Percentage
Concept and methods
How to solve problems easily

Presented By

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Introduction

Percentage is very basic and important topic. Not only for exams, but it is quite useful in day to day life too.

Imagine the situation that if you know how to calculate percentage in split second, what a nice impact it would be !!!.

Also knowing percentage is quite handy in solving problems for various topics like profit & loss, discount, taxes, Time & work, Data interpretation in fact whole arithmetic.

Also as you will see its quite useful to solve algebraic problems too.

Objective

The objective of this course is to explain :

- Core concepts in simple way
- Easy and fast methods to solve problems in seconds

So that students can :

- ✓ Utilize the concepts and methods to solve problems easily.
- ✓ Solve with super speed.
- ✓ Have an X factor compared to other students.
- ✓ Get successful in exams.

Course Plan

This course is planned as follows :

- Basic understanding of Percentage and its practical usage.
- Core concepts explanation with examples.
- Quick way of conversion from percentage to numbers.
- Quick way of conversion from numbers to percentage.
- Various examples for conversion from integers / fractions / decimals to percentage and vice-versa.

Maths is Easy

Course Plan

This course is planned as follows :

- Solving simple problems of Percentage quickly
- Various scenarios with examples.
- How to solve difficult and complex problems with ease.
- Mental math to find percentage in split second.
- Percentage increase, percentage decrease in seconds.

Maths is Easy

Course Plan

This course is planned as follows :

- Universal method to find percentage change, percentage error, percentage increase, percentage decrease, percentage profit, percentage loss etc..
- Blitz Quiz for practice with speed.
- Commonly asked question types.
- Tips to be successful in exams for Time & work problems.
- Previous years Questions and solutions with easy method.

Maths is Easy

Percentage : Concept

- What is Percentage ? %
- Percentage means :
  - Per – Cent
  - Per 100
  - Out of 100
  - Many hundredths

Percentage : Examples

- **10 %** means ? **10 out of 100**
  or **10 / 100**
- **27.4 %** means ? **27.4 out of 100**
  or **27.4 / 100**
- **13 ½ %** means ? **13 ½ out of 100**
  or **13 ½ / 100**
- **y %** means ? **y out of 100**
  or **y / 100**

Maths is Easy

Percentage : Converting to fraction

- 12 % means = 12 / 100 = 3 / 25
- 27.5 % means = 27.5 / 100 = 275 / 1000
  = 11 / 40
- 7 ½ % means = (15/2) / 100 = 15 / 200
  = 3 / 40
- 2y % means = 2y / 100 = y / 50

Core concept : % means by 100

Maths is Easy

Percentage : Converting to decimals

- 17 % means = 17 / 100 = 0.17
- 23.9 % means = 23.9 / 100 = 0.239
- 5 ½ % means = 5.5 / 100 = .055
- 400 % means = 400 / 100 = 4.00 = 4
- 6y % means = 6y / 100 = 0.06y

Core concept : % means by 100

Maths is Easy

Converting number to Percentage

Convert 3 /10 into percentage

→ (3 / 10) x 100 = 30 %

Convert 35 into percentage

→ 35 x 100 = 3500 %

Convert 4.8 into percentage

→ 4.8 x 100 = 480 %

Convert 2y into percentage

→ 2y x 100 = 200y %

Core concept : Just multiply by 100

Maths is Easy

Percentage Core concept

If any % needs to be converted into a number

Just divide by 100

If any number needs to be converted into a %

Just multiply by 100

Maths is Easy

Key Aspects

- Percentage is a basic topic and useful to solve problems from various topics like profit loss, arithmetic, Algebra, Data interpretation etc.

- Just 2 basic concepts to understand percentage completely.

If any % needs to be converted into a number

Just divide by 100

If any number needs to be converted into a %

Just multiply by 100

Percentage problems example

Q : How much is ¾ in terms of % ?

➔ (3 / 4) x 100 = 75 %

Q : How much is 2.524 in terms of % ?

➔ (2.524) x 100 = 252.4 %

Q : How much is 50000 in terms of % ?

➔ (50000) x 100 = 5000000 %

Core concept : Just multiply 100

Maths is Easy

Percentage problems example

Q : Find 36% of 75 meters + 45% of 20 meters

→ [(36/100) x 75] + [(45/100) x 20]

→ = (36 x 3/ 4) + (45 / 5)

→ = 27 + 9 = 36 meters

Q : Find 13 ½ % of 400 grams + 24.5 % of 200 grams

→ [(13.5/100) x 400] + [(24.5/100) x 200]

→ = (13.5 x 4) + (24.5 x 2)

→ = 54 + 49 grams

→ = 103 grams

Maths is Easy

Percentage problems example

Q : Find 1/3 is what % of 1/2 ?

Method : Convert the problem into mathematical expression.

- Assume its x %, then
- 1/3 = x% of 1/2
- 1/3 = (x/100) * 1/2
- x = (1/3) * 2 * 100
- x = 200 / 3
- x = 66.66 %

Maths is Easy

Tip : Make mathematical expression

Percentage problems example

Q : What % of 6.5 litres is 130 ml?

Method : Convert the problem into mathematical expression.

- Assume its x %, then
- x% of 6.5 = 130 / 1000 [converted ml into litres]
- (x/100) * 6.5 = 13 / 100
- x = 13 / 6.5
- x = 2%

Tip : Unit shall be same

Maths is Easy

Percentage problems example

Q : What % is 1 minute 10 seconds of half an hour?

Method : Convert minute into seconds & hour also into seconds.

- **1 minute 10 seconds = 70 seconds**
- **1/2 hour = 60 * 60 /2 seconds = 1800 seconds**
- Assume its x %, then
- x% of 1800 = 70 { Note the expression}
- (x/100) * 1800 = 70
- x = 70 / 18 = 35/9 = **3.89 %**

Tip : Unit shall be same

Maths is Easy

Percentage problems example

Q : If 50% of (x-y) = 30% (x+y) then what percent of x is y ?

Method : Convert the problem into mathematical expression.

➔ (50/100) * (x-y) = (30/100) * (x+y)

➔ (x-y)/(x+y) = 3/5 { On cross-multiplying and simplifying }

➔ 5(x-y) = 3(x+y) {On cross-multiplying}

➔ 2x = 8y

➔ x/y = 4 ➔ y/x = 1/4

➔ y/x = ¼ * 100 = 25%

Maths is Easy

Concept: To convert into %, multiply by 100

Key Aspects

- Percentage is a basic topic and useful to solve problems from various topics like profit loss, arithmetic, Algebra, Data interpretation etc.

- Just 2 basic concepts to understand percentage completely.

If any % needs to be converted into a number

Just divide by 100

If any number needs to be converted into a %

Just multiply by 100

Percentage by Mental Math

Quick Tip : Any % of 100 is number itself.

- 10 % of 100 = 10 Right ?
- 47.5 % of 100 = 47.5 Right ?
- ¾ % of 100 = ¾ Right ?

Maths is Easy

Then,

- 10 % of 50 = 5 Half
- 47.5 % of 200 = 95 Double
- ¾ % of 400 = 3 4 times

Percentage by Mental Math

Quick Tip : Any % of 100 is number itself.

- 10 % of 100 = 10 Right ?
- 10 % of 500 = 50 5 times of above
- 5 % of 500 = 25 Half of above
- 15 % of 500 = 75 3 times of above
- 300 % of 500 = 1500 20 times of above
- 75 % of 500 = 375 ¼ of above

Maths is Easy

Method : Get the relative multiplication or division factor

Percentage by Mental Math

Any number increased by certain %

Increase by 10 % means ➔ multiply by 1.1

See how : 10% means 10/100 = 0.1

Maths is Easy

- If original quantity is y

  then then new quantity would be y + 0.1y = 1.1y

- Multiplication Factor is 1.1y/ y = 1.1

- **40 increased by 10% ➔ 40 x 1.1 = 40 + 4 = 44**
- **130 increased by 10% ➔ 130 x 1.1 = 130 + 13 = 143**
- **816 increased by 10% ➔ 816 x 1.1 = 816 + 81.6 = 897.6**

Percentage by Mental Math

Any number increased by certain %

Increase by 10 % means → multiply by 1.1

Similarly,

- **Increase by 20 % means → multiply by 1.2**
- **Increase by 35 % means → multiply by 1.35**
- **Increase by 87 % means → multiply by 1.87**

Examples :

- **60 increased by 20% → 60 x 1.2 = 72**
- **180 increased by 25% → 180 x 1.25 = 225**
- **44.4 increased by 50% → 44.4 x 1.5 = 66.6**

Maths is Easy

Percentage by Mental Math

Any number decreased by certain %

Decrease by 10 % means → multiply by 0.9

Similarly,

- **Decrease by 20 % means → multiply by 0.8**
- **Decrease by 35 % means → multiply by 0.65**
- **Decrease by 87 % means → multiply by 0.13**

Maths is Easy

Examples :

- **60 decreased by 20% → 60 x 0.8 = 48**
- **180 decreased by 25% → 180 x 0.75 = 135**
- **44.4 decreased by 50% → 44.4 x 0.5 = 22.2**

Percentage by Mental Math

Any number N increase or decreased by certain %

- **N increased by 20 % means → multiply by 1.2 = 1.2N**
- **N decreased by 20 % means → multiply by 0.8 = 0.8N**
- **N increased by 44 % means → multiply by 1.44 = 1.44N**
- **N decreased by 44 % means → multiply by 0.56 = 0.56N**
- **N increased by 12.5 % means → multiply by 1.125 = 1.125N**
- **N decreased by 12.5 % means → multiply by 0.875 = 0.875N**

Concept :

Increase means that much part above 100 or unit

And decrease means that much part below 100 or unit.

Key Aspects

- Mental Maths is super fast math.
- Can be done intuitively and split second.
- Just need to have things handy like double, triple, half, one-third, one-fourth etc..
- Very key in competitive exams as it can be x factor.
- Just 2 basic concepts to understand percentage completely.

If any % needs to be converted into a number

Just divide by 100

If any number needs to be converted into a %

Just multiply by 100

Percentage problems example

Q : The difference between the value of a number increased by 20% and the value of original number decreased by 30% is 24. What is the original number?

Method : Let original number be x

Number increased by 20% means : 1.2x

Number decreased by 30% means : 0.7x

Now difference is given, so substituting, we get

- **1.2x - 0.7x = 24**
- **0.5x = 24**
- **x = 48** **Original number is 48**

Maths is Easy

Core concept : Find % increase and decrease by direct method as explained earlier.

Percentage problems example

Q : Sixty-five % of a number is 21 less than four-fifths of that number. What is the number ?

Method : Let original number be x

65% of a number : 0.65x

4/5 of a number : (4/5)x ➔ 0.8x

Now difference is given, so on forming equation , we get

➔ **0.65x = 0.8x - 21**

➔ **0.15x = 21**

➔ **x = 21/0.15 = 2100/15 = 140**

So the number is 140.

Maths is Easy

Percentage change concept

What is percentage change ?

Concept: *% change of a new entity over original entity.*

Method : Have a look at Universal formula

$$\% \text{ Change} = \frac{(\text{New value} - \text{Original value}) \times 100}{\text{Original value}}$$

Note :This concept is applicable to % change, % profit, % loss, % error, % increase, % decrease ……..

Percentage change example

Q : A number 425 is wrongly typed as 452. What is percentage error?

Concept: *% change of a new entity over original entity.*

Method : **Original number : 425**

New number : 452

% error = (452 – 425) x 100 / 425

= 27 x 100 / 425

= 6.35 %

Tip : Use Universal formula

Maths is Easy

Percentage change example

Q : A number 7500 was increased from number 6000. What is percentage increase?

Concept: *% change of a new entity over original entity.*

Method : **Original number : 6000**

New number : 7500

% increase = (7500 – 6000) x 100 / 6000

= 1500 x 100 / 6000

= 25 %

Tip : Use Universal formula

Maths is Easy

Percentage change example

Q : A TV was bought at Rs 45000 but it was originally costing Rs 50000. What is percentage gain?

Concept: *% change of a new entity over original entity.*

Method : **Original cost : 50000**

New cost : 45000

% gain = (50000 – 45000) x 100 / 50000

= 5000 x 100 / 50000

= 10 %

Tip : Use Universal formula

Maths is Easy

Key Aspects

- Whenever you need to find percentage change or percentage error, percentage profit, percentage loss, percentage increase or percentage decrease, utilize universal concept and formula :

  % Change = [New value – Original value] * 100 / Base value

- Just 2 basic concepts to understand percentage completely.

  If any % needs to be converted into a number

  Just divide by 100

  If any number needs to be converted into a %

  Just multiply by 100

Percentage problems example

Q : A man's wage was reduced by 50 %. Again the reduced age was increased by 50%. Find his gain or loss in percent.

Method : Let original wage was Rs 100

Wage after first reduction of 50% : 100 - 50 = Rs 50

Wage after 50% increase :

- ➔ **Increase = 50% of Rs 50 = Rs 25**
- ➔ **New wage = 50 + 25 = Rs 75**

Since new wage < original wage. Its LOSS

Loss = 100 – 75 = Rs 25

% Loss = 25 %

Maths is Easy

Tip : Assume entity as 100 for simplicity.

Percentage problems example

Q : How many kg of salt must be added to 30kg of 2% solution of salt and water to increase it to 10% solution.

Method : First find how much salt is there originally

Amount of salt in 2% solution of 30 kg = 2% of 30 kg

= 0.6 kg

Now let y kg of salt is added to make it 10% solution. Then,

New amount of salt / New amount of solution = 10% given.

➔ (0.6 + y) / (30 + y) = 10 /100

Tip : From %, find amount of entity.

Maths is Easy

Percentage problems example

Q : How many kg of salt must be added to 30kg of 2% solution of salt and water to increase it to 10% solution.

➔ (0.6 + y) / (30 + y) = 10 /100 = 1/10

By cross multiplying

➔ 10 (0.6 + y) = 1 (30 + y)

➔ 6 + 10y = 30 + y

➔ 9y = 24

➔ y = 24/9 = 8/3

Means 2 2/3 kg of salt needs to be added.

Maths is Easy

Tip : Assume entity as 100 for simplicity.

Percentage problems example

Q : In an exam, it is required to get 36% of the total marks to pass. A student gets 198 marks and is declared failed by 36 marks. What is the maximum total marks a student can get ?

Method : Let Total marks be Y

Passing marks = 36% of Y = 0.36Y

Student failed by 36 marks, it means if student got 36 more marks student would have been pass !!

So passing marks = 198 + 36 = 234

Now 0.36Y = 234

Y = 234/0.36 = 650

Maximum total marks = 650

Maths is Easy

Percentage problems example

Q : In an office, there were initially n employees. HR manager first hired p % employees then after a month q% employees left the office. Then there were finally n employees remained in office. What will be value of p –q ?

Method :

Initial number of employees = n

Hired p% means = p% of n = pn/100

Total employees now = n + pn/100 = (100n + pn) / 100

q% employees left means q% of Total given above in green.

= (q/100) * (100n + pn) / 100

Employees left = qn (100 + p) / 10000

Percentage problems example

Initial number of employees = n

Employees left = qn (100 + p) / 10000

Final number of employees remaining =

[(100n + pn) / 100] - [qn (100 + p) / 10000]

➔ **[n + pn/100] – [qn/100 + pqn / 10000] = n { Given}**

➔ **pn/100 - qn/100 - pqn/10000 = 0 {On simplifying}**

➔ **n [p/100 – q/100 - pq / 10000] = 0**

➔ **p/100 - q/100 = pq/10000**

➔ **p – q = pq / 100**

Maths is Easy

p – q = pq / 100

Key Aspects

- Universal concept and formula for % change :

  % Change = [New value – Original value] * 100 / Base value

- Just 2 basic concepts to understand percentage completely.

  If any % needs to be converted into a number

  Just divide by 100

  If any number needs to be converted into a %

  Just multiply by 100

High level Percentage problem

Q : After selling an article at a discount percentage of 50%, profit percentage obtained is 20%. What is the markup over cost price.

Method : Let original markup price was Rs 100

Given Discount is 50%. ***Concept :*** **Discount is always on Markup price.**

➔ **Selling price = 50% of Rs 100 = Rs 50**

Maths is Easy

Given profit is 20% Let CP be x then using discount concept,

Concept : **Profit is always on CP.** ➔ **SP = 1.2x = 50**

➔ **x = 50/1.2 = 125/3** ➔ **CP = Rs 125/3**

High level Percentage problem

Q : After selling an article at a discount percentage of 50%, profit percentage obtained is 20%. What is the markup over cost price.

Maths is Easy

➔ **Mark up price = Rs 100 (Assumed initially)**

➔ **Selling price = Rs 50**

➔ **CP = Rs 125/3 = Rs 41.66**

To find Markup over CP, we can use universal method :

Markup over CP = (MP – CP) * 100 / CP

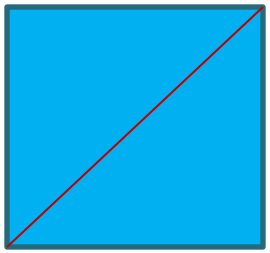
➔ **(100 – 125/3) * 100 = 175 * 100 / 125 = 140 %**

(125/3)

Markup over CP is 140%

Percentage problem in Geometry

Q : If the area of a square is increased by 100% then the percentage increase in the length of diagonal is ?



Case 1 : Let side of original Square is 10 units
Then Area = 100 units
And Diagonal = $\sqrt{(100 + 100)} = \sqrt{200}$ units

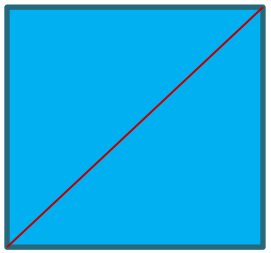
Case 2 : Area is increased by 100%
Then New square Area = 200 units
➔ Side of new square = $\sqrt{200}$ units
➔ Diagonal = $\sqrt{(200 + 200)} = \sqrt{400}$ units

Percentage problem in Geometry

Q : If the area of a square is increased by 100% then the percentage increase in the length of diagonal is ?

Case 1 : Area = 100 units

Diagonal = $\sqrt{200}$ units



Case 2 : New square Area = 200 units

Diagonal = $\sqrt{400}$ units

Concept : Apply % increase universal method

% increase = (New value – Original value) * 100 / Original value

= ($\sqrt{400}$ - $\sqrt{200}$) * 100 / $\sqrt{200}$

= ($\sqrt{2}$ – 1) * 100 = 41.4 %

Percentage increase in the length of diagonal is 41.4%

Mixed Percentage problems

Q : Two vendors sell some goods for Rs 4000 each. A vendor calculates his profit % on his CP and another calculates his profit % wrongly on SP. What is the difference in their actual profit if both claim to have a profit of 20%.

Vendor 1 : SP = 4000, Profit on CP = 20% **(Correct)**

➔ **Using percent method** CP = 4000/1.2 = Rs 3333.33

➔ Profit = SP – CP = 4000 – 3333.33 = Rs 666.66

Maths is Easy

Vendor 2 : SP = 4000, Profit on SP = 20% **(Wrong)**

➔ Since discount calculated was on SP, CP = 80% of 4000 = Rs 3200

➔ Profit = SP – CP = 4000 – 3200 = Rs 800

Difference in profit = 800 – 666.66 = Rs 133.33

Consumption Percentage problem

Q : When the price of rice was increased by 32%, a family reduced its consumption such that the expense on rice was only 10% more than before. If 150 kg were consumed per month before, find the new monthly consumption.

Concept : Expense = Price x Consumption

Maths is Easy

Given that ➔

Price increase is 32%

➔ New price = 132 % of original price.

Expense increase is 10%

➔ New expense = 110 % of original expense.

Original consumption = 150 kg

Let new consumption is Y kg

Consumption Percentage problem

Q : When the price of rice was increased by 32%, a family reduced its consumption such that the expense on rice was only 10% more than before. If 150 kg were consumed per month before, find the new monthly consumption.

Maths is Easy

➔ New price = 132 % of original price.

➔ New expense = 110 % of original expense.

Original consumption = 150 kg **New consumption is Y kg**

New Expense = New Price x New Consumption

➔ $\frac{110}{100} \times 150 = \frac{132}{100} \times Y$ ➔ Y = 110 x 150 / 132

➔ Y = 125

New monthly consumption = 125 kg

Key Aspects

- Universal concept and formula for % change :

  % Change = [New value – Original value] * 100 / Base value

- Just 2 basic concepts to understand percentage completely.

  If any % needs to be converted into a number

  Just divide by 100

  If any number needs to be converted into a %

  Just multiply by 100


THANK
YOU