a profit or a loss? What is his profit or loss percentage?

Ans: SP of 3 pencils = CP of 5 pencils

Let SP of 3 pencils = CP of 5 pencils

= 3 × 5

= 15

Then SP = ₹ 5; CP = ₹ 3

Profit = ₹ 2

Profit% = $\frac{2}{3} \times 100\%$ = 66 $\frac{2}{3}$ % (~ 67%)

Q10: The bus fares were increased by 3% last year and by 4% this year. What is the overall percentage price increase in the last 2 years?

Ans:

Let the bus fare 2 years ago be ₹ 100

Present bus fare = ₹ 100 × 1.03 × 1.04 = ₹ 107.12

Increase = ₹ 7.12

Increase% = $\frac{7.12}{100} \times 100\%$ **= 7.12%**

Q11: If the length of a rectangle is increased by 10% and the area is unchanged, by what percentage (exactly) does the breadth decrease by?

Ans: Let

- length = l
- breadth = bb

A=l×b

Length increased by **10%**:

$$l + \frac{10}{100}l = 1.1l$$

Breadth decreased by **x%**:

$$b - \frac{x}{100}b = \frac{100 - x}{100}b$$

Area remains the same.

$$(1.1l)\left(\frac{100 - x}{100}b\right) = lb$$

Cancel l and b:

$$1.1 \times \frac{100 - x}{100} = 1$$

On solving,

$$100 - x = \frac{100}{1.1}$$

$$100 - x = \frac{1000}{11}$$

$$x = 100 - \frac{1000}{11}$$

$$x = \frac{1100 - 1000}{11}$$

$$x = \frac{100}{11} = 9\frac{1}{11}$$

Breadth must decrease by

Q12: The percentage of ingredients in a 65 g chips packet is shown in the picture. Find out the weight each ingredient makes up in this packet.

Ans: Potato = $\frac{70}{100} \times 65$ g = 45.5 g

Veg oil = $\frac{24}{100} \times 65$ **g = 15.6 g**

Salt = $\frac{3}{100} \times 65$ **g = 1.95 g**

Spice = $\frac{3}{100} \times 65$ **g = 1.95 g**

Verification: 45.5 + 15.6 + 1.95 + 1.95 = 65g

Q13: Three shops sell the same items at the same price. The shops offer deals as follows:

Shop A: "Buy 1 and get 1 free"Shop B: "Buy 2 and get 1 free"Shop C: "Buy 3 and get 1 free"

(i) If the price of one item is ₹100, what is the effective price per item in each shop? Arrange the shops from cheapest to costliest.
(ii) For each shop, calculate the percentage discount on the items. [Hint: *Compare the free items to the total items you receive.*]
(iii) Suppose you need 4 items. Which shop would you choose? Why?

Ans: (i) Effective price per item at shop A = ₹ $\frac{100}{2}$ = ₹ 50

Effective price per item at shop B = ₹ $\frac{200}{3}$ = ₹ 66 $\frac{2}{3}$

Effective price per item at shop C = ₹ $\frac{300}{4}$ = ₹ 75

Cheapest to costliest: A; B; C.

(ii) Discount at shop A = $\frac{1}{2} \times 100\% = 50\%$

Discount at shop B = $\frac{1}{3} \times 100\% = 66\frac{2}{3}\%$

Discount at shop C = $\frac{1}{4} \times 100\% = 25\%$

(iii) To buy 4 items, we choose shop A. Pay for 2, and the other 2 are free.

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Q14: In a room of 100 people, 99% are left-handed. How many left-handed people have to leave the room to bring that percentage down to 98%?

Ans: Total people = 100
Left-handed people = 99
Right-handed people = 1

Let xx left-handed people leave the room.

Then,
Left-handed remaining = 99-x
Total people remaining = 100-x

We want left-handed people to be 98% of the remaining people:

$$\frac{99-x}{100-x} = \frac{98}{100}$$

$$100(99-x) = 98(100-x)$$

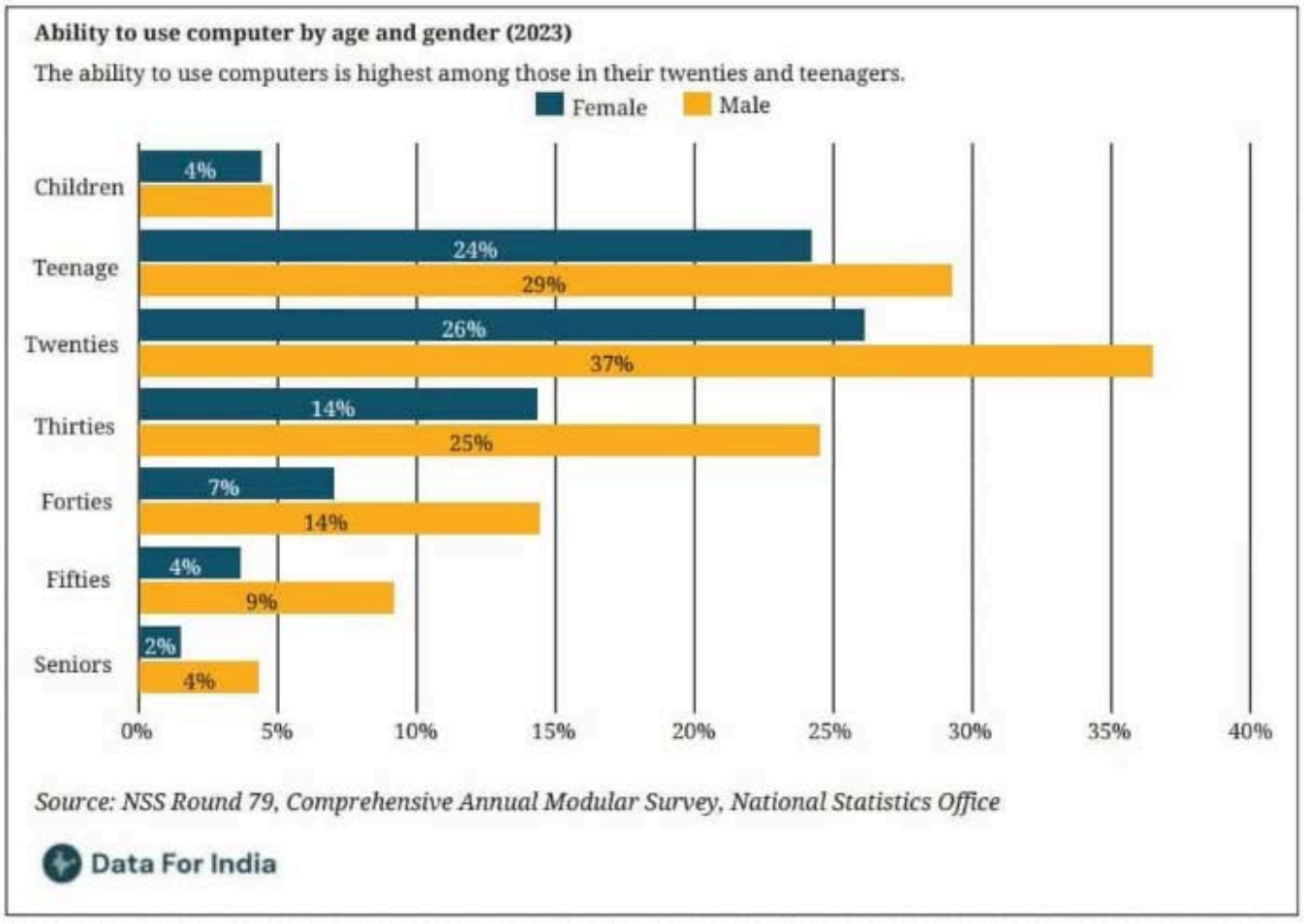
$$9900 - 100x = 9800 - 98x$$

$$100 = 2x$$

$$x = 50$$

Therefore, 50 left-handed people must leave the room.

Q15: Look at the following Graph.



Based on the graph, which of the following statement(s) are valid?

(i) People in their twenties are the most computer-literate among all age groups.
(ii) Women lag behind in the ability to use computers across age groups.
(iii) There are more people in their twenties than teenagers.
(iv) More than a quarter of people in their thirties can use computers.
(v) Less than 1 in 10 aged 60 and above can use computers.
(vi) Half of the people in their twenties can use computers.

Ans:

(i) People in their twenties are the most computer-literate among all age groups.
Teenagers = 24% + 29% = 53%
Twenties = 26% + 37% = 63% (highest)
This statement is true.

(ii) Women lag behind in the ability to use computers across age groups.
In every age group, the percentage for females is lower than that for males.
This statement is true.

(iii) There are more people in their twenties than teenagers.
The graph shows computer usage, not population size.
This statement is false.

(iv) More than a quarter of people in their thirties can use computers.
Thirties = 14% + 25% = 39%, which is more than 25%.
This statement is true.

(v) Less than 1 in 10 aged 60 and above can use computers.
Seniors = 2% + 4% = 6%, which is less than 10%.
This statement is true.

(vi) Half of the people in their twenties can use computers.
Twenties = 63%, not exactly 50%.
This statement is false.