



A collage of various analytical chemistry and data visualization elements. It includes a lightbulb with a brain-like filament, a 3D pie chart, a flowchart with arrows, laboratory glassware like test tubes and flasks, and a smartphone displaying data. The background features a dark area with floating black circles and diamonds.

# EPEA516 ANALYTICAL SKILLS II

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# Learning Outcomes



After this lecture, you will be able to

- develop understanding about the basic concepts of wages and work,
- solve problems relating to wages and work.

# Basic Concepts & Formulae

- Wage  $\propto$  Work Done
- More/Less Work – More/Less Money
- Wage  $\propto \frac{1}{\text{Time Taken}}$
- Wage  $\propto$  One day Work
- Total Wages  
 $= (\text{Wage of One day}) \times (\text{Total Number of Days})$

# Basic Concepts & Formulae

- If 'A' and 'B' can do a piece of work in 'X' and 'Y' days respectively, then the ratio of their wages will be

$$\frac{1}{X} : \frac{1}{Y}$$


$$Y : X$$

# Basic Concepts & Formulae

- If 'A' and 'B' can do a piece of work in 'X' and 'Y' days respectively. Then the wages earned by 'A' and 'B' will be

- Wage of A =  $\frac{(\text{Total Wages}) \cdot (Y)}{(X + Y)}$

- Wage of B =  $\frac{(\text{Total Wages}) \cdot (X)}{(X + Y)}$

# Example 1

- What will be the daily wage of Kapil if his monthly wage is Rs. 9300 and he worked for 31 days?
- Total Wages = Rs. 9300
- Total Number of Days = 31
- We know that Total Wages  
= (Wage of One day) x (Total Number of Days)

$$\text{Wage of One day} = \frac{\text{Total Wages}}{\text{Total Number of Days}}$$

# Example 1

- Total Wages = Rs. 9300
- Total Number of Days = 31

$$\begin{aligned}\text{Wage of One day} &= \frac{\text{Total Wages}}{\text{Total Number of Days}} \\ &= \frac{300}{\cancel{9300}} \\ &= \frac{\cancel{30}}{\cancel{31}} \\ &= \text{Rs. 300}\end{aligned}$$

## Example 2

- If 'A' and 'B' can do a work in 64 and 48 days, then calculate the ratio of their wages.
- We know that if 'A' and 'B' can do a piece of work in 'X' and 'Y' days respectively, then the ratio of their wages will be

$$\frac{1}{X} : \frac{1}{Y} \quad \text{or} \quad Y : X$$

- Ratio of A and B's wages will be  $\frac{1}{64} : \frac{1}{48}$   
or  $48 : 64$   
or  $3 : 4$

## Example 3

- Two persons A and B contacted to do a work for Rs. 5000.
- Calculate the wages earned by 'A' and 'B', if 'A' and 'B' can do a piece of work in 10 and 15 days respectively.
- Given  $X = 10$ ,  $Y = 15$  and Total Wages = Rs. 5000
- We know that
- Wage of A = 
$$\frac{(\text{Total Wages}) \cdot (Y)}{(X + Y)}$$
- Wage of B = 
$$\frac{(\text{Total Wages}) \cdot (X)}{(X + Y)}$$

## Example 3

- Given  $X = 10$ ,  $Y = 15$  and Total Wages = Rs. 5000
- Wage of A = 
$$\frac{(\text{Total Wages}) \cdot (Y)}{(X + Y)} = \frac{(5000) \cdot (15)}{(10 + 15)}$$
$$= \frac{200}{\cancel{(5000)} \cdot \cancel{(15)}} = \frac{\cancel{(25)}}{\cancel{(25)}} = \text{Rs. 3000}$$
- Wage of B = 
$$\frac{(\text{Total Wages}) \cdot (X)}{(X + Y)} = \frac{(5000) \cdot (10)}{(10 + 15)}$$
$$= \frac{200}{\cancel{(5000)} \cdot \cancel{(10)}} = \frac{\cancel{(25)}}{\cancel{(25)}} = \text{Rs. 2000}$$

## Example 4

- Three Persons A, B, and C contacted do a work for Rs. 7800. A, B, and C can do the work in 10, 15, and 20 days respectively. If they work together to do the work, then what will be the share of A, B, and C.

- Total Work = LCM of 10, 15, and 20 = 60

- A's one day's work =  $\frac{60}{10}^6 = 6$

- B's one day's work =  $\frac{60}{15}^4 = 4$

- C's one day's work =  $\frac{60}{20}^3 = 3$

## Example 4

- A's one day's work = 6
- B's one day's work = 4
- C's one day's work = 3
- Share of A =  $\frac{6}{13} \times 7800$   ~~$\frac{600}{13} \times 7800$~~  = Rs. 3600 (Because  $6 + 4 + 3 = 13$ )
- Share of B =  $\frac{4}{13} \times 7800$   ~~$\frac{600}{13} \times 7800$~~  = Rs. 2400
- Share of C =  $\frac{3}{13} \times 7800$   ~~$\frac{600}{13} \times 7800$~~  = Rs. 1800

## Example 5

- If 'A' alone can complete a piece of work of Rs. 300 in 6 days; but by engaging an assistant 'B', the work is completed in 4 days. Find the share to be received by the assistant 'B'.

- Assistant's/B's 1 day's work  $= \frac{1}{4} - \frac{1}{6}$

$$= \frac{3 - 2}{12}$$

$$= \frac{1}{12}$$

## Example 5

- Assistant's/B's 1 day's work =  $\frac{1}{12}$
- A's share : B's share = Ratio of their 1 day's work
  - $= \frac{1}{6} : \frac{1}{12}$
  - $= 12 : 6$
  - $= 2 : 1$
- Hence, B's share
  - $= \text{Rs. } (300 \times \frac{1}{3})$   
 ~~$= \text{Rs. } (300 \times \frac{100}{3})$~~
  - $= \text{Rs. } 100$

## Example 6

- A and B undertake to do a piece of work for Rs. 600. A alone can do it in 6 days while B alone can do it in 8 days. With the help of C, they finish it in 3 days. Find the share of each.

$$\bullet \text{A's 1 day's work} = \frac{1}{6}$$

$$\bullet \text{B's 1 day's work} = \frac{1}{8}$$

$$\begin{aligned}\bullet \text{C's 1 day's work} &= \frac{1}{3} - \left( \frac{1}{6} + \frac{1}{8} \right) = \frac{1}{3} - \frac{1}{6} - \frac{1}{8} = \frac{8 - 4 - 3}{24} \\ &= \frac{1}{24}\end{aligned}$$

## Example 6

- A's 1 day's work =  $\frac{1}{6}$
- B's 1 day's work =  $\frac{1}{8}$
- C's 1 day's work =  $\frac{1}{24}$
- Therefore A : B : C = Ratio of their 1 day's work

$$\begin{aligned}&= \frac{1}{6} : \frac{1}{8} : \frac{1}{24} \\&= \frac{4}{24} : \frac{3}{24} : \frac{1}{24} \\&= \frac{6}{6} : \frac{8}{8} : \frac{24}{24} \\&= 4 : 3 : 1\end{aligned}$$

## Example 6

- A : B : C = Ratio of their 1 day's work = 4 : 3 : 1

- A's share = Rs.  $\left(\frac{4}{8} \times 600\right)^{75}$

$$= \text{Rs. } 300$$

- B's share = Rs.  $\left(\frac{3}{8} \times 600\right)^{75}$

$$= \text{Rs. } 225$$

- C's share = Rs.  $\{600 - (300 + 225)\}$

$$= \text{Rs. } 75$$

## Example 7

- A and B together earn Rs. 188 per day. B and C together earn Rs. 152 per day. A, B and C when working together earn Rs. 300 per day. How much does A, B, and C earn daily?
- Let A's 1 day's wages = Rs. x
- B's 1 day's wages = Rs. y
- C's 1 day's wages = Rs. Z
- According to Question,  $x + y = 188$        $y + z = 152$   
 $x + y + z = 300$

## Example 7

- $x + y = 188$  ----- (1)
- $y + z = 152$  ----- (2)
- $x + y + z = 300$  ----- (3)
- (1) + (2) - (3), we get
- $\cancel{x + y} + \cancel{(y + z)} - \cancel{(x + y + z)} = 188 + 152 - 300$
- $y = 340 - 300$
- $y = 40$

## Example 7

- Put  $y = 40$  in  $x + y = 188$ , we get
- $x + 40 = 188$
- $x = 188 - 40$
- $x = 148$
- Put  $y = 40$  in  $y + z = 152$ , we get
- $40 + z = 152$
- $z = 152 - 40$
- $z = 112$

A, B, and C earn  
Rs. 148, Rs. 40, and Rs. 112 daily.

## Example 8

- A and B undertake a piece of work for Rs. 300. A can do it in 20 days and B can do it in 60 days. With the help of C, they finish it in 10 days. How much should C be paid for her contribution?
- A alone takes 20 days and B alone takes 60 days to finish the work.
- A, B, and C all together can finish the work in 10 days.
- The total work done is  $\text{LCM}(10, 20, 60) = 60$

## Example 8

- A's efficiency =  $\frac{3}{\frac{60}{20}} = 3$
- B's efficiency =  $\frac{1}{\frac{60}{60}} = 1$
- (A, B, and C)'s Efficiency =  $\frac{6}{\frac{60}{10}} = 6$
- C's efficiency =  $6 - 3 - 1 = 2$
- Efficiency ratio of A, B, and C =  $3 : 1 : 2$
- C's money =  $\frac{2}{6} \times \frac{50}{300}$  (Because  $3 + 1 + 2 = 6$ )  
= Rs. 100

## Example 9

- A sum of money is sufficient to pay A's wages for 21 days and B's wages for 28 days. For how many days the same money is sufficient to pay the wages of both?
- Let total money be Rs. x.
- A's 1 day's wages = Rs.  $\frac{x}{21}$
- B's 1 day's wages = Rs.  $\frac{x}{28}$
- (A + B)'s 1 day's wages = Rs.  $(\frac{x}{21} + \frac{x}{28})$

## Example 9

- (A + B)'s 1 day's wages = Rs.  $\left(\frac{x}{21} + \frac{x}{28}\right)$   
= Rs.  $\left(\frac{4x + 3x}{84}\right)$   
~~= Rs.  $\left(\frac{7x}{84}\right)$~~   
= Rs.  $\frac{x}{12}$

- Money is sufficient to pay the wages of both for 12 days.

## Example 10

- Varun can do a piece of work in 14 days and Karan can do the same work in 16 days. If they work together, in what ratio Varun and Karan will receive their wages?

- Varun's one day's work  $= \frac{1}{14}$

- Karan's one day's work  $= \frac{1}{16}$

- Varun's share : Karan's share  $= \frac{1}{14} : \frac{1}{16}$

$$= \frac{8}{\cancel{16}} : \frac{7}{\cancel{14}} = 8 : 7$$

## Example 11

- A can finish a work in 8 days, B in 16 days and C in 24 days.
- All these three worked together and earned Rs. 3300. Find the share of B.
- Total Work = LCM of 8, 16 and 24 = 48

- Work done in a day by A  $= \frac{6}{\cancel{48}} = 6$

- Work done in a day by B  $= \frac{3}{\cancel{48}} = 3$

- Work done in a day by C  $= \frac{2}{\cancel{48}} = 2$

## Example 11

- Work done in a day by A = 6
  - Work done in a day by B = 3
  - Work done in a day by C = 2
- 
- Share of B  $= \frac{3}{11} \times \frac{300}{3300}$  (Because  $6 + 3 + 2 = 11$ )  
  
 $= 900$

## Example 12

- If A and B undertake to do a piece of work for Rs. 2000. A alone can do it in 8 days, while B can do it in 4 days. With the help of C, they complete it in 2 days. Find the share of C.

- Total Work = LCM of 8, 4 and 2 = 8

- Work done in a day by A

$$= \frac{1}{8} = 1$$

- Work done in a day by B

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

- Work done in a day by  $(A + B + C)$  =  $\frac{4}{2} = 4$

## Example 12

- Work done in a day by A = 1
- Work done in a day by B = 2
- Work done in a day by (A + B + C) = 4
- Work done in a day by C
  - = Work done in a day by  $\{(A + B + C) - A - B\}$
  - =  $4 - 1 - 2$
  - = 1

## Example 12

- Work done in a day by C = 1
- Work done in a day by (A + B + C) = 4

- Share of C  $= \frac{1}{4} \times \cancel{2000}^{500}$

$$= \text{Rs. } 500$$

## Example 13

- If A, B, and C undertake to do a piece of work for Rs. 2000.

A and B together do  $\frac{1}{5}$  of the work and the rest work is done by C alone. What will be the share of C?

- Work done by A and B together =  $\frac{1}{5}$

- Work done by C alone =  $1 - \frac{1}{5}$

$$= \frac{5 - 1}{5} = \frac{4}{5}$$

## Example 13

- Work done by C alone =  $\frac{4}{5}$

- Total Wages = Rs. 2000

- Share of C =  $\frac{4}{5} \times \cancel{2000}^{400}$

$$= \text{Rs. } 1600$$

## Example 14

- A and B together earn Rs. 500 in 5 days. B and C together earn Rs. 800 in 4 days. A, B and C when working together earn Rs. 2000 in 10 days. How much does B earn daily?

- (A and B)'s 1 day's wages = Rs.  $\frac{500}{\cancel{5}} = 100$
- (B and C)'s 1 day's wages = Rs.  $\frac{800}{\cancel{4}} = 200$
- (A, B and C)'s 1 day's wages = Rs.  $\frac{2000}{\cancel{10}} = 200$

## Example 14

- (A and B)'s 1 day's wages = Rs. 100 ----- (1)
- (B and C)'s 1 day's wages = Rs. 200 ----- (2)
- (A, B and C)'s 1 day's wages = Rs. 200 ----- (3)
- (1) + (2), we get
- (A + B) 's 1 day's wages + (B + C)'s 1 day's wages  
= Rs. (100 + 200)
- (A, B and C)'s 1 day's wages + B's 1 day's wages = Rs. 300

## Example 14

- (A, B and C)'s 1 day's wages + B's 1 day's wages = Rs. 300
- But (A, B and C)'s 1 day's wages = Rs. 200
- Rs. 200 + B's 1 day's wages = Rs. 300
- B's 1 day's wages = Rs.  $(300 - 200)$
- B's 1 day's wages = Rs. 100

## Example 15

- A, B, and C can do a piece of work in 20, 24, and 30 days respectively. They under-took to do the piece of work for Rs. 5400. They began the work together but B left 2 days before the completion of work and C left 5 days before the completion of the work. What is the share of A from the assured money?
- Total Work = LCM of 20, 24 and 30 = 120

## Example 15

- Total Work = 120
- A, B, and C can do a piece of work in 20, 24, and 30 days respectively.

- Work done in a day by A

$$= \frac{120}{20} = 6$$

- Work done in a day by B

$$= \frac{120}{24} = 5$$

- Work done in a day by C

$$= \frac{120}{30} = 4$$

## Example 15

- Work done in a day by A = 6, Work done in a day by B = 5, and Work done in a day by C = 4
- Let work will be completed in 'x' days.
- Work done by A =  $6x$ , Work done by B =  $5x$ , and Work done by C =  $4x$ , and Total Work = 120
- B left 2 days before the completion of work and C left 5 days before the completion of the work.
- $6x + 5(x-2) + 4(x-5) = 120$

## Example 15

- $6x + 5(x-2) + 4(x-5) = 120$
- $6x + 5x - 10 + 4x - 20 = 120$
- $15x - 30 = 120$
- $15x = 120 + 30$
- ~~$15x = 150$~~   $\frac{10}{Or\ x = 10}$
- Work done by A =  $6x = 6 \cdot (10) = 60$
- Share of A =  $\frac{60}{120} \times \frac{45}{5400} = 2700$

# Conclusion

- Basic Concepts & Formulae

- Wage  $\propto$  Work Done

- More/Less Work – More/Less Money

- Wage  $\propto \frac{1}{\text{Time Taken}}$

- Wage  $\propto$  One day Work

- Total Wages = (Wage of One day)  $\times$  (Total Number of Days)

- If 'A' and 'B' can do a piece of work in 'X' and 'Y' days respectively, then the ratio of their wages will be Y : X.

# Conclusion

- Basic Concepts & Formulae
  - If 'A' and 'B' can do a piece of work in 'X' and 'Y' days respectively. Then the wages earned by 'A' and 'B' will be
  - Wage of A =  $\frac{(\text{Total Wages}) \cdot (Y)}{(X + Y)}$
  - Wage of B =  $\frac{(\text{Total Wages}) \cdot (X)}{(X + Y)}$

# Summary

- Time & Work
  - Computation of Wages

That's all for now...