



TATA
CONSULTANCY
SERVICES

NUMERICAL ABILITY

COMPLETE
12 HOURS

CONCEPTS

QUESTIONS

TRICKS

NOTES



Watch video of this PDF Notes: <https://www.youtube.com/channel/UC9SNR43c2fcf92A8AApUbVA>



NUMERICAL ABILITY APTITUDE

(KG PLACEMENT PREP BY YASH BHAIYA)

INDEX

Topic Name	Page Number	Topic Name	Page Number
Percentage	4	LCM HCF	329
Elementary Statistics	45	Linear Equation	379
Number System	93	Mixture & Alligation	395
Arithmetic	122	Permutation & Combination	406
Data Interpretation	148	Simple & Compound Interest	426
Geometry & Mensuration	173	Average	460
Profit & Loss	204	Divisibility Rules	473
Ratio & Proportion	237	Partnership	502
Time & Work	271	Probability	536
Simplification	291	Age Problems	551
Speed, Time & Distance	310	Train Problems	569



PERCENTAGE

PERCENTAGE



CONCEPT 1



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

CONVERSION OF PERCENTAGE TO FRACTION

Percentage to Fraction (Divide by 100)

PFJ

Eg: $25\% = \frac{25}{100} = \frac{1}{4}$

$60\% = \frac{60}{100} = \frac{6}{10} = \frac{3}{5}$

$16 + \left(\frac{2}{3}\right)\% = 16 \frac{2}{3} \Rightarrow \frac{50}{3}\% = \frac{\frac{50}{3}}{100} = \frac{50}{300} = \frac{1}{6}$

$83 + \left(\frac{1}{3}\right)\% = 83 \frac{1}{3} \Rightarrow \frac{250}{3}\% = \frac{\frac{250}{3}}{100} = \frac{250}{300} = \frac{5}{6}$

CONVERSION OF FRACTION TO PERCENTAGE

Fraction to Percentage (Multiply by 100)

FPM

$$\frac{3}{4} = \frac{3 \times 100}{4} = \frac{300}{4} = 75\%$$

$$\frac{2}{7} = \frac{2 \times 100}{7} = \frac{200}{7} = 28.57\%$$

$$\frac{2}{7} = 28.57\%$$

$$\frac{1}{7} = 14.28\%$$

$$\begin{array}{r} 28.57 \\ \times 7 \\ \hline 200 \\ -14 \\ \hline 60 \\ -56 \\ \hline 40 \\ -35 \\ \hline 50 \\ -49 \\ \hline 1 \end{array}$$

CONCEPT 2



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

IMPORTANT CONCEPT

1. A number is increased by 20%

Original no = 100

new no = 120

$$\frac{20}{100} = \frac{1}{5}$$

Original no = 5

new no = $5 + 1 = 6$

IMPORTANT CONCEPT

2. A number is decreased by 25%

$$\text{Orig} = 100$$

$$\text{new} = 75$$

$$\frac{25}{100} = \frac{1}{4}$$

$$\text{Orig} = 4$$

$$\text{new} = 4 - 1 = 3$$

Q. A number is increased by 25%, then it becomes 600. The original number is __



Q. A number is increased by 25%, then it becomes 600. The original number is __

$$\text{Original no} = y$$

$$\frac{5y}{4} = 600$$
$$y = \frac{120 \times 4}{5}$$

$$y = 480$$

$$y + 25\% \text{ of } y = 600$$

$$y + \frac{25}{100} \times y = 600$$

$$y + \frac{y}{4} = 600$$

4147 की परी ट्रिक

Original no = 100

New no = 125 \rightarrow 600

$$1 \rightarrow \frac{600}{125}$$

$$100 \rightarrow \frac{600}{125} \times 100^4$$
$$\Rightarrow 480$$

$$25\% = \frac{1}{4}$$

$$\text{Original} = 4$$

$$\text{new no} = 5 \rightarrow 600$$

$$\Rightarrow 1 \rightarrow \frac{600}{5}$$

$$\Rightarrow 4 \rightarrow \frac{600}{5} \times 4$$

$$\Rightarrow 480$$

Q. A number is decreased by 20%, then it becomes 120. The original number is __



Q. A number is decreased by 20%, then it becomes 120. The original number is __

$$20\% = \frac{20}{100} = \frac{1}{5}$$
$$5 \rightarrow 30 \times 5$$
$$= 150 \swarrow$$

$$\text{orig} = 5$$

$$\text{new} = 4 \rightarrow 120$$
$$= 1 \rightarrow 120/4 = 30$$

Q. A number is decreased by $33 + \frac{1}{3}\%$, then it becomes 180. The original number is __



Q. A number is decreased by $33 + \frac{1}{3}\%$, then it becomes 180. The original number is __

270

$$33\frac{1}{3} = \frac{100}{3}\% = \frac{100}{3} \xrightarrow{100} \frac{100}{300} = \frac{1}{3}$$

$$\begin{aligned} \text{orig} &= 3 & \xleftarrow{3 \rightarrow 270} \\ \text{new} &= 2 \rightarrow 180 \\ 1 &\rightarrow 90 \end{aligned}$$

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

- A. Rs. 96
- B. Rs. 100
- C. Rs. 104
- D. Rs. 108



**WHENEVER YOU ASK MONEY
FROM YOUR DAD**



Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

(M)

let $2017 \rightarrow y$

A. Rs. 96

B. Rs. 100

C. Rs. 104

D. Rs. 108

$$2018 \rightarrow y + 20\% \text{ of } y$$

$$= y + \frac{20}{100} \times y$$

$$= y + 0.2y$$

$$= 1.2y$$

$$2019 \rightarrow 1.2y + 20\% \text{ of } 1.2y$$

$$= 1.2y + \frac{20}{100} \times 1.2y$$

$$= 1.2y + 0.2 \times 1.2y$$

$$= 1.2y + 0.24y$$

$$= 1.44y$$

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

A. Rs. 96

B. Rs. 100

C. Rs. 104

D. Rs. 108

$$\begin{array}{l} 2017 \rightarrow y \\ 2018 \rightarrow 1.2y \\ 2019 \rightarrow 1.44y \end{array} \quad \left. \begin{array}{l} \Rightarrow y + 1.2y + 1.44y = 364 \\ 3.64y = 364 \\ y = \frac{364}{3.64} = 100 \end{array} \right\}$$

\therefore Income in 2017 = $y = \text{Rs. } 100$

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

A. Rs. 96

B. Rs. 100

C. Rs. 104

D. Rs. 108

m2

let

2017 → Rs. 100

2018 → $100 + 20\% \text{ of } 100$
→ Rs. 120

2019 → $120 + 20\% \text{ of } 120$
→ $120 + 24$
→ Rs. 144

$$\begin{aligned} & 100 + 120 + 144 \\ & = \text{Rs. } 364 \end{aligned}$$

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

A. Rs. 96

B. Rs. 100

C. Rs. 104

D. Rs. 108

m2

let

2017 \rightarrow Rs. ~~100~~ 200

2018 \rightarrow $100 + 20\% \text{ of } 100$
 \rightarrow Rs. ~~120~~ 240

2019 \rightarrow $120 + 20\% \text{ of } 120$

\rightarrow $120 + 24$

\rightarrow Rs. ~~144~~ 288

~~200 240 288~~
 ~~$100 + 120 + 144$~~
 $=$ Rs. ~~364~~ 728

\Rightarrow $728 \div 2 \rightarrow 364$
 $200 \div 2 \rightarrow 100 \checkmark$

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

M3

let 2017 → Rs. 1

A. Rs. 96

2018 → $1 + 20\% \text{ of } 1$

$$\Rightarrow 1 + \frac{20}{100} \times 1$$

$$\Rightarrow 1 + \frac{1}{5} = \frac{6}{5}$$

B. Rs. 100

2019 → $\frac{6}{5} + 20\% \text{ of } \frac{6}{5}$

$$\Rightarrow \frac{6}{5} + \frac{20}{100} \times \frac{6}{5}$$

C. Rs. 104

$$\frac{6}{5} + \frac{1}{5} \times \frac{6}{5}$$

$$\frac{6}{5} + \frac{6}{25} \Rightarrow \frac{6}{5} + \frac{6}{25}$$

$$\Rightarrow \frac{30}{25} + \frac{6}{25}$$

$$\Rightarrow \frac{36}{25}$$

D. Rs. 108

Q. The total income Yash Sir of 2017, 2018, 2019 is Rs. 364. Every year the salary increases by 20%. What is the income in 2017?

A. Rs. 96

B. Rs. 100

C. Rs. 104

D. Rs. 108

$$\begin{aligned} & \text{2017} \rightarrow 1 \\ & \text{2018} \rightarrow \frac{6}{5} \\ & \text{2019} \rightarrow \frac{36}{25} \end{aligned}$$

$1 + \frac{6}{5} + \frac{36}{25} \Rightarrow \frac{1 \times 25}{1 \times 25} + \frac{6}{5} + \frac{36}{25}$

$\Rightarrow \frac{25}{25} + \frac{30}{25} + \frac{36}{25} \Rightarrow \frac{91}{25}$

$\frac{91}{25} \rightarrow 364$

$1 \rightarrow 364 \times \frac{25}{91} \Rightarrow 4 \times 25 = 100$

Correct Answer: Option B (Rs.100)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q(VK). The total income of Eesha in the years 2003, 2004, 2005 was \$36,400. Her income increased by 20% each year. What was her income in 2005?



A. 14400

B. 4599

C. 59998

D. 23488

Correct Answer: Option A (14400)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

CONCEPT 3



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



Q. The price of petrol is increased by 10%, in order to keep the expenditure as constant, by what % usage must be reduced?



$x y = \text{constant}$

$\uparrow \text{Price} \times \text{consumption} \downarrow = \text{expenditure}(\text{const})$

$\uparrow \text{Speed} \times \text{time} \downarrow = \text{distance}(\text{const})$

$\uparrow \text{Price} \times \text{Sales} \downarrow = \text{revenue}(\text{const})$

$$\frac{\gamma}{100 + \gamma} \times 100$$

Q. The price of petrol is increased by 10%, in order to keep the expenditure as constant, by what % consumption must be reduced?

$$\frac{x}{100 \pm x} \times 100 \Rightarrow \frac{x}{100+x} \times 100$$

$$\Rightarrow \frac{10}{100+10} \times 100$$

$$\Rightarrow \frac{10}{110} \times 100 = \frac{100}{11} = 9.09\%$$

Q. The price of onion decreased by 25%, in order to keep the expenditure as constant, by what % consumption must be increased?

When you ask piyaaj for salad.

Your mom: #OnionPrice



Q. The price of onion decreased by 25%, in order to keep the expenditure as constant, by what % consumption must be increased?

$$\frac{\gamma}{100 \pm \gamma} \times 100$$

$$\frac{25}{100 - 25} \times 100$$

$$\frac{25}{75} \times 100 = \frac{100}{3} = 33.33\%$$

Q. A is 25% less than B. By what % is B more than A?



- a) 25 %
- b) 20 %
- c) 33.33 %
- d) 50 %



Q. A is 25% less than B. By what % is B more than A?



a) 25 %

$$\frac{\gamma}{100 + \gamma} \times 100$$

b) 20 %

$$\frac{25}{100 - 25} \times 100$$

c) 33.33 % ✓

$$\frac{25}{75} \times 100 = \frac{100}{3} = \underline{\underline{33.33\%}}$$

d) 50 %

Q. A is 25% more than B. By what % is B less than A?

a) 25 %

b) 20 %

c) 33.33 %

d) 50 %



Q. A is 25% more than B. By what % is B less than A?

a) 25 %

$$\frac{\gamma}{100 \pm \gamma} \times 100 \quad \gamma = 25$$

b) 20 % ✓

$$\frac{25}{100 + 25} \times 100$$

c) 33.33 %

$$\frac{25}{125} \times 100 = \frac{100}{5} = 20\%$$

d) 50 %

Q. Indian Film Industry is 2/7 more rich than Indian TV Industry. By what % is Indian TV Industry less rich than Indian Film Industry?

- A) 28.57%
- B) 14.28%
- C) 22.22%
- D) 33.33 %



What On Indian TV serials

1. 5% Story

2. 20% Ads

3. 25% Crying

4. 50% –

**Dhootana..Dhootana.
.dhomm Tere Na Tere
Na**



Q. Indian Film Industry is $\frac{2}{7}$ more rich than Indian TV Industry. By what % is Indian TV Industry less rich than Indian Film Industry?

$$\frac{\gamma}{100 \pm \gamma} \times 100$$

Input \rightarrow Output

Percentage : 100

Fraction : 1

$$\frac{\gamma}{1 \pm \gamma} \times 100$$

$$\frac{\frac{2}{7}}{1 + \frac{2}{7}} \times 100$$

$$\frac{\frac{2}{7}}{\frac{9}{7}} \times 100 \Rightarrow \frac{2}{9} \times 100 \Rightarrow \frac{200}{9} \Rightarrow 22.22\%$$

CONCEPT 4



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q. You and your crush wrote the TCS NQT test. While you scored 45% and got 4 marks below the cut-off. Your crush scored 60% and got 8 marks above cut-off and got selected for the interview. What was the maximum marks in the test?

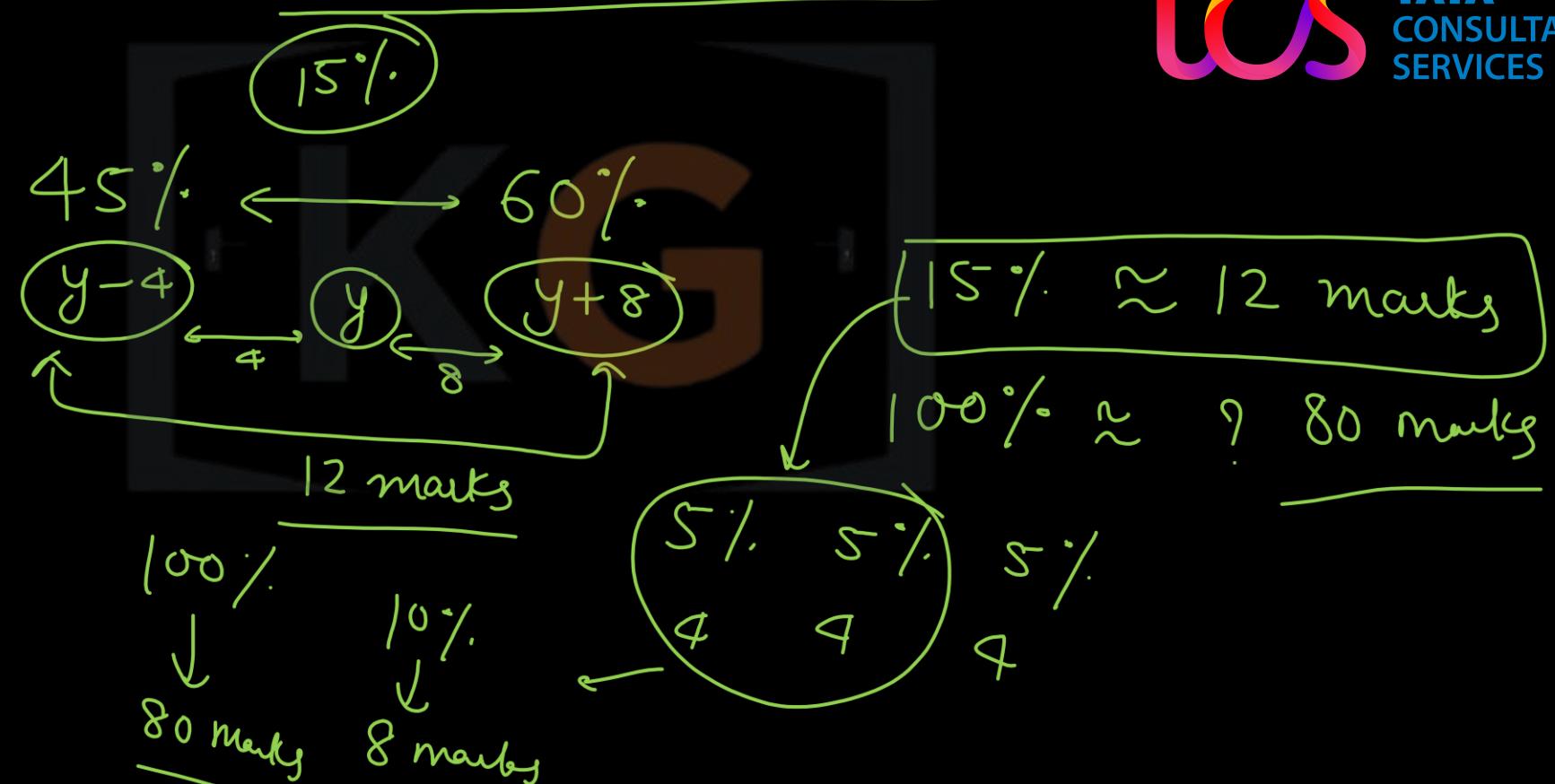


- A. 99
- B. 80
- C. 70
- D. 65

Q. You and your crush wrote the TCS NQT test. While you scored 45% and got 4 marks below the cut-off. Your crush scored 60% and got 8 marks above cut-off and got selected for the interview. What was the maximum marks in the test?



- A. 99
- B. 80 ✓
- C. 70
- D. 65



Correct Answer : Option B

Explanation : Let the maximum marks be =100

You scored 45% = 45 out of 100

Your crush scored 60% = 60 out of 100

Let say cut off mark be = x

Then 45 marks = x - 4

and, 60 marks = x + 8

On solving the two equations

5 marks = 4

100 marks = 80



ELEMENTARY STATISTICS

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Mean Mode & Median

Given data : 5 5 7 6 5

$$\text{Mean/Average} \mid \begin{array}{l} \text{Arithmetic} \\ \text{Mean} \end{array} = \frac{\text{Sum of all observations}}{\text{no. of observations}}$$
$$= \frac{5+5+7+6+5}{5} = \underline{5.6}$$

min max
5 - 7

Mean Mode & Median

Given data : 5 5 7 6 5

Median = central term [Median = 7 ×]

asc | desc ⇒ 5 5 5 6 7
median

Data : 5 5 7 6 6 5

asc ⇒ 5 5 5 6 6 7
median = mid point / average

$$\frac{5+6}{2} = \frac{11}{2} = 5.5$$

Mean Mode & Median

Given data : 5 5 7 6 5

For 'n' terms arranged in ascending / descending order

(i) $n \rightarrow \text{odd}$

$$\text{median} = \left(\frac{n+1}{2} \right)^{\text{th}} \text{ term}$$

(ii) $n \rightarrow \text{even}$

$$\text{median} = \frac{\frac{n}{2}^{\text{th}} + \left(\frac{n}{2} + 1 \right)^{\text{th}} \text{ term}}{2}$$

Data: 5 5 5 6 7

$n=5$ (odd)

$$\text{median} = \frac{5+1}{2} = 3^{\text{rd}} \text{ term}$$

Data: 5 5 5 6 6 7

$n=6$ (even)

$$\text{median} = \frac{\frac{6}{2}^{\text{th}} + \left(\frac{6}{2} + 1 \right)^{\text{th}} \text{ term}}{2}$$

$$= \frac{3^{\text{rd}} + 4^{\text{th}} \text{ term}}{2} = \frac{5+6}{2} = 5.5$$

Mean Mode & Median

Given data : 5 5 7 6 5

Mode \Rightarrow term with most occurrences
or
term having highest frequency

$$\boxed{\text{mode} = 5}$$

Q1: THE HEIGHTS (IN CM) OF 9 STUDENTS OF A CLASS ARE AS FOLLOWS:

155 160 149 150 147 152 144 148 145

FIND THE MEDIAN OF THIS DATA



Q1: THE HEIGHTS (IN CM) OF 9 STUDENTS OF A CLASS ARE AS FOLLOWS:

155 160 149 150 147 152 144 148 145

FIND THE MEDIAN OF THIS DATA

144 145 147 148 149 150 152 155 160
144 145 147 148 149 150 152 155 160

Q2: JIMMY'S DOG HAS 6 PUPPIES. HE WEIGHTED THE PUPPIES RIGHT AFTER THEY WERE BORN. THEIR WEIGHTS WERE 657 GRAMS, 789 GRAMS, 456 GRAMS, 554 GRAMS, 635 GRAMS AND 446 GRAMS, WHAT WAS THE MEAN WEIGHT OF THE PUPPIES?

- a) 589.5
- b) 707.4
- c) 353.5
- d) 632.9



Q2: JIMMY'S DOG HAS 6 PUPPIES. HE WEIGHTED THE PUPPIES RIGHT AFTER THEY WERE BORN. THEIR WEIGHTS WERE 657 GRAMS, 789 GRAMS, 456 GRAMS, 554 GRAMS, 635 GRAMS AND 446 GRAMS, WHAT WAS THE MEAN WEIGHT OF THE PUPPIES?

- a) 589.5
- b) 707.4
- c) 353.5
- d) 632.9

M1

$$\begin{array}{r} 657 + 789 + 456 + 554 + 635 + 446 \\ \hline 6 \\ = 589.5 \end{array}$$

Q2: JIMMY'S DOG HAS 6 PUPPIES. HE WEIGHTED THE PUPPIES RIGHT AFTER THEY WERE BORN. THEIR WEIGHTS WERE 657 GRAMS, 789 GRAMS, 456 GRAMS, 554 GRAMS, 635 GRAMS AND 446 GRAMS, WHAT WAS THE MEAN WEIGHT OF THE PUPPIES?

- a) 589.5 ✓ b) 707.4 c) 353.5 ✗ d) 632.9

M2

$$\min = 446$$

$$\max = 789$$

$$\text{mean} = [446, 789]$$

option 'c' eliminated

$$\text{mean} = \frac{\text{sum}}{n}$$

$$\Rightarrow \text{mean} = \frac{\text{INTEGER}}{n}$$

$$\Rightarrow \text{mean} \times n = \text{INTEGER}$$

$$\Rightarrow \text{mean} \times 6 = \text{INTEGER} \Rightarrow \text{option A}$$

Q3: FIND THE MODE OF THE FOLLOWING SET OF NUMBERS

25 27 36 32 41 22 28 33 44 51 37 32

- A) 36 B) 32 C) 28 D) 22



Q3: FIND THE MODE OF THE FOLLOWING SET OF NUMBERS

25 27 36 32 41 22 28 33 44 51 37 32

- A) 36 B) 32 C) 28 D) 22

↓ ↓ ↓ ↓
1 2 1 1



Q4. In 50 numbers 10 are threes, 15 are fours, 18 are fives and remaining are sixes. If a, b and c respectively represent the mean, mode and median of data, what is the value of $a+2b-c$?

- A. 10
- B. 12.65
- C. 9.94
- D. 8.34



Q4. In 50 numbers 10 are threes, 15 are fours, 18 are fives and remaining are sixes. If a, b and c respectively represent the mean, mode and median of data, what is the value of $a+2b-c$?



A. 10



B. 12.65

1

$$a = \frac{(3 \times 10) + (4 \times 15) + (5 \times 18) + (6 \times 7)}{50}$$

C. 9.94

$$= \frac{30 + 60 + 90 + 42}{50} = \frac{222}{50} = \frac{444}{100} = 4.44$$

Q4. In 50 numbers 10 are threes, 15 are fours, 18 are fives and remaining are sixes. If a, b and c respectively represent the mean, mode and median of data, what is the value of $a+2b-c$?

- A. 10
- B. 12.65
- C. 9.94 ✓
- D. 8.34

$$a \rightarrow \text{mean} \rightarrow 4.44$$

$$b \rightarrow \text{mode} \rightarrow 5$$

$$c \rightarrow \text{median} \rightarrow \frac{4+5}{2} = \frac{9}{2} = 4.5$$



$$a + 2b - c$$

$$4.44 + 2(5) - 4.5$$

$$= 9.94$$

Correct Answer : Option C

Explanation :

Solution:

Total of 50 numbers 10 are threes, 15 are fours, 18 are fives and 7 are sixes.

$$\text{Mean} = \frac{10 \times 3 + 15 \times 4 + 18 \times 5 + 7 \times 6}{50}$$

$$\text{Mean} = 4.4 = a$$

Mode = 5 = b (value of most repeated frequency)

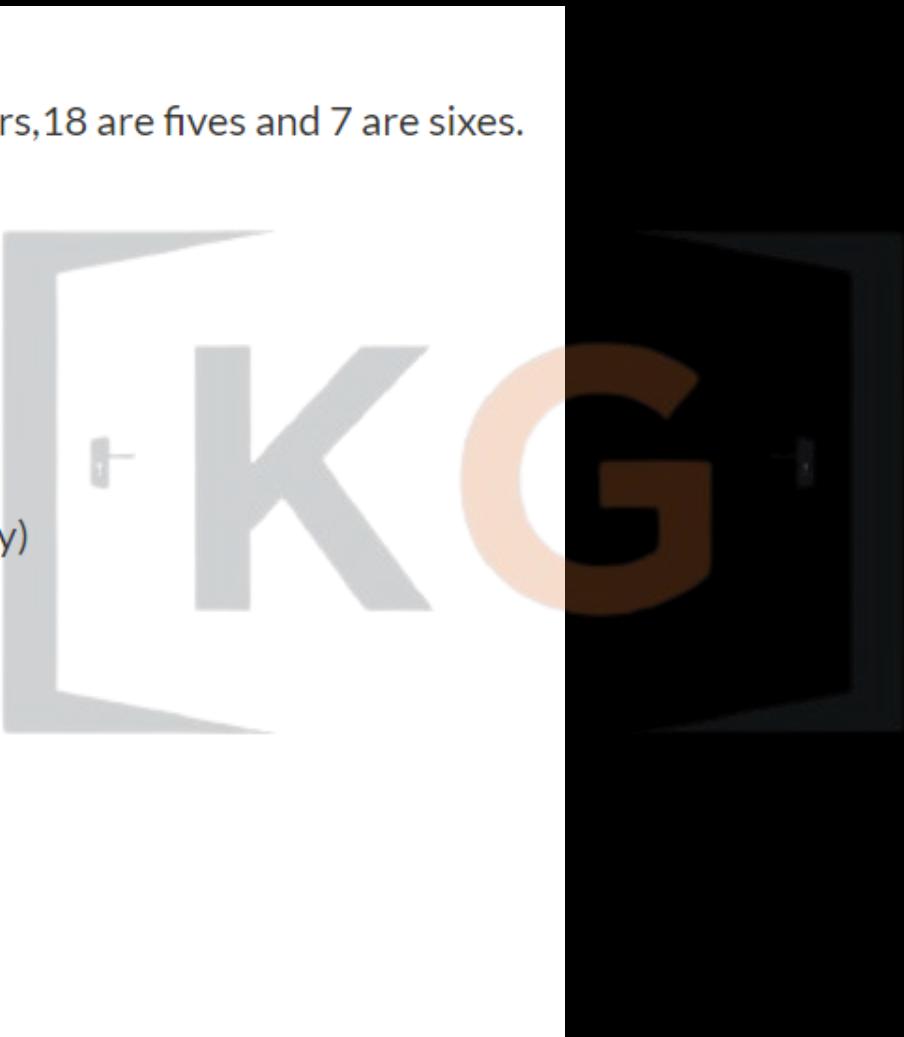
$$\text{Median} = \frac{50}{2} \text{ (25th, 26th term average)}$$

$$\text{Median} = \frac{4+5}{2}$$

$$\text{Median} = 4.5 = c$$

$$a + 2b - c = 4.44 + 2 \times 5 - 4.5$$

$$= 9.94$$



Q5: GIVEN MEAN = 66 , MODE = 60. FIND MEDIAN



Q5: GIVEN MEAN = 66 , MODE = 60. FIND MEDIAN

$$3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$$

$$3 \text{ median} = 60 + 2(66)$$

$$\begin{aligned}\text{median} &= \frac{60 + 2(66)}{3} \\ &= \frac{60 + 2(66)}{3} = 20 + 44 = \underline{\underline{64}}\end{aligned}$$

Q5: IF THE RATIO OF MODE AND MEDIAN OF A DISTRIBUTION IS 6 : 5, THEN THE RATIO OF ITS MEAN AND MEDIAN IS :

M1

let mode $\rightarrow 6$

median $\rightarrow 5$

mean $\rightarrow 4.5$

$$3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$$

$$3(5) = 6 + 2(\text{Mean})$$

$$\frac{\text{mean}}{\text{median}} = \frac{4.5}{5} = \frac{9}{10}$$
$$= 9 : 10$$

$$15 = 6 + 2(\text{Mean})$$

$$\frac{9}{2} = \text{Mean}$$

$$\text{Mean} = 4.5$$

Q5: IF THE RATIO OF MODE AND MEDIAN OF A DISTRIBUTION IS 6 : 5, THEN THE RATIO OF ITS MEAN AND MEDIAN IS :

M2

$$\text{Mode} \rightarrow 6x$$

$$\text{Median} \rightarrow 5x$$

$$\text{Mean} \rightarrow 4.5x$$

$$\frac{\text{Mean}}{\text{Median}} = \frac{4.5x}{5x} = \frac{4.5}{5} = \frac{9}{10}$$

$$= 9:10$$

$$3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$$

$$3(5x) = 6x + 2(\text{Mean})$$

$$\frac{9x}{2} = \text{Mean}$$

$$4.5x = \text{Mean}$$

Q6. Identify the statement which is not true?

- a) It is compulsory to have mean, mode and median for a given data set.
- b) We cannot have more than one mean, one median and one mode for a given data set.
- c) Mean, Mode and Median has to be a value from given data set.
- d) All the above are not true.

Mean Mode & Median

Given data : 5 5 7 6 5

$$\begin{aligned} \text{Mean/Average} | \text{Arithmetic Mean} &= \frac{\text{Sum of all observations}}{\text{no. of observations}} \\ &= \frac{5+5+7+6+5}{5} \\ &= \frac{28}{5} = 5.6 \end{aligned}$$

min
max
5 - 7

Mean Mode & Median

Given data : 5 5 7 6 5

Median = central term [Median = 7 ×]

asc | desc ⇒ 5 5 5 6 7
median

Data : 5 5 7 6 6 5

asc ⇒ 5 5 5 6 6 7
median = mid point / average

$$\frac{5+6}{2} = \frac{11}{2} = 5.5$$

Mean Mode & Median

Given data : 5 5 7 6 5

Mode \Rightarrow term with most occurrences
or
term having highest frequency

$$\boxed{\text{mode} = 5}$$

Q: Find the mode of the following data :

4 5 1 3 8 7 9



Q: Find the mode of the following data :

4 5 1 3 8 7 9 → no mode
 → all mode

no modal database

mode → freq > 1

5 5 5 6 7
single modal
db

Q: Find the mode of the following data :

I) 4 4 4 4 9 9 9 9

- a) 9 b) 4 c) 9 or 4 d) 9 and 4 e) $(9 + 4)/2$

II) 4 4 3 3 2 2 1 1

Q: Find the mode of the following data :

I) 4 4 4 4

9 9 9

9

bi-modal database

- a) 9 b) 4 c) 9 or 4 d) 9 and 4

- e) $(9 + 4)/2$

$$\frac{13}{2} = 6.5$$

II) 4 4 3 3 2 2 1 1

4 3 2 1

multi-modal db

Q6. Identify the statement which is not true?

False

- a) It is compulsory to have mean, mode and median for a given data set. (False)
- mean ✓
median ✓
mode ✗
- b) We cannot have more than one mean, one median and one mode for a given data set. (False)
- mean → 1
median → 1
mode → multi
- c) Mean, Mode and Median has to be a value from given data set. (False)
- d) All the above are not true.

Q7. The salary in rupees of 10 employees in a company per day is 50, 55, 60, 65, 70, 72, 75, 80, 84, 89.
What is the standard deviation in the above data?



- A. 13.751
- B. 11.983
- C. 9.432
- D. 5.754



Q7. The salary in rupees of 10 employees in a company per day is 50, 55, 60, 65, 70, 72, 75, 80, 84, 89.
What is the standard deviation in the above data?



Solution:

Employees salaries=50, 55, 60, 65, 70, 72, 75, 80, 84, 89.

$$\sigma = \left[\sqrt{\frac{\sum(x_i - \mu)^2}{N}} \right]$$

$$Mean(\mu) = \frac{50+55+60+65+70+72+75+80+84+89}{10}$$

$$Mean(\mu) = 70$$

$$\sigma = \sqrt{\frac{1}{10}(20^2 + 15^2 + 10^2 + 5^2 + 0^2 + 2^2 + 5^2 + 10^2 + 14^2 + 19^2)}$$

$$\sigma = \sqrt{\frac{1}{10} \times (400 + 225 + 100 + 25 + 0 + 4 + 25 + 100 + 196 + 361)}$$

$$\sigma = \sqrt{\frac{1436}{10}}$$

$$\sigma = \sqrt{143.6}$$

$$\sigma = 11.983$$

$$\sigma = \sqrt{Var}$$
$$Var = \sigma^2$$

Q7. The salary in rupees of 10 employees in a company per day is 50, 55, 60, 65, 70, 72, 75, 80, 84, 89.
What is the standard deviation in the above data?



- A. 13.751
- B. 11.983 ✓
- C. 9.432
- D. 5.754



Correct Answer : Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q8. The mean of a set of data is 5. What will be the mean if ten is subtracted from each data ?



A. 5

B. 10

C. -10

D. -5



Q8. The mean of a set of data is 5. What will be the mean if ten is subtracted from each data ?

$$5 - 10 = -5$$



A. 5 ~~X~~

$$\frac{a_1 + a_2 + a_3 + \dots + a_n}{n} = 5$$

B. 10 ~~X~~

$$\frac{(a_1 - 10) + (a_2 - 10) + (a_3 - 10) + \dots + (a_n - 10)}{n} = \boxed{}$$

C. -10

$$\frac{a_1 + a_2 + a_3 + \dots + a_n - 10n}{n} = \frac{a_1 + a_2 + a_3 + \dots + a_n}{n} - \frac{10n}{n}$$

D. -5 ~~X~~

$$5 - 10 = -5$$

EFFECT ON MEAN

Original
Data

+2

-3

*2

/5

25

20

35

40

60

Total : 180

Avg: 36

Total :

Avg:

Total :

Avg:

Total :

Avg:

Total :

Avg:

EFFECT ON MEAN

Original
Data

+2

-3

*2

/5

25

27

22

50

5

20

22

17

40

4

35

37

32

70

7

40

42

37

80

8

60

62

57

120

12

Total : 180

Avg: 36

Total : 190

Avg: 38

Total : 165

Avg: 33

Total : 360

Avg: 72

Total : 36

Avg: 7.2

+2
-3

$\times 2$

Q8. The mean of a set of data is 5. What will be the mean if ten is subtracted from each data ?

- A. 5
- B. 10
- C. -10
- D. -5

Correct Answer : Option D

Solution:

let the number of data be n

so sum of data = *mean × number of data*

$$= 5n$$

now 10 is subtracted to each data

so now sum becomes = $5n - 10n = -5n$

mean = sum of data / no. of data

$$= \frac{-5n}{n} = -5$$

so new mean becomes -5



Q9. With what value should the highest quantity in the data :
65, 52, 14, 26, 18, 35, 32, 38 be replaced so that the mean and
median become equal?



- A. 67
- B. 40
- C. 50
- D. 53



Q9. With what value should the highest quantity in the data : 65, 52, 14, 26, 18, 35, 32, 38 be replaced so that the mean and median become equal?



A. 67

(M)

14 18 26 32 35 38 52 65

B. 40

Median =

$$\frac{32+35}{2} = 33.5$$

C. 50

Mean = 35

New Mean = 33.5

New Data: 14 18 26 32 35 38 52 x

$$\frac{14+18+26+32+35+38+52+x}{8} = 33.5$$

$$x = 53$$

D. 53 ✓

Q9. With what value should the highest quantity in the data :
65, 52, 14, 26, 18, 35, 32, 38 be replaced so that the mean and median become equal?



A. 67

14 18 26 32 35 38 52 65

median = $\frac{32+35}{2} = 33.5$

mean = 35

$$\begin{array}{r} 35 \\ - 33.5 \\ \hline 1.5 \end{array}$$

$$1.5 \times 8 = 12$$

$$\begin{array}{r} 65 \\ - 12 \\ \hline 53 \end{array}$$

B. 40

C. 50

D. 53

Correct Answer : Option D

Explanation :

Let's sort the given data - 14, 18, 26, 32, 35, 38, 52, 65

mean = 35

$$\text{median} = \frac{32+35}{2} = 33.5$$

$$\text{Difference} = 35 - 33.5 = 1.5$$

$$\text{Value} = 1.5 \times 8 = 12$$

$$65 - 12 = 53$$



Q10. If the mean of 26 observations is 29, and on adding four more observations, the new mean becomes 32. What is the mean of the last four observations?



- A. 32.45
- B. 51.5
- C. 37
- D. 50.8



Q10. If the mean of 26 observations is 29, and on adding four more observations, the new mean becomes 32. What is the mean of the last four observations?



- A. 32.45
- B. 51.5
- C. 37
- D. 50.8

$$\frac{a_1 + a_2 + a_3 + \dots + a_{26}}{26} = 29$$
$$a_1 + a_2 + a_3 + \dots + a_{26} = 29 \times 26$$

$$\frac{a_1 + a_2 + a_3 + \dots + a_{26} + a_{27} + a_{28} + a_{29} + a_{30}}{30} = 32$$
$$a_1 + a_2 + a_3 + \dots + a_{30} = 32 \times 30$$
$$\underbrace{a_1 + a_2 + \dots + a_{26}}_{(29 \times 26)} + a_{27} + a_{28} + a_{29} + a_{30} = 32 \times 30$$

Q10. If the mean of 26 observations is 29, and on adding four more observations, the new mean becomes 32. What is the mean of the last four observations?



A. 32.45

B. 51.5 ✓

C. 37

D. 50.8

$$a_{27} + a_{28} + a_{29} + a_{30} = (32 \times 30) - (29 \times 26)$$

$$\frac{a_{27} + a_{28} + a_{29} + a_{30}}{4} = \frac{(32 \times 30) - (29 \times 26)}{4} = \frac{\cancel{(32 \times 30)} - \cancel{(29 \times 26)}}{\cancel{4}^2} = \frac{480 - 377}{2} = \frac{103}{2} = 51.5$$

Correct Answer : Option B

Explanation -

Solution:

mean of 26 observations is 29

$$\text{Sum of 26 observations} = 26 \times 29 = 754$$

When 4 more observations are added

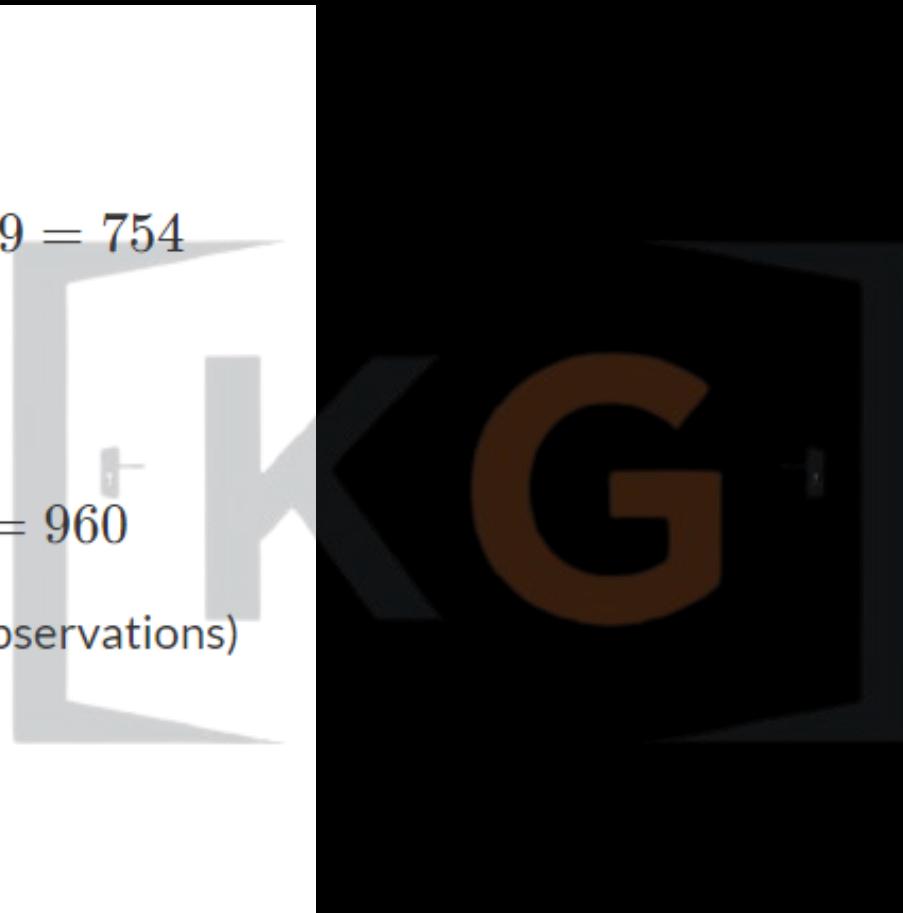
Average of 30 observations=32

$$\text{Sum of observations} = 30 \times 32 = 960$$

Difference is $960 - 754 = 206$ (sum of 4 observations)

$$\text{Mean of 4 observations} = \frac{206}{4}$$

$$\text{Mean of 4 observations} = 51.5$$



Q11 (VK). What is the difference between the mean and the median of the given data ?



5,9,8,15,12,9,2,19,21,11

- A. 2.3
- B. 1.5
- C. 1.1
- D. 3.5



Correct Answer : Option C

Explanation

Given Sequence=2,5,9,8,15,12,9,2,19,21,11

$$\text{Media} = \frac{9+11}{2}$$

$$\text{Mean} = \frac{2+5+9+8+15+12+9+2+19+21+11}{2}$$

$$\text{Mean} = 11.1$$

$$\text{Difference} = 1.1$$





NUMBER SYSTEM

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Concept 1 - Factors

$$12 = \{1, 2, 3, 4, 6, 12\}$$

$$\frac{12}{1} \checkmark \quad \frac{12}{2} \checkmark \quad \frac{12}{3} \checkmark \quad \frac{12}{4} \checkmark \quad \frac{12}{6} \checkmark \quad \frac{12}{12} \checkmark$$

$$\frac{12}{5} \times$$

$$12 = a \times b \quad [a \text{ & } b \text{ are factors of } 12]$$

$$\begin{aligned} 12 &= 1 \times 12 \\ &= 2 \times 6 \\ &= 3 \times 4 \end{aligned} \quad \left[\begin{array}{l} 1, 2, 3, 4, 6, 12 \\ \text{are factors of } 12 \end{array} \right]$$

$$a \times b = c$$

a, b are factors of c

$$\frac{c}{a} = b \checkmark$$

$$\frac{c}{b} = a \checkmark$$

Number of Factors

Prime Factorization

(M1)

$$\begin{array}{c|c} 2 & 12 \\ \hline 2 & 6 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$$12 = 2 \times 2 \times 3$$

$$12 = 2^2 \times 3^1$$

Number of factors: $(2+1)(1+1)$

$$\begin{aligned} & : 3 \times 2 \\ & : 6 \end{aligned}$$

(M2)

$$12 = 4 \times 3 = 2^2 \times 3$$

$$12 = 2 \times 6 = 2 \times 2 \times 3 = 2^2 \times 3$$

$$N = p^a \times q^b \times r^c$$

$p, q, r \rightarrow \text{prime numbers}$

Number of factors:

$$(a+1)(b+1)(c+1)$$

Product of Factors : $N^{\frac{n}{2}}$ → no. of factors
Number

$$12 = (12)^{\frac{6}{2}} = 12^3$$

$$12 = \left\{ \overbrace{1, 2, 3, 4, 6, 12}^{1 \times 12 = 12} \right\}$$

$$2 \times 6 = 12$$

$$3 \times 4 = 12$$

$$1 \times 2 \times 3 \times 4 \times 6 \times 12 = 12 \times 12 \times 12 = 12^3$$

Number of Factors/Divisors

What are Factors of a number?

Factors of a number N refers to all the numbers which divide N completely. These are also called **divisors of a number**.

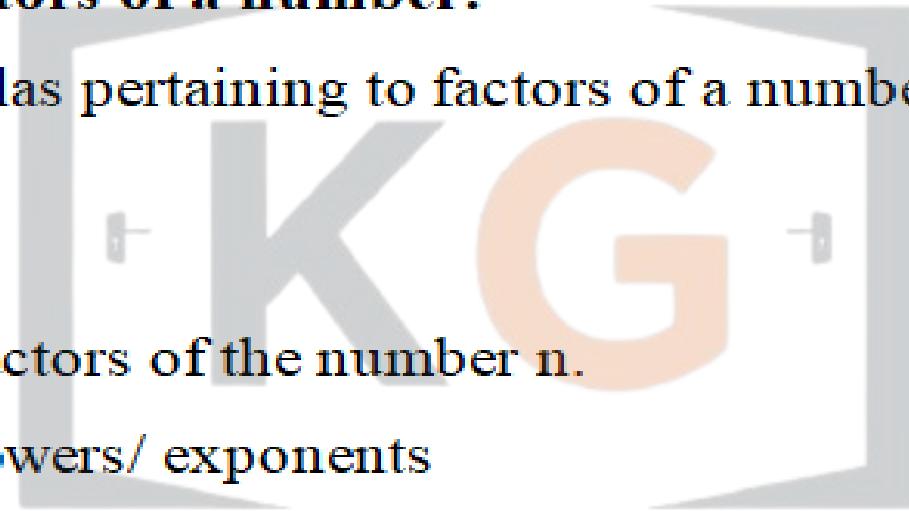
Basic formula related to factors of a number:

These are certain basic formulas pertaining to factors of a number N , such that,

$$N = p^a q^b r^c$$

Where, p , q and r are prime factors of the number n .

a , b and c are non-negative powers/ exponents



- Number of factors of $N = (a+1)(b+1)(c+1)$
- Product of factors of $N = N^{\text{No. of factors}/2}$

Q1: Find Number of Factors and Product of Factors of 72.



Q1: Find Number of Factors and Product of Factors of 72.

2	72
2	36
2	18
3	9
3	3
	1

$$72 = 2 \times 2 \times 2 \times 3 \times 3$$
$$= 2^3 \times 3^2$$

$$72 = 9 \times 8$$

$$= 3^2 \times 2^3$$

$$n = (3+1)(2+1)$$
$$= 4 \times 3 = 12$$

$$\{ 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72 \}$$
$$\begin{aligned} 1 \times 72 &= 72 \\ 2 \times 36 &= 72 \\ 3 \times 24 &= 72 \\ 4 \times 18 &= 72 \\ 6 \times 12 &= 72 \\ 8 \times 9 &= 72 \end{aligned}$$



Concept 2 – Magic of 9



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q2: Consider the expression: $(999\dots9)^2$, if there are a total of 2020 9's, then find the following:



- a) Total number of digits in the expression
- b) Value of the expression
- c) Digits Sum



$$9^2 = 81$$

$$99^2 = 9801$$

$$999^2 = 998001$$

$$9999^2 = 9998\ 0001$$

$$99999^2 = 99998\ 00001$$

$$999999^2 = 999998\ 000001$$

Q2: Consider the expression: $(999\dots9)^2$, if there are a total of 2020 9's, then find the following:



- a) Total number of digits in the expression
- b) Value of the expression
- c) Digits Sum

⑤ $\left(\underbrace{9999\dots9}_{2020} \right)^2 = \underbrace{9999\dots9}_{2019} 8 \underbrace{00000\dots0}_{2019} 1$

⑥
$$\begin{aligned} & \underbrace{9+9+9+\dots+9}_{(2019 \times 9)} + 8 + 0 + 0 + \dots + 0 + 1 \\ & (2019 \times 9) + 8 + 1 = (2019 \times 9) + 9 = 2020 \times 9 = 18,180 \end{aligned}$$

⑦ Total digits

$$\begin{array}{r} 2019 \\ + 1 \\ + 2019 \\ \hline 2020 \\ + 2020 \\ \hline 4040 \end{array}$$

Answer : Total there are 4040 digits in the expression and digits sum is $9 * 2020$



Q3: Consider the expression: $(999\dots9)^3$, if there are a total of 2020 9's, then find the following:

- a) Total number of digits in the expression
- b) Value of the expression
- c) Digits Sum



$$9^3 = 729$$

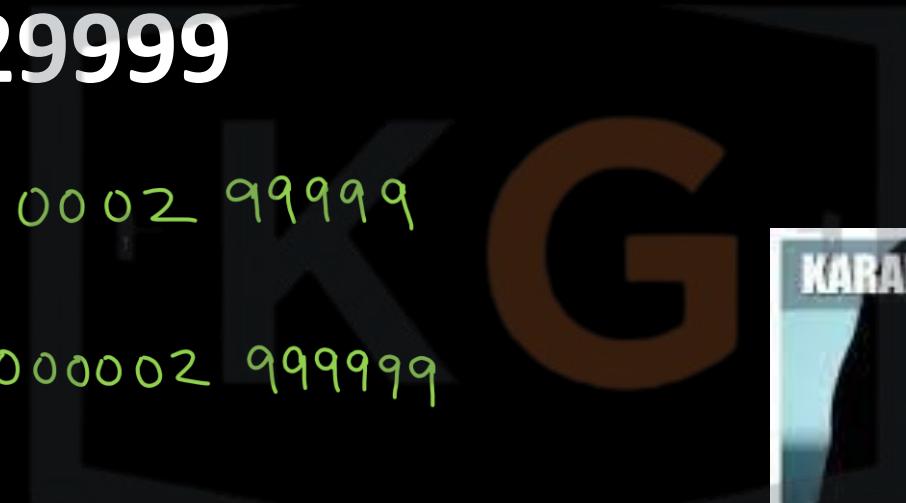
$$99^3 = 970299$$

$$999^3 = 997002999$$

$$9999^3 = 999700029999$$

$$99999^3 = 9999\ 7\ 00002\ 99999$$

$$999999^3 = 99999\ 7\ 000002\ 999999$$



Q3: Consider the expression: $(999\dots9)^3$, if there are a total of 2020 9's, then find the following:

a) Total number of digits in the expression

b) Value of the expression

c) Digits Sum

$$\textcircled{b} \quad \underbrace{(9999\dots9)}_{2020}^3 = \underbrace{999\dots9}_{2019} 7 \underbrace{000\dots0}_{2019} 2 \underbrace{9999\dots9}_{2020}$$
$$\textcircled{c} \quad \underbrace{9+9+9+\dots+9}_{2019} + 1 + \underbrace{9+9+9+\dots+9}_{2020}$$
$$4040 \times 9 = 36,360$$

① Total digits

$$\begin{array}{r} 2019 \\ + 1 \\ + 2019 \\ + 1 \\ + 2020 \\ \hline 2020 \\ + 2020 \\ + 2020 \\ \hline 6060 \end{array}$$



Answer : Total there are 6060 digits in the expression and digits sum is $9 * 4040$



Concept 3 – Magic of 11



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4. The square root of 12345678987654321 is nnnnnn... upto 'p' times, find the sum of n and p ?



Q4. The square root of 12345678987654321 is nnnnnn... upto 'p' times, find the sum of n and p ?



$$\sqrt{1\underline{23456} \underline{7898} \underline{7654} \underline{321}} = \underbrace{\text{nnnn} \dots}_{p \text{ times}}$$

$n+p=??$



$$(\text{..})^2 = 121$$

$$(\text{...})^2 = 12321$$

$$(\text{...})^2 = 1234321$$

$$(\text{|||})^2 = 123454321$$

$$(\text{|||||})^2 = 12345678987654321$$

$$\sqrt{12345678987654321} = \underbrace{\text{|||||}}_{9 \text{ times}}$$

Q4. The square root of 12345678987654321 is nnnnnn... upto 'p' times, find the sum of n and p ?



$$\sqrt{12345678987654321} = \underbrace{nnnn \dots}_{p \text{ times}}$$

\Downarrow

$$\underbrace{11111+111}_{9 \text{ times}}$$

$n=1$
 $p=9$

$n+p=1+9=10$

Concept 4 – Remainders



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q5. A number is divided by 406 leaves remainder 115 , What will be the remainder when it will be divided by 29?

- A. 28
- B. 31
- C. 32
- D. Cannot be determined / Data Insufficient



Q5. A number is divided by 406 leaves remainder 115 , What will be the remainder when it will be divided by 29?

$$q \overline{)P} \quad \begin{array}{l} \text{P: dividend} \\ \text{q: divisor} \\ \text{x: quotient} \\ \text{s: remainder} \end{array}$$

$$\text{dividend} = (\text{divisor} \times \text{quotient}) + \text{remainder}$$

$$P = qx + s$$

M1

$$406 \overline{)N} \quad \begin{array}{l} x \\ \hline 115 \end{array}$$

$$N = 406x + 115$$

$$\frac{N}{29} = \frac{406x + 115}{29}$$

$$= \frac{406x}{29} + \frac{115}{29}$$

$$= \frac{406}{29} \cdot x + \frac{115}{29}$$

$$= \cancel{\frac{406}{29}} \cdot x + \frac{115}{29}$$

0

$$29 \overline{)115} \quad \begin{array}{r} 3 \\ - 87 \\ \hline 28 \end{array}$$

Rem: 28

Q5. A number is divided by 406 leaves remainder 115 , What will be the remainder when it will be divided by 29?

M²

$$406 \overline{)N} \quad \Rightarrow \quad 406 \overline{)N} \begin{array}{r} | \\ -406 \\ \hline 115 \end{array}$$

$$\Rightarrow N - 406 = 115$$

$$N = 115 + 406 = 521$$

$$\Rightarrow \frac{N}{29} = \frac{521}{29} \Rightarrow R(28)$$

$$29 \overline{)521} \begin{array}{r} | \\ -29 \\ \hline 231 \\ -203 \\ \hline 28 \end{array}$$

Trick

$$406 \overline{)N} \begin{array}{r} | \\ \hline 115 \end{array}$$

$$\frac{406 + 115}{29} \Rightarrow \frac{\text{Divisor} + \text{Given Rem}}{\text{Target Divisor}}$$

$$\frac{521}{29} \quad \text{or} \quad \frac{406 + 115}{29}$$

$$\begin{array}{c} | \\ 0 \\ \hline 28 \end{array} \quad \begin{array}{c} | \\ 29 \\ \hline 0 \\ 28 \end{array}$$

$$= 28$$

Q6. When a four digit number is divided by 85, it leaves a remainder of 39, if same number is divided by 17, the remainder would be __



Q6. When a four digit number is divided by 85, it leaves a remainder of 39, if same number is divided by 17, the remainder would be __

$$\frac{85 + 39}{17} = \frac{\boxed{}}{17}$$

$$\frac{85}{17} + \frac{39}{17}$$

$$\cancel{\frac{85}{17}} + \frac{39}{17}$$

0

When 39 is divided by 17, it will give 5 as remainder, so correct answer is 5.

Q7 (VK). When a number is divided by 899, it leaves a remainder of 63, if same number is divided by 29, the remainder would be __



Q7 (VK). When a number is divided by 899, it leaves a remainder of 63, if same number is divided by 29, the remainder would be __

$$(899 + 63) / 29 = (899 / 29) + (63 / 29)$$

899/29 gives no remainder and 63/29 gives 5 as remainder, so overall remainder will be 5, correct answer is 5.



ARITHMETIC

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. In the IT department of TCS, the administrator password is changed every month. The team of administrators, spread across the globe, receive an 8 digit number via email. This number is to be prefixed with a single digit number and suffixed with a single digit number to get the actual password. The password is divisible by 11 and 8. If the team received 65351364 this month, then which of the following pairs give prefix and suffix respectively.

- A. 8,9
- B. 7,8
- C. 3,4
- D. Cannot be determined / Data Insufficient



Q1. In the IT department of TCS, the administrator password is changed every month. The team of administrators, spread across the globe, receive an 8 digit number via email. This number is to be prefixed with a single digit number and suffixed with a single digit number to get the actual password. The password is divisible by 11 and 8. If the team received 65351364 this month, then which of the following pairs give prefix and suffix respectively.

- A. 8,9
- B. 7,8
- C. 3,4
- D. Cannot be determined / Data Insufficient


$$\begin{array}{r} 8 \underline{6} 5 3 5 1 3 6 4 \underline{9} \\ - 6 5 3 5 1 3 6 4 \underline{8} \\ \hline 3 6 5 3 5 1 3 6 4 \underline{4} \end{array}$$



$$\times \frac{649}{8} \rightarrow \frac{649}{2} \times \frac{N}{P} \Rightarrow \frac{N}{\text{factors of } P}$$

✓ $\frac{648}{8} \rightarrow \frac{648}{2} \checkmark \quad \frac{N}{8} \Rightarrow \frac{N}{\text{factors of } 8}$

Factors of 8 = {1, 2, 4, 8}

$a \times b = c$
 (a, b) factors of c

$$\times \frac{644}{8} \rightarrow \frac{644}{2} \checkmark \quad \frac{32}{8}, \frac{32}{4}, \frac{32}{2}, \frac{32}{1}$$

$$1 \times 8 = 8 \\ 2 \times 4 = 8$$

$7 \downarrow 6 \downarrow 5 \downarrow 3 \downarrow 5 \downarrow 1 \downarrow 3 \downarrow 6 \downarrow 4 \downarrow 8 \downarrow$

$\Rightarrow 7 + 5 + 3 + 4 = 24$

$6 \downarrow 3 \downarrow 1 \downarrow 6 \downarrow 8 \downarrow$

$\Rightarrow 6 + 3 + 1 + 6 + 8 = 24$

$24 - 24 = 0 \mid_{11n}$

$24 - 24 = 0 \checkmark \text{ (divisible by 11)}$

Q1. In the IT department of TCS, the administrator password is changed every month. The team of administrators, spread across the globe, receive an 8 digit number via email. This number is to be prefixed with a single digit number and suffixed with a single digit number to get the actual password. The password is divisible by 11 and 8. If the team received 65351364 this month, then which of the following pairs give prefix and suffix respectively.

- A. 8,9
- B. 7,8
- C. 3,4
- D. Cannot be determined / Data Insufficient



$$\begin{array}{r} 8 \quad 6 \quad 5 \quad 3 \quad 5 \quad | \quad 3 \quad 6 \quad 4 \quad 9 \\ - \quad 6 \quad 5 \quad 3 \quad 5 \quad | \quad 3 \quad 6 \quad 4 \quad 8 \\ \hline 3 \quad 6 \quad 5 \quad 3 \quad 5 \quad | \quad 3 \quad 6 \quad 4 \quad 4 \end{array}$$

The first row shows the number 65351364 with a 9 at the end. The second row shows the same number with an 8 at the end. The third row shows the number with a 4 at the end. The first two rows result in remainders of 9 and 8 respectively, both marked with a red 'X' indicating they are incorrect. The third row results in a remainder of 4, marked with a red 'X' indicating it is also incorrect.



Correct Answer : Option B

Explanation –

Option A - 8,9

The password would be 8653513649

$$8653513649 \div 11 = 786683059$$

$$8653513649 \div 8 = 1081689206 \text{ Remainder } 1$$

\Rightarrow Number cannot be divisible by 8

Option B - 7,8

The password would be 7653513648

$$7653513648 \div 11 = 695773968$$

$$7653513648 \div 8 = 956689206$$

\Rightarrow Number is both divisible by 8 and 11

Option C - 3,4

The password would be 3653513644

$3653513644 \div 11 = 332137604$

$3653513644 \div 8 = 456689205$ Remainder 4

\Rightarrow Number cannot be divisible by 8

Therefore Correct Answer Option B : 7, 8



Q2. Two packets are available for sale. Packet A: peanuts 100 grams for Rs 72 only, Packet B: peanuts 150 grams for Rs 108 only. Which is a better buy ?



- A. Packet A
- B. Packet B
- C. Data insufficient
- D. Both have same value



Q2. Two packets are available for sale. Packet A: peanuts 100 grams for Rs 72 only, Packet B: peanuts 150 grams for Rs 108 only. Which is a better buy ?



A. Packet A

(A) $100 \text{ gm} \rightarrow \text{Rs. } 72$

$$1 \text{ gm} \rightarrow \text{Rs. } \frac{72}{100} = \text{Rs. } \frac{18}{25}$$

B. Packet B

(B)

$$150 \text{ gm} \rightarrow \text{Rs. } 108$$

$$1 \text{ gm} \rightarrow \text{Rs. } \frac{108}{150} = \text{Rs. } \frac{18}{25}$$

Same value

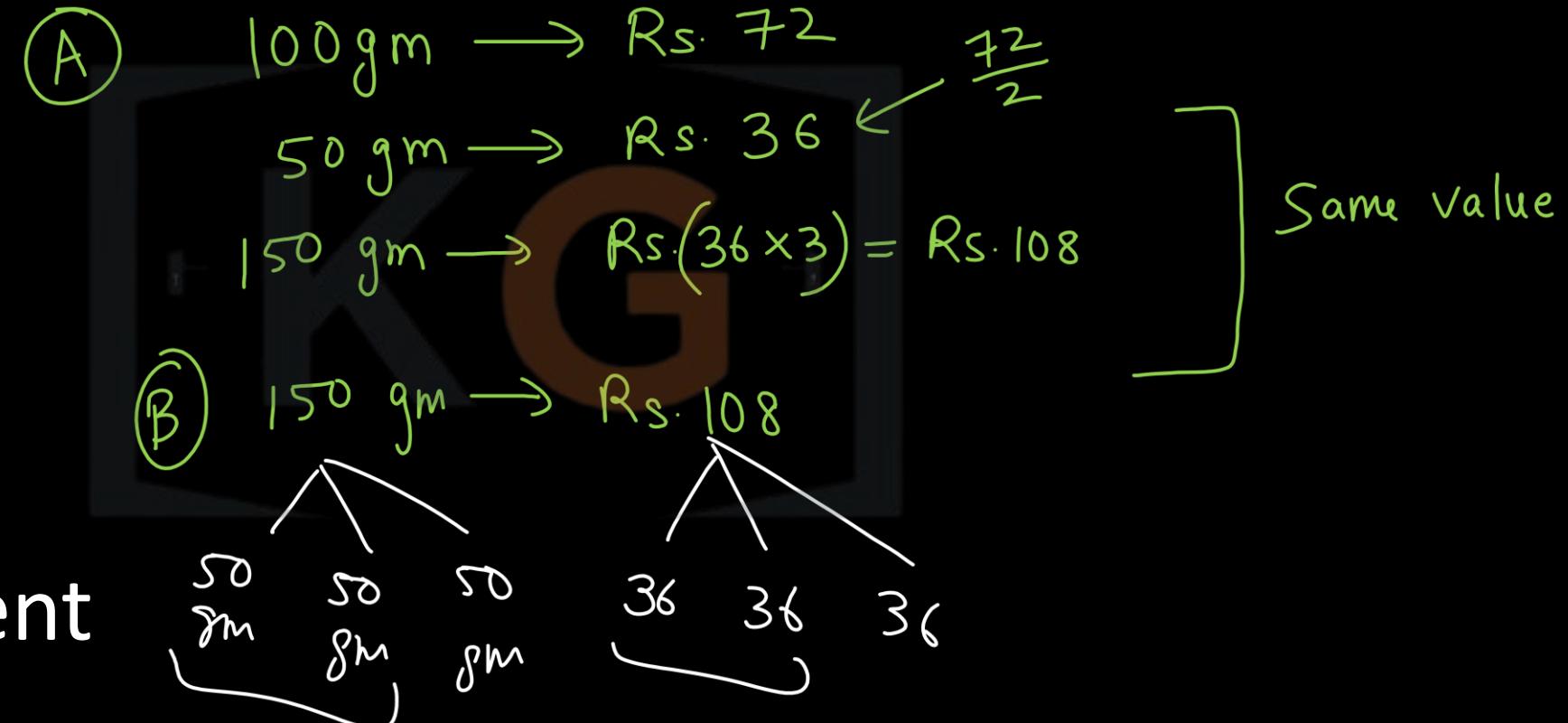
C. Data insufficient

D. Both have same value ✓

Q2. Two packets are available for sale. Packet A: peanuts 100 grams for Rs 72 only, Packet B: peanuts 150 grams for Rs 108 only. Which is a better buy ?



A. Packet A



B. Packet B

C. Data insufficient

D. Both have same value

Correct Answer : Option D

Explanation -

Ans: Both have the same value

For packet A : 1 gm cost = $72/100 = \text{Rs. } 18/25$

For Packet B : 1 gm cost = $108/150 = \text{Rs. } 18/25$

Thus both packets have the same value.

Q3. 6 cows cost the same as 9 sheep, 27 sheep cost the same as 30 goats. 50 goats cost the same as 3 elephants. If two elephants cost Rs 7200, then the cost of one cow is



Q3. 6 cows cost the same as 9 sheep, 27 sheep cost the same as 30 goats. 50 goats cost the same as 3 elephants. If two elephants cost Rs 7200, then the cost of one cow is

$$\begin{aligned}1 \text{ cow} &\rightarrow C \\1 \text{ sheep} &\rightarrow S \\1 \text{ goat} &\rightarrow G \\1 \text{ elephant} &\rightarrow E\end{aligned}$$

$$2 \text{ elephants} \Rightarrow 2E$$

$$2E = 7200$$

$$E = \frac{7200}{2} = 3600$$

$$\begin{aligned}50G &= 3E \\1G &= \frac{3E}{50} \\30G &= \frac{3E}{50} \times 30 \\30G &= \frac{9E}{5}\end{aligned}$$

$$27S = 30G$$

$$27S = \frac{9E}{5}$$

$$\begin{array}{rcl}6C &=& 9S \\ \downarrow \times 3 && \downarrow \times 3\end{array}$$

$$18C = 27S$$



Q3. 6 cows cost the same as 9 sheep, 27 sheep cost the same as 30 goats. 50 goats cost the same as 3 elephants. If two elephants cost Rs 7200, then the cost of one cow is

$$18C = 27S = \frac{9E}{5}$$

$$C = \frac{E}{10} = \frac{3600}{10}$$



$$18C = \frac{9E}{5}$$

$$C = \frac{\frac{9E}{5}}{18} = \frac{9E}{5 \times 18} = \frac{E}{10}$$

$$C = \text{Rs. } 360$$

Correct Answer : Option B

Explanation -

$$6C = 9S \Rightarrow C = (9/6)S = (3/2)S \quad \text{---(i)}$$

$$27S = 30G \Rightarrow S = (30/27)G = (10/9)G \quad \text{---(ii)}$$

$$50G = 3E \Rightarrow G = (3/50)E \quad \text{---(iii)}$$

Cost of 1 elephant(E)=Rs. $7200/2$ =Rs. 3600

$$\text{So } G = (3/50)E = (3/50)*3600 = \text{Rs. } 216$$

$$S = (10/9)G = (10/9)*216 = \text{Rs. } 240 \text{ and}$$

$$C = (3/2)S = (3/2)*240 = \text{Rs. } 360$$

Q4. Thomas bought X number of sports goods for Rs 9600. If each item was cheaper by Rs 20 then with the same amount he could have bought 40 more items than X. Find the number of items bought by Thomas ?



- A.120
- B.260
- C.500
- D.350



Q4. Thomas bought X number of sports goods for Rs 9600. If each item was cheaper by Rs 20 then with the same amount he could have bought 40 more items than X. Find the number of items bought by Thomas ?

Price of each item (let) = y

$$xy = 9600 \rightarrow y = \frac{9600}{x}$$

New Price = $y - 20$

New Quantity = $x + 40$

$$(x+40)(y-20) = 9600$$

$$xy + 40y - 20x - 800 = 9600$$

$$9600 + 40y - 20x - 800 = 9600$$

$$40y - 20x - 800 = 0$$

$$40y - 20x = 800$$

$$2y - x = 40$$

$$2 \cdot \frac{9600}{x} - x = 40$$

$$\frac{19200}{x} - x = 40$$

$$19200 - x^2 = 40x$$

$$x^2 + 40x - 19200 = 0$$

$$\frac{-40 \pm \sqrt{(40)^2 - 4 \times 1 \times (-19200)}}{2}$$

$$\frac{-40 \pm \sqrt{1600 + 76800}}{2}$$

$$\frac{-40 \pm \sqrt{78400}}{2}$$

$$\frac{-40 \pm 280}{2}$$

Q4. Thomas bought X number of sports goods for Rs 9600. If each item was cheaper by Rs 20 then with the same amount he could have bought 40 more items than X. Find the number of items bought by Thomas ?



$$\frac{-40 - 280}{2}$$

negative
X

$$\frac{-40 + 280}{2} \quad \checkmark$$

$$\frac{280 - 40}{2} = \frac{240}{2} = 120$$

$$X = 120$$

no. of items = 120

Correct Answer : Option A

Explanation –

Let the cost of each item be Y , then $X = 9600/Y \Rightarrow$

$$XY=9600 \text{ --(i)}$$

When cost is reduced 20, we have $(X+40) = 9600 / (Y-20)$

$$\Rightarrow XY - 20X + 40Y - 800 = 9600$$

$$\Rightarrow 9600 - 20X + 40Y - 800 = 9600$$

$$\Rightarrow -20X + 40Y = 800 \text{ --(ii)}$$

As we require X , so substituting $Y=9600/X$ in (ii)

$$\Rightarrow -20X + 40*(9600/X) = 800$$

$$\Rightarrow X^2 + 40X - 19200 = 0$$

$$\Rightarrow (X-120)(X+160) = 0$$

Considering +ve value for X , we have $X=120$.

Q5. A lady engaged a servant on a condition that she will pay Rs 90 and also give him a turban at the end of the year. He served for 9 months and was given a turban and Rs 65. So the price of turban is :



- A. Rs 50
- B. Rs 100
- C. Rs 20
- D. Rs 10

Q5. A lady engaged a servant on a condition that she will pay Rs 90 and also give him a turban at the end of the year. He served for 9 months and was given a turban and Rs 65. So the price of turban is :

- A. Rs 50
- B. Rs 100
- C. Rs 20
- D. Rs 10

$$\text{Turban (let)} = \text{Rs. } y$$

$$1 \text{ year} = 12 \text{ months} \Rightarrow \frac{90+y}{12}$$

$$1 \text{ month} \Rightarrow \frac{90+y}{12}$$

$$9 \text{ months} \Rightarrow \frac{90+y}{12} \times 9$$

$$\Rightarrow \frac{3}{4} (90+y)$$

$$\frac{3}{4} (90+y) = 65 + y$$

$$3(90+y) = 4(65+y)$$

$$270+3y = 260+4y$$

$$270 - 260 = 4y - 3y$$

$$y = 10$$

Q5. A lady engaged a servant on a condition that she will pay Rs 90 and also give him a turban at the end of the year. He served for 9 months and was given a turban and Rs 65. So the price of turban is :

- A. Rs 50
- B. Rs 100
- C. Rs 20
- D. Rs 10

$$\text{Turban} = \text{Rs. } 10$$

$$12 \text{ months} = 90 + 10 = 100$$

$$1 \text{ month} = \frac{100}{12}$$

$$9 \text{ months} = 9 \times \frac{100}{12} = \frac{3 \times 100}{4} = 3 \times 25 = 75$$



$$\begin{array}{c} 75 \\ \swarrow \quad \searrow \\ 65 + 10 \end{array}$$

Correct Answer : Option D

Explanation:

Let the price of the turban be Rs. x

Then, total income for 12 months = Rs. $(90 + x)$

$$\Rightarrow \text{Income for 9 months} = \left(\frac{90 + x}{12} \right) \times 9 = \frac{3x + 270}{4}$$

$$\text{Given, } \frac{3x + 270}{4} = 65 + x$$

$$\Rightarrow 3x + 270 = 4x + 260$$

$$\Rightarrow x = \text{Rs. } 10$$

Q6 (VK). A girl is promised Rs. 8400 and a cloak as her wages for a year. After 7 months she leaves this service and receives the cloak and Rs. 4600 as her due. How much is the cloak worth?

- a) Rs. 840
- b) Rs. 780
- c) Rs. 900
- d) Rs. 720



Correct Answer : Option D (Rs.720)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

A semi-transparent watermark is positioned in the center of the slide. It features the word "DATA" in large, white, uppercase letters. Behind the letters, there is a smaller, dark brown circular graphic that partially overlaps the letters.

DATA INTERPRETATION

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

TYPES OF GRAPH :

1. TABLE GRAPH

2. PIE CHART

3. BAR GRAPH

4. LINE GRAPH



TABLE GRAPH

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1: Refer to the table above and answer the following questions:



2019 Pre-Election Survey

	Number of Electorate	Number of Stations	Number of Candidates	Number of seats available
Andhra Pradesh	27440879	29614	132	21
Assam	7099829	8311	48	6
Bihar	15058548	15261	146	11
Gujarat	33675054	36826	162	26
Karnataka	22617551	22999	93	15
Maharashtra	29376057	29432	210	24
Orissa	12942456	13741	54	11
Tripura	1978222	2372	12	2
Chhattisgarh	13719235	15669	102	11
Jharkhand	7835616	7748	85	6

Q1: Which state shows maximum number of average electorate per polling station?

- (A) Jharkhand
- (B) Maharashtra
- (C) Bihar
- (D) Orissa

Q1: Refer to the table above and answer the following questions:



2019 Pre-Election Survey				
	Number of Electorate	Number of Stations	Number of Candidates	Number of seats available
Andhra Pradesh	27440879	29614	132	21
Assam	7099829	8311	48	6
Bihar	15058548	15261	146	11
Gujarat	33675054	36826	162	26
Karnataka	22617551	22999	93	15
Maharashtra	29376057	29432	210	24
Orissa	12942456	13741	54	11
Tripura	1978222	2372	12	2
Chhattisgarh	13719235	15669	102	11
Jharkhand	7835616	7748	85	6

27440879

29614

27440879

100000

≈ 274

29614
1000

≈ 29

Q1: Which state shows maximum number of average electorate per polling station?

- (A) Jharkhand
- (B) Maharashtra
- (C) Bihar
- (D) Orissa

$$\frac{\text{Electorate}}{\text{Polling station}}$$

2019 Pre-Election Survey

	Number of Electorate	Number of Stations	Number of Candidates	Number of seats available
Andhra Pradesh	27440879 274	29614 29	132	21
Assam	7090829 70	8311 8	48	6
Bihar	15058548 150	15261 15	146	11
Gujarat	33675054 336	36826 36	162	26
Karnataka	22617551 226	22999 22	93	15
Maharashtra	29376057 293	29432 29	210	24
Orissa	12942456 129	13741 13	54	11
Tripura	1978222 19	2372 2	12	2
Chhattisgarh	13719235 137	15669 15	102	11
Jharkhand	7835616 78	7748 7	85	6

$$\frac{274}{29} < 10$$

$$\frac{70}{8} < 10$$

$$\frac{150}{15} = 10$$

$$\frac{336}{36} < 10$$

$$\frac{226}{22} \approx 10$$

$$\frac{293}{29} \approx 10$$

$$\frac{78}{7} > 10$$

$$\frac{137}{15} < 10$$

$$\frac{129}{13} < 10$$

$$\frac{293}{29} > 10$$

$$\frac{226}{22} > 10$$

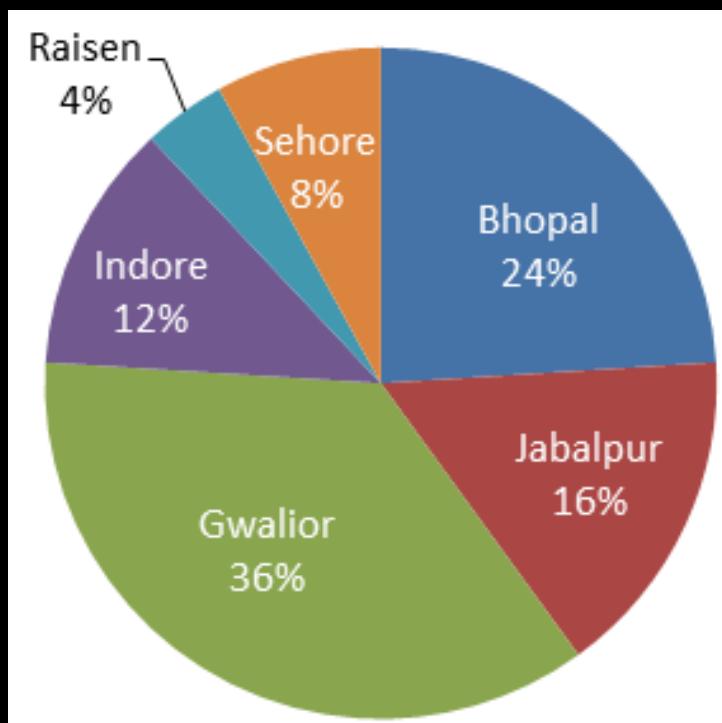
$$\frac{78}{7} \approx 11$$

PIE CHART

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

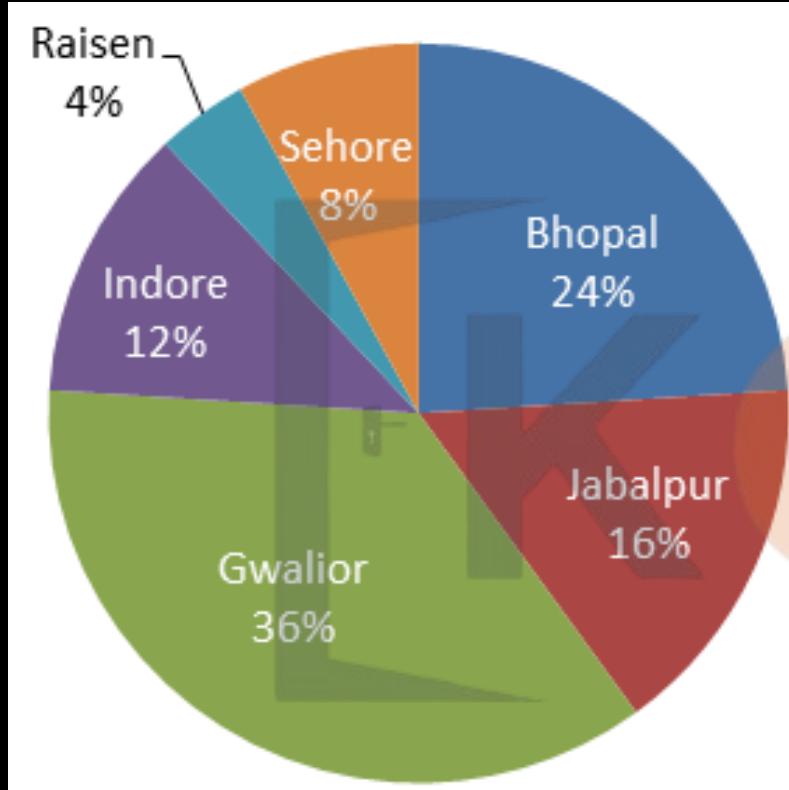
Q2. Study the following pie chart carefully and answer the questions given beside.

The following pie – chart shows the percentage distribution of candidates who were selected in RBI exam from six different districts of MP. Total selected candidates from MP = 54000



Total candidates selected from Jabalpur is what percent of the total candidates selected from Gwalior?

- (A) 125%
- (B) 55.55%
- (C) 225%
- (D) 44.44%



Total candidates selected from Jabalpur is what percent of the total candidates selected from Gwalior?

(M1)

- (A) 125%
- (B) 55.55%
- (C) 225%
- (D) 44.44%

Jab is $x\%$ of Gwa

$$\text{Jab} = \frac{x}{100} \times \text{Gwa}$$

$$16\% \text{ of } 54000 = \frac{x}{100} \times 36\% \text{ of } 54000$$

$$\frac{16}{100} \times 54000 = \frac{x}{100} \times \frac{36}{100} \times 54000$$

$$\cancel{\frac{16}{100}} \times 54000 = \frac{x}{100} \times \cancel{\frac{36}{100}} \times 54000$$

$$x = \frac{16}{36} \times 100$$

$$= \frac{4}{9} \times 100$$

$$= \frac{400}{9} \Rightarrow 40 \text{ to } 50$$

$$9 \times 40 = 360$$

$$9 \times 50 = 450$$

Total candidates selected from Jabalpur is what percent of the total candidates selected from Gwalior?

(M2)

Let total selected candidates from MP be 100

- (A) 125%
- (B) 55.55%
- (C) 225%
- (D) 44.44%

$$\text{Jab} = 16$$

$$\text{Gwa} = 36$$

Jab is $x\%$ of Gwa

$$\text{Jab} = \frac{x}{100} \times \text{Gwa}$$

$$\frac{\text{Jab}}{\text{Gwa}} \times 100 = x$$

$$\frac{16}{36} \times 100 = x$$

Correct Answer : Option D

Explanation –

Number of candidates selected from Jabalpur = 16% of 54000

$$16/100 * 54000 = 8640$$

Number of candidates selected from Gwalior = 36% of 54000

$$36/100 * 54000 = 19440$$

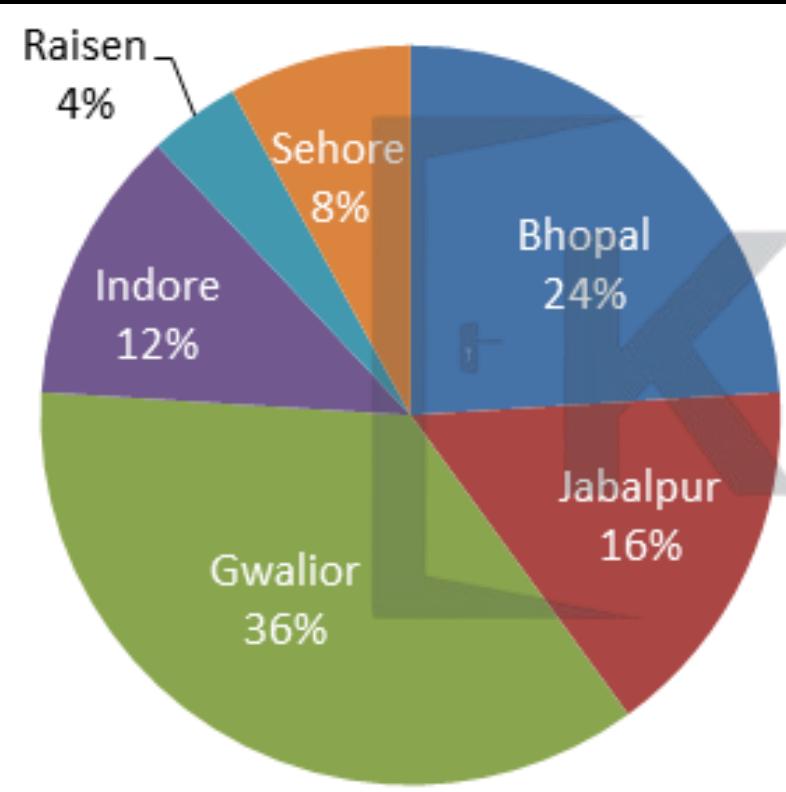
$$\text{Required \%} = 8640/19440 * 100 = 44.44\%$$

Hence, the correct option is (D).

Q3(VK). Out of total selected candidates from Gwalior, if 20% candidates are female, then find the total male candidates who are selected from Gwalior?



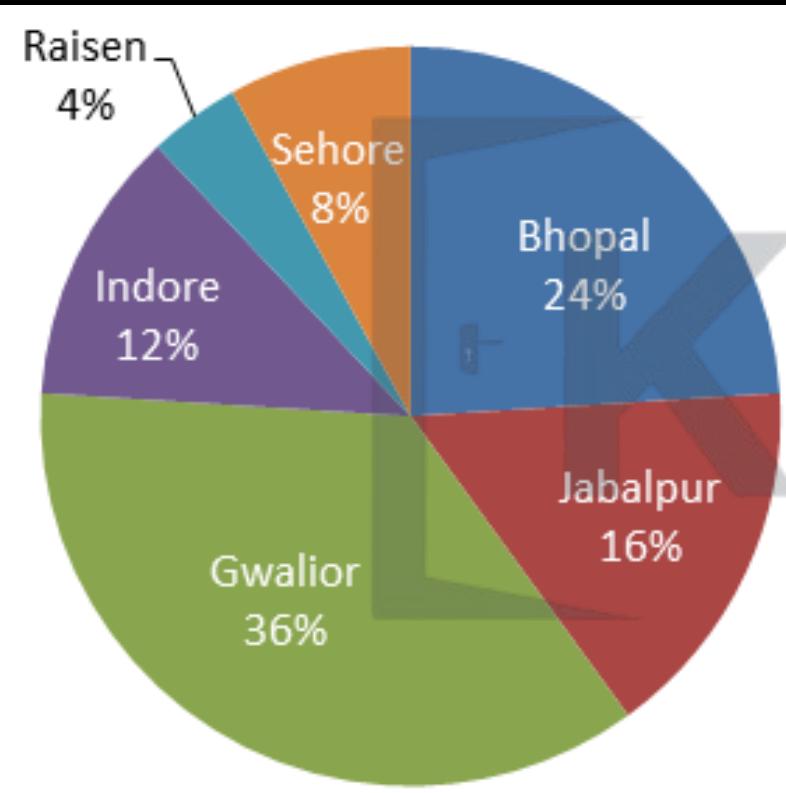
- (A) 15552
- (B) 31104
- (C) 3888
- (D) 11664



Q3(VK). Out of total selected candidates from Gwalior, if 20% candidates are female, then find the total male candidates who are selected from Gwalior?



- (A) 15552
- (B) 31104
- (C) 3888
- (D) 11664



20% female

80% male

total selected from GWA = 36% of 54000

$$= \frac{36}{100} \times 54000$$

Male Selected \Rightarrow 80% of $\left[\frac{36}{100} \times 54000 \right]$

$$= \frac{80}{100} \times \frac{36}{100} \times 54000$$

Correct Answer : Option A



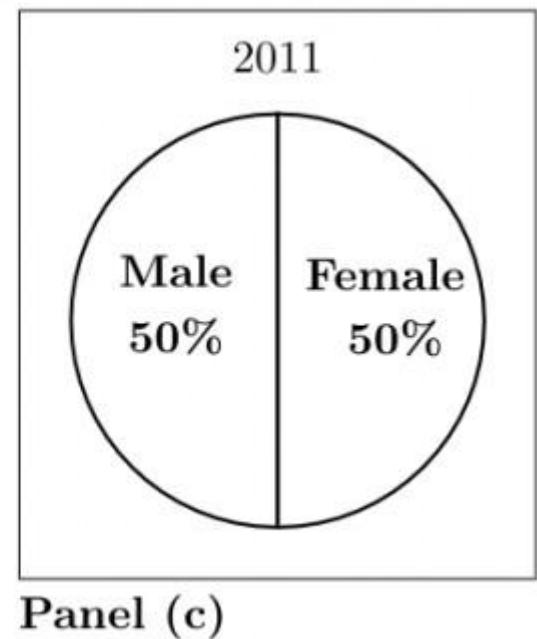
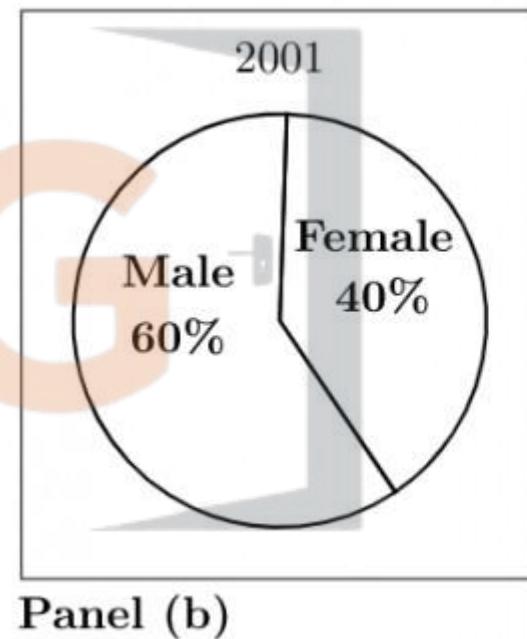
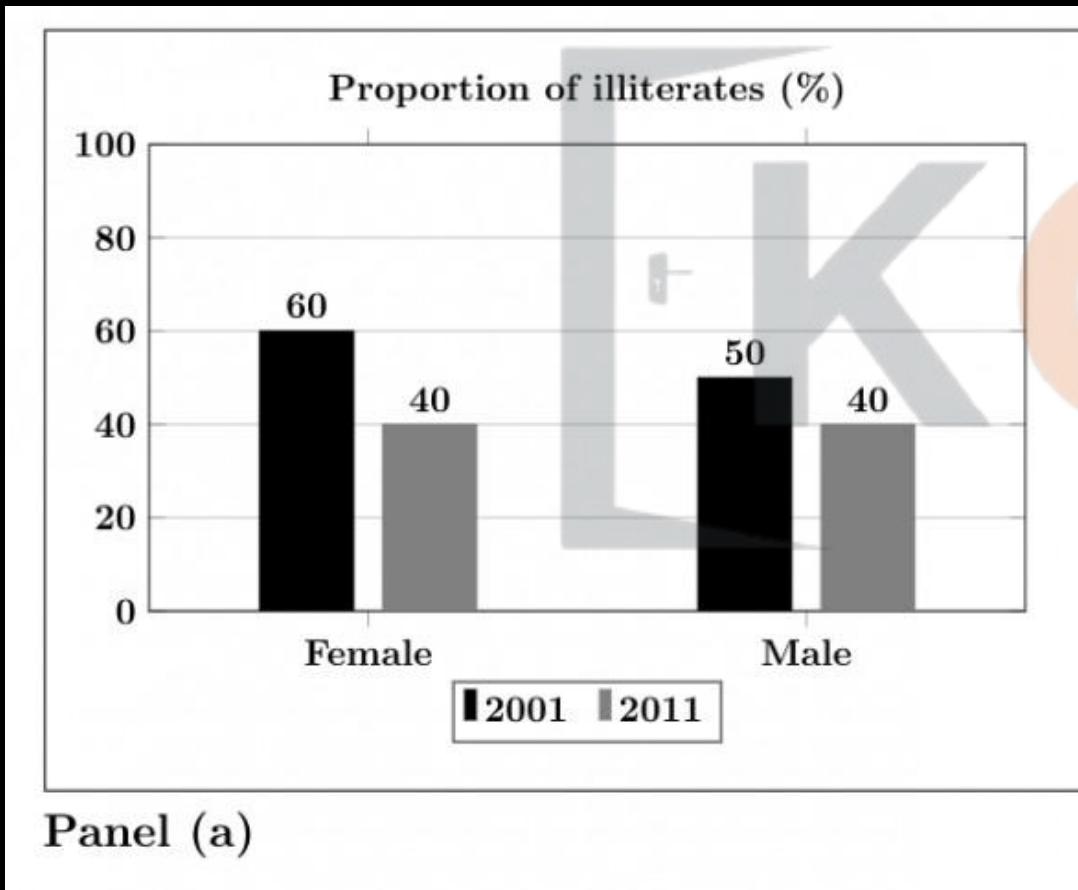
<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

BAR GRAPH

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4: The bar graph in panel (a) shows the proportion of male and female illiterates in 2001 and 2011. The proportions of males and females in 2001 and 2011 are given in Panel (b) and (c), respectively. The total population did not change during this period. The percentage increase in the total number of literates from 2001 to 2011 is _____.

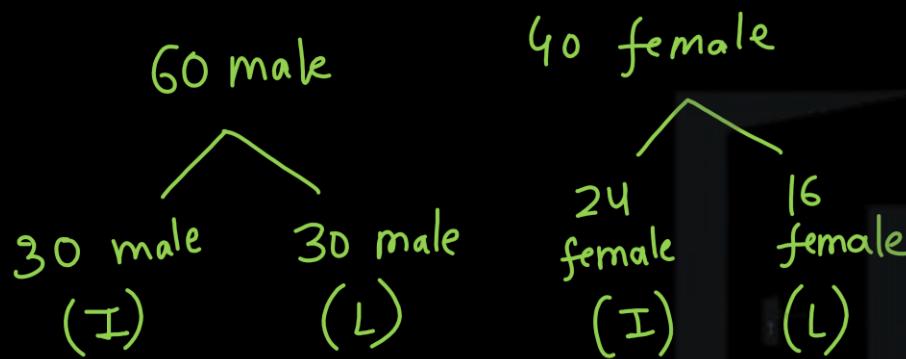
- A) 35.43
- b) 33.43
- c) 30.43
- d) 34.43



Assume 2001 or 2011

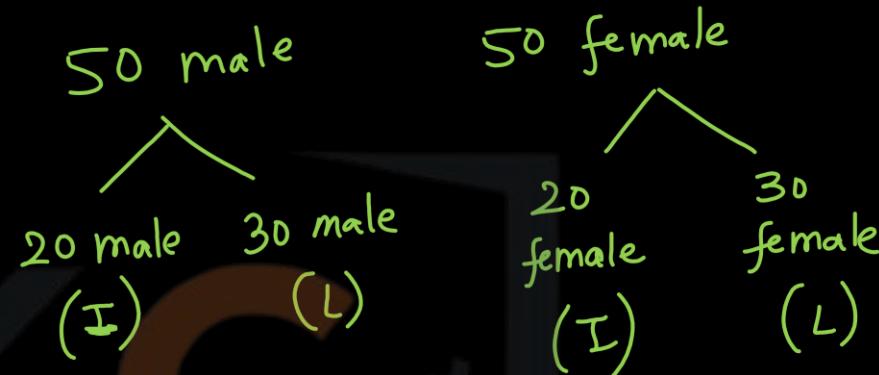
$$\boxed{\text{total} = 100}$$

2001



$$\text{Total literates} = 30 + 16 = 46$$

2011



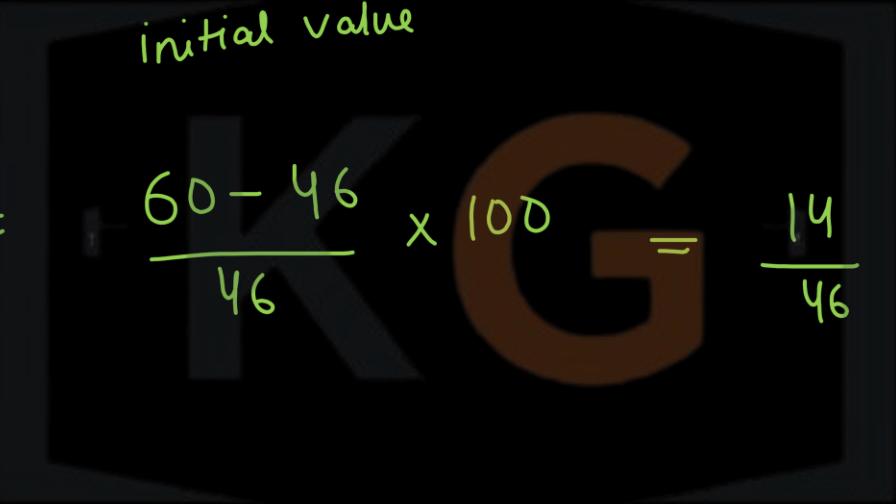
$$\text{Total literates} = 30 + 30 = 60$$

Total literates, 2001 = 46

Total literates, 2011 = 60

$$\% \text{ change} = \frac{\text{final value} - \text{initial value}}{\text{initial value}} \times 100$$

$$= \frac{60 - 46}{46} \times 100 = \frac{14}{46} \times 100 \Rightarrow \frac{14}{\cancel{46}} \times 100 = 33.33\%$$



↓
46 $\Rightarrow < 33.33\%$

Correct Answer : Option C



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

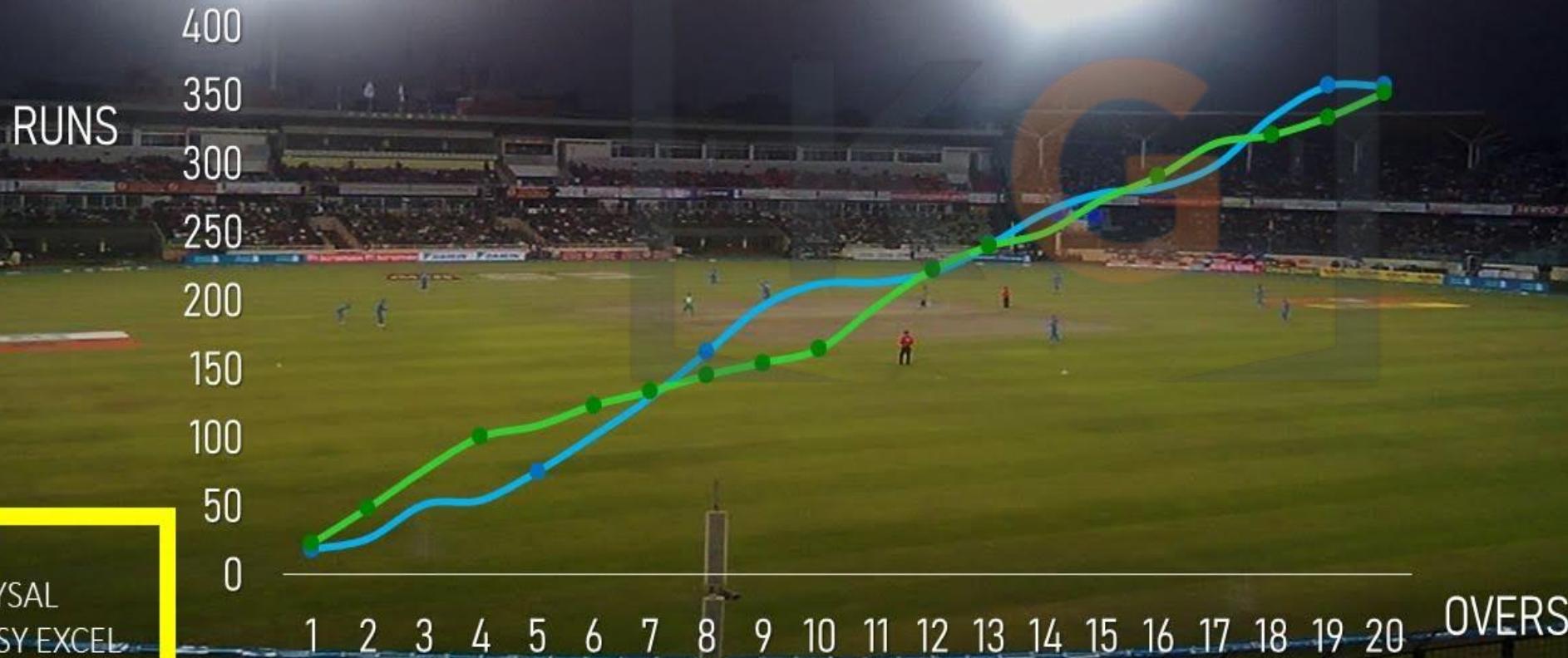
LINE GRAPH

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

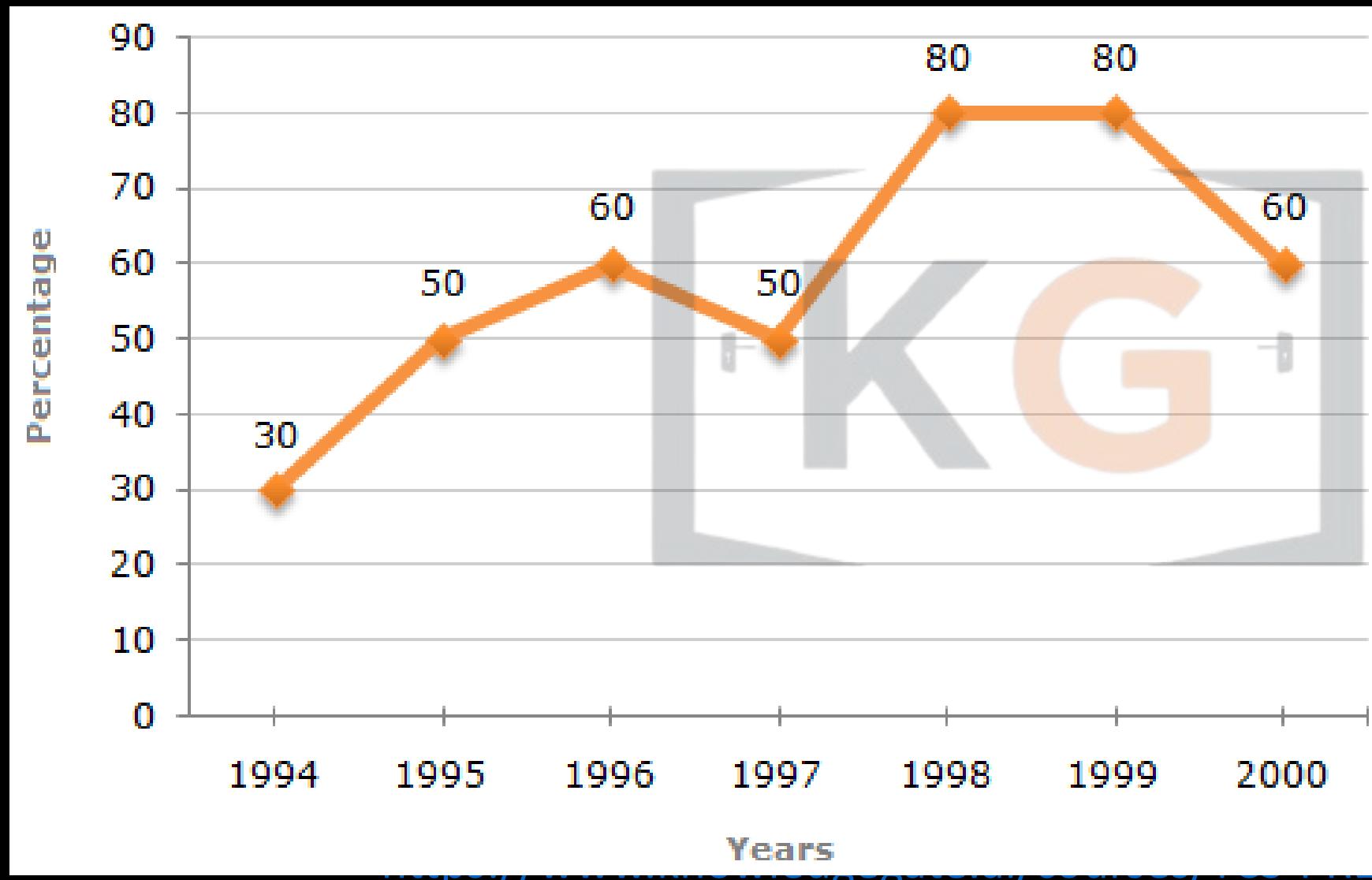
LINE GRAPH

CRICKET RUN COMPARISON LINE CHART

BANGLADESH VS INDIA, ASIA CUP FINAL 2012, DHAKA

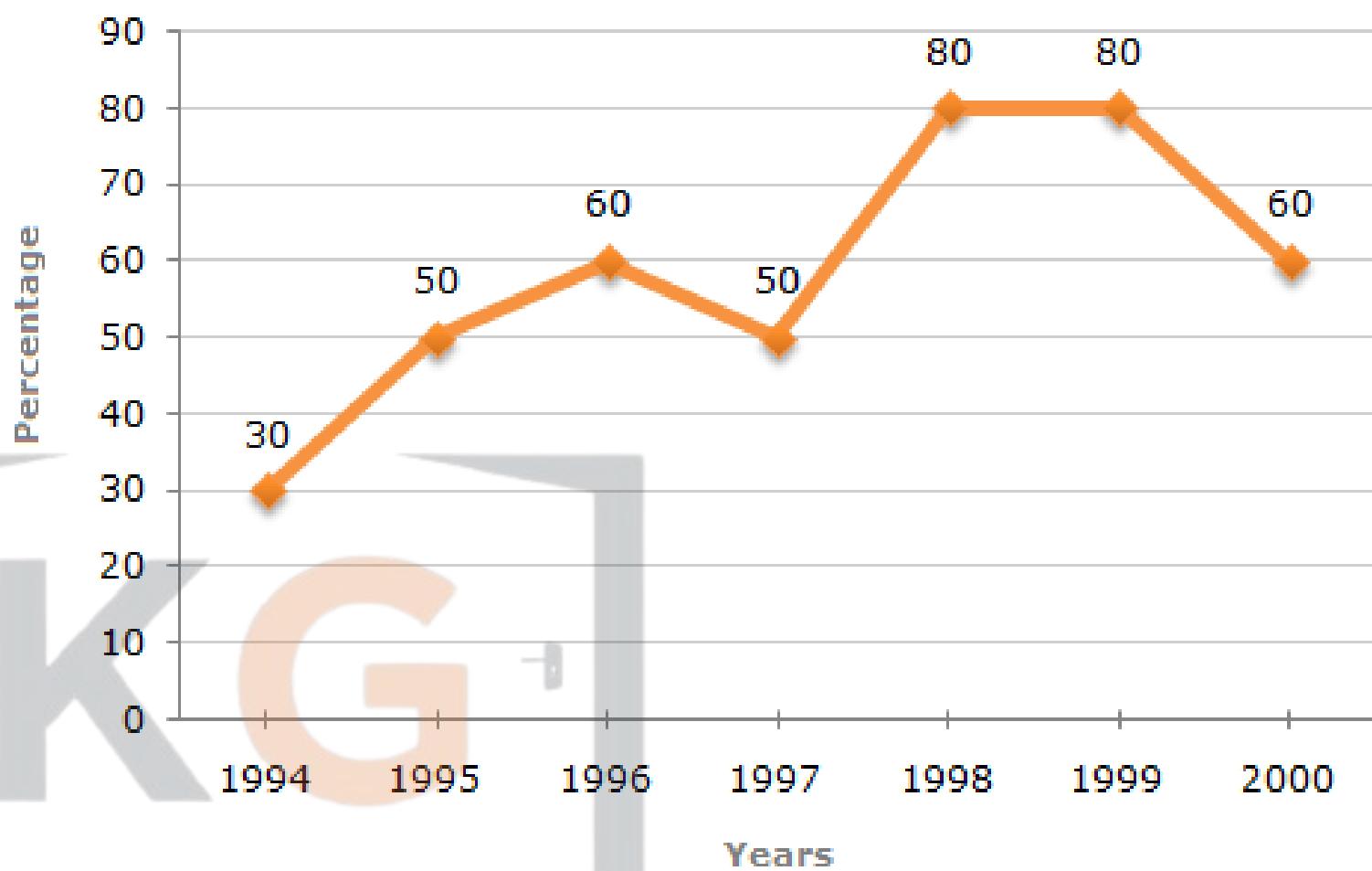


Q5: The following line graph gives the percentage of the number of candidates who qualified an examination out of the total number of candidates who appeared for the examination over a period of seven years from 1994 to 2000



The difference between the percentage of candidates qualified to appeared was maximum in which of the following pairs of years?

- A. 1994 and 1995
- B. 1997 and 1998
- C. 1998 and 1999
- D. 1999 and 2000



Answer: Option B

Explanation:

The differences between the percentages of candidates qualified to appeared for the give pairs of years are:

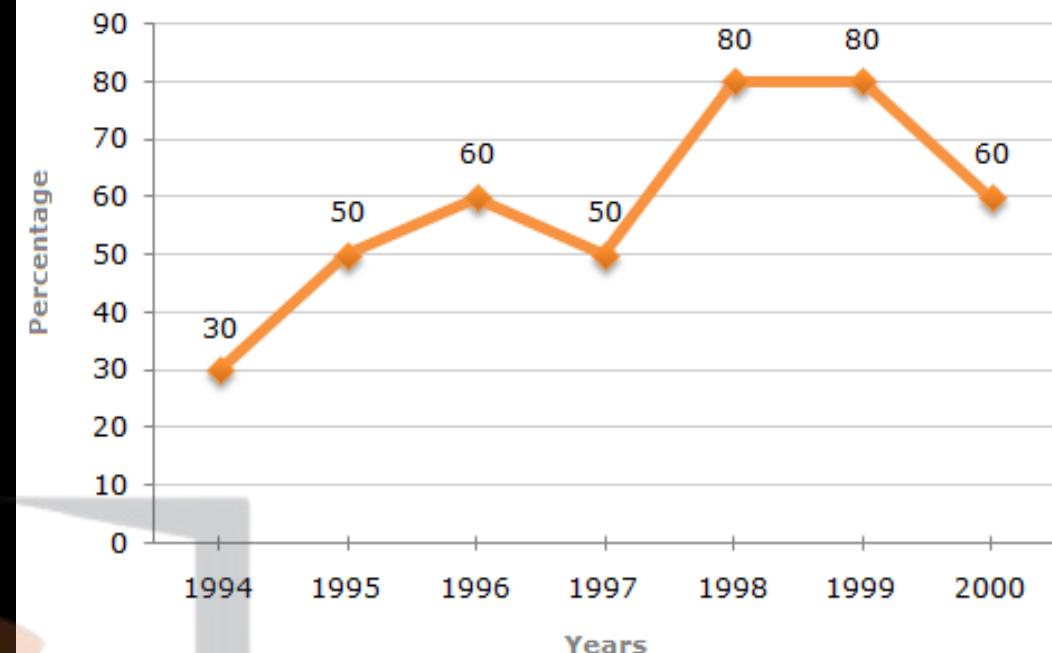
For 1994 and 1995 = $50 - 30 = 20$.

For 1998 and 1999 = $80 - 80 = 0$.

For 1994 and 1997 = $50 - 30 = 20$.

For 1997 and 1998 = $80 - 50 = 30$.

For 1999 and 2000 = $80 - 60 = 20$.



Thus, the maximum difference is between the years
1997 and 1998. <https://www.knowledgegate.ai/courses/TCS-PREPARATION>



MENSURATION & GEOMETRY

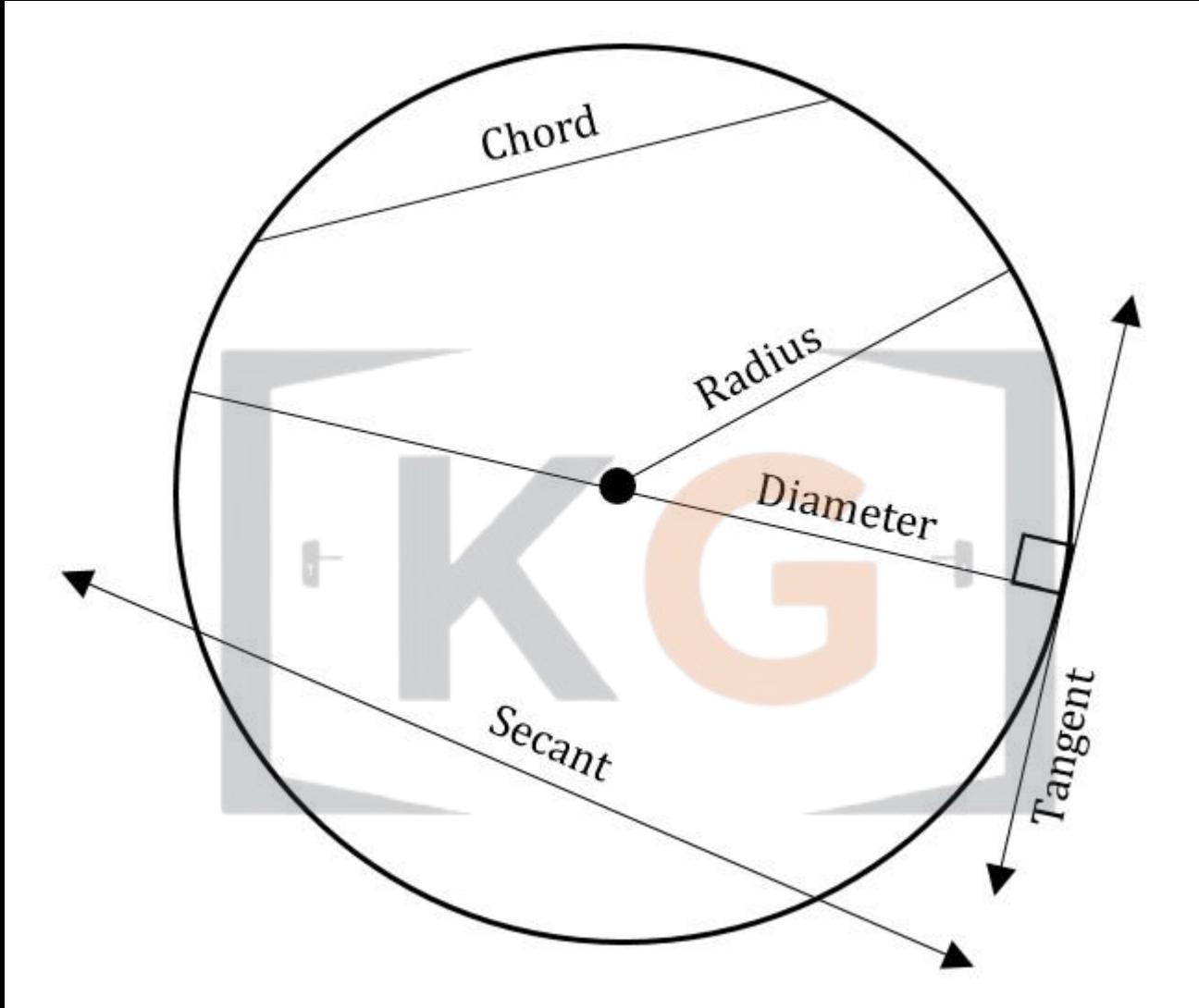
<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. Which of the following statements is incorrect in regard to a circle?



- i) Every Chord is Secant
 - ii) Every Secant is Chord
 - iii) Secant is technically not a chord, but it contains a chord.
 - iv) Every secant line defines a unique chord.
-
- a) Only ii
 - b) Only i ii & iii
 - c) Only i & ii
 - d) All are correct





Secant of a Circle

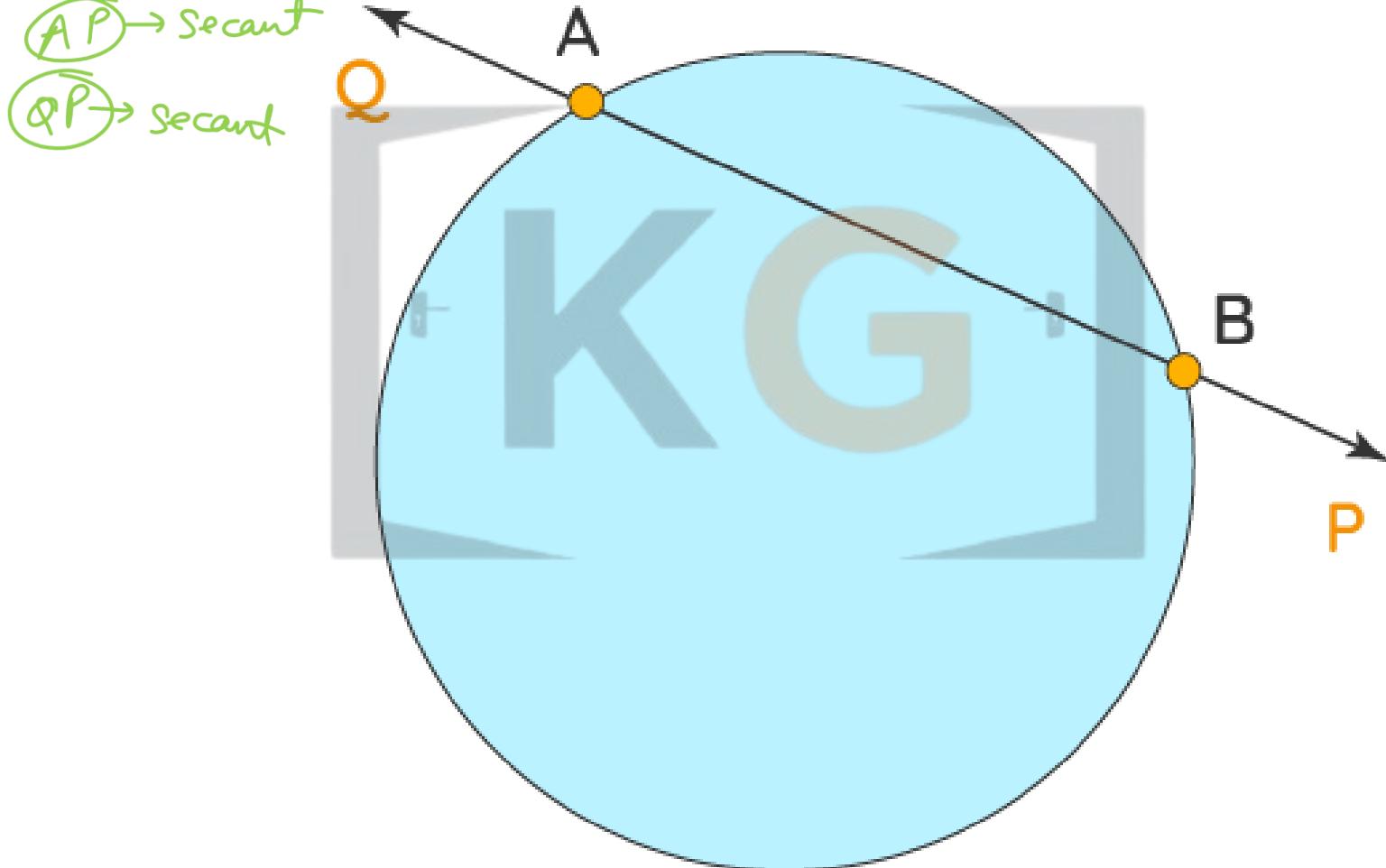
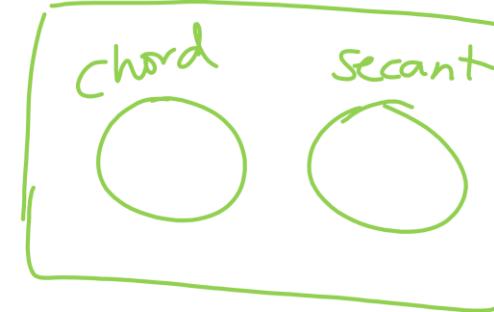
\overline{AB} → chord

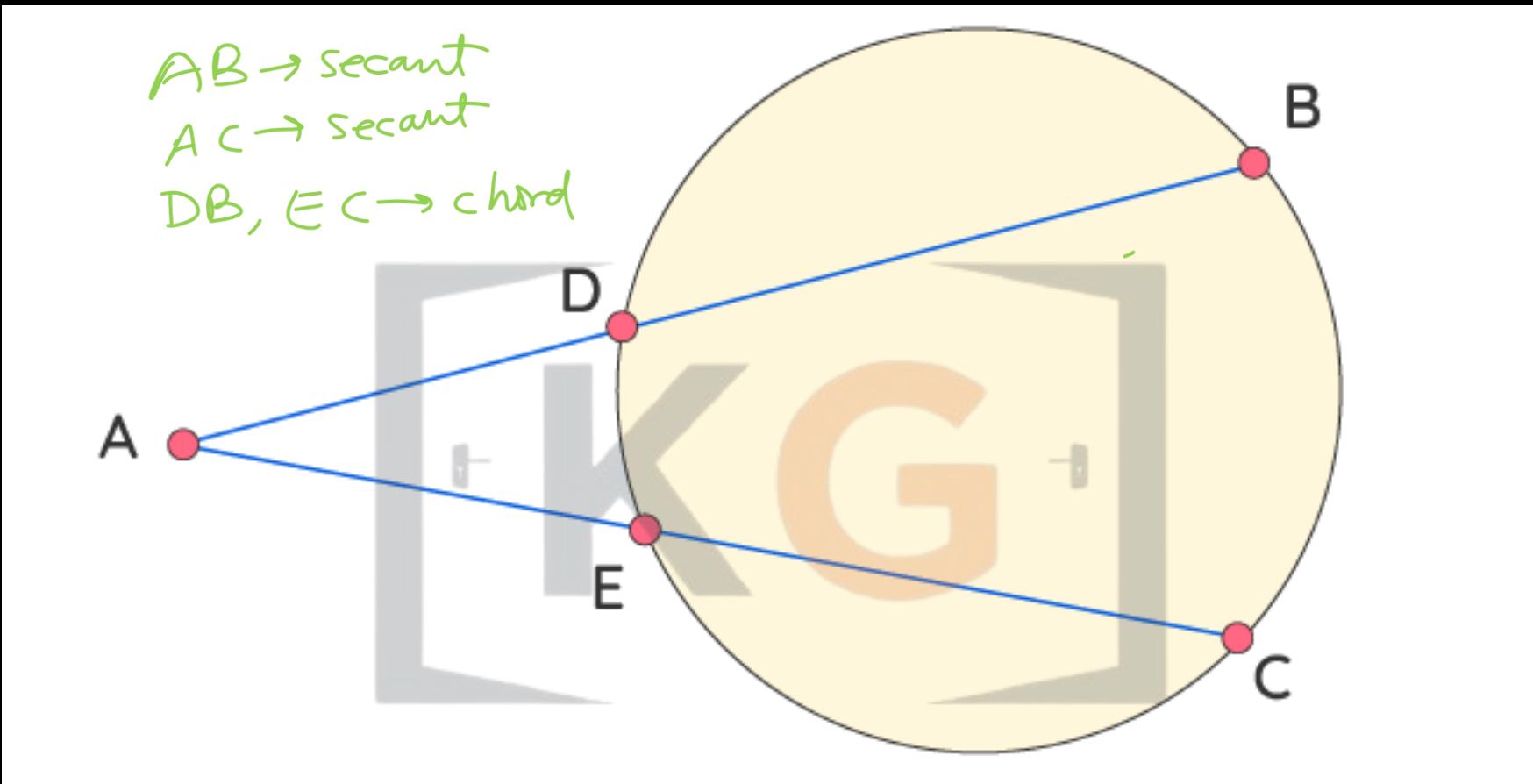
\overline{QB} → secant

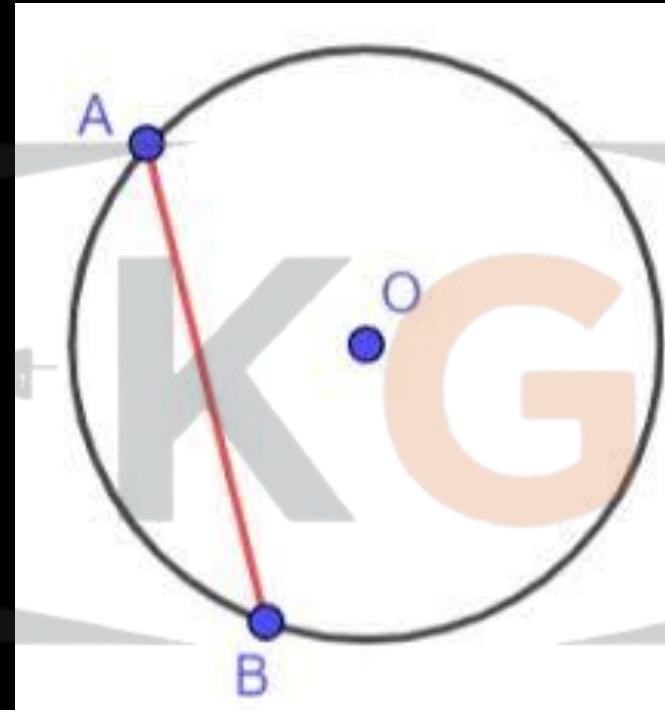
\overline{AP} → secant

\overline{QP} → secant

$\overline{QP} \rightarrow$ chord X







<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. Which of the following statements is incorrect in regard to a circle?



- i) Every Chord is Secant ✗
 - ii) Every Secant is Chord ✗
 - iii) Secant is technically not a chord, but it contains a chord. ✓
 - iv) Every secant line defines a unique chord. ✓
-
- a) Only ii
 - b) Only i ii & iii
 - c) Only i & ii ✓
 - d) All are correct

Correct Answer : Option C

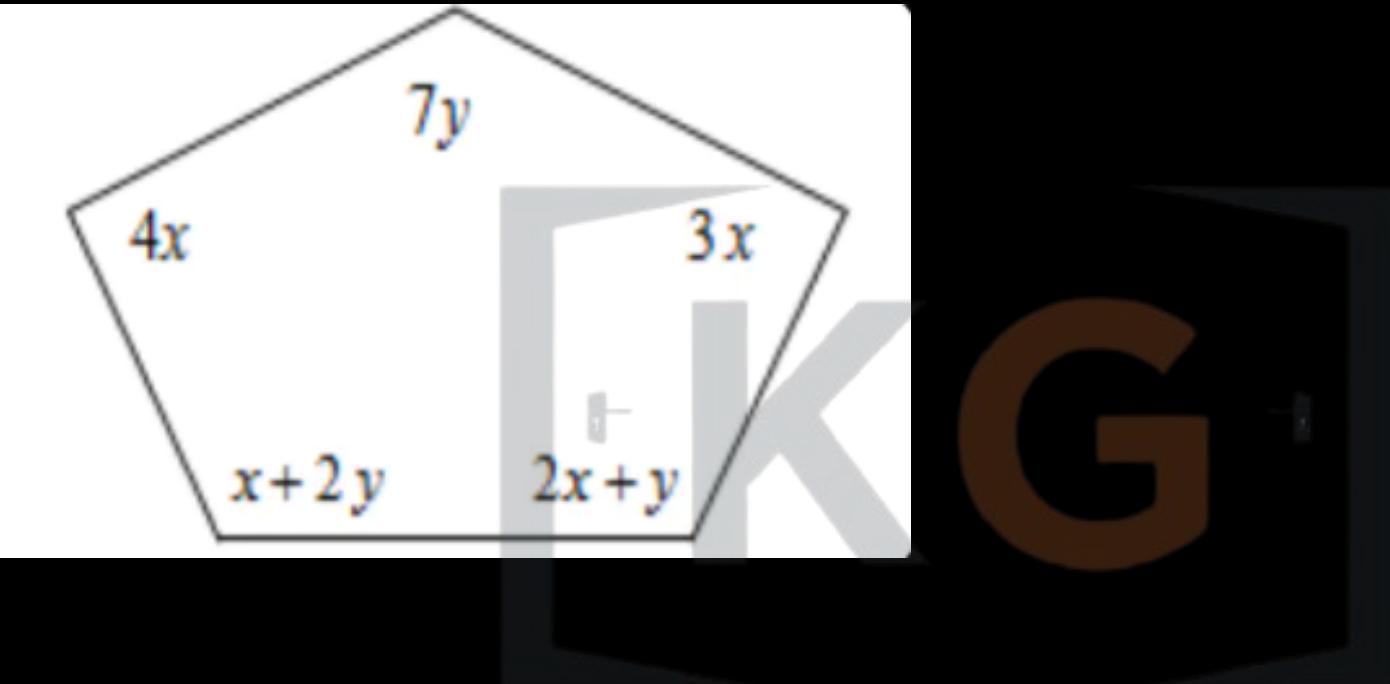


<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q2. If the expression shown are the degree measures of the angles if the pentagon, find the value $x+y$.



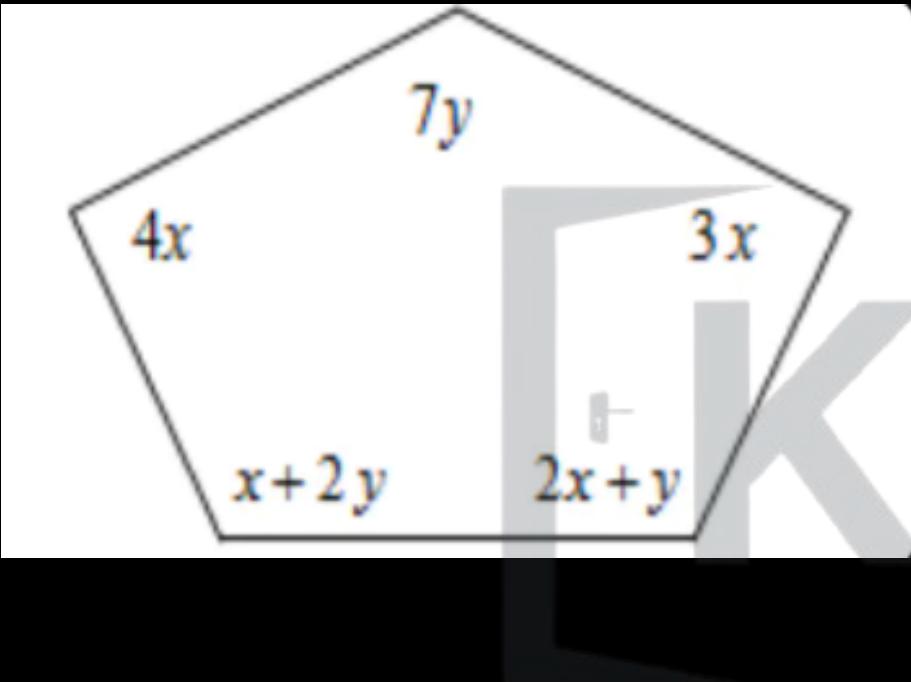
- a) 36
- b) 45
- c) 54
- d) 63



Q2. If the expression shown are the degree measures of the angles if the pentagon, find the value $x+y$.



- a) 36
- b) 45
- c) 54
- d) 63



$$\text{Interior angles sum} = (n-2) \times 180$$

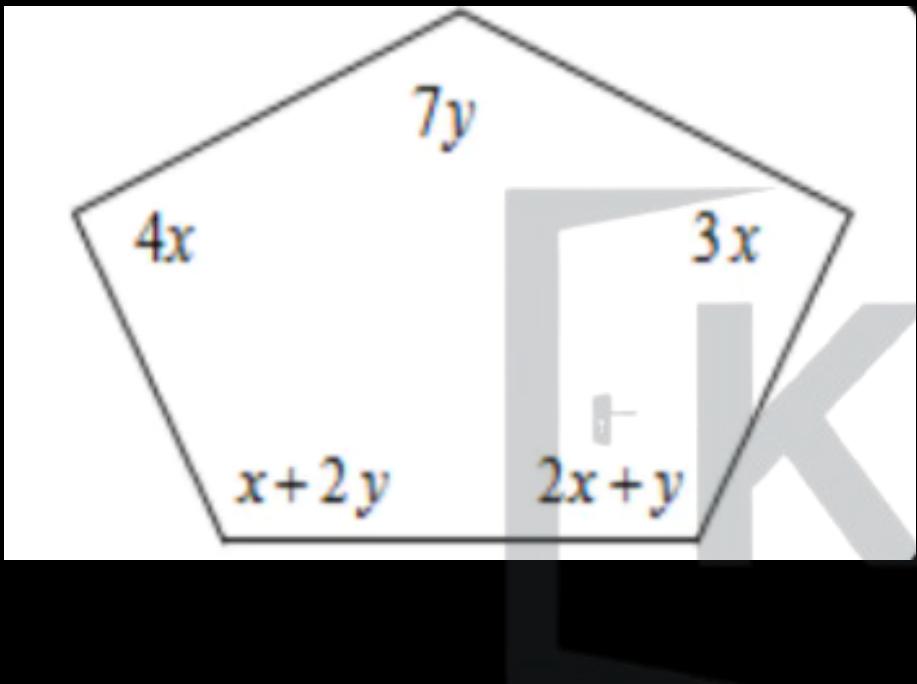
For regular polygon [all sides & angle are equal]

$$\text{Individual Angle} = \frac{(n-2) \times 180}{n}$$

Q2. If the expression shown are the degree measures of the angles if the pentagon, find the value $x+y$.



- a) 36
- b) 45
- c) 54
- d) 63



$$\text{Interior angle sum} = (n-2) \times 180^\circ$$

$$n = 5$$

$$= (5-2) \times 180^\circ$$

$$= 3 \times 180^\circ = 540^\circ$$

$$7y + 3x + (2x+y) + (x+2y) + 4x = 540^\circ$$

$$10x + 10y = 540$$

$$10[x+y] = 540 \Rightarrow x+y = \frac{540}{10}$$

$$= 54$$

Correct Answer : Option C



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q3. One angle of a regular polygon measures 177° . This polygon has a total on ‘n’ sides, ‘n’ is a multiple of which of the following numbers ?



- a) 3
- b) 4
- c) 12
- d) All of the above



Q3. One angle of a regular polygon measures 177° . This polygon has a total on 'n' sides, 'n' is a multiple of which of the following numbers ?



- a) 3
- b) 4
- c) 12
- d) All of the above

$$\text{Individual angle} = \frac{(n-2) \times 180}{n}$$

$$177 = \frac{(n-2) \times 180}{n}$$

$$177n = (n-2) \times 180$$

$$177n = 180n - 360$$

$$360 = 180n - 177n$$

$$360 = 3n$$

$$n = \frac{360}{3} = 120$$

Correct Answer : Option D



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4. Find the sum of the measures of one interior and one exterior angle of a regular 940-gon.



- a) 168°
- b) 174°
- c) 180°
- d) 186°

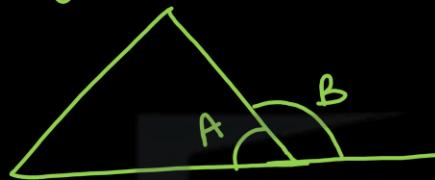


Q4. Find the sum of the measures of one interior and one exterior angle of a regular 940-gon.



a) 168°

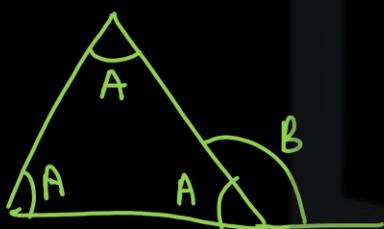
A: Interior Angle
B: Exterior Angle



b) 174°

c) 180°

d) 186°



$$A + B = 180^\circ$$

Interior + Corresponding
Exterior $= 180^\circ$

↳ valid for all polygons [regular irregular]

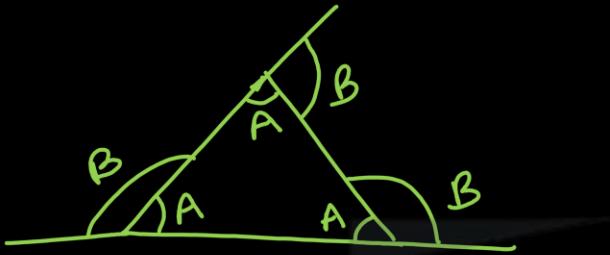
Any Interior + Any Exterior $= 180^\circ$

↳ Valid only for regular polygons

Q4. Find the sum of the measures of one interior and one exterior angle of a regular 940-gon.



- a) 168°
- b) 174°
- c) 180°
- d) 186°



Regular Polygon

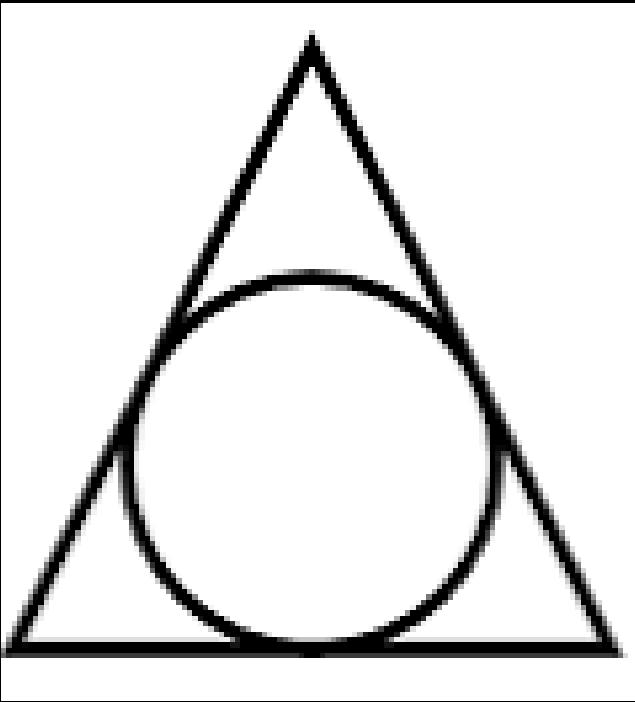
- ① All sides equal
- ② All interior angles equal
- ③ All exterior angles equal

Correct Answer : Option C



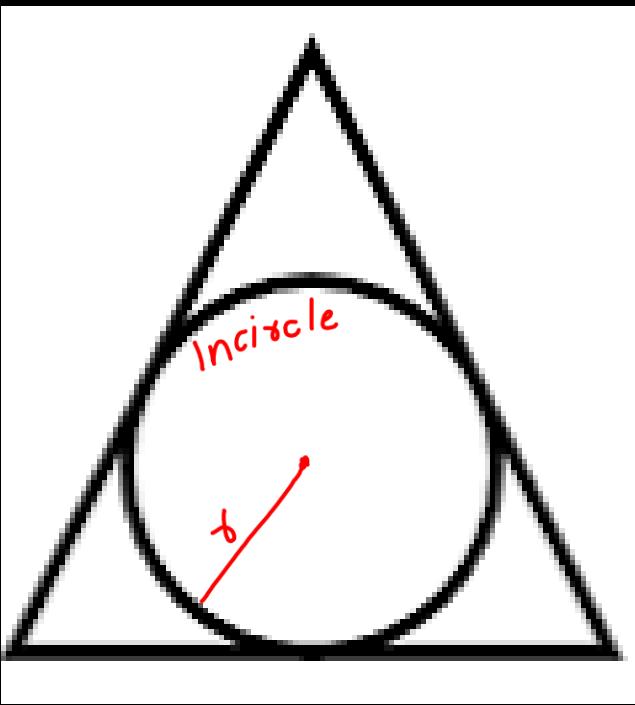
<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q5. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?



Q5. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?

Infosys®



r : inradius

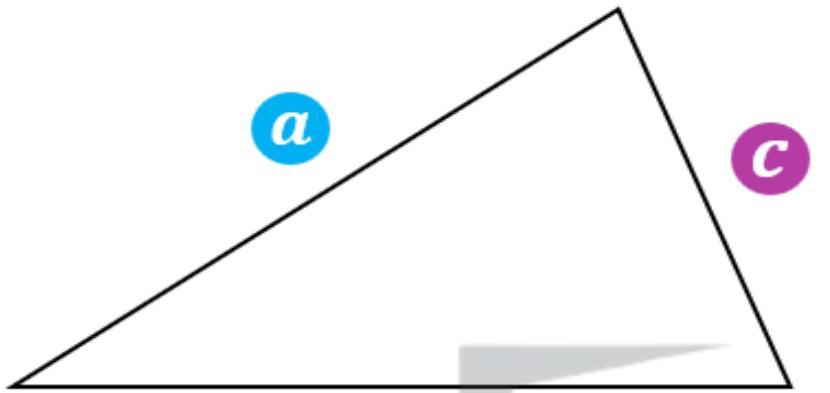
$$r = \frac{\text{Area of } \triangle}{\text{Semi perimeter of } \triangle}$$

$$\text{Semi - perimeter} = \frac{\text{Perimeter}}{2}$$

$$\begin{array}{c} a \\ b \\ \backslash \\ \triangle \\ / \\ c \end{array}$$
$$\text{Perimeter} = a + b + c$$

$$S = \frac{a+b+c}{2}$$

Heron's Formula

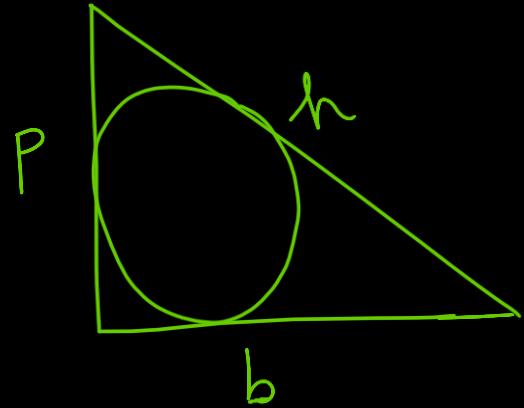


$$A = \sqrt{s(s - a)(s - b)(s - c)}$$

WHERE $s = \frac{a + b + c}{2}$

s = semi-perimeter

Q5. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?



$$r = \text{Inradius} = \frac{\text{area}}{\text{Semi perimeter}} = \frac{\frac{1}{2} \times b \times P}{\frac{b+p+h}{2}}$$

$$r = \frac{b+p-h}{2}$$

$$r = \frac{bp}{b+p+h}$$

$$= \frac{bp}{\text{Perimeter}}$$

Q5. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?

$$b = 8 \quad p = 15 \\ h = 17$$

In right angled triangle , $h^2 = b^2 + p^2$

$$(17)^2 = (15)^2 + 8^2$$
$$289 = 225 + 64$$
$$\boxed{289 = 289}$$

$$r = \frac{bp}{b+p+h} \quad \begin{array}{c} 15 \\ | \\ 17 \\ | \\ 8 \end{array}$$

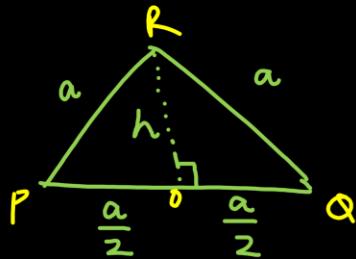
$$= \frac{8 \times 15}{8 + 15 + 17} = \frac{8 \times 15}{40}$$

$$= 3$$

$$r = \frac{b+p-h}{2} = \frac{8+15-17}{2}$$
$$= \frac{6}{2} = 3$$

Q. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?

Equilateral Triangle



$\triangle QOR$

$$a^2 = h^2 + \left(\frac{a}{2}\right)^2$$

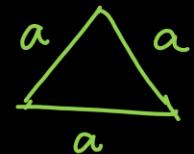
$$a^2 = h^2 + \frac{a^2}{4}$$

$$\begin{aligned} h^2 &= a^2 - \frac{a^2}{4} \\ &= \frac{3a^2}{4} \end{aligned}$$

$$h = \sqrt{\frac{3a^2}{4}} = \frac{\sqrt{3}a}{2}$$

$$\gamma = \frac{\text{area}}{\text{Semi perimeter}} = \frac{\frac{\sqrt{3}a^2}{4}}{\frac{a+a+a}{2}} = \frac{\sqrt{3}a^2}{2 \times 3a}$$

$$\gamma = \frac{a}{2\sqrt{3}}$$



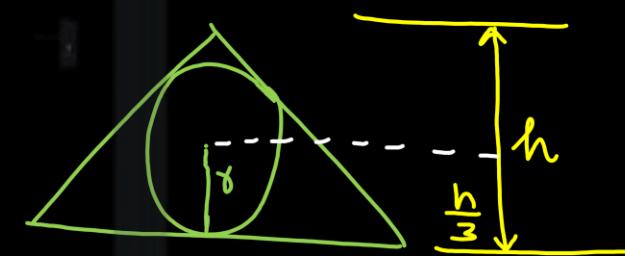
Q. What is the measure of the radius of the circle inscribed in a triangle whose sides measure 8, 15 and 17 units?

$$h = \frac{\sqrt{3}a}{2}$$

$$a = \frac{2h}{\sqrt{3}}$$

$$\begin{aligned} r &= \frac{a}{2\sqrt{3}} = \frac{\frac{2h}{\sqrt{3}}}{2\sqrt{3}} \\ &= \frac{2h}{2\sqrt{3} \cdot \sqrt{3}} = \frac{h}{3} \end{aligned}$$

$$r = \frac{h}{3}$$



Q6 (VK). Find the radius of the circle inscribed in the triangle ABC, having sides 10 cm, 10cm and 16 cm . 

- A. 5
- B. 1.77
- C. 2.66
- D. 3.8



Q6 (VK). Find the radius of the circle inscribed in the triangle ABC, having sides 10 cm, 10cm and 16 cm .



A. 5

B. 1.77

C. 2.66

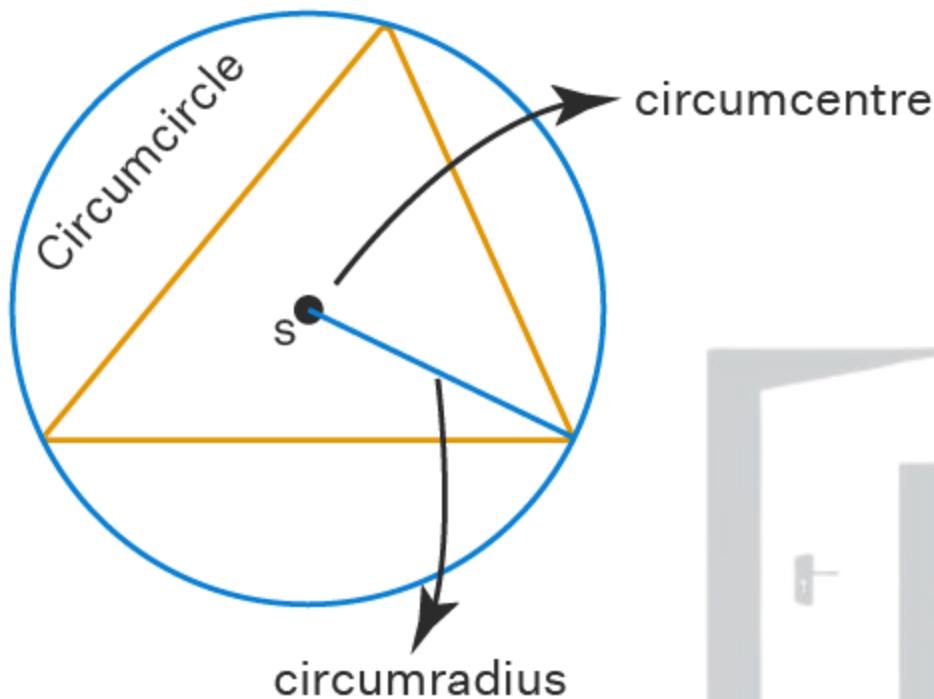
D. 3.8



Correct Answer : Option C



Circumcircle

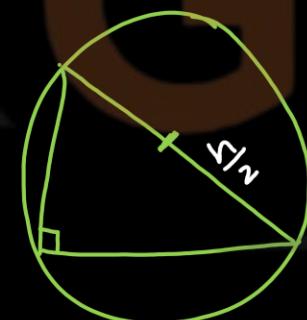


Circumradius = $\frac{\text{Product of sides of } \triangle}{4 * \text{Area of } \triangle}$

$$R = \frac{abc}{4 * A_{\triangle}}$$

right angled triangle

$$R = \frac{b \cdot p \cdot h}{4 * \frac{1}{2} \cdot b \cdot p} = \frac{h}{2}$$



$$R = \frac{\text{hypotenuse}}{2}$$

Equilateral triangle

$$R = \frac{\text{Product of sides}}{4 * \text{Area}}$$

$$= \frac{a \cdot a \cdot a}{4 \cdot \frac{\sqrt{3} a^2}{4}} = \frac{a}{\sqrt{3}}$$

$$R = \frac{\text{Side}}{\sqrt{3}}$$



PROFIT & LOSS

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

① Max Retail Price (MRP), Marked Price (MP),
Catalogue Price, List Price = Rs. 475

② Selling Price, SP = Rs. 390

③ Discount = MP - SP = 475 - 390 = Rs. 85

④ Cost Price, CP = Rs. 350

⑤ Profit = SP - CP = 390 - 350 = Rs. 40
(SP > CP)



$$CP = \text{Rs. } 400$$

$$\begin{aligned} \text{Loss} &= CP - SP = 400 - 390 \\ &= \text{Rs. } 10 \\ &\quad ((CP > SP)) \end{aligned}$$

⑥ Profit & Loss is always calculated on CP.

⑦ Discount is always calculated on MP.

⑧ $\% = \frac{\text{obtain}}{\text{Total}} \times 100$

$$D = \frac{D\% \times MP}{100}$$

↑

$$P\% = \frac{P}{CP} \times 100$$

$$L\% = \frac{L}{CP} \times 100$$

$$D\% = \frac{D}{MP} \times 100$$

$$\hookrightarrow P = \frac{P\% \times CP}{100}$$

$$L = \frac{L\% \times CP}{100}$$

$$P = SP - CP$$

$$SP = CP + P$$

$$= CP + \frac{P\% \times CP}{100}$$

$$= CP \left[1 + \frac{P\%}{100} \right] \Rightarrow CP \left[\frac{100}{100} + \frac{P\%}{100} \right]$$

$$\boxed{SP = CP \left[\frac{100 + P\%}{100} \right]}$$

$$L = CP - SP$$

$$SP = CP - L$$

$$= CP - \frac{L\% \times CP}{100}$$

$$= CP \left[1 - \frac{L\%}{100} \right]$$

$$= CP \left[\frac{100}{100} - \frac{L\%}{100} \right]$$

$$\boxed{SP = CP \left[\frac{100 - L\%}{100} \right]}$$

$$D = MP - SP$$

$$SP = MP - D$$

$$= MP - \frac{D\% \times MP}{100}$$

$$= MP \left[1 - \frac{D\%}{100} \right]$$

$$= MP \left[\frac{100}{100} - \frac{D\%}{100} \right]$$

$$SP = MP \left[\frac{100 - D\%}{100} \right]$$



25% Profit

$$CP = 100\%$$

$$SP = CP + P$$

$$= 100\% + 25\%$$

$$= 125\%$$

$$SP = 125\% \text{ of } CP$$

$$SP = \frac{125}{100} \times CP$$

$$SP = \left(\frac{100 + 25}{100} \right) CP$$

$$SP = \left(\frac{100 + P\%}{100} \right) CP$$

25% Loss

$$SP = (100 - 25)\% \text{ of } CP$$

$$SP = 75\% \text{ of } CP$$

25% discount

$$MP = 100\%$$

$$SP = (100 - 25)\% \text{ of } MP$$

$$\boxed{SP = 75\% \text{ of } MP}$$

$$\frac{75}{100} \times MP$$

$$\frac{100 - 25}{100} \times MP$$

$$SP = \frac{100 - d\%}{100} \times MP$$

- ① Profit % → added to 100
- ② Loss % → subtracted from 100
- ③ Discount % → Subtracted from 100

Q1. Find the cost price of Amul Paneer which is sold at Rs. 300 at a loss of 25%?



Q1. Find the cost price of Amul Paneer which is sold at Rs. 300 at a loss of 25%?

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

$$L = 25\%$$

$$M1 \quad SP = CP \left(\frac{100 - L\%}{100} \right)$$

$$300 = CP \left(\frac{100 - 25}{100} \right)$$

$$300 = CP \times \frac{75}{100}$$

$$CP = 400$$

M2

$SP = 75\% \text{ of } CP$

$$300 = \frac{75}{100} \times CP$$

$$CP = 400$$

M3

$$CP = \text{Rs. } 100$$

$$L = \text{Rs. } 25$$

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

$$\xrightarrow{\times 4} 400 \text{ Rs.}$$

$$\xrightarrow{\times 4} 100 \text{ Rs.}$$

$$\xrightarrow{\times 4} 300 \text{ Rs.}$$

Q1. Find the cost price of Amul Paneer which is sold at Rs. 300 at a loss of 25%?

$$\text{L.P.} = 25\% = \frac{25}{100} = \frac{1}{4}$$

L
CP

Mu

$$CP = \text{Rs. } 4 \xrightarrow{\times 100} \text{Rs. } 400$$

$$L = \text{Rs. } 1 \xrightarrow{\times 100} \text{Rs. } 100$$

$$SP = \text{Rs. } 3 \xrightarrow{\times 100} \text{Rs. } 300$$

Answer: Rs.400

Q2. The cost price of an article is Rs. 560 and Munna Bhaiya sells it at profit of 12.5%. Find the selling price?

Me : Thukra ke mera pyaar mera
inteqam dekhegii..

She : Kaise ???

Me :

Translate Tweet



Matlab Aisa bilkul immediate nahi
soche hain but.. sochenge

Q2. The cost price of an article is Rs. 560 and Munna Bhaiya sells it at profit of 12.5%. Find the selling price?

Me : Thukra ke mera pyaar mera
inteqam dekhegii..

She : Kaise ???

Me :

Translate Tweet



$$CP = 560$$
$$P = 12.5\%$$

$$P = 12.5\% \text{ of } 560$$

$$SP = CP + P$$

Q2. The cost price of an article is Rs. 560 and Munna Bhaiya sells it at profit of 12.5%. Find the selling price?

$$P\% = 12.5\% = \frac{12.5}{100} = \frac{1}{8}$$

$\swarrow P$
 $\searrow CP$

$$CP = \text{Rs. } 8 \xrightarrow{\times 70} \text{Rs. } 560$$

$$P = \text{Rs. } 1 \xrightarrow{\times 70} \text{Rs. } 70$$

$$SP = \text{Rs. } 9 \xrightarrow{\times 70} \text{Rs. } 630$$

$$8 \rightarrow 560$$

$$1 \rightarrow \frac{560}{8}$$

$$1 \rightarrow 70$$

Answer: Rs.630

Q3. A mobile costing Rs. 24000 is sold and a profit of 10% is received.
Find selling price of mobile.



Q3. A mobile costing Rs. 24000 is sold and a profit of 10% is received.
Find selling price of mobile.

$$CP = \text{Rs. } 24000$$

$$P = 10\% = \text{Rs. } 2400$$

$$SP = 24000 + 2400 = \text{Rs. } 26400$$

Answer: Rs.26400

Q4. A bicycle has a cost price of Rs. 3000 and is sold at a loss of 15%.
Find the selling price.



Q4. A bicycle has a cost price of Rs. 3000 and is sold at a loss of 15%. Find the selling price.

$$CP = \text{Rs. } 3000$$

$$L = 15\% = \text{Rs. } 450$$

$$SP = 3000 - 450 = \text{Rs. } 2550$$

Answer: Rs.2550

Q5. An item is sold for Rs.240 thereby getting a profit of 20%.
Find cost price of item.



Q5. An item is sold for Rs.240 thereby getting a profit of 20%.
Find cost price of item.

$$P = 20\% = \frac{20}{100} = \frac{1}{5}$$

P
 \swarrow \searrow
 CP

$$CP = Rs. 5 \xrightarrow{\times 40} Rs. 200 \quad \checkmark$$

$$P = Rs. 1 \xrightarrow{\times 40} Rs. 40$$

$$SP = Rs. 6 \xrightarrow{\times 40} 240$$

Answer: Rs.200

Q6 (VK). An iron is sold for Rs.315 and incurred a loss of 10%. Find the cost price of iron.



Answer: Rs.350



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

FALSE WEIGHT PROBLEMS



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q7. A shopkeeper sells items at cost price but he uses a weight of 920 gram for 1 Kg. Find his gain percent.



Q7. A shopkeeper sells items at cost price but he uses a weight of 920 gram for 1 Kg. Find his gain percent.



$$P = 80 \text{ gm}$$

$$CP = 920 \text{ gm}$$

$$P\% = \frac{\text{Error}}{\text{Act wt}} \times 100$$

$$P\% = \frac{P}{CP} \times 100$$

$$\begin{aligned} &= \frac{80}{920} \times 100 \\ &= 8.69\% \end{aligned}$$

$$\frac{80 \text{ gm}}{1000 \text{ gm}} \times 100$$

= 8%. profit \times

Answer: 8.69%

Q8. If in place of 1 kg weight, a weight of 800 grams is used and the goods are sold at cost price, find the profit percent.



Q8. If in place of 1 kg weight, a weight of 800 grams is used and the goods are sold at cost price, find the profit percent.

$$P\% = \frac{200 \text{ gm}}{800 \text{ gm}} \times 100$$
$$= 25\%$$

$$P\% = \frac{P}{CP} \times 100$$



Answer: 25%

Q9. A dealer sells items at 20% profit and also uses a weight which is 10% less than actual, find his net profit percent.



Q9. A dealer sells items at 20% profit and also uses a weight which is 10% less than actual, find his net profit percent.



$$P\% = \frac{P}{CP} \times 100 = \frac{\frac{20\% + 10\%}{90\%}}{\times 100} = \frac{30\%}{90\%} \times 100 = 33.33\%$$

Answer: 33.33%

Q9. A dealer sells items at 20% profit and also uses a weight which is 10% less than actual, find his net profit percent.



$$P\% = \frac{P}{CP} \times 100 = \frac{20\% + 10\%}{90\%} \times 100 = \frac{30\%}{90\%} \times 100$$

$$P\% = \frac{(20\%) + (10\%)}{100 - \% \text{ less in weight}} \times 100$$

(20%) + (10%)

External Profit% + % less in weight

(100 - 10%)

Answer: 33.33%

Q10. Peter buys a brand new Honda bicycle for Rs. 800/-. He uses it for a year and then sells it. He makes a profit of 10% in this transaction. Then again he buys a new cycle but finds that the price has gone up by 20 %. He uses it for a year and then sells it for a profit of 30%. Find the average annual profit of Peter.

- A. 368
- B. 250
- C. 184
- D. 278



Q10. Peter buys a brand new Honda bicycle for Rs. 800/- . He uses it for a year and then sells it. He makes a profit of 10% in this transaction. Then again he buys a new cycle but finds that the price has gone up by 20 %. He uses it for a year and then sells it for a profit of 30%. Find the average annual profit of Peter. $10\% = 96$

$$800 \xrightarrow{10\%} + \frac{800}{80} \boxed{}$$

$$800 \xrightarrow{20\%} + \frac{800}{160} 960 \xrightarrow{30\%} \boxed{}$$

$$\begin{array}{r} 96 \\ \times 3 \\ \hline 288 \end{array}$$

$$\begin{array}{r} 960 \\ \hline 288 \\ \boxed{} \end{array}$$

Total profit in 2 years = $80 + 288 = 368$

Average annual profit = $\frac{368}{2} = \text{Rs. } 184$

Q10. Peter buys a brand new Honda bicycle for Rs. 800/-. He uses it for a year and then sells it. He makes a profit of 10% in this transaction. Then again he buys a new cycle but finds that the price has gone up by 20 %. He uses it for a year and then sells it for a profit of 30%. Find the average annual profit of Peter.

- A. 368
- B. 250
- C. 184 ✓
- D. 278



Correct Answer : Option C

Explanation :

CP of first bicycle – 800, SP of first bicycle - 880

CP of second bicycle - 960

SP of second bicycle - $960 + 0.30 \times 960 = 1248$

Total profit in 2 years = $880 + 1248 - 800 - 960 = 368$, profit in 1 year = 184



RATIO & PROPORTION

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

What is a Ratio ?

$\frac{a}{b}$ = Fraction, Ratio a:b a to b

a: Numerator | First term | antecedant

b: Denominator | second term | consequent

What is a Ratio ?

Definition of Ratio

Ratio is the comparison of two or more numbers in terms of 'how many times'.

In certain situations, the comparison of two quantities by the method of division is very efficient. We can say that the comparison or simplified form of two quantities of the same kind is referred to as ratio. This relation gives us how many times one quantity is equal to the other quantity. In simple words, the ratio is the number which can be used to express one quantity as a fraction of the other ones.

The two numbers in a ratio can only be compared when they have the same unit. We make use of ratios to compare two things. **The sign used to denote a ratio is ‘::’.**



For Example: Popatlal purchased dozen of lemon worth Rs. 20 and dozen of apples worth Rs. 100. Now suppose we need to compare the cost of apples and lemon.

Therefore, Cost of Apples/ Cost of Lemons = $100/20$ = 5

Hence we can conclude that apples are 5 times more expensive than lemon.

$$\frac{20}{100} = \frac{1}{5}$$

lemon apple
1 : 5

What is a Ratio ?

Definition of Ratio

Ratio is the comparison of two or more numbers in terms of 'how many times'.

In certain situations, the comparison of two quantities by the method of division is very efficient. We can say that the comparison or simplified form of two quantities of the same kind is referred to as ratio. This relation gives us how many times one quantity is equal to the other quantity. In simple words, the ratio is the number which can be used to express one quantity as a fraction of the other ones.

The two numbers in a ratio can only be compared when they have the same unit. We make use of ratios to compare two things. **The sign used to denote a ratio is ‘::’.**

A ratio can be written as a fraction, say $2/5$, or can be represented by using “to”, as “2 to 5” or as 2:5. We happen to see various comparisons or say ratios in our daily life.

Ratio is denoted as “ $a:b$ ” or “ a/b ” or “ a to b ” where ‘ a ’ is called the first term or numerator or **antecedent** and b is called the second term or denominator or **consequent**.

Comparison of same item must be done in ratio. A Kilogram can't be compared with a gram. Similarly you cannot compare money with weights.

PROPERTIES OF RATIO

1. If we multiply or divide the numerator and denominator of a ratio by the same number, the ratio does not change.

Example: $3 / 4 = 0.75$

$3 * 2 / 4 * 2 = 6 / 8 = 0.75$ (Numerator and denominator multiplied by 2, and there is no change in ratio)

Ratio remains unchanged if both antecedent and consequent are multiplied by same number.

EQUIVALENCE RATIO PROPERTY



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(p + r + t) / (q + s + u)$?

A. $2 : 3$

B. $3 : 8$

C. $1 : 4$

D. $4 : 5$



Q1. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(p + r + t) / (q + s + u)$?

A. $2 : 3$

$$\frac{P}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$$

B. $3 : 8$

$$\frac{P}{q} = \frac{2}{3} \Rightarrow P = \frac{2q}{3}$$

$$\frac{r}{s} = \frac{2}{3} \Rightarrow r = \frac{2s}{3}$$

C. $1 : 4$

$$\frac{t}{u} = \frac{2}{3} \Rightarrow t = \frac{2u}{3}$$

D. $4 : 5$

$$\begin{aligned} \frac{P+r+t}{q+s+u} &= \frac{\frac{2q}{3} + \frac{2s}{3} + \frac{2u}{3}}{q+s+u} \\ &= \frac{\frac{2}{3}[q+s+u]}{q+s+u} \\ &= \frac{2}{3} \end{aligned}$$

Q1. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(p + r + t) / (q + s + u)$?

A. $2 : 3$

$$\frac{P}{q} = \frac{\sigma}{S} = \frac{t}{u} = \frac{v}{w}$$

B. $3 : 8$

$$\frac{P+\sigma+t}{q+s+u} = \frac{v}{w}$$

C. $1 : 4$

$$\frac{P+\sigma}{q+s} = \frac{t}{u} = \frac{v}{w}$$

D. $4 : 5$

$$\frac{P+\sigma+v}{q+s+w} = \frac{t}{u}$$

$$\frac{P+t+v}{q+u+w} = \frac{\sigma}{s}$$

$$\frac{\sigma+t+v}{s+u+w} = \frac{P}{q}$$

$$\frac{P+t}{q+u} = \frac{\sigma}{s} = \frac{v}{w}$$

$$\frac{\sigma+t}{s+u} = \frac{P}{q} = \frac{v}{w}$$

$$\frac{\sigma+v}{s+w} = \frac{P}{q} = \frac{t}{u}$$

Q2. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(mp + nr + ot) : (mq + ns + ou)$?

A. 1 : 3

B. 4 : 7

C. 2 : 3

D. 5 : 6



Q2. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(mp + nr + ot) : (mq + ns + ou)$?

A. $1 : 3$

$$\frac{P}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$$

$$mp = A$$

$$mq = B$$

$$nr = C$$

$$ns = D$$

$$ot = E$$

$$ou = F$$

B. $4 : 7$

$$\frac{mP}{mq} = \frac{n\gamma}{ns} = \frac{ot}{ou} = \frac{2}{3}$$

C. $2 : 3 \checkmark$

$$\frac{A}{B} = \frac{C}{D} = \frac{E}{F} = \frac{2}{3} \Rightarrow \frac{A+C+E}{B+D+F} = \frac{2}{3} \Rightarrow \frac{mp + nr + ot}{mq + ns + ou} = \frac{2}{3}$$

D. $5 : 6$

Q2. If $p : q = r : s = t : u = 2 : 3$ then what is the value of $(mp + nr + ot) : (mq + ns + ou)$?

A. $1 : 3$

$$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{v}{w}$$

B. $4 : 7$

$$\frac{p+r+t}{q+s+u} = \frac{v}{w}$$

C. $2 : 3$

$$\frac{p+r}{q+s} = \frac{t}{u} = \frac{v}{w}$$

D. $5 : 6$

$$\frac{mp + nr + ot}{mq + ns + ou} = \frac{v}{w} = \frac{k \cdot v}{k \cdot w}$$

$$\frac{mp + nr}{mq + ns} = \frac{t}{u} = \frac{ot}{ou} = \frac{v}{w} = \frac{k \cdot v}{k \cdot w}$$

EQUIVALENCE RATIO PROPERTY

$$1. \frac{a}{b} = \frac{c}{d} = \frac{a}{b} = \frac{c}{d} = \frac{2a+3c}{2b+3d} = \frac{ab+cd}{b^2+d^2}, \text{ etc.}$$

$$2. \frac{a}{b} = \frac{c}{d} = \frac{e}{f} \Rightarrow \frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{a+2c+3e}{b+2d+3f} = \frac{4a-3c+9e}{4b-3d+9f}, \text{ etc.}$$

Q3. If $a : b = c : d = 2 : 3$ then what is the value of $(ab + cd) / (b^2 + d^2)$?



- A. 2 : 3
- B. 1 : 7
- C. 3 : 2
- D. 4 : 3



Q3. If $a : b = c : d = 2 : 3$ then what is the value of $(ab + cd) / (b^2 + d^2)$?



A. $2 : 3$ ✓

$$\frac{\cancel{ab}}{\cancel{bb}} = \frac{\cancel{cd}}{\cancel{dd}} = \frac{2}{3}$$

B. $1 : 7$

$$\frac{ab + cd}{b^2 + d^2} = \frac{2}{3}$$

C. $3 : 2$

D. $4 : 3$

COMBINING RATIOS



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4: If $a:b = 2:3$ and $b:c = 5:6$, then find $a:b:c$?



Q4: If $a:b = 2:3$ and $b:c = 5:6$, then find $a:b:c$?

$$a:b = \frac{2}{\cancel{5}} : \frac{3}{\cancel{5}} = 10 : \cancel{15} \quad \frac{10}{15} = \underline{\underline{\frac{2}{3}}}$$

$$b:c = \frac{5}{\cancel{3}} : \frac{6}{\cancel{3}} = \cancel{15} : 18$$

$$a:b:c = 10:15:18$$

Q4: If $a:b = 2:3$ and $b:c = 5:6$, then find $a:b:c$?

$a : b : c$

$2 : 3 : \boxed{3}$

$\boxed{5} : \underline{5} : 6$

$2 \times 5 : 3 \times 5 : \underline{3 \times 6}$

$10 : 15 : 18$
 $a : b : c$

Q5: If $a:b = 3:4$ and $b:c = 7:8$, then find $a:b:c$?



Q5: If $a:b = 3:4$ and $b:c = 7:8$, then find $a:b:c$?

$$\begin{array}{rcl} a & : & b & : & c \\ 3 & : & 4 & : & \boxed{4} \\ \hline 7 & : & 7 & : & 8 \\ \hline 3 \times 7 & : & 4 \times 7 & : & 4 \times 8 \\ \hline \boxed{21} & : & \boxed{28} & : & \boxed{32} \end{array}$$

Q6: If $a:b = 3:4$ and $b:c = 5:6$ and $c:d = 2:3$, then find $a:b:c:d$?



Q6: If $a:b = 3:4$ and $b:c = 5:6$ and $c:d = 2:3$, then find $a:b:c:d$?

$$\begin{array}{ccccccc} a & : & b & : & c & : & d \\ 3 & : & 4 & : & 4 & : & 4 \\ \hline 5 & : & 5 & : & 6 & : & 6 \\ 2 & : & 2 & : & 2 & : & 3 \\ \hline 3 \times 5 \times 2 & : & 4 \times 5 \times 2 & : & 4 \times 6 \times 2 & : & 4 \times 6 \times 3 \\ 30 & : & 40 & : & 48 & : & 72 \\ \boxed{15:20:24:36} \end{array}$$

Q7. If the ratio of x to y is $6/5$ and the ratio of z to y is $3/4$ then the ratio of x to z is



Q7. If the ratio of x to y is $6/5$ and the ratio of z to y is $3/4$ then the ratio of x to z is



M1

$$\frac{x}{y} = \frac{6}{5} \quad \frac{z}{y} = \frac{3}{4} \Rightarrow \frac{y}{z} = \frac{4}{3}$$

M2

$$x : y : z$$

$$6 : 5 : \boxed{5}$$

$$\boxed{4} : 4 : 3$$

$$\underline{6 \times 4 : 5 \times 4 : 5 \times 3}$$

$$24 : 20 : 15$$

$$x : y : z$$

$$\frac{x}{y} \cdot \frac{y}{z} = \frac{6}{5} \cdot \frac{4}{3}$$

$$\frac{x}{z} = \frac{8}{5}$$

$$x : z = 8 : 5$$

$$x : z = 24 : 15 = 8 : 5$$

$$\frac{24}{15} = \frac{8}{5}$$

Q8. Divide Rs. 1162 among A, B, and C in the ratio 35 : 28 : 20.



- A. 490,392 and 280
- B. 400,350 and 250
- C. 480,320 and 260
- D. 440 , 360 and 320



Q8. Divide Rs. 1162 among A, B, and C in the ratio 35 : 28 : 20.

(M1)

$$35 : 28 : 20 \Rightarrow \text{sum} \Rightarrow 35 + 28 + 20 = 83$$



$$A = \frac{35}{83} \times 1162 = 35 \times 14 = \text{Rs. } 490$$

$$B = \frac{28}{83} \times 1162 = 28 \times 14 = \text{Rs. } 392$$

$$C = \frac{20}{83} \times 1162 = 20 \times 14 = \text{Rs. } 280$$

Rs. 1162

Q8. Divide Rs. 1162 among A, B, and C in the ratio 35 : 28 : 20.

M2

$$35 : 28 : 20 \Rightarrow \text{sum} \rightarrow 35 + 28 + 20 = 83$$

Divide 1162 Rupees in 83 parts

$$\frac{1162}{83} = \text{Rs. } 14 \rightarrow 1 \text{ part is equal to Rs. } 14$$

A will get 35 parts out of 83 $\Rightarrow 35 \times \text{Rs. } 14 \Rightarrow \text{Rs. } 490$

B will get 28 parts out of 83 $\Rightarrow 28 \times \text{Rs. } 14 \Rightarrow \text{Rs. } 392$

C will get 20 parts out of 83 $\Rightarrow 20 \times \text{Rs. } 14 \Rightarrow \text{Rs. } 280$



Q8. Divide Rs. 1162 among A, B, and C in the ratio 35 : 28 : 20.

- A. 490,392 and 280 ✓
- B. 400,350 and 250
- C. 480,320 and 260
- D. 440 , 360 and 320

Eliminate options

Correct Answer : Option A

Explanation:

Sum of the terms of the ratio = $(35 + 28 + 20) = 83$.

A's share = Rs. $(1162 \times 35/83)$ = Rs. 490.

B's share = Rs. $(1162 \times 28/83)$ = Rs. 392.

C's share = $[1162 - (490 + 392)]$ = Rs. 280.

Q9. Rs. 200 is divided between Neha Kakkar, Tony Kakkar, and Sonu Kakkar such that Neha : Tony = 2 : 3 and Tony: Sonu = 3 : 5, find the share of Neha Kakkar?

- a) Rs. 25
- b) Rs. 30
- c) Rs. 40
- d) Rs. 45



Q9. Rs. 200 is divided between Neha Kakkar, Tony Kakkar, and Sonu Kakkar such that Neha : Tony = 2 : 3 and Tony: Sonu = 3 : 5, find the share of Neha Kakkar?

- a) Rs. 25
- b) Rs. 30
- c) Rs. 40
- d) Rs. 45

$$\begin{array}{rcl} \text{Neha} & : & \text{Tony} & : & \text{Sonu} \\ 2 & : & 3 & : & 3 \\ \hline 3 & : & 3 & : & 5 \\ \hline 2 \times 3 & : & 3 \times 3 & : & 3 \times 5 \\ 6 & : & 9 & : & 15 \\ 2 & : & 3 & : & 5 \end{array}$$

by observation

Neha : Tony : Sonu

$$\text{Total parts} = 2 + 3 + 5 = 10$$

$$\begin{aligned} \text{Neha's share} &= \frac{2}{10} \times 200 \\ &= \boxed{40} \end{aligned}$$

Correct Answer: Option C (Rs.40)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



TIME AND WORK

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

TIME WORK



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. Sunny Deol can do a piece of work in 10 days and Ravina Tandan can do the same piece of work in 15 days, find how many days it would take for the work to finish if Sunny Deol and Ravina Tandan work together?



Q1. Sunny Deol can do a piece of work in 10 days and Ravina Tandan can do the same piece of work in 15 days, find how many days it would take for the work to finish if Sunny Deol and Ravina Tandan work together?

⇒ Answer : < 10 days

M1

Reciprocal Method

Total work = 1 litre पूरी क्रिया

Sunny

10 days → 1 litre

1 day → $\frac{1}{10}$ litre

Correct Answer: 6 days

Ravina

15 days → 1 litre

1 day → $\frac{1}{15}$ litre

Together

1 day = $\frac{1}{10} + \frac{1}{15}$ litre

$$= \frac{3}{30} + \frac{2}{30} = \frac{5}{30} \text{ litre}$$

1 day = $\frac{1}{6}$ litre

6 days → 1 litre

Ans: 6 days

Q1. Sunny Deol can do a piece of work in 10 days and Ravina Tandan can do the same piece of work in 15 days, find how many days it would take for the work to finish if Sunny Deol and Ravina Tandan work together?

M2 LCM Method

$$\text{LCM}(10, 15) = 30$$

Total work = 30 chairs

Sunny

10 days = 30 chairs

$$1 \text{ day} = \frac{30}{10} = 3 \text{ chairs}$$

Ravina

15 days = 30 chairs

$$1 \text{ day} = \frac{30}{15} = 2 \text{ chairs}$$

Together

$$1 \text{ day} = 3+2 = 5 \text{ chairs}$$

1 day → 5 chairs

$\frac{1}{5}$ days ← 1 chair

$\frac{1}{5} \times 30$ days ← 30 chairs

6 days ← 30 chairs

Ans: 6 days

Q1. Sunny Deol can do a piece of work in 10 days and Ravina Tandan can do the same piece of work in 15 days, find how many days it would take for the work to finish if Sunny Deol and Ravina Tandan work together?

Total work = 100 chairs

Sunny

10 days = 100 chairs

$$1 \text{ day} = \frac{100}{10} = 10 \text{ chairs}$$

Ravina

15 days = 100 chairs

$$1 \text{ day} = \frac{100}{15} = \frac{20}{3} \text{ chairs}$$

Together

$$10 + \frac{20}{3} \text{ chairs}$$

$$\frac{30}{3} + \frac{20}{3} \text{ chairs}$$

$$1 \text{ day} = \frac{50}{3} \text{ chairs}$$

$$\frac{3}{50} \text{ days} = 1 \text{ chair}$$

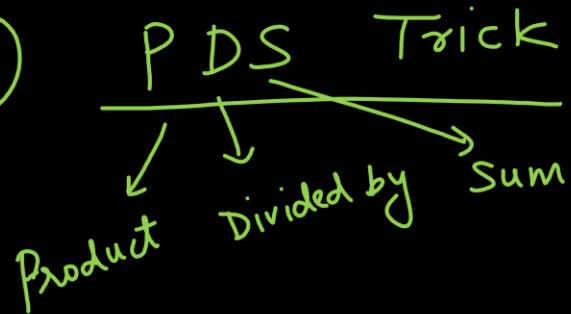
$$\frac{3}{50} \times 100 \text{ days} = 100 \text{ chairs}$$

$$6 \text{ days} = 100 \text{ chairs}$$

Ans: 6 days

Q1. Sunny Deol can do a piece of work in 10 days and Ravina Tandan can do the same piece of work in 15 days, find how many days it would take for the work to finish if Sunny Deol and Ravina Tandan work together?

M3



Sunny \rightarrow 10 days

Ravina \rightarrow 15 days

$$\text{Together} \rightarrow \frac{10 \times 15}{10 + 15} = \frac{10 \times 15}{25} = 6 \text{ days}$$

A $\rightarrow x$ days

B $\rightarrow y$ days

$$A+B = \frac{xy}{x+y} \text{ days}$$

Valid for 2 people

Sunny \rightarrow more efficient

Efficiency $\propto \frac{1}{\text{time}}$

Q2. Jatin and Manisha together can do a piece of work in 15 days and Manisha alone can do the same work in 20 days, find the number of days that Jatin will take to do the same work alone?



Q2. Jatin and Manisha together can do a piece of work in 15 days and Manisha alone can do the same work in 20 days, find the number of days that Jatin will take to do the same work alone?

(M1)

Reciprocal Method

$$J+M \rightarrow 15 \text{ days}$$

$$M \rightarrow 20 \text{ days}$$

$$J \rightarrow ? \text{ days}$$

$$\text{Total work} = 1 \text{ litre}$$

J+M

$$15 \text{ days} = 1 \text{ litre}$$

$$1 \text{ day} = \frac{1}{15} \text{ litre}$$

Ans > 15 days

Manisha

$$20 \text{ days} = 1 \text{ litre}$$

$$1 \text{ day} = \frac{1}{20} \text{ litre}$$

Jatin

$$1 \text{ day} = y \text{ litre}$$

$$y + \frac{1}{20} = \frac{1}{15}$$

$$y = \frac{1}{15} - \frac{1}{20}$$

$$y = \frac{20-15}{15 \times 20} = \frac{5}{15 \times 20} = \frac{1}{60}$$

Q2. Jatin and Manisha together can do a piece of work in 15 days and Manisha alone can do the same work in 20 days, find the number of days that Jatin will take to do the same work alone?

Jatin

$$1 \text{ day} = \frac{1}{60} \text{ litre}$$

$$60 \text{ days} = 1 \text{ litre}$$

Ans: 60 days

Manisha

$$20 \text{ days} = 60 \text{ chairs}$$

$$1 \text{ day} = \frac{60}{20} = 3 \text{ chairs}$$

Jatin

$$1 \text{ day} = 1 \text{ chair}$$

$$60 \text{ days} = 60 \text{ chairs}$$

Ans:

60 days

(n2)

LCM Method

$$\text{LCM}(15, 20) = 60$$

Total work = 60 chairs

J+M

$$15 \text{ days} = 60 \text{ chairs}$$

$$1 \text{ day} = \frac{60}{15} = 4 \text{ chairs}$$

Q2. Jatin and Manisha together can do a piece of work in 15 days and Manisha alone can do the same work in 20 days, find the number of days that Jatin will take to do the same work alone?

M3

PDS Trick

Jatin $\rightarrow y$ days

Manisha $\rightarrow 20$ days

$J+M \rightarrow 15$ days

$$15 = \frac{20y}{20+y}$$

$$15(20+y) = 20y$$

$$15 \times 20 + 15y = 20y$$

$$300 = 5y$$

$$y = \frac{300}{5} = 60 \text{ days}$$

PDD Trick
Product Divided by Difference

$M \rightarrow 20$ days
 $J+M \rightarrow 15$ days
 $J \rightarrow ?$

$$\left. \begin{array}{l} \frac{20 \times 15}{20-15} \\ \end{array} \right\}$$

$$= \frac{20 \times 15}{5}$$

$$= 60 \text{ days}$$

$A \rightarrow x$ days

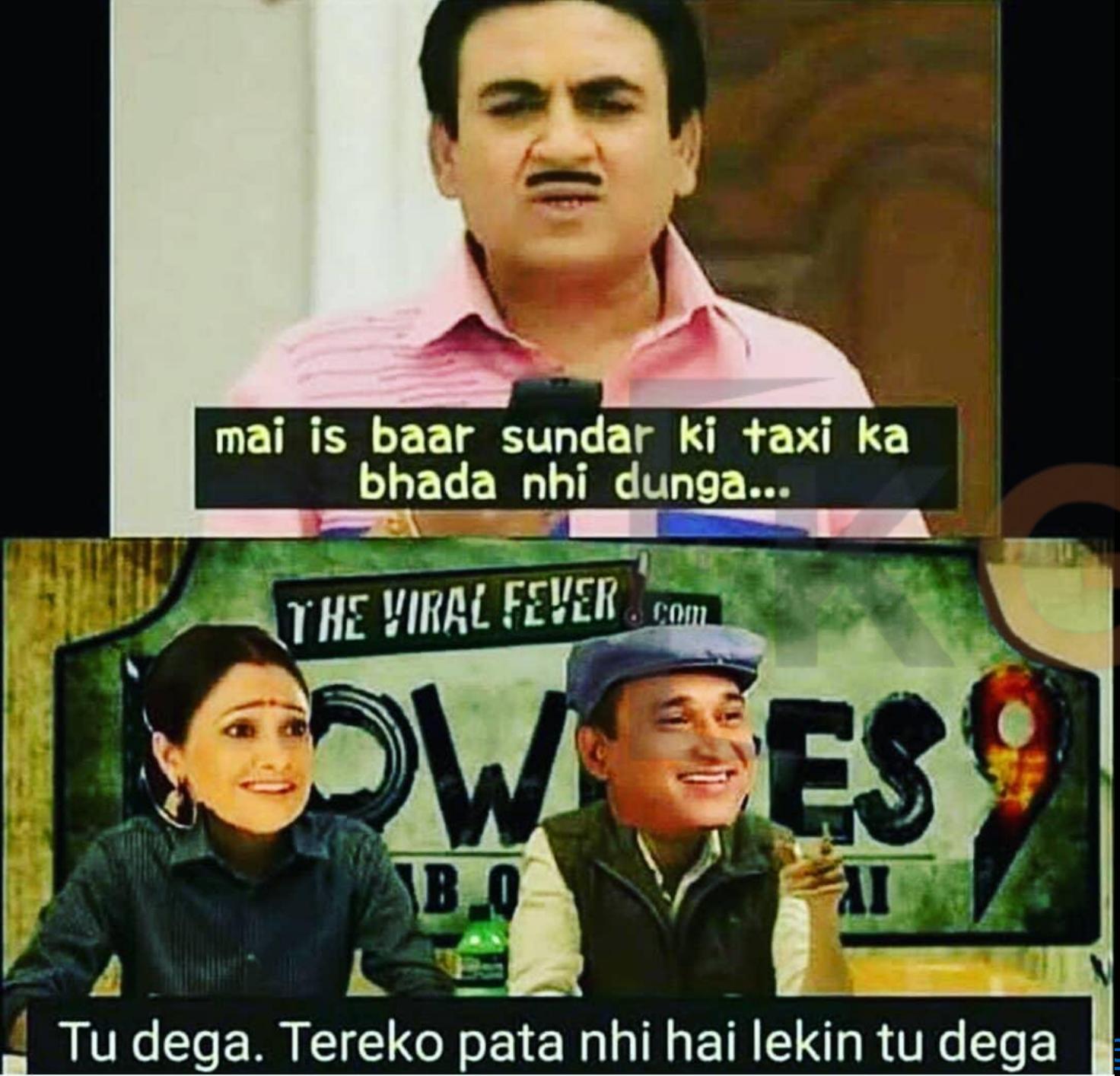
$A+B \rightarrow y$ days

$B \rightarrow ?$

$$x > y$$

↑

$$B = \frac{xy}{x-y}$$



Tu dega. Tereko pata nhi hai lekin tu dega

Q3. Jethiya alone can do half of a work in 5 days, Daya alone can do three-fifth of the same work in 9 days and Sunderlal alone can do two-third of the same work in 8 days. Find the number of days it will take for the work to be completed if all three work together.

Q3. Jethiya alone can do half of a work in 5 days, Daya alone can do three-fifth of the same work in 9 days and Sunderlal alone can do two-third of the same work in 8 days. Find the number of days it will take for the work to be completed if all three work together.

$$J \rightarrow 10 \text{ days}$$

$$D \rightarrow \frac{3}{5}^{\text{th}} = 9 \text{ days}$$

$$1 \Rightarrow 9 \times \frac{5}{3} \Rightarrow 15 \text{ days}$$

$$S \rightarrow \frac{2}{3}^{\text{rd}} = 8 \text{ days}$$

$$1 = 8 \times \frac{3}{2} \Rightarrow 12 \text{ days}$$

$$J \rightarrow 10 \text{ days } (x)$$

$$D \rightarrow 15 \text{ days } (y)$$

$$S \rightarrow 12 \text{ days } (z)$$

$$J+D+S = \frac{xyz}{xy+yz+zx}$$

PDS Trick for 3 people

$$\rightarrow \frac{10 \times 15 \times 12}{(10 \times 15) + (15 \times 12) + (12 \times 10)}$$

$$= \underline{\underline{4 \text{ days}}} \text{ (Ans)}$$

Correct Answer: 4 days

Q3. Jethiya alone can do half of a work in 5 days, Daya alone can do three-fifth of the same work in 9 days and Sunderlal alone can do two-third of the same work in 8 days. Find the number of days it will take for the work to be completed if all three work together.

LCM Method

$$\left. \begin{array}{l} J \rightarrow 10 \text{ days} \\ D \rightarrow 15 \text{ days} \\ S \rightarrow 12 \text{ days} \end{array} \right\} \text{LCM}(10, 15, 12) = 60$$

Total work = 60 chairs

Jetha

$$10 \text{ days} = 60 \text{ chairs}$$
$$1 \text{ day} = \frac{60}{10} = 6 \text{ chairs}$$

Daya

$$15 \text{ days} = 60 \text{ chairs}$$
$$1 \text{ day} = \frac{60}{15} = 4 \text{ chairs}$$

Sunderlal

$$12 \text{ days} = 60 \text{ chairs}$$
$$1 \text{ day} = \frac{60}{12} = 5 \text{ chairs}$$

$6 + 4 + 5 = 15 \text{ chairs}$

$\frac{1}{15} \text{ days} > 1 \text{ day}$

$\frac{1}{15} \times 60 \text{ days} = 60 \text{ chairs}$

4 days



Q4. Daya takes 4 days to complete $\frac{1}{3}$ of job, Abhijeet takes 3 days to complete $\frac{1}{6}$ th of the same work and ACP Praduman takes 5 days to complete half the job. If all of them work together for 3 days and Daya and ACP Praduman quit. How long will it take for Abhijeet to complete remaining work alone?



Q4. Daya takes 4 days to complete $\frac{1}{3}$ of job, Abhijeet takes 3 days to complete $\frac{1}{6}$ th of the same work and ACP Praduman takes 5 days to complete half the job. If all of them work together for 3 days and Daya and ACP Praduman quit. How long will it take for Abhijeet to complete remaining work alone?

$$\text{Daya} \Rightarrow \frac{1}{3} \text{ day} \rightarrow 4 \text{ days}$$

$$1 \Rightarrow 4 \times 3 = 12 \text{ days}$$

$$\text{Abhijeet} \Rightarrow \frac{1}{6} \text{ day} \rightarrow 3 \text{ days}$$

$$1 \Rightarrow 3 \times 6 = 18 \text{ days}$$

$$\text{ACP} \Rightarrow 10 \text{ days}$$

$$\left. \begin{array}{l} D \rightarrow 12 \text{ days} \\ Ab \rightarrow 18 \text{ days} \\ ACP \rightarrow 10 \text{ days} \end{array} \right\} \text{LCM}(12, 18, 10) = 180$$

$$\text{Total work} = 180 \text{ chairs}$$

~~Daya~~

$$12 \text{ days} = 180 \text{ chairs}$$

$$1 \text{ day} = \frac{180}{12} = 15 \text{ chairs}$$

Abhijeet

$$18 \text{ days} = 180 \text{ chairs}$$

$$1 \text{ day} = \frac{180}{18} = 10 \text{ chairs}$$

Q4. Daya takes 4 days to complete $\frac{1}{3}$ of job, Abhijeet takes 3 days to complete $\frac{1}{6}$ th of the same work and ACP Praduman takes 5 days to complete half the job. If all of them work together for 3 days and Daya and ACP Praduman quit. How long will it take for Abhijeet to complete remaining work alone?

ACP

$$10 \text{ days} = 180 \text{ chairs}$$

$$1 \text{ day} = \frac{180}{10} = 18 \text{ chairs}$$

Total work

$$1 \text{ day} = 15 + 10 + 18 = 43 \text{ chairs}$$

$$3 \text{ days} = 43 \times 3 = 129 \text{ chairs}$$

$$\text{Total work} = 180 \text{ chairs}$$

$$\text{Work left} = 180 - 129 = 51 \text{ chairs}$$

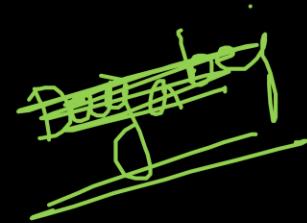
51 chairs \leftarrow Abhijeet alone

$$1 \text{ day} = 10 \text{ chairs}$$

$$\frac{1}{10} \text{ days} = 1 \text{ chair}$$

$$\frac{1}{10} \times 51 \text{ days} \leftarrow 51 \text{ chairs}$$

5.1 days or 6 days [depending on options]



Call OT Trick

A, B, C

$$\frac{A \text{ work}}{A \text{ alone work}} + \frac{B \text{ work}}{B \text{ alone work}} + \frac{C \text{ work}}{C \text{ alone work}} = 1$$

Day a $\rightarrow 12$

Abhi $\rightarrow 18$

Acf $\rightarrow 10$

$$\frac{\text{Day a work}}{\text{Day a alone}} + \frac{\text{Abhi}}{\text{Abhi alone}} +$$

$$\frac{3}{12} + \frac{P}{18} + \frac{3}{10} = 1$$

$$P = 8 \cdot 1 \\ \text{days} \\ P - 3 = 5 \cdot 1$$

Q5 (VK). A can complete a piece of work in 8 hours, B can complete in 10 hours and C in 12 hours. If A, B, C start the work together but A leaves after 2 hours. Find the time taken by B and C to complete the remaining work.



- A. $2 + (1/11)$
- B. $4 + (1/11)$
- C. $6 + (2/11)$
- D. $2 + (6/11)$



Correct Answer : Option A

Explanation:

Total unit of the work is 120 units. In 1 hour A can complete 15 units. In 1 hour B can complete 12 units. In 1 hour C can complete 10 units .
In 1 hour. A+B+C can complete 37 units.

Therefore in 2 hours A+B+C would have completed 74 units. Remaining work to be completed is $120-74=46$. In 1 hour. B+C can complete 22 units.

Therefore time taken to complete the remaining job = $46/22=23/11$
 $=2(1/11)$ hours.



TATA
CONSULTANCY
SERVICES

SIMPLIFICATION

$$\frac{a^n + b^n + c^n + d^n + \dots}{a+b+c+d \dots} \quad n: \text{odd}$$

Eg

$$\frac{a^n + b^n}{a+b} \quad n: \text{odd}$$

$$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$$

$$a^3 + b^3 = (a+b)^3 - 3ab(a+b)$$

$$\frac{a^1 + b^1}{a+b} = \frac{a+b}{a+b}$$

$$\frac{a^3 + b^3}{a+b} = \frac{(a+b)^3 - 3ab(a+b)}{a+b}$$

$$= \frac{(a+b)^3}{a+b} - \frac{3ab(a+b)}{a+b}$$

$$\frac{a^5 + b^5}{a+b} \checkmark$$

$$\frac{a^5 + b^5 + c^5}{a+b+c} \checkmark$$

Q1: If $22^3 + 23^3 + 24^3 + \dots + 87^3 + 88^3$ is divided by 110, then the remainder will be __ ?



Q1: If $22^3 + 23^3 + 24^3 + \dots + 87^3 + 88^3$ is divided by 110, then the remainder will be __ ?

$$\frac{a^n + b^n}{a+b} \quad n: \text{odd}$$

$$\frac{22^3 + 88^3}{22+88} + \frac{23^3 + 87^3}{23+87} + \frac{24^3 + 86^3}{24+86} + \dots + \frac{55^3}{110}$$

Remainder :

$$\frac{55^3}{110} = \frac{55 \times 55 \times 55}{110 \times 2} = \frac{55 \times 55}{2}$$

$$\boxed{\text{Remainder} = 1}$$

Answer = 1

Q1: If $22^3 + 23^3 + 24^3 + \dots + 87^3 + 88^3$ is divided by 110, then the remainder will be __ ?

$22, 23, 24, \dots, 87, 88$ → Arithmetic progression

$$a_n = a + (n-1)d$$

$$88 = 22 + (n-1)1$$

$$88 - 22 = n - 1$$

$$66 = n - 1$$

$$n = 66 + 1$$

$$n = 67$$

d : common difference

a : first term

a_n : n^{th} term

n : number of terms

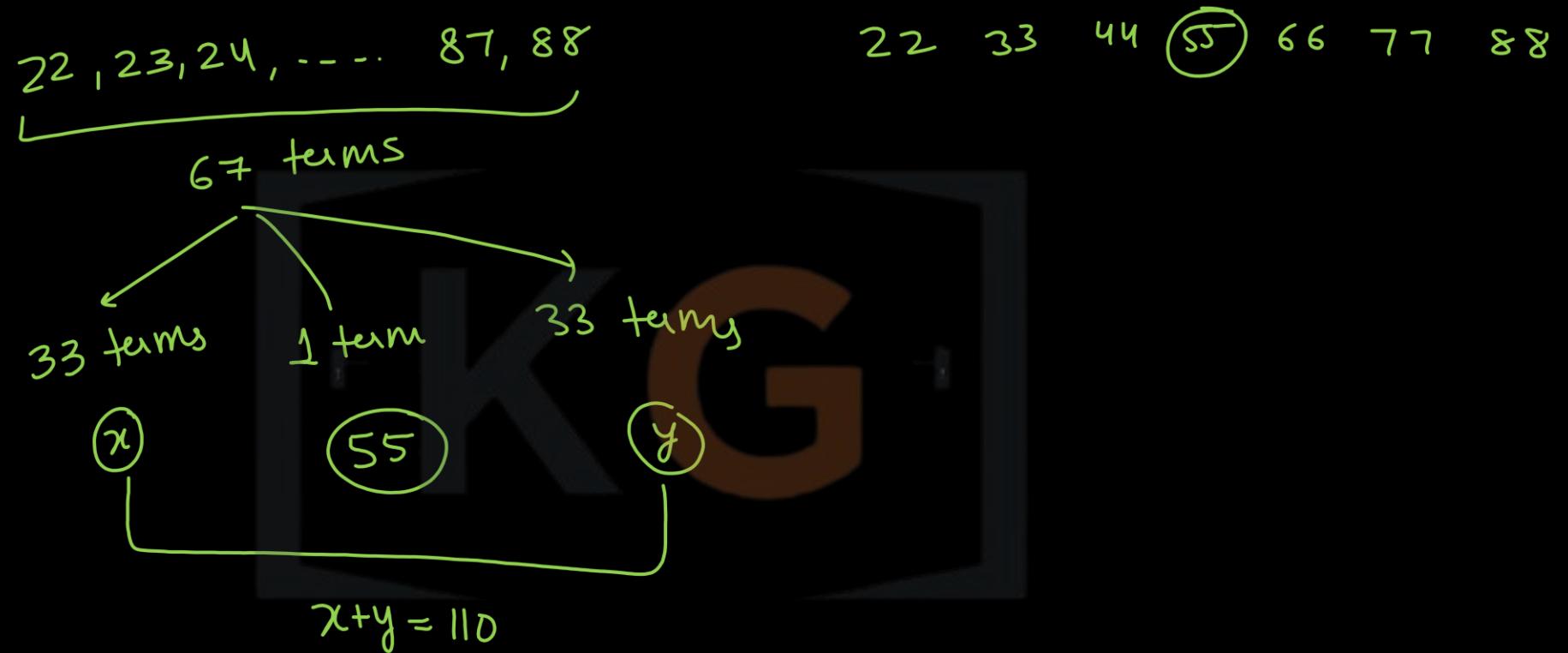
$$d = \text{last term} - \text{first term}$$

$$23 - 22 = 1$$

$$24 - 23 = 1$$

$$d = 1$$

Q1: If $22^3 + 23^3 + 24^3 + \dots + 87^3 + 88^3$ is divided by 110, then the remainder will be __ ?



Q2: If $16^7 + 17^7 + 18^7 + 19^7$ is divided by 5, 7, 14 and 35 and remainder thus obtained are R1, R2, R3 and R4 respectively. Find $R1 + R2 + R3 + R4$.



Q2: If $16^7 + 17^7 + 18^7 + 19^7$ is divided by 5, 7, 14 and 35 and remainder thus obtained are R1, R2, R3 and R4 respectively. Find $R1 + R2 + R3 + R4$.

$$\frac{a^n + b^n}{a+b} \Rightarrow n: \text{odd}$$

$$\frac{N}{P} \quad \checkmark \quad \frac{N}{\text{factors of } p'}$$

$$a \times b = c$$

$a, b \leftarrow \text{factors of } c$

Factors of 70 :

$$\begin{aligned} 1 \times 70 &= 70 \\ 2 \times 35 &= 70 \\ 5 \times 14 &= 70 \\ 7 \times 10 &= 70 \end{aligned} \quad \left. \begin{array}{l} 1 \times 70 = 70 \\ 2 \times 35 = 70 \\ 5 \times 14 = 70 \\ 7 \times 10 = 70 \end{array} \right\} 5, 7, 14, 35$$

$$\frac{N}{70} = \frac{N}{\text{factors of } 70} = \frac{N}{5}, \frac{N}{7}, \frac{N}{14}, \frac{N}{35}$$

Q2: If $16^7 + 17^7 + 18^7 + 19^7$ is divided by 5, 7, 14 and 35 and remainder thus obtained are R₁, R₂, R₃ and R₄ respectively. Find R₁ + R₂ + R₃ + R₄.

$$n = 7 \Rightarrow \text{odd}$$

$$\frac{16^7 + 17^7 + 18^7 + 19^7}{16+17+18+19}$$

$$\frac{a^n + b^n + c^n + d^n}{a+b+c+d}$$

$$= \frac{16^7 + 17^7 + 18^7 + 19^7}{70} \Rightarrow \frac{\boxed{}}{5} \Rightarrow \frac{\boxed{}}{7} \Rightarrow \frac{\boxed{}}{14} \Rightarrow \frac{\boxed{}}{35}$$

$$\therefore R_1 = R_2 = R_3 = R_4 = 0 \Rightarrow R_1 + R_2 + R_3 + R_4 = 0$$

$$0.1234 = \frac{1234}{10000}$$

$$0.\overline{1234} = \frac{1234}{9999} \Rightarrow 0.\underline{1234}\underline{1234}\underline{1234}\dots$$

$$0.\overline{1234} = \frac{1234 - 1}{9990} \Rightarrow 0.\underline{1234}\underline{234}\underline{234}\dots$$

$$0.\overline{1234} = \frac{1234 - 12}{9900} \Rightarrow 0.\underline{1234}\underline{34}\underline{34}\dots$$

$$0.\overline{1234} = \frac{1234 - 123}{9000} \Rightarrow 0.\underline{1234}\underline{444444}\dots$$

Q3: Simplest form $0.\overline{5}$ =

- (A) $5/10$ (B) $5/9$ (C) $1/2$ (D) **None of these**



Q3: Simplest form $0.\overline{5}$ =

- (A) $5/10$ (B) $5/9$ (C) $1/2$ (D) **None of these**

$$0.\overline{5} = \frac{5}{9}$$



Q4:

Let $A = 0.a_1a_2a_1a_2a_1a_2\dots$ and $B = b_1b_2b_1b_2b_1b_2\dots$ where a_1, a_2, b_1 and b_2 are integers between 1 to 9 not necessarily distinct.

Then with which of the following A must be multiplied such that it gives an integer?

- a) 99
- b) 198
- c) 297
- d) All the above



Q4:

Let $A = 0.a_1a_2a_1a_2a_1a_2\dots$ and $B = b_1b_2b_1b_2b_1b_2\dots$ where a_1, a_2, b_1 and b_2 are integers between 1 to 9 not necessarily distinct.

Then with which of the following A must be multiplied such that it gives an integer?

- a) 99
- b) 198
- c) 297
- d) All the above



$$A = 0.a_1a_2a_1a_2a_1a_2\dots = 0.\overline{a_1a_2} = \frac{a_1a_2}{99} = \frac{\text{Integer}}{99}$$

$$A = \frac{\text{Integer}}{99}$$

$$A * 99 = \text{Integer}$$

$$A * 198 = \frac{\text{Integer}}{99} * 198 = 2 * \text{Integer} = \text{Integer}$$

$$A * 297 = \frac{\text{Integer}}{99} * 297 = 3 * \text{Integer} = \text{Integer}$$

Q5:

Let $A = 0.a_1a_2a_3a_1a_2a_3a_1\dots$ and $B = 0.b_1b_2b_1b_2b_1\dots$ where a_1, a_2, a_3, b_1 and b_2 are integers between 1 to 9 not necessarily distinct. Then which of the following is an integer?

- (A) $1989 \times (A+B)$ (B) $10989 \times (A+B)$ (C) $100989 \times (A+B)$ (D) None of these



Q5:

Let $A = 0.a_1a_2a_3a_1a_2a_3a_1\dots$ and $B = 0.b_1b_2b_1b_2b_1\dots$ where a_1, a_2, a_3, b_1 and b_2 are integers between 1 to 9 not necessarily distinct. Then which of the following is an integer?

- (A) $1989 \times (A+B)$ (B) $10989 \times (A+B)$ (C) $100989 \times (A+B)$ (D) None of these

$$A + B = ??$$

$$A = 0.a_1a_2a_3a_1a_2a_3\dots = 0.\overline{a_1a_2a_3} = \frac{a_1a_2a_3}{999}$$

$$B = 0.b_1b_2b_1b_2\dots = 0.\overline{b_1b_2} = \frac{b_1b_2}{99}$$



$$A+B = \frac{a_1 a_2 a_3}{999} + \frac{b_1 b_2}{99}$$

$$A+B = \frac{1}{9} \left[\frac{a_1 a_2 a_3}{111} + \frac{b_1 b_2}{11} \right]$$

$$A+B = \frac{1}{9} \left[\frac{11 a_1 a_2 a_3 + 111 b_1 b_2}{111 \times 11} \right]$$

$$A+B = \frac{\text{Integer}}{9 \times 111 \times 11} \Rightarrow A+B = \frac{\text{Integer}}{10989}$$

$$\Rightarrow (A+B) \times 10989 = \text{Integer}$$

Q6 (VK):

The value of $0.\overline{136}$ is :

- (1) $136/1000$
- (2) $136/999$
- (3) $136/990$
- (4) $3/22$
- (5) $3/20$



Correct Answer: Option 4 (3/22)

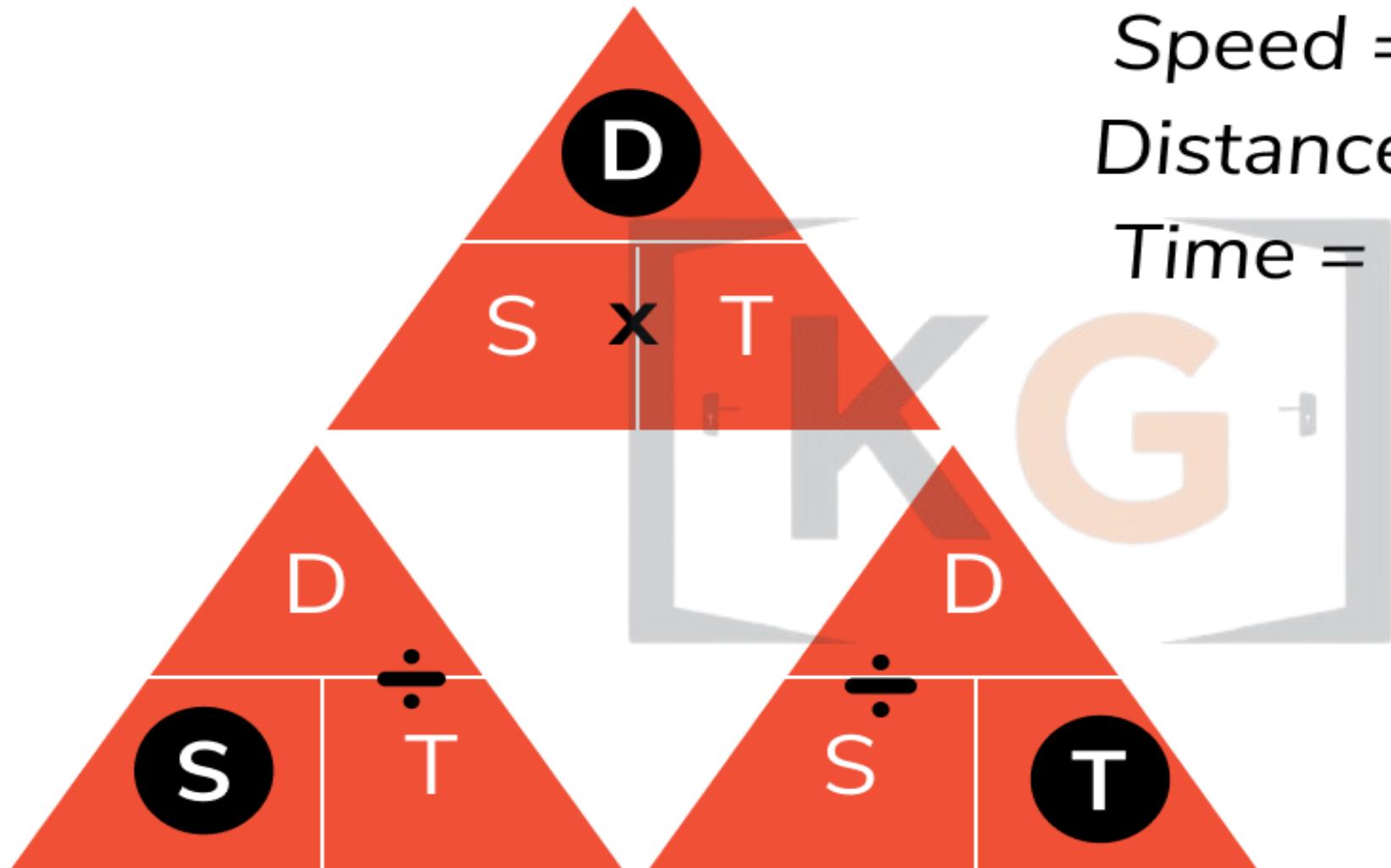




TATA
CONSULTANCY
SERVICES

SPEED, TIME & DISTANCE

CONCEPT 1 – BASIC FORMULA



Speed = Distance / Time

Distance = Speed x Time

Time = Distance / Speed

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

if distance constant,

$$\text{Speed} \propto \frac{1}{\text{time}}$$

$$\text{Speed ratio} \Rightarrow a : b$$

$$\text{time ratio} \Rightarrow b : a$$

same distance

$$A = 2 \text{ kmph} \rightarrow 3 \text{ hrs}$$

$$B = 3 \text{ kmph} \rightarrow ? \text{ hrs}$$

$$\frac{\text{Speed ratio}}{A:B}$$

$$2:3$$

$$\frac{\text{Time ratio}}{A:B}$$

$$3:2$$

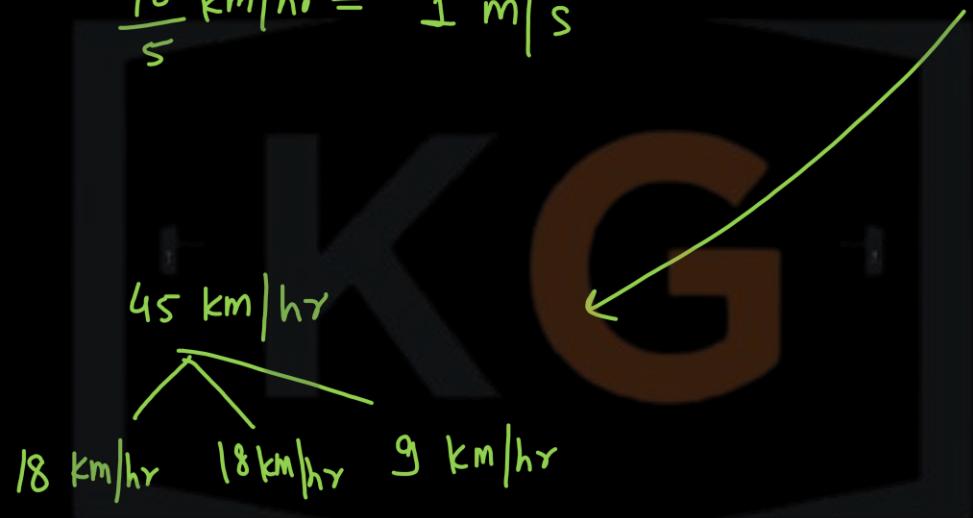
$$\begin{matrix} & 3:2 \\ 3 \text{ hrs} & \swarrow \quad \searrow \\ & 2 \text{ hrs} \end{matrix}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$$1 \text{ km/hr} = \frac{5}{18} \text{ m/s}$$

$$\frac{18}{5} \text{ km/hr} = 1 \text{ m/s}$$

$$18 + 18 + 9 = 45$$



$$45 \text{ km/hr} \rightarrow \text{--- m/s}$$

$$18 \text{ km/hr} \rightarrow 5 \text{ m/s}$$

$$1 \text{ km/hr} \rightarrow \frac{5}{18} \text{ m/s}$$

$$45 \text{ km/hr} = \frac{5}{18} \times 45 \text{ m/s}$$

$$= \frac{5}{18} \times \frac{45}{2} = \frac{25}{2}$$

$$= 12.5 \text{ m/s}$$

Q1. Tesla Car travelling at the rate of 45 kmph. How many seconds, it will take to cover a distance of $4/5$ km?



Q1. Tesla Car travelling at the rate of 45 kmph. How many seconds, it will take to cover a distance of $\frac{4}{5}$ km?

M

$$S = \frac{d}{t} \Rightarrow t = \frac{d}{S} = \frac{\frac{4}{5}}{45} = \frac{4}{5 \times 45} \text{ hrs}$$

$$1 \text{ hr} = 60 \text{ mins}$$

$$1 \text{ min} = 60 \text{ seconds}$$

$$1 \text{ hr} = 60 \times 60 \text{ seconds}$$

$$= \frac{4}{5 \times 45} \times 60 \times 60 \text{ seconds}$$

$$= \frac{4}{9 \times 45} \times \cancel{60}^4 \times \cancel{60}^4$$

$$= 4 \times 4 \times 4 = 64 \text{ seconds}$$

Q1. Tesla Car travelling at the rate of 45 kmph. How many seconds, it will take to cover a distance of $\frac{4}{5}$ km?

(M2)

$$\text{Speed} = 45 \text{ km/hr} = 12.5 \text{ m/s} = \frac{25}{2} \text{ m/s}$$

$$\text{distance} = \frac{4}{5} \text{ km} = \frac{4}{5} \times 1000 \text{ m} = 800 \text{ m}$$

$$1 \text{ km} = 1000 \text{ m}$$

$$S = \frac{d}{t} \Rightarrow t = \frac{d}{S} = \frac{800}{\frac{25}{2}} = \frac{800 \times 2}{25} = \frac{8 \times 100 \times 2}{25} = 8 \times 4 \times 2 = 64 \text{ seconds}$$

Q2. A person is driving a car at a speed of 40 kmph can complete a journey in 9 hours. How long will it take to travel the same distance at 60 kmph?



Q2. A person is driving a car at a speed of 40 kmph can complete a journey in 9 hours. How long will it take to travel the same distance at 60 kmph?

M1

$$S = \frac{d}{t} \Rightarrow d = S \times t
= 40 \times 9
= 360 \text{ km}$$

$$S = \frac{d}{t} \Rightarrow t = \frac{d}{S} = \frac{360}{60} = 6 \text{ hrs}$$

M2

distance same

$$\text{Speed ratio} = 40 : 60
= 4 : 6
= 2 : 3$$

$$\text{Time ratio} = 3 : 2$$

$$\begin{matrix} +3 \\ 9 : 6 \\ \times 3 \end{matrix}$$

$$9 : 6 = 3 : 2$$

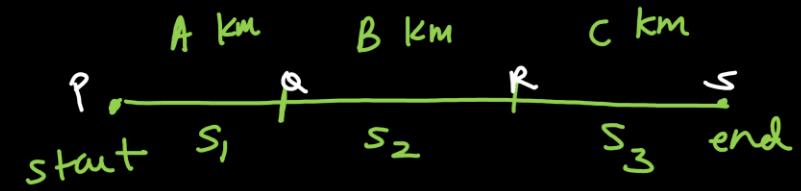
Ans: 6 hrs

CONCEPT 2 – AVERAGE SPEED

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

$$= \frac{A + B + C}{\frac{A}{S_1} + \frac{B}{S_2} + \frac{C}{S_3}}$$



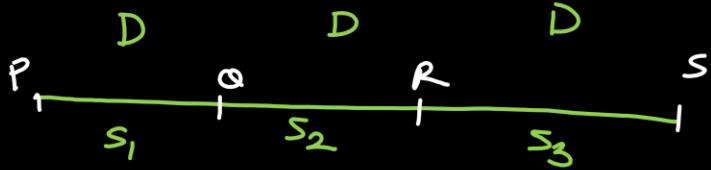
$$\text{Avg Speed} = \frac{s_1 + s_2 + s_3}{3} \times$$

$$\underline{PQ} \quad t_1 = \frac{A}{S_1}$$

$$\underline{QR} \quad t_2 = \frac{B}{S_2}$$

$$\underline{RS} \quad t_3 = \frac{C}{S_3}$$

Distance same

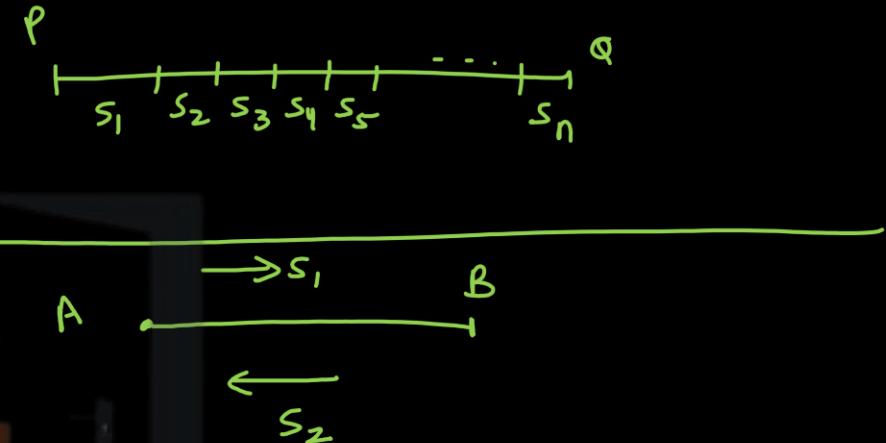


$$\text{Avg Speed} = \frac{D + D + D}{\frac{D}{s_1} + \frac{D}{s_2} + \frac{D}{s_3}}$$

$$= \frac{3D}{D \left[\frac{1}{s_1} + \frac{1}{s_2} + \frac{1}{s_3} \right]}$$

$$= \frac{3}{\frac{1}{s_1} + \frac{1}{s_2} + \frac{1}{s_3}}$$

$$\text{Avg Speed} = \frac{n}{\frac{1}{s_1} + \frac{1}{s_2} + \frac{1}{s_3} + \dots + \frac{1}{s_n}}$$



$$\text{Avg Speed} = \frac{s_1 + s_2}{2} \times = \frac{\frac{2}{s_1 + s_2}}{\frac{1}{s_1} + \frac{1}{s_2}} = \frac{2s_1 s_2}{s_1 + s_2}$$

Q3. A man goes from Hyderabad to Bangalore at a uniform speed of 35 kmph and comes back to Hyderabad at a uniform speed of 65 kmph. His average speed for the whole journey is ____.



Q3. A man goes from Hyderabad to Bangalore at a uniform speed of 35 kmph and comes back to Hyderabad at a uniform speed of 65 kmph. His average speed for the whole journey is ____.

$$S_1 = 35 \quad S_2 = 65$$

$$\text{Avg Speed} = \frac{2}{\frac{1}{S_1} + \frac{1}{S_2}} = \frac{2S_1 S_2}{S_1 + S_2} = \frac{2 \times 35 \times 65}{35 + 65} = \frac{2 \times 35 \times 65}{100}$$

$$= \frac{2 \times 35 \times 65}{100} = \frac{130}{100} = 1.3$$

$$= \frac{7 \times 65}{10} = \frac{455}{10}$$

$$= 45.5 \text{ km/hr}$$

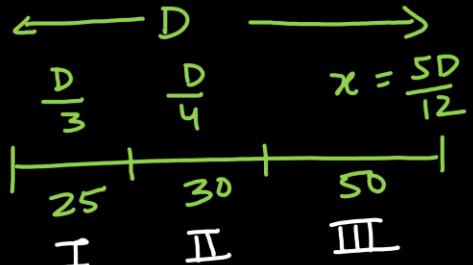
$\underbrace{(35, 65)}$

Q4. Peter travels from his home to a famous tea stall. One-third of his journey is covered at the rate of 25 kmph, one-fourth at the rate of 30 kmph and the rest at 50 kmph. The average speed for the whole journey is __



Q4. Peter travels from his home to a famous tea stall. One-third of his journey is covered at the rate of 25 kmph, one-fourth at the rate of 30 kmph and the rest at 50 kmph. The average speed for the whole journey is __

(M)



$$\frac{D}{3} + \frac{D}{4} + x = D$$

$$\frac{4D+3D}{12} + x = D$$

$$\frac{7D}{12} + x = D$$

$$x = D - \frac{7D}{12} = \frac{12D - 7D}{12} = \frac{5D}{12}$$

$$t_I = \frac{\frac{D}{3}}{25} = \frac{D}{75}$$

$$t_{II} = \frac{\frac{D}{4}}{30} = \frac{D}{120}$$

$$t_{III} = \frac{\frac{5D}{12}}{50} = \frac{D}{120}$$

$$\frac{s=d}{t} \quad t = \frac{d}{s}$$

$$\text{Avg Speed} = \frac{D}{\frac{D}{75} + \frac{D}{120} + \frac{D}{120}}$$

$$\text{Avg Speed} = \frac{\text{total distance}}{\text{total time}}$$

Q4. Peter travels from his home to a famous tea stall. One-third of his journey is covered at the rate of 25 kmph, one-fourth at the rate of 30 kmph and the rest at 50 kmph. The average speed for the whole journey is _____

M2

$$\frac{1}{3}, \frac{1}{4}$$

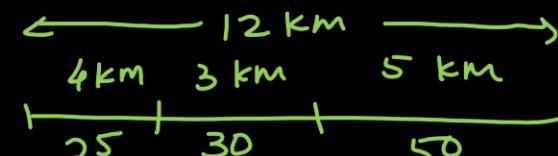
$$\text{LCM}(3, 4) = 12$$

Assume, total distance = 12 km

$$\frac{1}{3}^{\text{rd}} \rightarrow \frac{1}{3} \times 12 = 4 \text{ km}$$

$$\frac{1}{4}^{\text{th}} \rightarrow \frac{1}{4} \times 12 = 3 \text{ km}$$

$$\text{remaining} = 5 \text{ km}$$



$$t = \frac{4}{25}, \frac{3}{30}, \frac{5}{50}$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$\frac{4}{25}, \frac{1}{10}, \frac{1}{10}$$

$$\text{total time} = \frac{4}{25} + \frac{1}{10} + \frac{1}{10} = \frac{4}{25} + \frac{2}{10} = \frac{4}{25} + \frac{1}{5}$$

$$= \frac{4}{25} + \frac{5}{25} = \frac{9}{25}$$

Q4. Peter travels from his home to a famous tea stall. One-third of his journey is covered at the rate of 25 kmph, one-fourth at the rate of 30 kmph and the rest at 50 kmph. The average speed for the whole journey is __

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}} = \frac{\frac{12}{\frac{9}{25}}}{\frac{12 \times 25}{9}} = \frac{100}{3} = 33.33 \text{ km/hr}$$

$(25, 50)$

Q5 (VK). A traveler completes 30 km of a journey at the speed of 6 kmph and the remaining 40 km of the journey in 5 hours. His average speed for the whole journey is __ .



Correct Answer: 7 km/hr



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

What is Factor (Divisor) ?

$$12 = \{ 1, 2, 3, 4, 6, 12 \}$$

$$\left[\frac{12}{1} \quad \frac{12}{2} \quad \frac{12}{3} \quad \frac{12}{4} \quad \frac{12}{6} \quad \frac{12}{12} \right] \checkmark$$

$$\frac{12}{5} \times$$

$$a \times b = c$$

a, b are factors of c

$$\frac{c}{a} = b \quad \frac{c}{b} = a$$

$$12 = 1 \times 12$$

$$= 2 \times 6$$

$$= 3 \times 4$$

$$\{ 1, 2, 3, 4, 6, 12 \}$$

What is a Factors?

Multiplying two whole numbers gives a product. The numbers that we multiply are the factors of the product.

$$\begin{array}{ccc} 2 & \times & 4 \\ \swarrow & & \searrow \\ \text{Factors} & & \text{Product} \end{array}$$



Example: $3 \times 5 = 15$ therefore, 3 and 5 are the factors of 15.

This also means:

A factor divides a number completely without leaving any remainder.

Factors of numbers

$$\begin{aligned}10 &= 1 \times 10 \\&= 2 \times 5\end{aligned}$$

Factors of 10 ?

$$\{1, 2, 5, 10\}$$

$$\begin{array}{r} 10 \\ 1) \overline{)10} \\ - 10 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 5 \\ 2) \overline{)10} \\ - 10 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 2 \\ 5) \overline{)10} \\ - 10 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 10 \\ 10) \overline{)10} \\ - 10 \\ \hline 0 \end{array}$$

Therefore factors of 10 are 1, 2, 5 and 10.

What is Highest Common Factor (HCF) (Greatest Common Divisor / GCD) ?

The greatest number which divides each of the two or more numbers is called HCF or **Highest Common Factor**. It is also called the **Greatest Common Measure(GCM)** and **Greatest Common Divisor(GCD)**

Example: The Highest common factor of 60 and 75 is 15 because 15 is the largest number which can divide both 60 and 75 exactly.

$$\frac{60}{15} \checkmark \quad \frac{75}{15} \checkmark$$

What is a Multiple ?

$$3 = \{3, 6, 9, 12, \dots\}$$

$$8 = \{8, 16, 24, 32, \dots\} \leftarrow \text{multiple}$$

$$\leftarrow \{1, 2, 4, 8\} \leftarrow \text{Factors}$$

$$\frac{8}{8}, \frac{16}{8}, \frac{24}{8}, \frac{32}{8}, \dots \checkmark$$

$$\boxed{\text{factor}(n) \leq n \leq \text{multiple}(n)}$$

Factors \rightarrow Finite

Multiple \rightarrow Infinite

What is Least Common Multiple (LCM)?

$\text{LCM}(a, b)$ = Smallest number which comes in table of both a & b

= Smallest number that divides both a & b

$$\text{LCM}(6, 9) = 18$$

$$6 \times 3 = 18$$
$$9 \times 2 = 18$$

$$\frac{18}{6} \checkmark$$

$$\frac{18}{9} \checkmark$$

HCF by Inspection

HCF (12, 18)

Highest Common Factor

Factor (12) = 1, 2, 3, 4, 6, 12

Factor (18) = 1, 2, 3, 6, 9, 18

Common Factors = 1, 2, 3, 6

Highest Common Factor (HCF) = 6

$$\frac{12}{6} \checkmark \quad \frac{18}{6} \checkmark$$

$$\begin{aligned}12 &= 1 \times 12 \\&= 2 \times 6 \\&= 3 \times 4\end{aligned}$$

$$\begin{aligned}18 &= 1 \times 18 \\&= 2 \times 9 \\&= 3 \times 6\end{aligned}$$

LCM by Inspection

LCM (5, 15, 20, 30) Lowest Common Multiple

Multiple (5) = 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85 ...

Multiple (15) = 15, 30, 45, 60, 75, 90, 105, 120, 135, 150 ...

Multiple (20) = 20, 40, 60, 80, 100, 120, 140 ...

Multiple (30) = 30, 60, 90, 120, 150, 180 ...

Common Multiples = 60, 120, 180 ...

Least Common Multiple (LCM) = 60

\Rightarrow LCM is always bigger than or equal to the biggest number.

\Rightarrow HCF is always smaller than or equal to the smallest number.



1

HCF by Prime Factorization

Follow the below-given steps to find the hcf of numbers using prime factorization method.

Step 1: Write each number as a product of its prime factors. This method is called here prime factorization.

Step 2: Now list the common factors of both the numbers

Step 3: The product of all common prime factors is the HCF (use the lower power of each common factor)

Let us understand with the help of examples.

Example 1: Evaluate the HCF of 60 and 75.

Solution:

HCF(60, 75)

Prime factors = $a^p \times b^q \times c^r$

$a, b, c \rightarrow$ prime No.

$$60 = 2 \times 2 \times 3 \times 5 = 2^2 \times 3^1 \times 5^1$$

$$75 = 3 \times 5 \times 5 = 3^1 \times 5^2$$

Common = $3^1 \times 5^1 = 15$ \leftarrow HCF

2	60
2	30
3	15
5	5
	1

$$\begin{aligned} 60 &= 12 \times 5 \\ &= 4 \times 3 \times 5 \\ &= 2^2 \times 3 \times 5 \end{aligned}$$

$$\begin{aligned} 75 &= 5 \times 15 \\ &= 5 \times 3 \times 5 \\ &= 3 \times 5^2 \end{aligned}$$

3	75
5	25
5	5
	1

HCF by Prime Factorization

Follow the below-given steps to find the hcf of numbers using prime factorization method.

Step 1: Write each number as a product of its prime factors. This method is called here prime factorization.

Step 2: Now list the common factors of both the numbers

Step 3: The product of all common prime factors is the HCF (use the lower power of each common factor)

Let us understand with the help of examples.

Example 1: Evaluate the HCF of 60 and 75.

Solution:

Write each number as a product of its prime factors.

$$2^2 \times 3 \times 5 = 60$$

$$3 \times 5^2 = 75$$

The product of all common prime factors is the HCF.

The common prime factors in this example are 3 & 5.

The lowest power of 3 is 3 and 5 is 5.

$$\text{So, HCF} = 3 \times 5 = 15$$

Example 2: Find the HCF of 36, 24 and 12.



Example 2: Find the HCF of 36, 24 and 12.

$$\begin{aligned}36 &= 12 \times 3 \\&= 4 \times 3 \times 3 \\&= 2^2 \times 3^2\end{aligned}$$

$$\begin{aligned}24 &= 8 \times 3 \\&= 2^3 \times 3 \\12 &= 4 \times 3 \\&= 2^2 \times 3\end{aligned}$$

$$\begin{aligned}36 &= 2^2 \times 3^2 \\24 &= 2^3 \times 3^1 \\12 &= 2^2 \times 3^1\end{aligned}$$

$$\begin{aligned}\text{HCF} &= 2^2 \times 3^1 \\&= 4 \times 3 = 12\end{aligned}$$

Example 2: Find the HCF of 36, 24 and 12.

$$\text{HCF}(36, 24, 12) = \text{HCF}(a, 12)$$

$$\underbrace{\text{HCF}(36, 24)}_{\downarrow} = a$$

$$36 = 2^2 \times 3^2$$

$$24 = 2^3 \times 3^1$$

$$\text{HCF}(36, 24, 12) = \text{HCF}(12, 12) = 12$$

$$12 = 2^2 \times 3^1$$

$$12 = 2^2 \times 3^1 \quad \text{HCF} = 2^2 \times 3^1 = 12$$

$$\boxed{\text{HCF}(a, a, a, a \dots) = a}$$

$$\Rightarrow \text{LCM}(a, b, c) = \text{LCM}(z, c)$$

$$z = \text{LCM}(a, b)$$

Example 2: Find the HCF of 36, 24 and 12.

Solution:

Write each number as a product of its prime factors.

$$2^2 \times 3^2 = 36$$

$$2^3 \times 3 = 24$$

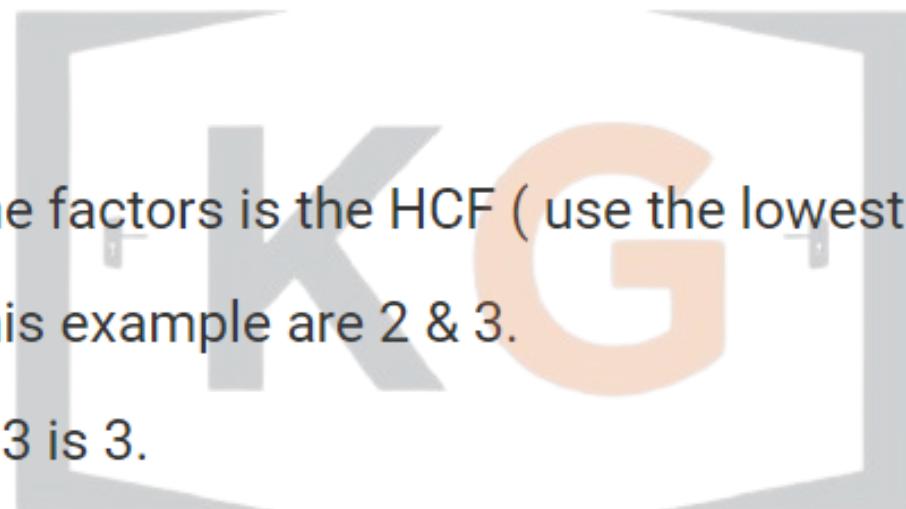
$$2^2 \times 3 = 12$$

The product of all common prime factors is the HCF (use the lowest power of each common factor)

The common prime factors in this example are 2 & 3.

The lowest power of 2 is 2^2 and 3 is 3.

$$\text{So, HCF} = 2^2 \times 3 = 12$$



Example 3: Find the HCF of 36, 27 and 80.



Example 3: Find the HCF of 36, 27 and 80.

$$36 = 2^2 \times 3^2$$

$$\boxed{\text{HCF} = 1}$$

$$27 = 3^3$$

$$80 = 8 \times 10$$

$$= 2^3 \times 2 \times 5$$

$$= 2^4 \times 5$$



Example 3: Find the HCF of 36, 27 and 80.

Solution:

Write each number as a product of its prime factors.

$$2^2 \times 3^2 = 36$$

$$3^3 = 27$$

$$2^4 \times 5 = 80$$

The product of all common prime factors is the HCF

The common prime factors in this example are none.

So, HCF is 1.

LCM using Prime Factorization Method

LCM (12, 18)

$$12 = 4 \times 3 = 2^2 \times 3$$

$$18 = 2 \times 9 = 2 \times 3^2$$

$$12 = 2^2 \times 3^1$$

$$18 = 2^1 \times 3^2$$

$$\begin{aligned} \text{LCM} &= 2^2 \times 3^2 \\ &= 4 \times 9 \\ &= 36 \end{aligned}$$

The LCM of $2^6 * 3^2 * 5 * 7$, $2^3 * 3^5 * 7$ and $2 * 3^4 * 5$ is:

- a) $2^6 * 3^5$
- b) $2^6 * 3^5 * 5$
- c) $2^6 * 3^5 * 7$
- d) None of these



The LCM of $2^6 * 3^2 * 5 * 7$, $2^3 * 3^5 * 7$ and $2 * 3^4 * 5$ is:

- a) $2^6 * 3^5$
- b) $2^6 * 3^5 * 5$
- c) $2^6 * 3^5 * 7$
- d) None of these

$$\text{LCM} = 2^6 \times 3^5 \times 5^1 \times 7^1$$



The LCM of $2^6 * 3^2 * 5 * 7$, $2^3 * 3^5 * 7$ and $2 * 3^4 * 5$ is:

- a) $2^6 * 3^5$
- b) $2^6 * 3^5 * 5$
- c) $2^6 * 3^5 * 7$
- d) None of these

LCM is $2^6 * 3^5 * 5 * 7$, which does not matches any of the given options, so correct answer is option D, none of these.



LCM & HCF (24, 60)

$$24 = 8 \times 3 = 2^3 \times 3^1$$

$$60 = 12 \times 5 = 4 \times 3 \times 5 = 2^2 \times 3^1 \times 5^1$$

$$\text{HCF} = 2^2 \times 3^1 = 4 \times 3 = 12$$

$$\text{LCM} = 2^3 \times 3^1 \times 5^1 = 8 \times 3 \times 5 = 120$$

$$\text{HCF} \times \text{LCM} = 12 \times 120 = 1440$$

Product of Given Numbers

$$\underline{24 \times 60} = 1440$$

$$2 \times 12 \times 60$$

$$12 \times 120$$

For two given numbers,

Product of numbers = HCF * LCM

→ Rule only valid for two numbers

a, b, c, d

$\text{LCM} \times \text{HCF} \neq a * b * c * d$ [may or may not be equal]

Q: If HCF of 189 and 297 is 27, find their LCM.



Q: If HCF of 189 and 297 is 27, find their LCM.

HCF * LCM = Product of two numbers

$$27 * \text{LCM} = 189 * 297$$

$$\text{LCM} = \frac{189 * 297}{27}$$

$$= \frac{189 * 297}{27}$$

$$= 189 * 11$$

$$= 2079$$

HCF by Long Division Method

HCF (48, 72)

$$\begin{array}{r} 1 \\ 48 \overline{)72} \\ -48 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 2 \\ 24 \overline{)48} \\ -48 \\ \hline \times \times \end{array}$$

$$\text{HCF} = 24$$

$$\begin{array}{l} z = \{1, 2\} \\ 3 = \{1, 3\} \end{array}$$

$$\text{HCF}(48, 72) = a$$

$$\text{HCF}\left(\frac{48}{2}, \frac{72}{2}\right) = \frac{a}{2}$$

$$\text{HCF}(24, 36) = \frac{a}{2}$$

$$\text{HCF}(12, 18) = \frac{\frac{a}{2}}{2} = \frac{a}{4}$$

$$\text{HCF}(2, 3) = \frac{\frac{a}{4}}{6} = \frac{a}{24}$$

$$\text{HCF}(2, 3) = 1$$

$$\boxed{\begin{array}{l} \text{HCF}(P_1, P_2) = 1 \\ P_1, P_2 \rightarrow \text{Prime} \\ P_1 = \{1, P_1\} \\ P_2 = \{1, P_2\} \end{array}}$$

$$\left| \begin{array}{l} \frac{a}{24} = 1 \\ a = 24 \end{array} \right.$$

HCF by Long Division Method

HCF (48, 72)

$$\text{HCF}(48, 72) = b$$

$$\text{HCF} \left(\frac{48}{24}, \frac{72}{24} \right) = \frac{b}{24}$$

$$\text{HCF}(2, 3) = \frac{b}{24}$$

$$\frac{b}{24} = 1 \Rightarrow b = 24$$

HCF (770, 1430, 1760)

Applicable for Large Numbers

$$\text{HCF}(770, 1430, 1760) = \alpha$$

$$\text{HCF}(77, 143, 176) = \frac{\alpha}{10}$$

$$\text{HCF}(z, 176)$$

$$z = \text{HCF}(77, 143)$$

$$\begin{array}{r} 1 \\ 77) 143 \\ - 77 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 1 \\ 66) 77 \\ - 66 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 11 \\ 11) 66 \\ - 66 \\ \hline 0 \end{array}$$

$$\text{HCF}(77, 143) = 11$$

$$\text{HCF}(11, 176)$$

$$\begin{array}{r} 16 \\ 11) 176 \\ - 11 \\ \hline 66 \\ - 66 \\ \hline 0 \end{array}$$

$$\text{HCF}(11, 176) = 11$$

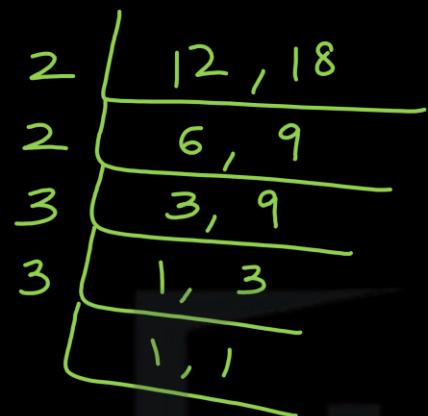
$$\therefore \text{HCF}(77, 143, 176) = 11$$

$$\frac{\alpha}{10} = 11$$

$$\alpha = 11 \times 10 = 110$$

LCM by Long Division Method

LCM (12, 18)



$$\text{LCM} = 2 \times 2 \times 3 \times 3 = 36$$

HCF using Least Number

HCF (6 , 12 , 18)

$$\text{HCF} (6, 12, 18)$$

$$\text{HCF} = 6$$



HCF (8 , 16 , 20, 28, 44)

HCF (~~8~~, ~~16~~, 20, 28, 44)

Factors of 8 = { 1, 2, \checkmark 4, ~~8~~ } $\frac{20, 28, 44}{4}$ HCF = 4

Factors of 20 = { ... 5 ... }

HCF (8 , 16 , 20, 28, 44 , 46)

8, 16, 20, 28, 44, 46

8 ✓ x

$$\frac{8}{2} = 4 \checkmark \quad x$$

$$\frac{8}{3} \times$$

$$\frac{8}{4} = 2 \checkmark \quad x$$

$$\frac{8}{5} \times \quad \frac{8}{6} \times \quad \frac{8}{7} \times$$

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

$$8 = \{ 1, 2, 4, 8 \}$$

$$8 \Rightarrow \cancel{8}, \cancel{16}, \cancel{20}, \cancel{28}, \cancel{44}, \cancel{46}$$

$$4 \Rightarrow \cancel{20}, \cancel{28}, \cancel{44}, \cancel{46}$$

$$2 \Rightarrow \cancel{46}$$

$$\rightarrow HCF = 2$$

HCF (8 , 11, 16 , 20, 28, 44 , 46)

$$8 = \{ 1, 2, 4, 8 \}$$

←

$$8 \Rightarrow 8, 11, \cancel{16}, 20, 28, 44, 46$$

$$8, 11, 16, 20, 28, 44, 46$$

$$4 \Rightarrow 11, \cancel{20}, \cancel{28}, \cancel{44}, 46$$

$$2 \Rightarrow 11, \cancel{46}$$

$$1 \Rightarrow \cancel{11}$$

$$\boxed{\text{HCF} = 1}$$

LCM using Biggest Number

LCM (3, 9, 27, 81)

multiple of 81 = { 81, 162, 243 ... }

81 \Rightarrow 3, 9, 27, 81

LCM = 81

$\text{LCM}(5, 15, 20, \underline{30})$

$$30 = \{30, 60, 90 \dots\}$$

$30 \Rightarrow \cancel{5}, \cancel{15}, 20, 30$

$60 \Rightarrow \cancel{20}$

$$\boxed{\text{LCM} = 60}$$



Q. Find the GCD of 30, 42, 135 ?

- A) 3
- B) 6
- C) 15
- D) 42



Q. Find the GCD of 30, 42, 135 ?

HCF

- A) 3 ✓
- B) 6 ✗
- C) 15 ✗
- D) 42 ✗

$$\text{HCF} \leq 30$$

$$15 \Rightarrow 30, 42, 135$$

X

$$6 \Rightarrow 30, 42, 135$$

X

$$3 \Rightarrow 30, 42, 135$$

$$\boxed{\text{HCF} = 3}$$

$$6 \swarrow^2 \searrow^3$$

$$1+3+5=9$$

$$4+2=6$$

Q: Find the HCF of 24, 60, 84, 108 ?

- A) 10
- B) 9
- C) 8
- D) 12



Q: Find the HCF of 24, 60, 84, 108 ?

- A) 10
- B) 9
- C) 8
- D) 12 (Answer)



HCF (0.15, 2.5, 10)

$$\text{HCF}(0.15, 2.5, 10) = \alpha$$

$$\text{HCF}(15, 250, 1000) = 100\alpha$$

$$15 = \{1, 3, 5, 15\}$$

✓ ×

$$\frac{N}{15} \Rightarrow \frac{N}{3}, \frac{N}{5}$$

$$\frac{1000}{3} \times \frac{1000}{15} \times$$

$$\frac{250}{3} \times \frac{250}{15} \times$$

$$100\alpha = 5$$

$$\alpha = \frac{5}{100} = 0.05$$

Same concept is valid for finding LCM of decimals also.



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

HCF of Fractions

$$\text{HCF of fractions} = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$$



Example: Find the HCF of $\frac{9}{10}, \frac{6}{15}, \frac{12}{20}, \frac{18}{5}$

$$\text{HCF of fractions} = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$$

$$\frac{\text{HCF}(9, 6, 12, 18)}{\text{LCM}(10, 15, 20, 5)} = \frac{3}{60} = \frac{1}{20}$$

$$\text{HCF}(9, 6, 12, 18)$$

$$6 \Rightarrow 9, 6, 12, 18$$

$$3 \Rightarrow 9$$

$$\therefore \text{HCF} = 3$$

$$6 = \{1, 2, 3, 6\}$$

$$\text{LCM}(10, 15, 20, 5)$$

$$20 \Rightarrow 10, 15, 20, 5$$

$$40 \Rightarrow 15$$

$$60 \Rightarrow 18$$

$$\therefore \text{LCM} = 60$$

Example: Find the HCF of $\frac{9}{10}, \frac{6}{15}, \frac{12}{20}, \frac{18}{5}$

Solution: According to the HCF formula, $HCF = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$.

So finding the HCF of the numerators:

$$9 = 1 \times 3 \times 3$$

$$6 = 1 \times 2 \times 3$$

$$12 = 1 \times 2 \times 2 \times 3$$

$$18 = 1 \times 2 \times 3 \times 3$$

Therefore, the HCF of 9, 6, 12, 18 = 3

$$10 = 1 \times 2 \times 5$$

$$15 = 1 \times 3 \times 5$$

$$20 = 1 \times 2 \times 2 \times 5$$

$$5 = 1 \times 5$$

Therefore, the LCM of 10, 15, 20, 5 = 60

$HCF = \frac{\text{HCF of numerators}}{\text{LCM of denominators}}$

$$HCF = \frac{3}{60}$$

Therefore, the HCF of $\frac{9}{10}, \frac{6}{15}, \frac{12}{20}, \frac{18}{5}$ is $\frac{3}{60}$

HCF (0.15, 2.5, 10)

$$\text{HCF}(0.15, 2.5, 10) = \alpha$$

$$\text{HCF}(15, 250, 1000) = 100\alpha$$

$$15 = \{1, 3, 5, 15\}$$

✓ ×

$$\frac{N}{15} \Rightarrow \frac{N}{3}, \frac{N}{5}$$

$$\frac{1000}{3} \times \frac{1000}{15} \times$$

$$\frac{250}{3} \times \frac{250}{15} \times$$

$$100\alpha = 5$$

$$\alpha = \frac{5}{100} = 0.05$$

HCF (0.15, 2.5, 10)

HCF of fractions = $\frac{\text{HCF of numerators}}{\text{LCM of denominators}}$

$$\text{HCF} \left(\frac{15}{100}, \frac{25}{10}, \frac{10}{1} \right) = \frac{\text{HCF}(15, 25, 10)}{\text{LCM}(100, 10, 1)} \rightarrow \text{undefined}$$

$$\text{HCF} \left(\frac{15}{100}, \frac{25}{10}, \frac{20}{2} \right) = \frac{\text{HCF}(15, 25, 20)}{\text{LCM}(100, 10, 2)} = \frac{5}{100} = 0.05$$

$$\Rightarrow \text{HCF}(15, 25, 20) = 5$$

$$\{1, 3, 5, 15\}$$

$$\text{LCM}(100, 10, 2) = 100$$

$$\{100, 200, \dots\}$$

$$\begin{aligned}\text{Multiple}(1) &= \{1\} \\ \text{Multiple}(10) &= \{10, 20, \dots\} \\ \text{Multiple}(100) &= \{100, 200, \dots\}\end{aligned}$$

Multiple \rightarrow always infinite \times

LCM of Fractions

$$\text{LCM of fractions} = \frac{\text{LCM of Numerators}}{\text{HCF of Denominators}}$$

$$\text{LCM} \left[\frac{a}{b}, \frac{c}{d}, \frac{e}{f} \right] = \frac{\text{LCM}(a, c, e)}{\text{HCF}(b, d, f)}$$



LINEAR EQUATIONS

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q1. In a competitive exam, 5 marks are awarded for every correct answer and for every wrong answer, 2 marks are deducted. Sathwik scores 32 marks in the examination. If 4 marks had been awarded for each correct answer and 1 mark had been deducted for each incorrect answer, Sathwik would have scored 34 marks. If Sathwik attempted all the questions, how many questions were there in the test ?

- A. 14
- B. 26
- C. 12
- D. 20



Q1. In a competitive exam, 5 marks are awarded for every correct answer and for every wrong answer, 2 marks are deducted. Sathwik scores 32 marks in the examination. If 4 marks had been awarded for each correct answer and 1 mark had been deducted for each incorrect answer, Sathwik would have scored 34 marks. If Sathwik attempted all the questions, how many questions were there in the test ?

- A. 14
- B. 26 ✓
- C. 12
- D. 20

$$\begin{aligned}
 & \text{Total answers correct} = c \\
 & \text{Total answers wrong} = w \\
 & \left. \begin{array}{l} 5c - 2w = 32 \\ 4c - w = 34 \end{array} \right\} \text{total questions} = c+w \\
 & \left. \begin{array}{l} 5c - 2w = 32 \\ 8c - 2w = 68 \end{array} \right\} -5c + 2w = -32 \\
 & \qquad \qquad \qquad 3c = 36 \\
 & \qquad \qquad \qquad c = \frac{36}{3} = 12 \\
 & \qquad \qquad \qquad c+w = 12+14 \\
 & \qquad \qquad \qquad = 26
 \end{aligned}$$



Correct Answer : Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q2. Let a, b, c, d and e be distinct integers in ascending order such that

$$(76-a)(76-b)(76-c)(76-d)(76-e) = 1127.$$



Then, What will be the value of $a + b + c + d$

- A. 30
- B. 274
- C. 334
- D. 136



Q2. Let a, b, c, d and e be distinct integers in ascending order such that

$$(76-a)(76-b)(76-c)(76-d)(76-e) = 1127.$$



Then, What will be the value of $a + b + c + d$

- A. 30
- B. 274
- C. 334
- D. 136



Q2. Let a, b, c, d and e be distinct integers in ascending order such that



$$(76-a)(76-b)(76-c)(76-d)(76-e) = 1127.$$

$$a < b < c < d < e$$

$$(76-a) > (76-b) > (76-c) > (76-d) > (76-e)$$

Then, What will be the value of $a + b + c + d$

- A. 30
- B. 274 ✓
- C. 334
- D. 136

$$\begin{aligned} 1127 &= 23 \times 49 \\ &= 23 \times 7 \times 7 \\ &= 23 \times 7 \times 7 \times 1 \times 1 \\ &= 23 \times (-7) \times 7 \times (-1) \times 1 \\ &= 23 \times 7 \times 1 \times (-1) \times (-7) \end{aligned}$$

$$\left. \begin{array}{l} 76-a = 23 \\ 76-b = 7 \\ 76-c = 1 \\ 76-d = -1 \\ 76-e = -7 \end{array} \right\} \quad \begin{array}{l} a = 76-23 = 53 \\ b = 76-7 = 69 \\ c = 76-1 = 75 \\ d = 76+1 = 77 \\ e = 76+7 = 83 \end{array}$$

$$\begin{aligned} a+b+c+d &= 53 + 69 + 75 + 77 \\ &= 274 \end{aligned}$$

Correct Answer : Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q3. Assume that $f(1)=0$ and $f(m+n) = f(m) + f(n) + 4(9mn-1)$.

For all natural numbers (Integers>0) m and n. What is the value of $f(17)$?

- A. 5436
- B. 4831
- C. 5508
- D. 4832



Q3. Assume that $f(1)=0$ and $f(m+n) = f(m) + f(n) + 4(9mn-1)$.

For all natural numbers (Integers>0) m and n. What is the value of $f(17)$?

- A. 5436
- B. 4831
- C. 5508
- D. 4832

$$f(1) \Rightarrow m=1 \quad n=1 \Rightarrow f(2)$$

$$f(2) \Rightarrow m=2 \quad n=2 \Rightarrow f(4)$$

$$f(4) \Rightarrow m=4 \quad n=4 \Rightarrow f(8)$$

$$f(8) \Rightarrow m=8 \quad n=8 \Rightarrow f(16)$$

$$f(16) \Rightarrow m=16 \quad n=1 \Rightarrow f(17) \checkmark$$



$$f(1) = 0$$

$$f(2) = f(1+1) = f(1)+f(1)+4(9 \times 1 \times 1 - 1) = 0+0+4 \times 8 = 32$$

$$f(4) = f(2+2) = f(2)+f(2)+4(9 \times 2 \times 2 - 1) = 32+32+4 \times 35 = 204$$

$$f(8) = f(4+4) = f(4)+f(4)+4(9 \times 4 \times 4 - 1) = 204+204+4 \times 143 = 980$$

$$f(16) = f(8+8) = f(8)+f(8)+4(9 \times 8 \times 8 - 1) = 980+980+4 \times 575 = 4260$$

$$f(17) = f(1+16) = f(16)+f(1)+4(9 \times 16 \times 1 - 1) = 4260+0+4 \times 143 = 4832$$

Correct Answer : Option D



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4 (VK). If $f(1) = 4$, $f(x+y) = f(x) + f(y) + 7xy + 2$ for $x > 0$ and $y > 0$, find $f(2) + f(5)$.



- A. 98
- B. 120
- C. 115
- D. Cannot be determined



Q4 (VK). If $f(1) = 4$, $f(x+y) = f(x) + f(y) + 7xy + 2$ for $x > 0$ and $y > 0$, find $f(2) + f(5)$.

- A. 98
- B. 120
- C. 115
- D. Cannot be determined

$$f(1) \Rightarrow x=1 \quad y=1 \quad \Rightarrow f(2) \quad \checkmark$$

$$f(2) \Rightarrow x=2 \quad y=2 \quad \Rightarrow f(4)$$

$$f(4) \Rightarrow x=4 \quad y=1 \quad \Rightarrow f(5) \quad \checkmark$$



$$f(2) + f(5) = \underline{\hspace{2cm}}$$

Correct Answer : Option C

Explanation –

$$F(x+y) = f(x) + f(y) + 7xy + 2$$

so

$$f(1+1) = f(1) + f(1) + 7 \cdot 1 \cdot 1 + 2$$

$$= 4 + 4 + 7 + 2$$

$$= 17$$

$$f(2) = 17$$

$$f(2+2) = f(2) + f(2) + 7 \cdot 2 \cdot 2 + 2$$

$$= 17 + 17 + 28 + 2$$

$$= 64$$

$$f(4)=64$$

$$f(4+1)=f(4)+f(1)+7*4*1+2$$

$$=64+4+28+2$$

$$=98$$

$$f(5)=98$$

Now

$$f(2)+f(5)= 17+98$$

$$=115$$





MIXTURE & ALLIGATION

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Weighted Average

Class 3A $\Rightarrow n_1$ Students \Rightarrow Avg marks x_1
 Class 3B $\Rightarrow n_2$ Students \Rightarrow Avg marks x_2
 Class 3C $\Rightarrow n_3$ Students \Rightarrow Avg marks x_3

Average marks of class 3

(\bar{x})

$$= \frac{n_1 x_1 + n_2 x_2 + n_3 x_3}{n_1 + n_2 + n_3}$$

10 students $\rightarrow 5$ marks

20 students $\rightarrow 10$ marks

30 students $\rightarrow 20$ marks

$$\frac{(10 \times 5) + (20 \times 10) + (30 \times 20)}{10 + 20 + 30}$$

$$\frac{50 + 200 + 600}{60}$$

$$\frac{850}{60} = \frac{85}{6} = 14.16$$

Q1. Rice is sold at Rs. 450 per kg & Dal is sold at Rs. 510 per kg. In what ratio Rice & Dal should be mixed so that the mixture costs Rs. 475 per kg ?

- a) 4 : 7
- b) 5 : 7
- c) 6 : 7
- d) 7 : 5



Q1. Rice is sold at Rs. 450 per kg & Dal is sold at Rs. 510 per kg. In what ratio Rice & Dal should be mixed so that the mixture costs Rs. 475 per kg ?

- a) 4 : 7
- b) 5 : 7
- c) 6 : 7
- d) 7 : 5 ✓

$$\bar{x} = \frac{n_1 x_1 + n_2 x_2}{n_1 + n_2}$$

$$x_1 = 450$$

$$x_2 = 510$$

$$\bar{x} = 475$$

$$n_1 : n_2$$

$$\frac{n_1}{n_2}$$

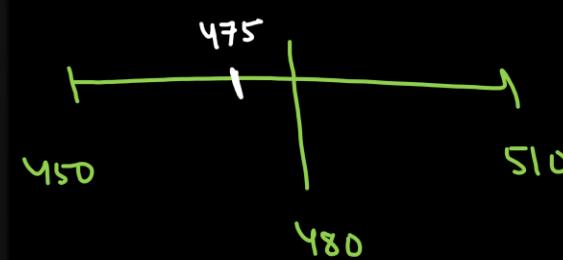
$$475 = \frac{n_1(450) + n_2(510)}{n_1 + n_2}$$

$$475(n_1 + n_2) = 450n_1 + 510n_2$$

$$475n_1 + 475n_2 = 450n_1 + 510n_2$$

$$475n_1 - 450n_1 = 510n_2 - 475n_2$$

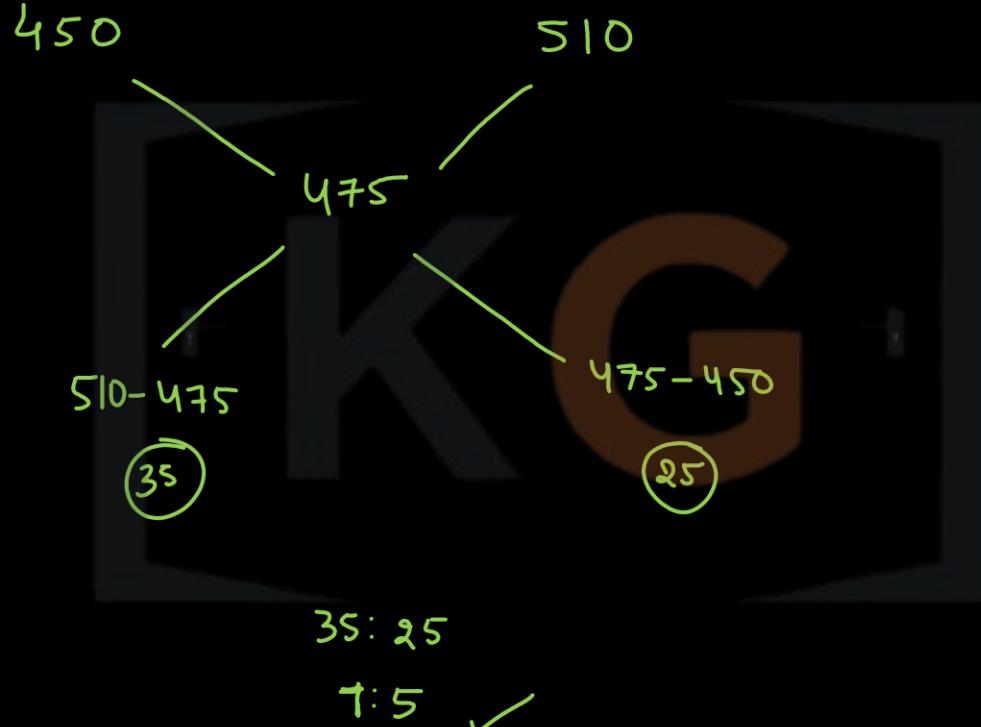
$$25n_1 = 35n_2 \Rightarrow \frac{n_1}{n_2} = \frac{35}{25} = \frac{7}{5} = 7:5$$



Q1. Rice is sold at Rs. 450 per kg & Dal is sold at Rs. 510 per kg. In what ratio Rice & Dal should be mixed so that the mixture costs Rs. 475 per kg ?

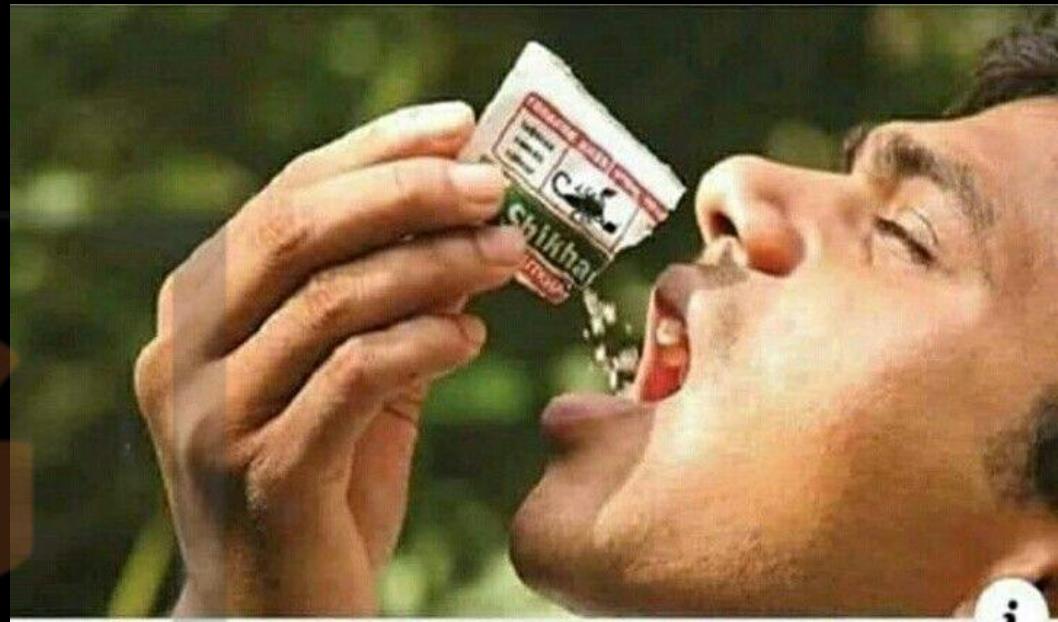
- a) 4 : 7
- b) 5 : 7
- c) 6 : 7
- d) 7 : 5

Alligation Rule



Q2. There are two qualities of Vimal Paan Masala, one is Kesar Wala Vimal, another one is Bina Kesar Wala Vimal, Bina Kesar Wala Vimal Costs Rs. 28.50 per Kg and Kesar wala Vimal Costs Rs. 34.50 per kg. This mixture is sold at Rs. 30.50. Find the ratio of two qualities of Vimal in the mixture.

- a) 4 : 1
- b) 3 : 1
- c) 2 : 1
- d) 3 : 2



HINDI.FAKINGNEWS.COM

दही-शक्कर की जगह छात्र ने पान मसाला खाकर दी परीक्षा , सभी विषयों में आए पूरे अंक

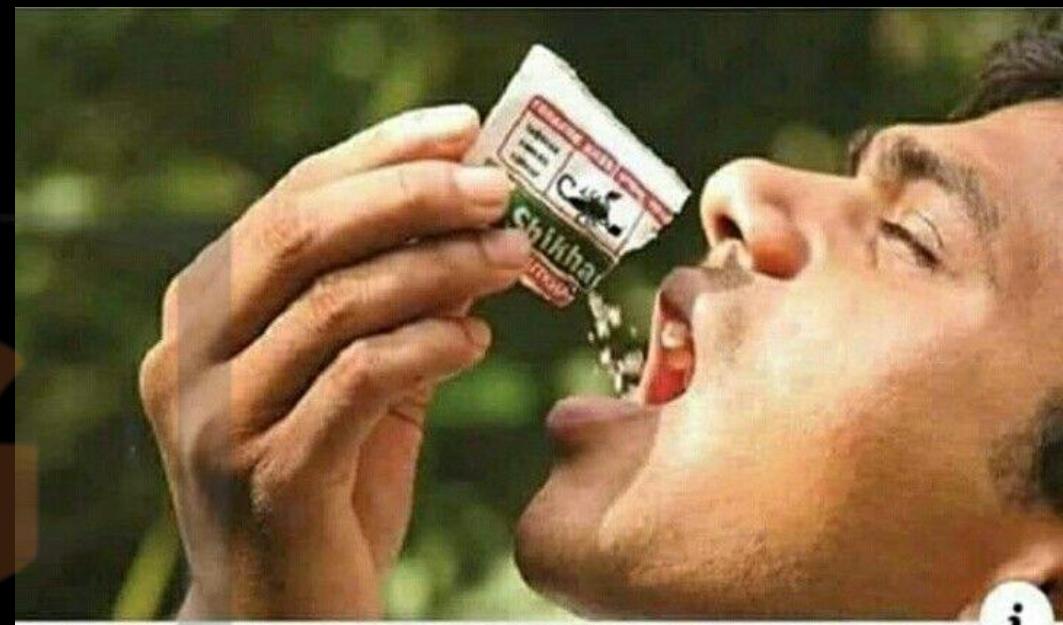
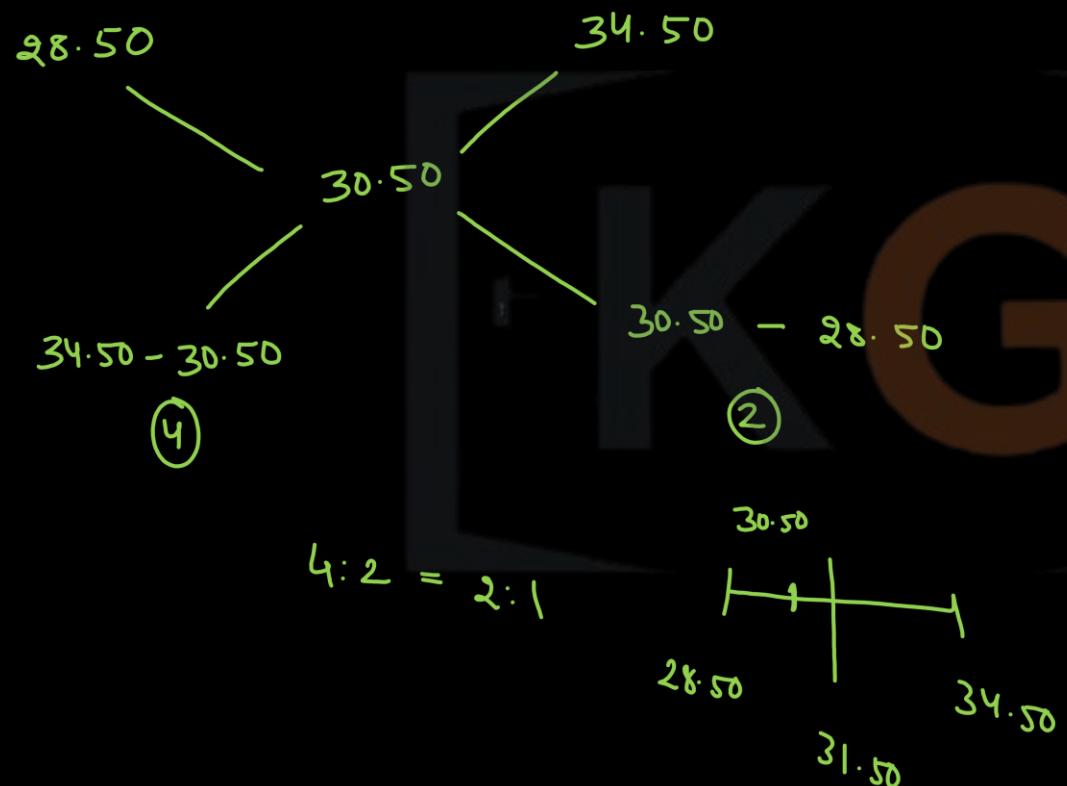


Ajay devgan check kr rha tha
kya exam 😊😊😊😊

43m 14 likes Reply

Q2. There are two qualities of Vimal Paan Masala, one is Kesar Wala Vimal, another one is Bina Kesar Wala Vimal, Bina Kesar Wala Vimal Costs Rs. 28.50 per Kg and Kesar wala Vimal Costs Rs. 34.50 per kg. This mixture is sold at Rs. 30.50. Find the ratio of two qualities of Vimal in the mixture.

- a) 4 : 1
- b) 3 : 1
- c) 2 : 1 ✓
- d) 3 : 2



HINDI.FAKINGNEWS.COM

दही-शक्कर की जगह छात्र ने पान मसाला खाकर दी परीक्षा , सभी विषयों में आए पूरे अंक



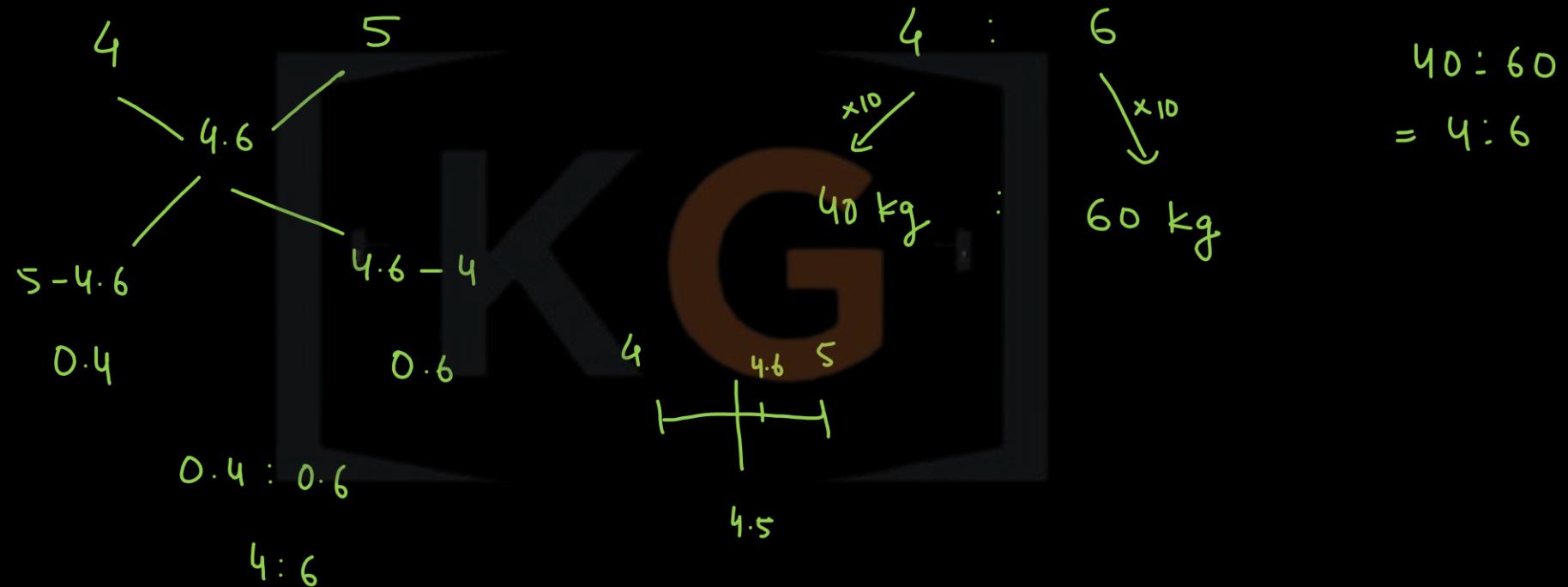
Q3. Mrs. Verma has two types of oil, these two types of oil having the rates Rs. 4 per kg and Rs. 5 per kg respectively are mixed in order to produce a mixture having the rate of Rs. 4.6 per kg. What should be the amount of the second type of oil if the amount of the first type of oil in the mixture is 40 Kg?

- a) 30 kg
- b) 40 kg
- c) 50 kg
- d) 60 kg



Q3. Mrs. Verma has two types of oil, these two types of oil having the rates Rs. 4 per kg and Rs. 5 per kg respectively are mixed in order to produce a mixture having the rate of Rs. 4.6 per kg. What should be the amount of the second type of oil if the amount of the first type of oil in the mixture is 40 Kg?

- a) 30 kg
- b) 40 kg
- c) 50 kg
- d) 60 kg ✓



Q4(VK). Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.



- A) 1 : 3
- B) 2 : 3
- C) 3 : 4
- D) 4 : 5



Correct Answer: Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



PERMUTATION & COMBINATION

BASIC CONCEPTS

$$10! = 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

$$7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$$

$$0! = 1$$

6 ways

$$3! = 3 \times 2 \times 1 = 6$$

- $b_1 \quad b_2 \quad b_3$
- $b_1 \quad b_3 \quad b_2$
- $b_2 \quad b_1 \quad b_3$
- $b_2 \quad b_3 \quad b_1$
- $b_3 \quad b_1 \quad b_2$
- $b_3 \quad b_2 \quad b_1$

b_1
 b_2
 b_3

3 places, 3 objects arrange = $3!$
n places, n objects arrange = $n!$

Combination

↳ choosing, selecting, selection

$$5 \text{ people} \rightarrow 3 \text{ people choose} = {}^5C_3$$
$$\frac{n: 5}{\sigma: 3} \quad \frac{5!}{(5-3)! 3!}$$

P_1
 P_2
 P_3
 P_4
 P_5

} P_1 P_3 P_4

$$= \frac{5 \times 4 \times 3 \times 2 \times 1}{2! \times 3 \times 2 \times 1}$$
$$= \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1 \times 3 \times 2 \times 1} = 10 \text{ ways}$$

n people
→ people choose

↳ n_C_σ

$$n_C_\sigma = \frac{n!}{(n-\sigma)! \sigma!}$$

n_{C_r} Trick

$$7_{C_2} = \frac{2 \text{ items}}{2 \text{ items}} = \frac{7 \times 6}{1 \times 2} = 21$$

$n: 7$
 $r: 2$

$$n_{C_r} = \frac{n!}{(n-r)! r!} = \frac{7!}{(7-2)! 2!} = \frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{5! \times 2 \times 1}$$

$$\boxed{n_{C_r} = \frac{r \text{ items}}{r \text{ items}} = \frac{n \times (n-1) \times (n-2) \times \dots}{1 \times 2 \times 3 \times \dots}}$$
$$= \frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{5 \times 4 \times 3 \times 2 \times 1 \times 2 \times 1}$$
$$= \frac{7 \times 6}{2 \times 1}$$
$$= 21$$

$$8C_3 = \frac{3 \text{ items}}{3 \text{ items}} = \frac{8 \times 7 \times 6}{1 \times 2 \times 3} = 56$$

$$8C_6 = \frac{6 \text{ items}}{6 \text{ items}} = \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3}{1 \times 2 \times 3 \times 4 \times 5 \times 6} = \frac{8 \times 7}{2} = 28$$

$$8C_2 = \frac{2 \text{ items}}{2 \text{ items}} = \frac{8 \times 7}{1 \times 2} = 28$$

$$\boxed{nC_r = nC_{n-r}}$$

8 people → 6 people
 → 2 people

$8C_6$
 $8C_2$

} Same

n people → r people
 → n-r people

} Same

g_{C_6}

$$n: 9$$

$$r: 6$$

$$n-r: 9-6=3$$

$$n_{C_r} = n_{C_{n-r}}$$

$$g_{C_6} = g_{C_3} = \frac{3 \text{ items}}{3 \text{ items}} = \frac{9 \times 8 \times 7}{1 \times 2 \times 3} = 3 \times 4 \times 7 = 84$$



Permutation

↳ Selection + Arrangement

Compulsory , AND (*)
Optional, choice, OR (+)

Q. Arrange 5 balls in 3 places.

$$5C_3 * 3!$$

$b_1 \ b_2 \ b_3 \ b_4 \ b_5$



choose 3 balls



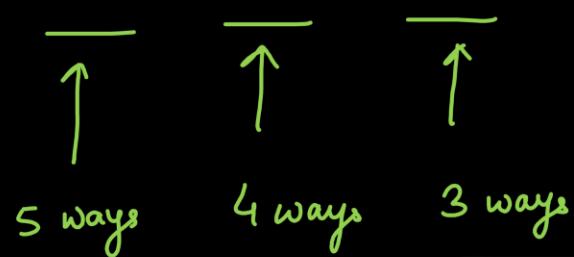
arrange 3 balls in 3 places

$$3!$$

$$\frac{5 \times 4 \times 3}{1 \times 2 \times 3} \times 3 \times 2 \times 1$$

$$= 5 \times 4 \times 3 = 60 \text{ ways}$$

b_1
 b_2
 b_3
 b_4
 b_5



total ways : $5 \times 4 \times 3 = 60$ ways

n objects \rightarrow arrange ' r ' places = $n_{P_r} = \frac{n!}{(n-r)!}$

$$\Rightarrow 5_{P_3} = \frac{5!}{(5-3)!} = \frac{5!}{2!} = \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1}$$

$n: 5$

$r: 3$

$$= 5 \times 4 \times 3 = 60 \text{ ways}$$

$$\frac{n_{P_r}}{r!} = \frac{\frac{n!}{(n-r)!}}{r!} = \frac{n!}{(n-r)! r!} = n_{C_r}$$

$$\frac{n_{P_r}}{r!} = n_{C_r} \Rightarrow n_{P_r} = n_{C_r} \times r!$$

arranging
 'r' objects out of 'n'
 in 'r' places after
 selecting 'r' objects
 out of 'n'

Selecting
 'r' objects out
 of 'n'
 (AND)

Arranging 'r' selected
objects in 'r' places

Q1: If we have 10 people and 4 chairs, what are the number of ways to seat them?

- A) 5040
- B) 4880
- C) 3600
- D) 6890



Q1: If we have 10 people and 4 chairs, what are the number of ways to seat them?

- A) 5040 ✓
- B) 4880
- C) 3600
- D) 6890

(M1)

$$10P_4 = \frac{10!}{(10-4)!} = \frac{10 \times 9 \times 8 \times 7 \times 6!}{6!}$$

$$6 \times 5 \times 4 \times 3 \times 2 \times 1$$

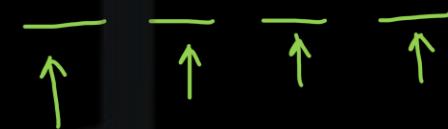
$$nPr = \frac{n!}{(n-r)!}$$

$$= 10 \times 9 \times 8 \times 7 = 5040 \text{ ways}$$

(M2)

$$10C_4 * 4! = 5040 \text{ ways}$$

(M3)



10 ways 9 ways 8 ways 7 ways

$P_1 P_2 P_3 P_4 P_5$
 $P_6 P_7 P_8 P_9 P_{10}$

$$\begin{aligned} \text{total} &= 10 \times 9 \times 8 \times 7 \\ &= 5040 \text{ ways} \end{aligned}$$

Correct Answer: Option A, $10*9*8*7 = 5040$



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q2: In how many ways can we form a 5 lettered word?

No repetition, starting with 'a' and ending with 'z'.  TATA CONSULTANCY SERVICES



Q2: In how many ways can we form a 5 lettered word?

No repetition, starting with 'a' and ending with 'z'.  TATA CONSULTANCY SERVICES

$$\begin{array}{c} a \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad z \\ \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ 24 \quad 23 \quad 22 \\ \text{ways} \quad \text{ways} \quad \text{ways} \end{array} \quad \begin{array}{c} b \ c \ d \ e \ f \ g \ h \ ; \\ j \ k \ l \ m \ n \ o \ p \ q \\ \gamma \ s \ t \ u \ v \ w \ x \ y \end{array}$$

$$\text{Total ways} = 24 \times 23 \times 22 = 12,144$$

Correct Answer: $24 * 23 * 22 = 12,144$



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q3: In how many ways a committee consisting of 4 men and 2 women, can be chosen from 6 men and 5 women?



- A) 130
- B) 140
- C) 150
- D) 160



Q3: In how many ways a committee consisting of 4 men and 2 women, can be chosen from 6 men and 5 women?



- A) 130
- B) 140
- C) 150
- D) 160

$$\begin{aligned} & 6C_4 * 5C_2 \\ & = 6C_2 * 5C_2 \\ & = \frac{6 \times 5}{1 \times 2} * \frac{5 \times 4}{1 \times 2} \\ & = 15 * 10 = 150 \text{ ways} \end{aligned}$$

Correct Answer: Option C (150)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4 (VK): In how many ways a committee consisting of 5 men and 3 women, can be chosen from 9 men and 12 women?



- A) 27683
- B) 13465
- C) 21110
- D) 27720



Correct Answer: Option D (27720)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



SIMPLE AND COMPOUND INTEREST

BASIC CONCEPTS

INTEREST





<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

TERMINOLOGY

1. Principle = Rs. 100
2. Rate = 10% per annum (p.a.)
3. Time = 3 years
4. Interest (SI / CI) = Rs. I = Rs. 30 (let)
5. Amount = $P + I = 100 + 30 = \text{Rs. } 130$

Out of these 5, any 4 values will be given and we will be asked to find the 5th value.

SIMPLE INTEREST & COMPOUND INTEREST

$$\begin{aligned}P &= 100 \\R &= 10\% \\T &= 3 \text{ years}\end{aligned}$$

SI

$$\begin{array}{r} 100 \\ \swarrow 10\% \quad \searrow 10\% \\ 10 \qquad 10 \\ \hline 10+10+10 = 30 \end{array}$$

$$SI = \text{Rs. } 30$$

$$A = P + I = 100 + 30 = \text{Rs. } 130$$

CI

$$100 \xrightarrow{10\%} 10$$

At the end of 1 year : $100 + 10 = 110$

$$110 \xrightarrow{10\%} 11$$

At the end of 2 years : $110 + 11 = 121$

$$121 \xrightarrow{10\%} 12.1$$

At the end of 3 years : $121 + 12.1 = 133.1$

$$\begin{array}{ccc} 133.1 & & \\ \swarrow & \searrow & \\ 100 & & 33.1 \end{array}$$

$$\begin{aligned}A &= 133.1 \\I &= 33.1\end{aligned}$$

SIMPLE INTEREST & COMPOUND INTEREST

$$I = 10 + 11 + 12.1 = 33.1$$

$CI \geq SI$

$CI = SI$

$CI > SI$

for first year

After 1 year

SIMPLE INTEREST

$$S.I. = \frac{P \times R \times T}{100}$$



$$\begin{aligned}
 SI &= \frac{PRT}{100} && (RT)\% \text{ of } P \\
 &= P \cdot \frac{RT}{100} && \frac{RT}{100} \times P \\
 &= P \cdot (RT)\%
 \end{aligned}$$

① find $(RT)\%$ ← overall interest in terms of percentage

② find $(RT)\% \text{ of } P$ to get SI .

③ $A = P + SI$

Q1. Find the amount & simple interest on Rs. 6000 at the rate of 6% per annum for 2 years?



Q1. Find the amount & simple interest on Rs. 6000 at the rate of 6% per annum for 2 years?

$$P = 6000$$

$$R = 6\%$$

$$T = 2$$

M1

$$SI = \frac{P \times R \times T}{100}$$

$$= \frac{6000 \times 6 \times 2}{100}$$

$$= 60 \times 12$$

$$\boxed{SI = \text{Rs. } 720}$$

$$A = 6000 + 720 = \text{Rs. } 6720$$

M2

6% \rightarrow 1 year

12% \rightarrow 2 years

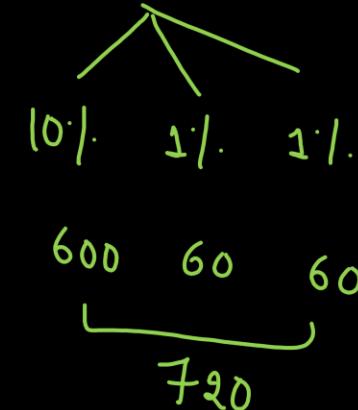
Total interest = 12%
 $(RT)\%$

SI = 12% of 6000

$$\frac{12}{100} \times 6000$$

$$12 \times 60$$

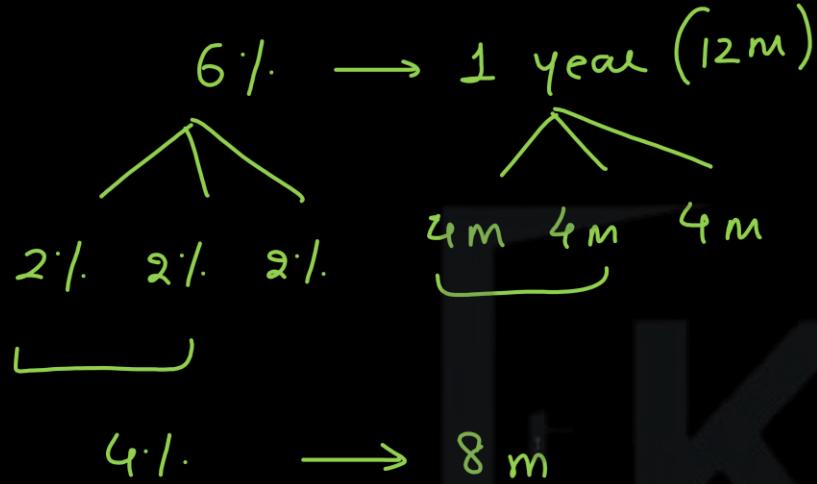
$$= 720$$



Q2. Find the amount & simple interest on Rs. 6000 at the rate of 6% per annum for 8 months?



Q2. Find the amount & simple interest on Rs. 6000 at the rate of 6% per annum for 8 months?



$$12 \text{ m} \rightarrow 6\%$$

$$1 \text{ m} \rightarrow \frac{6}{12}\%$$

$$8 \text{ m} \rightarrow \frac{6}{12} \times 8 = 4\%$$

Total Interest = 4%

4% of 6000

↓
1%. 1%. 1%. 1%.
60 60 60 60
↓
Rs. 240

$$SI = \text{Rs. } 240$$

$$\begin{aligned} A &= 6000 + 240 \\ &= 6240 \end{aligned}$$

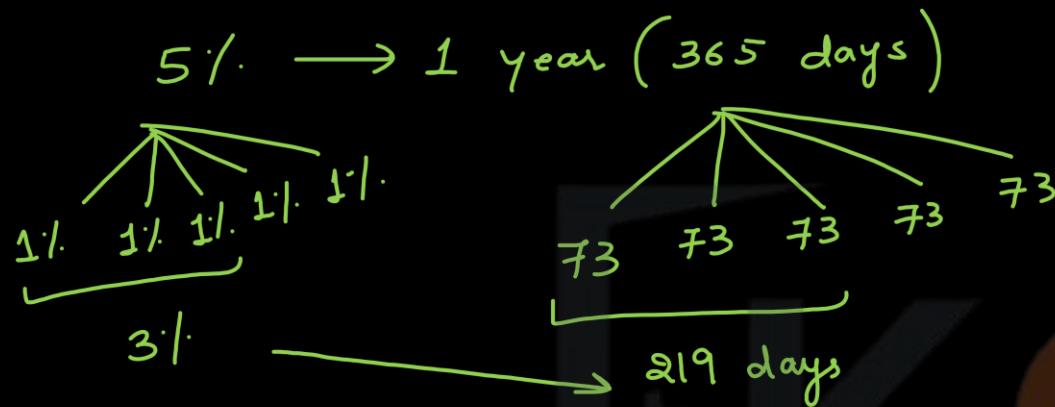
Q3. Find the Simple Interest on Rs. 2500 at the rate of 5% per annum for 219 days.



Tip: Assume a year to be ordinary year unless leap year is specified explicitly.



Q3. Find the Simple Interest on Rs. 2500 at the rate of 5% per annum for 219 days.



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

$$A = 2500 + 75 = 2575$$

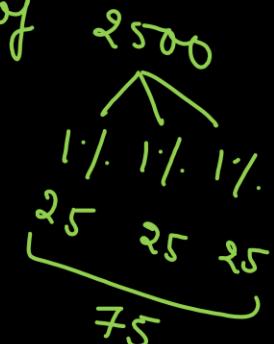
$$\frac{365}{5} = 73$$

$$365 \text{ days} \rightarrow 5\%$$

$$1 \text{ day} \rightarrow \frac{5}{365} \%$$

$$219 \text{ days} \rightarrow \frac{5}{365} \times 219 = 3\%$$

Total Interest = 3% \Rightarrow 3% of 2500



Q4. What will be the simple interest on Rs.3200 at the rate of 5% per annum from 4th April to 16th June.



Tip: Interest Starts from next day, and day of return is also counted as a part of interest.



Q4. What will be the simple interest on Rs.3200 at the rate of 5% per annum from 4th April to 16th June.



Interest will start from 5th April to 16th June

$$5 \text{ April} - 30 \text{ April} = 26 \text{ days}$$

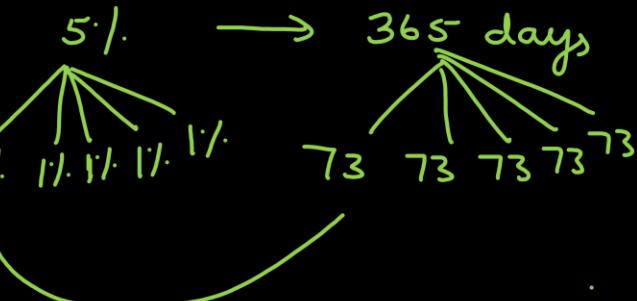
$$1 \text{ May} - 31 \text{ May} = 31 \text{ days}$$

$$1 \text{ June} - 16 \text{ June} = 16 \text{ days}$$

$$SI = \text{Rs. } 32$$

$$A = 3200 + 32 = 3232$$

$$26 + 31 + 16 = 73 \text{ days}$$



$$\begin{aligned} 5\% &\rightarrow 365 \text{ days} \\ 1/ &= 73 \text{ days} \\ \text{Total Interest} &= 1/ \\ &\Rightarrow 1/ \text{ of } 3200 \\ &= \text{Rs. } 32 \end{aligned}$$

Q5 (VK). If you deposit Rs. 110 in a bank at a simple interest of 12% per year, how much money will you have in the bank after 2 years?



- A. 134
- B. 136.4
- C. 123
- D. 456



Correct Answer - Option B

Explanation:

$$SI = PTR/100$$

$$SI = (110 * 2 * 12) / 100$$

$$SI = 26.4$$

$$\text{Total amount after 2 years} = P + SI = 110 + 26.4 = 136.4$$

COMPOUND INTEREST

$$SI = \frac{P \times R \times T}{100}$$

$$CI \times CI, A = P \left(1 + \frac{R}{100}\right)^T$$

A ✓

$$A = P + CI$$

$$CI = A - P$$

$$P = 100$$

$$R = 10\%$$

$$T = 3 \text{ yrs}$$

$$A = P \left(1 + \frac{R}{100}\right)^T$$

$$= 100 \left[1 + \frac{10}{100}\right]^3$$

$$= 100 \left[1 + \frac{1}{10}\right]^3$$

$$= 100 \times \left(\frac{11}{10}\right)^3 = 100 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10} = \frac{1331}{10}$$

$$= 133.1$$

$$A = 133.1$$

$$P = 100$$

$$CI = 133.1 - 100 \\ = 33.1$$

COMPOUND INTEREST

2 yrs \Rightarrow 2 : 1

3 yrs \Rightarrow 3 : 3 : 1

4 yrs \Rightarrow 4 : 6 : 4 : 1

$$P = 100$$

$$R = 10\%$$

$$T = 3 \text{ yrs}$$

$$100$$

$$\downarrow 10\%$$

$$10$$

$$\downarrow 10\%$$

$$1$$

$$\downarrow 10\%$$

$$0.1$$

$$10 \times 3 = 30$$

$$1 \times 3 = 3$$

$$0.1 \times 1 = 0.1$$

$$30 + 3 + 0.1$$

$$= 33.1$$

$$CI = 33.1$$

$$A = P + CI$$

$$= 100 + 33.1$$

$$= 133.1$$

Q6. What will be the compound interest on Rs. 45000 at the rate of 10% per annum for 2 years?



Tip: Assume Compounded Annually if nothing mentioned in question.



Q6. What will be the compound interest on Rs. 45000 at the rate of 10% per annum for 2 years?

2 years
2:1

$$\begin{array}{r} 45000 \\ \times 10\% \\ \hline 4500 \\ \times 10\% \\ \hline 450 \end{array}$$

$$\begin{aligned} 4500 \times 2 &= 9000 \\ 450 \times 1 &= 450 \\ \hline CI &= 9000 + 450 \\ &= 9450 \end{aligned}$$

Answer cross check

10% ← 1 yr
20% ← 2 yr
20% of 45000
 $SI = 9000$
 $CI > SI \checkmark$

Q7. What will be the compound interest on Rs. 18000 at the rate of 5% per annum for 3 years?



Q7. What will be the compound interest on Rs. 18000 at the rate of 5% per annum for 3 years?

3 years
3: 3: 1

18000

↓
5%.

900

↓
5%.

45

↓
5%.

2.25

$$900 \times 3 = 2700$$

$$45 \times 3 = 135$$

$$\begin{array}{r} 2.25 \times 1 = 2.25 \\ \hline 2837.5 \end{array}$$

(CI)

10% of 45

$$\frac{10}{100} \times 45 = \frac{45}{10} = 4.5$$

$$\begin{array}{r} 18000 \xrightarrow{10\%} 1800 \\ \xrightarrow{5\%} \frac{1800}{2} = 900 \end{array}$$

$$\begin{array}{r} 900 \xrightarrow{10\%} 90 \\ \xrightarrow{5\%} \frac{90}{2} = 45 \end{array}$$

$$\begin{array}{r} 45 \xrightarrow{10\%} 4.5 \\ \xrightarrow{5\%} \frac{4.5}{2} = 2.25 \end{array}$$

$$P = 100$$

$$R = 10\%$$

$$T = 3 \text{ years}$$

SI

$$\begin{array}{r} 100 \\ \swarrow 10\% \quad \searrow 10\% \\ 10 \quad 10 \\ \downarrow 10\% \\ 10 \end{array}$$
$$10 + 10 + 10 = 30$$

$$SI = \text{Rs. } 30$$

$$A = P + I = 100 + 30 = \text{Rs. } 130$$

CI

$$100 \xrightarrow{10\%} 10$$

$$\text{At the end of 1 year : } 100 + 10 = 110$$

$$110 \xrightarrow{10\%} 11$$

$$\text{At the end of 2 years : } 110 + 11 = 121$$

$$121 \xrightarrow{10\%} 12.1$$

$$\text{At the end of 3 years : } 121 + 12.1 = 133.1$$

$$\begin{array}{ccc} & 133.1 & \\ & \swarrow & \searrow \\ 100 & & 33.1 \end{array}$$

$$A = 133.1$$

$$I = 33.1$$

$$P = 100$$

$$R = 10\%$$

$$T = 3 \text{ yrs}$$

Compounded half yearly (6 months)

$$R \Rightarrow 10\% \leftarrow 1 \text{ yr}$$

$$S.I. \leftarrow 6 \text{ months}$$

$$100 \xrightarrow{S.I.} 5$$

At the end of 6 months = $100 + 5 = 105$

$$105 \xrightarrow{S.I.} 5.25$$

At the end of 1 year = $105 + 5.25 = 110.25$

$$110.25 \xrightarrow{S.I.} \boxed{}$$

At the end of 1.5 years = $110.25 + \boxed{}$
⋮

At the end of 3 years ⇒

Given P, R, T

Compounded Annually $\Rightarrow P, R, T$

Compounded Half yearly $\Rightarrow P, \frac{R}{2}, 2T$

Compounded Quarterly (3 months) $\Rightarrow P, \frac{R}{4}, 4T$

Compounded Monthly (1 month) $\Rightarrow P, \frac{R}{12}, 12T$

Compounded Weekly (1 week) $\Rightarrow P, \frac{R}{52}, 52T$

Compounded Daily (1 day) $\Rightarrow P, \frac{R}{365}, 365T$

Compounded Hourly (1 hour) $\Rightarrow P, \frac{R}{\square}, \square T$

Q8: At the rate of 12% per annum on Rs. 125000, what will be the compound interest if the interest is calculated on half yearly basis for 1 and $\frac{1}{2}$ years.



Q8: At the rate of 12% per annum on Rs. 125000, what will be the compound interest if the interest is calculated on half yearly basis for 1 and $\frac{1}{2}$ years.

$$P = 125000$$

$$R = 12\%$$

$$T = 1.5 \text{ yrs}$$

$$P = 125000$$

$$R = \frac{12}{2} = 6\%$$

$$T = 1.5 \times 2 = 3$$

$$\boxed{CI = \text{Rs. } 23,877}$$

$$\begin{array}{l} 3.485 \\ 3.3:1 \end{array}$$

$$125000$$

$$\downarrow 6\%$$

$$7500$$

$$\downarrow 6\%$$

$$450$$

$$\downarrow 6\%$$

$$27$$

$$7500 \times 3$$

$$= 22500$$

$$450 \times 3$$

$$= 1350$$

$$27 \times 1 = 27$$

$$\overline{22500}$$

$$\overline{1350}$$

$$\overline{27}$$

$$\overline{23877}$$

$$1\% = 1250 \quad | \quad 2\% = 2500$$

$$6\% = 1250 \times 6 = 7500$$

$$1\% = 75 \quad | \quad 2\% = 150$$

$$6\% = 450$$

$$1\% = 4.5 \quad | \quad 2\% = 9$$

$$6\% = 27$$

Q9: What will be the compound interest on Rs. 16000 at the rate of 20% annually for 9 months if the interest is compounded quarterly.



Q9: What will be the compound interest on Rs. 16000 at the rate of 20% annually for 9 months if the interest is compounded quarterly.

$$P = 16,000$$

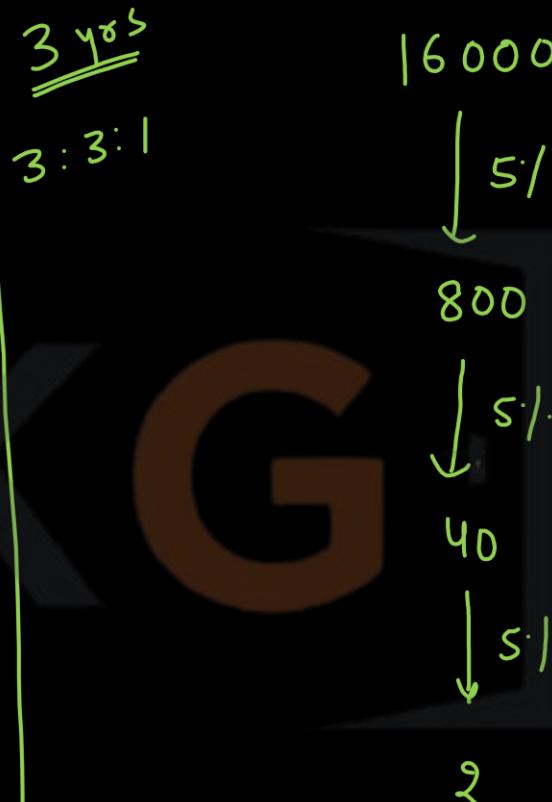
$$R = 20\%$$

$$T = 9 \text{ months}$$

$$P = 16,000$$

$$R = \frac{20}{4} = 5\%$$

$$T = 4 \times 9 = 36 \text{ months}$$
$$= 3 \text{ years}$$



$$800 \times 3 = 2400$$

$$40 \times 3 = 120$$

$$2 \times 1 = \underline{\underline{2}}$$

2522

$$CI = \text{Rs. } 2522$$



BASIC CONCEPTS

Marksheet of a student is shown below, we need to find the average marks per subject.

Subject	Marks
Maths	80
English	70
Science	60
Social Science	50
Hindi	70

$$\text{Avg} = \frac{\text{Sum of all observations}}{\text{No. of observations}}$$

$$\begin{aligned} &= \frac{80 + 70 + 60 + 50 + 70}{5} \\ &= \frac{330}{5} = 66 \end{aligned}$$

Average is Central Value of the data.

Average is also called as Mean or Arithmetic Mean or Conclusion or Result.

Average lies between lowest and highest value.

BASIC CONCEPTS

Average = Sum of all observations / Number of observations

Let $x_1, x_2, x_3 \dots x_N$ be N numbers and A be the average of these numbers, then

$$A = (x_1 + x_2 + x_3 + \dots + x_N) / N$$

$$A = \text{Sum of } N \text{ numbers} / N$$

$$\text{Sum of } N \text{ numbers} = A * N$$

Q1. The average of first 5 natural numbers

Q2. The average of first 5 odd numbers

Q3. The average of first 5 even numbers



Q1. The average of first 5 natural numbers 1, 2, 3, 4, 5

$$\frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$$

Q2. The average of first 5 odd numbers 1, 3, 5, 7, 9

$$\frac{1+3+5+7+9}{5} = \frac{25}{5} = 5$$

Q3. The average of first 5 even numbers 2, 4, 6, 8, 10

$$\frac{2+4+6+8+10}{5} = \frac{30}{5} = 6$$

Q4. The average of first 30 odd numbers.

- (a) 30
- (b) 60
- (c) 90
- (d) 120

Q5. The average of first 30 even numbers.

- (a) 31
- (b) 61
- (c) 91
- (d) 121

Q6. The average of first 30 natural numbers.

- (a) 15.5
- (b) 14.5
- (c) 16.5
- (d) 17.5

Average

First 'n' odd numbers = n^2

First 'n' even numbers = $n(n+1)$

First 'n' natural numbers = $\frac{n(n+1)}{2}$

$$\text{Sum} = n + n = n^2$$

$$\text{Sum} = (n+1) * n = n(n+1)$$

$$\text{Sum} = \frac{n+1}{2} * n = \frac{n(n+1)}{2}$$

$$\text{Avg} = \frac{\text{Sum}}{n}$$

$$\text{Sum} = \text{Avg} * n$$

Q4. The average of first 30 odd numbers. $\frac{n}{30}$

(a) 30 ✓

(b) 60

(c) 90

(d) 120

Q5. The average of first 30 even numbers. $\frac{n+1}{30+1} = 31$

(a) 31 ✓

(b) 61

(c) 91

(d) 121

Q6. The average of first 30 natural numbers. $\frac{n+1}{2}$

(a) 15.5

(b) 14.5

(c) 16.5

(d) 17.5

Q7 (VK). Find the average of first 48 Odd Numbers?



- A. 48
- B. 96
- C. 72
- D. None of these



Correct Answer: Option A (48)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q8. The average salary of all the employees in a small organization is Rs 8,000. The average salary of 7 technicians is Rs 12,000 and the average salary of the rest is Rs 6,000. The total number of employees in the organization is ?



- A. 21
- B. 20
- C. 26
- D. 22



Q8. The average salary of all the employees in a small organization is Rs 8,000. The average salary of 7 technicians is Rs 12,000 and the average salary of the rest is Rs 6,000. The total number of employees in the organization is ?



A. 21

$$\text{Avg}_{7+x} = \frac{\text{Sum}(7+x)}{7+x} = \frac{\text{Sum}_7 + \text{Sum}_x}{7+x}$$

$$\textcircled{2} \quad \text{Avg}_x = \frac{\text{Sum}_x}{x}$$

$$6000 = \frac{\text{Sum}_x}{x}$$

$$\text{Sum}_x = 6000x$$

7 technicians , 'x' other

total = $7+x$

$$\textcircled{1} \quad \text{Avg}_7 = \frac{\text{Sum}_7}{7}$$

$$12000 = \frac{\text{Sum}_7}{7}$$

$$\text{Sum}_7 = 12000 \times 7$$

$$\textcircled{3} \quad \text{Avg}_{7+x} = \frac{12000 \times 7 + 6000x}{7+x}$$

$$8000 = \frac{12000 \times 7 + 6000x}{7+x}$$

B. 20

C. 26

D. 22

Q8. The average salary of all the employees in a small organization is Rs 8,000. The average salary of 7 technicians is Rs 12,000 and the average salary of the rest is Rs 6,000. The total number of employees in the organization is ?



A. 21 ✓

B. 20

C. 26

D. 22

$$8000 = \frac{(12000 \times 7) + 6000x}{7+x} \rightarrow 4x - 3x = 42 - 28$$
$$x = 14$$
$$\text{Total Employees} = 7+x$$
$$= 7+14 = 21$$
$$8 = \frac{(12 \times 7) + 6x}{7+x}$$
$$4 = \frac{(6 \times 7) + 3x}{7+x}$$
$$4(7+x) = 42 + 3x$$
$$28 + 4x = 42 + 3x$$



DIVISIBILITY RULES

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

1

Any integer (not a fraction) is divisible by 1



2

The last digit is even (0,2,4,6,8)

→ 128 Yes

→ 129 No



3

The sum of the digits is divisible by 3

→ 381 ($3+8+1=12$, and $12 \div 3 = 4$) Yes

→ 217 ($2+1+7=10$, and $10 \div 3 = 3 \frac{1}{3}$) No

This rule can be repeated when needed:

→ 99996 ($9+9+9+9+6 = 42$, then $4+2=6$) Yes

4

The last 2 digits are divisible by 4

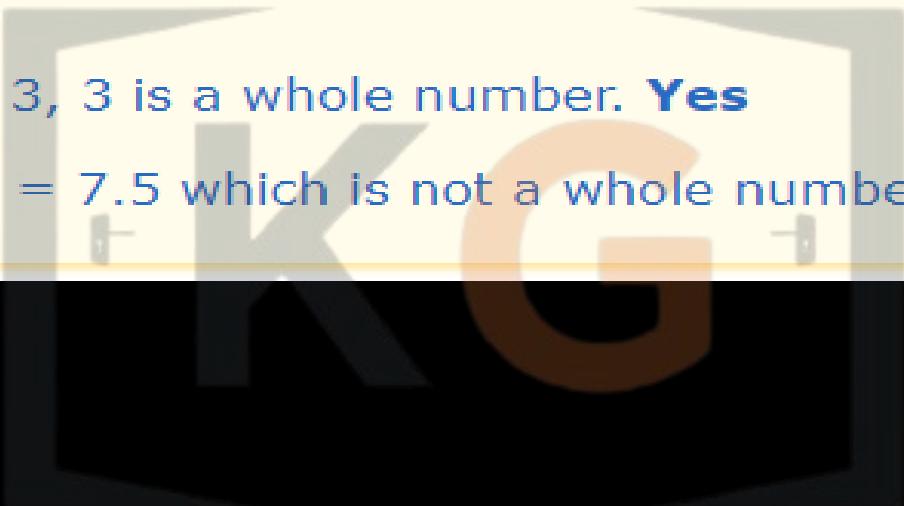
→ 13**12** is ($12 \div 4 = 3$) **Yes**

→ 70**19** is not ($19 \div 4 = 4 \frac{3}{4}$) **No**

A quick check (useful for small numbers) is to halve the number twice and the result is still a whole number.

→ $12/2 = 6, 6/2 = 3$, 3 is a whole number. **Yes**

→ $30/2 = 15, 15/2 = 7.5$ which is not a whole number. **No**



5

The last digit is 0 or 5

→ 175 Yes

→ 809 No



6

Is even and is divisible by 3 (it passes both the 2 rule and 3 rule above)

→ 114 (it is even, and $1+1+4=6$ and $6 \div 3 = 2$) **Yes**

→ 308 (it is even, but $3+0+8=11$ and $11 \div 3 = 3\frac{2}{3}$) **No**

7

Double the last digit and subtract it from a number made by the other digits. The result must be divisible by 7. (We can apply this rule to that answer again)

- 672 (Double 2 is 4, $67 - 4 = 63$, and $63 \div 7 = 9$) **Yes**
- 105 (Double 5 is 10, $10 - 10 = 0$, and 0 is divisible by 7) **Yes**
- 905 (Double 5 is 10, $90 - 10 = 80$, and $80 \div 7 = 11 \frac{3}{7}$) **No**

672

$$\begin{array}{r} 67(2) \\ - 4 \\ \hline 63 \end{array}$$

$$2 \times 2 = 4$$

$$\begin{array}{r} 6(3) \\ - 6 \\ \hline 0 \end{array}$$

$$3 \times 2 = 6$$

✓

105

$$\begin{array}{r} 10(5) \\ - 10 \\ \hline 0 \end{array}$$

$$5 \times 2 = 10$$

905

$$\begin{array}{r} 90(5) \\ - 10 \\ \hline 80 \end{array}$$

$$5 \times 2 = 10$$

$$\begin{array}{r} 8(0) \\ - 0 \\ \hline 8 \end{array}$$

✗

8

The last three digits are divisible by 8

→ 109**816** ($816 \div 8 = 102$) **Yes**

→ 216**302** ($302 \div 8 = 37 \frac{3}{4}$) **No**

A quick check is to halve three times and the result is still a whole number:

→ $816/2 = 408$, $408/2 = 204$, $204/2 = 102$ **Yes**

→ $302/2 = 151$, $151/2 = 75.5$ **No**

9

The sum of the digits is divisible by 9

(Note: This rule can be repeated when needed)

- 1629 ($1+6+2+9=18$, and again, $1+8=9$) **Yes**
- 2013 ($2+0+1+3=6$) **No**

10

The number ends in 0



220 Yes



221 No



11

Add and subtract digits in an alternating pattern (add digit, subtract next digit, add next digit, etc). Then check if that answer is divisible by 11.

→ **1364** ($+1 - 3 + 6 - 4 = 0$) Yes

→ **913** ($+9 - 1 + 3 = 11$) Yes

→ **3729** ($+3 - 7 + 2 - 9 = -11$) Yes

→ **987** ($+9 - 8 + 7 = 8$) No

Another Rule For 11

- Subtract the last digit from a number made by the other digits.
- If that number is divisible by 11 then the original number is, too.

Can repeat this if needed,

Example: 286

$28 - 6$ is 22, which **is** divisible by 11, so 286 is divisible by 11

Example: 14641

- $1464 - 1$ is 1463
- $146 - 3$ is 143
- $14 - 3$ is 11, which **is** divisible by 11, so 14641 is divisible by 11

286

$$\begin{array}{r} 286 \\ - 6 \\ \hline 22 \end{array}$$

$6 \times 1 = 6$

$$\begin{array}{r} 22 \\ - 2 \\ \hline 0 \end{array}$$

$2 \times 1 = 2$

14641

$$\begin{array}{r} 14641 \\ - 1 \\ \hline 1463 \end{array}$$

$1 \times 1 = 1$

$$\begin{array}{r} 1463 \\ - 3 \\ \hline 143 \end{array}$$

$3 \times 1 = 3$

$$\begin{array}{r} 143 \\ - 3 \\ \hline 11 \end{array}$$

$3 \times 1 = 3$

12

The number is divisible by both 3 **and** 4 (it passes both the 3 rule and 4 rule above)

648

→ (By 3? $6+4+8=18$ and $18 \div 3=6$ Yes)

(By 4? $48 \div 4=12$ Yes)

Both pass, so **Yes**

524

→ (By 3? $5+2+4=11$, $11 \div 3=3\frac{2}{3}$ No)

(Don't need to check by 4) **No**



14

$$\frac{N}{P} \quad \checkmark$$

$\frac{N}{\text{factors of } P}$ \checkmark

$$14 = 1 \times 14$$

$$\frac{N}{14} \quad \frac{N}{2} \quad \frac{N}{7}$$

$$14 = 2 \times 7$$

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



Divisibility By	Factor	
11	-1	145
13	+4	213
17	-5	311
19	+2	413
23	+7	
29	+3	
31	-3	
37	-11	
41	-4	
43	+13	

Test for divisibility by 13. Add four times the last digit to the remaining leading truncated number. If the result is divisible by 13, then so was the first number. Apply this rule over and over again as necessary.

Example: $50661 \rightarrow 5066 + (1 \cdot 4) \rightarrow 5066 + 4 = 5070 \rightarrow 507 + (0 \cdot 4) \rightarrow 507 + 0 = 507 \rightarrow 50 + (7 \cdot 4) \rightarrow 50 + 28 = 78$ and 78 is $6 \cdot 13$, so 50661 is divisible by 13.

$$\begin{array}{r} 50661 \\ \hline 13 \end{array}$$

$$\begin{array}{r} 5066 \\ + 4 \\ \hline 5070 \end{array} \quad 1 \times 4 = 4$$

$$13 \Rightarrow (x^4)$$

$$13 \times 3 = 39$$

$$\frac{39}{13} = 3 \quad \checkmark$$

$$\begin{array}{r} 5070 \\ 0 \\ \hline 507 \end{array} \quad 0 \times 4 = 0$$

$$\begin{array}{r} 50 \\ + 28 \\ \hline 78 \end{array} \quad 7 \times 4 = 28$$

$$\begin{array}{r} 78 \\ + 32 \\ \hline 39 \end{array} \quad 8 \times 4 = 32$$

Test for divisibility by 17. Subtract five times the last digit from the remaining leading truncated number. If the result is divisible by 17, then so was the first number. Apply this rule over and over again as necessary.

Example: $3978 \rightarrow 397 - 5 \cdot 8 = 357 \rightarrow 35 - 5 \cdot 7 = 0$. So 3978 is divisible by 17.



Test for divisibility by 19. Add two times the last digit to the remaining leading truncated number. If the result is divisible by 19, then so was the first number. Apply this rule over and over again as necessary.

EG: $101156 \rightarrow 10115 + 2 * 6 = 10127 \rightarrow 1012 + 2 * 7 = 1026 \rightarrow 102 + 2 * 6 = 114$
and $114 = 6 * 19$, so 101156 is divisible by 19.



Test for divisibility by 23. Add 7 times the last digit to the remaining leading truncated number. If the result is divisible by 23, then so was the first number. Apply this rule over and over again as necessary.

Example: $17043 \rightarrow 1704 + 7 \cdot 3 = 1725 \rightarrow 172 + 7 \cdot 5 = 207$ which is $9 \cdot 23$, so 17043 is also divisible by 23.



Test for divisibility by 29. Add three times the last digit to the remaining leading truncated number. If the result is divisible by 29, then so was the first number. Apply this rule over and over again as necessary.

Example: $15689 \rightarrow 1568 + 3 * 9 = 1595 \rightarrow 159 + 3 * 5 = 174 \rightarrow 17 + 3 * 4 = 29$, so 15689 is also divisible by 29.



Test for divisibility by 31. Subtract three times the last digit from the remaining leading truncated number. If the result is divisible by 31, then so was the first number. Apply this rule over and over again as necessary.

Example: $7998 \rightarrow 799 - 3 * 8 = 775 \rightarrow 77 - 3 * 5 = 62$ which is twice 31, so 7998 is also divisible by 31.

$$\begin{array}{r} 7998 \\ \hline 31 \end{array}$$

$$\begin{array}{r} 799 \\ - 24 \\ \hline 775 \end{array} \quad (8)$$

$$8 \times 3 = 24$$

(-3)

$$\begin{array}{r} 77 \\ - 15 \\ \hline 62 \end{array} \quad (5)$$

$$5 \times 3 = 15$$

$$31 \times 2 = 62$$

$$\frac{62}{31} = 2 \checkmark$$

Test for divisibility by 37. This is (slightly) more difficult, since it performance uses a double-digit multiplier, namely eleven. People can usually do single digit multiples of 11, so we can use the same technique still. Subtract eleven times the last digit from the remaining leading truncated number. If the result is divisible by 37, then so was the first number. Apply this rule over and over again as necessary.

Example: $23384 \rightarrow 2338 - 11 \cdot 4 = 2294 \rightarrow 229 - 11 \cdot 4 = 185$ which is five times 37, so 23384 is also divisible by 37.



Test for divisibility by 41. Subtract four times the last digit from the remaining leading truncated number. If the result is divisible by 41, then so was the first number. Apply this rule over and over again as necessary.

Example: $30873 \rightarrow 3087 - 4 \cdot 3 = 3075 \rightarrow 307 - 4 \cdot 5 = 287 \rightarrow 28 - 4 \cdot 7 = 0$, remainder is zero and so 30873 is also divisible by 41.



Test for divisibility by 43. Now it starts to get really difficult for most people, because the multiplier to be used is 13, and most people cannot recognize even single digit multiples of 13 at sight. You may want to make a little list of $13 \times N$ first. Nevertheless, for the sake of completeness, we will use the same method. Add thirteen times the last digit to the remaining leading truncated number. If the result is divisible by 43, then so was the first number. Apply this rule over and over again as necessary.

Example: $3182 \rightarrow 318 + 13 \times 2 = 344 \rightarrow 34 + 13 \times 4 = 86$ which is recognizably twice 43, and so 3182 is also divisible by 43.



TATA
CONSULTANCY
SERVICES

PARTNERSHIP

<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Types of Business :

① Solo : A \Rightarrow Rs. 50,000 $\xrightarrow{1 \text{ Year}}$ Profit : Rs. 5000 (A)

② Simple Partnership : Rs. 20,000 + Rs. 30,000
(A) (B)

1 year later \Rightarrow Profit : Rs. 5,000

$$\boxed{\text{Investment Ratio} = \text{Profit Ratio}}$$

$$A \rightarrow \text{Profit} : \frac{2}{5} \times 5000 = 2000 \leftarrow 5000$$

$$B \rightarrow \text{Profit} : \frac{3}{5} \times 5000 = 3000$$

$2 : 3$

$$2+3=5$$

Investment ratio
A : B

20,000 : 30,000

2 : 3

∴ Profit Ratio = 2 : 3

③ Compound Partnership:

Day 1 → A → Rs. 20,000

After 6 months → B → Rs. 30,000

After 1 year → Profit: Rs. 5,000

$$20,000 \times 12 : 30,000 \times 6 \Rightarrow$$

$$\begin{matrix} 4 \\ (A : B) \end{matrix}$$

$$4+3=7$$

$$\text{Profit ratio} = \frac{\text{value investment ratio}}{\text{time ratio}}$$

$$\Rightarrow \boxed{\text{Profit ratio} = \frac{\text{investment ratio}}{\text{time ratio}}}$$

$$\Rightarrow \boxed{\text{Profit} = \text{Investment} \times \text{Time}}$$

$$A's \text{ profit} : \frac{4}{7} \times 5000$$

$$B's \text{ profit} : \frac{3}{7} \times 5000$$

OR

$$\boxed{5000 - \frac{4}{7} \times 5000}$$

$$B's \text{ profit} = \text{Total} - A's \text{ profit}$$

$$\textcircled{1} \quad \text{Profit Ratio} = \text{Investment Ratio} \times \text{Time Ratio}$$

$$\textcircled{2} \quad \text{Investment Ratio} = \frac{\text{Profit Ratio}}{\text{Time Ratio}}$$

$$\textcircled{3} \quad \text{Time Ratio} = \frac{\text{Profit Ratio}}{\text{Investment Ratio}}$$

A: Rs. 20,000 → 12 months

B: Rs. 30,000 → 6 months

Investment Ratio (A:B) = $20,000 : 30,000 = 2 : 3$

Time ratio (A:B) = $12 : 6 = 2 : 1$

⇒ Profit ratio = Investment ratio \times time ratio

Profit ratio (A:B) = $2 \times 2 : 3 \times 1 = 4 : 3$

$$P_R = I_1 T_1 : I_2 T_2 : I_3 T_3 : \dots$$

Investment ratio \Rightarrow 3 : 5

Time ratio \Rightarrow 4 : 7

Profit ratio \Rightarrow $I_1 T_1 : I_2 T_2$
 $\Rightarrow 3 \times 4 : 5 \times 7$

$\Rightarrow 12 : 35$ $(12 + 35 = 47)$

If total profit \Rightarrow Rs. 47000

A's profit $\Rightarrow \frac{12}{47} \times 47000 \Rightarrow$ Rs. 12,000

B's profit $\Rightarrow \frac{35}{47} \times 47000 \Rightarrow$ Rs. 35,000

Q1. Balu and Somu started the Bar, Balu invests Rs 35000 for 8 months and Somu invests Rs 42000 for 10 months. Out of a profit of Rs.31,570. Balu share is



Q1. Balu and Somu started the Bar, Balu invests Rs 35000 for 8 months and Somu invests Rs 42000 for 10 months. Out of a profit of Rs.31,570. Balu share is

$$\textcircled{1} \quad P_R = I_1 T_1 : I_2 T_2$$

$$= 35000 \times 8 : 42000 \times 10$$

$$= \cancel{35000}^{\cancel{5}} \times \cancel{8}^{\cancel{2}} : \cancel{42000}^{\cancel{6}^3} \times \cancel{10}^{\cancel{5}}$$

$$= 2 : 3$$

$$2+3=5$$

$$\text{Balu's share} = \frac{2}{5} \times 31570$$

$$= 12628$$

$$\text{Somu's share} = \frac{3}{5} \times 31570$$

$$08$$

$$31570 - 12628$$

$$= 18942$$

Q1. Balu and Somu started the Bar, Balu invests Rs 35000 for 8 months and Somu invests Rs 42000 for 10 months. Out of a profit of Rs.31,570. Balu share is

② $I_R : 35000 : 42000 \Rightarrow 5 : 6$

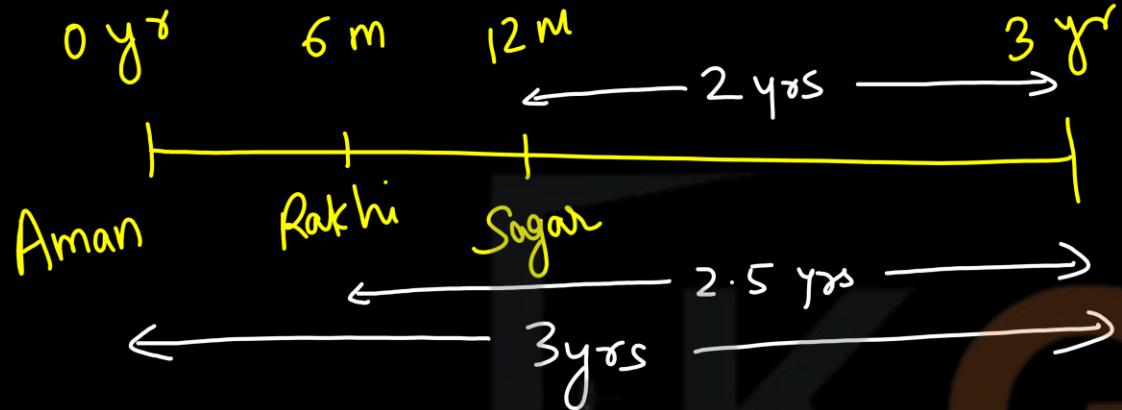
$$T_R : 8 : 10 \Rightarrow 4 : 5$$

$$\boxed{P_R = I_R \times T_R} \Rightarrow P_R \Rightarrow \frac{5 \times 4}{= 20} : \frac{6 \times 5}{= 30} \\ = 2 : 3$$

Q2. Aman started a business investing Rs.70000. Rakhi joined him after six months with an amount of Rs.105000 and Sagar joined them with Rs.1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, after three years if Aman started the business?



Q2. Aman started a business investing Rs.70000. Rakhi joined him after six months with an amount of Rs.105000 and Sagar joined them with Rs.1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, after three years if Aman started the business?



$\text{Aman} \rightarrow 3 \text{ yrs}$
 $\text{Rakhi} \rightarrow 2.5 \text{ yrs}$
 $\text{Sagar} \rightarrow 2 \text{ yrs}$

$$P_R = I_1 T_1 : I_2 T_2 : I_3 T_3 \Rightarrow 70,000 \times 3 : 1,05,000 \times 2.5 : 1,40,000 \times 2$$

$$6 : 7.5 : 8$$

$$12 : 15 : 16$$

Q3. A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.



- A. Rs. 1900
- B. Rs. 2660
- C. Rs. 2800
- D. Rs. 2840



Q3. A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.



- A. Rs. 1900
- B. Rs. 2660
- C. Rs. 2800
- D. Rs. 2840

For managing, A received = 5% of Rs. 7400 = Rs. 370.

Balance = Rs. (7400 - 370) = Rs. 7030.

Ratio of their investments = $(6500 \times 6) : (8400 \times 5) : (10000 \times 3)$

$$= 39000 : 42000 : 30000$$

$$= 13 : 14 : 10$$

\therefore B's share = Rs. $\left(7030 \times \frac{14}{37} \right)$ = Rs. 2660.

Correct Answer - Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q4. A, B, C subscribe Rs. 50,000 for a business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35,000, A receives:



- A. Rs. 8400
- B. Rs. 11,900
- C. Rs. 13,600
- D. Rs. 14,700



Q4. A, B, C subscribe Rs. 50,000 for a business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35,000, A receives:



- A. Rs. 8400
- B. Rs. 11,900
- C. Rs. 13,600
- D. Rs. 14,700



$$A = B + 4000$$
$$B = C + 5000$$

$$A = C + 5000 + 4000$$

$$A = C + 9000$$

Q4. A, B, C subscribe Rs. 50,000 for a business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35,000, A receives:



- A. Rs. 8400
- B. Rs. 11,900
- C. Rs. 13,600
- D. Rs. 14,700

Let C = x .

Then, B = $x + 5000$ and A = $x + 5000 + 4000 = x + 9000$.

$$\text{So, } x + x + 5000 + x + 9000 = 50000$$

$$\Rightarrow 3x = 36000$$

$$\Rightarrow x = 12000$$

$$A : B : C = 21000 : 17000 : 12000 = 21 : 17 : 12.$$

$$\therefore \text{A's share} = \text{Rs.} \left(35000 \times \frac{21}{50} \right) = \text{Rs.} 14,700.$$

Correct Answer - Option D



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q5. Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?



- A. 5 : 7 : 8
- B. 20 : 49 : 64
- C. 38 : 28 : 21
- D. None of these



Q5. Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?



A. 5 : 7 : 8

B. 20 : 49 : 64

C. 38 : 28 : 21

D. None of these

$$I = \frac{P}{T}$$

$$\text{LCM}(7, 8, 14) = 56$$

$$I = \frac{\frac{5}{14} \times 4}{\cancel{14} \times \cancel{4}} : \frac{\frac{1}{8} \times 7}{\cancel{8} \times \cancel{7}} : \frac{\frac{8}{7} \times 8}{\cancel{7} \times \cancel{8}}$$

$$= \frac{20}{56} : \frac{49}{56} : \frac{64}{56} \Rightarrow 20 : 49 : 64$$

Q5. Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?



Let their investments be Rs. x for 14 months, Rs. y for 8 months and Rs. z for 7 months respectively.

Then, $14x : 8y : 7z = 5 : 7 : 8$.

$$\text{Now, } \frac{14x}{8y} = \frac{5}{7} \Leftrightarrow 98x = 40y \Leftrightarrow y = \frac{49}{20}x$$

$$\text{And, } \frac{14x}{7z} = \frac{5}{8} \Leftrightarrow 112x = 35z \Leftrightarrow z = \frac{112}{35}x = \frac{16}{5}x.$$

$$\therefore x : y : z = x : \frac{49}{20}x : \frac{16}{5}x = 20 : 49 : 64.$$

Correct Answer - Option B



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q6 (VK). P, Q and R invest in a business if the ratio of their time period are 3:4:5 and their profits are in the ratio 5:6:8. Find the ratio in which the investment are made by P, Q and R ?



Correct Answer – 50:45:48



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q7. A starts business with Rs. 3500 and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?



- A. Rs. 7500
- B. Rs. 8000
- C. Rs. 8500
- D. Rs. 9000



Q7. A starts business with Rs. 3500 and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?



- A. Rs. 7500
- B. Rs. 8000
- C. Rs. 8500
- D. Rs. 9000 ✓

$$P_R = I_1 T_1 : I_2 T_2$$

$$= 3500 \times 12 : x \times 7 \Rightarrow 2 : 3$$

$$\frac{3500 \times 12}{7x} = \frac{2}{3}$$

$$\frac{\cancel{3500}^5 \times \cancel{12}^6}{7x} = \frac{2}{3} \Rightarrow x = 500 \times 6 \times 3 = 9000$$

Correct Answer - Option D

Explanation

Let B's capital be Rs. x .

Then, $\left(\frac{3500 \times 12}{7x} \right) = \frac{2}{3}$

$$\Rightarrow 14x = 126000$$

$$\Rightarrow x = 9000.$$

Q8. A and B started a partnership business investing some amount in the ratio of 3 : 5. C joined then after six months with an amount equal to that of B. In what proportion should the profit at the end of one year be distributed among A, B and C?



- A. 3 : 5 : 2
- B. 3 : 5 : 5
- C. 6 : 10 : 5
- D. Data inadequate



Q8. A and B started a partnership business investing some amount in the ratio of 3 : 5. C joined then after six months with an amount equal to that of B. In what proportion should the profit at the end of one year be distributed among A, B and C?



A. $3 : 5 : 2$

Invest $\Rightarrow 3 : 5 : 5$

B. $3 : 5 : 5$

Time $\Rightarrow 1 : 1 : 0.5 \Rightarrow 2 : 2 : 1$

C. $6 : 10 : 5$

Profit $\Rightarrow 3 \times 2 : 5 \times 2 : 5 \times 1$

$\Rightarrow 6 : 10 : 5$

D. Data inadequate

Q8. A and B started a partnership business investing some amount in the ratio of 3 : 5. C joined then after six months with an amount equal to that of B. In what proportion should the profit at the end of one year be distributed among A, B and C?

$$A : B = 3x : 5x = 3 : 5$$



A. 3 : 5 : 2

$$A \rightarrow 3x$$

$$B \rightarrow 5x$$

$$C \rightarrow 5x$$

B. 3 : 5 : 5

C. 6 : 10 : 5 ✓

D. Data inadequate

$$P_R = I_1 T_1 : I_2 T_2 : I_3 T_3$$

$$= 3x \cdot 12 : 5x \cdot 12 : 5x \cdot 6$$

$$= \cancel{3x \cdot 12}^2 : \cancel{5x \cdot 12}^2 : 5x \cdot 6$$

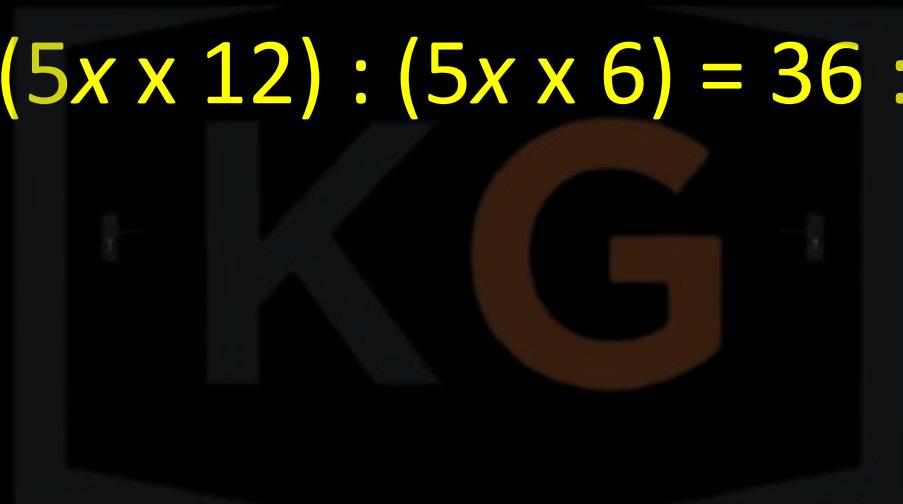
$$= 6 : 10 : 5$$

Correct Answer - Option C

Explanation

Let the initial investments of A and B be $3x$ and $5x$.

$$A : B : C = (3x \times 12) : (5x \times 12) : (5x \times 6) = 36 : 60 : 30 = 6 : 10 : 5.$$



Q9. A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?



- A. Rs. 7500
- B. Rs. 9000
- C. Rs. 9500
- D. Rs. 10,000



Q9. A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?



- A. Rs. 7500
- B. Rs. 9000
- C. Rs. 9500
- D. Rs. 10,000

$$A : B : C = (20,000 \times 24) : (15,000 \times 24) : (20,000 \times 18) = 4 : 3 : 3.$$

$$\therefore B's\ share = \text{Rs. } \left(25000 \times \frac{3}{10} \right) = \text{Rs. } 7,500.$$

Correct Answer - Option C



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

WHAT IS PROBABILITY?

Probability comes from the word ‘Probable’ which means uncertainty in happening of an event.

Probability aims at measuring uncertainty from logical decision making.

$$\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{\text{इन परिस्थितियों की संख्या}}{\text{कुल संभावित परिस्थितियों की संख्या}} = \frac{\text{इन परिस्थितियों की संख्या}}{\text{कुल}}$$

Q1. What are the chances that no two boys are sitting together for a photograph if there are 5 girls and 2 boys?

- a. $1/21$
- b. $4/7$
- c. $2/7$
- d. $5/7$



Q1. What are the chances that no two boys are sitting together for a photograph if there are 5 girls and 2 boys?

- a. $1/21$
- b. $4/7$
- c. $2/7$
- d. $5/7$ ✓

Total outcomes = 7 people, 7 places = $7!$

Favourable outcomes =

$$\begin{aligned} & \times \frac{G_1}{ } \times \frac{G_2}{ } \times \frac{G_3}{ } \times \frac{G_4}{ } \times \frac{G_5}{ } \times \frac{}{ } \quad 5! * 6_{C_2} * 2! \\ & = \frac{5! * 6_{C_2} * 2!}{7!} = \frac{5! * \frac{6 \times 5}{1 \times 2} * 2 \times 1}{7 \times 6 \times 5!} \quad 5! * 6_{P_2} \\ & = \frac{5! * \cancel{6} * 5 + \cancel{2} \times 1}{\cancel{7} \times \cancel{6} \times \cancel{5}!} = \frac{5}{7} \end{aligned}$$

Q2. A pot has 2 white, 6 black, 4 grey and 8 green balls. If one ball is picked randomly from the pot, what is the probability of it being black or green?

- a. $3/4$
- b. $7/10$
- c. $4/3$
- d. $1/10$



Q2. A pot has 2 white, 6 black, 4 grey and 8 green balls. If one ball is picked randomly from the pot, what is the probability of it being black or green?

- a. $3/4$
- b. $7/10$ ✓
- c. $4/3$
- d. $1/10$

$$P = \frac{\text{Fav Outcomes}}{\text{Total Outcomes}} = \frac{6+8}{2+6+4+8} = \frac{14}{20} = \frac{7}{10}$$

$$\frac{14_{C_1}}{20_{C_1}} = \frac{14}{20} = \frac{7}{10}$$

Q3. A box has 6 black, 4 red, 2 white and 3 blue shirts. Find the probability of drawing 2 black shirts if they are picked randomly?



- A. $1/8$
- B. $2/15$
- C. $6/15$
- D. $1/7$



Q3. A box has 6 black, 4 red, 2 white and 3 blue shirts. Find the probability of drawing 2 black shirts if they are picked randomly?



- A. $1/8$
- B. $2/15$
- C. $6/15$
- D. $1/7$ ✓

$$P = \frac{\text{Fav outcomes}}{\text{Total outcomes}} = \frac{2}{6+4+2+3} = \frac{2}{15} \times$$

$$P = \frac{2}{6} = \frac{1}{3} \times \quad P = \frac{6}{15} \times$$

$$\boxed{P = \frac{6}{15} \times \frac{5}{14} = \frac{2}{15} \times \frac{8}{14} = \frac{1}{7}}$$

Q3. A box has 6 black, 4 red, 2 white and 3 blue shirts. Find the probability of drawing 2 black shirts if they are picked randomly?



- A. $1/8$
- B. $2/15$
- C. $6/15$
- D. $1/7$ ✓

$$P = \frac{\text{Fav outcomes}}{\text{Total outcomes}} = \frac{6C_2}{15C_2} = \frac{\frac{6 \times 5}{1 \times 2}}{\frac{15 \times 14}{1 \times 2}} = \frac{6 \times 5}{15 \times 14} = \frac{1}{7}$$

Q4 (VK). A box has 6 black, 4 red, 2 white and 3 blue shirts.
Find the probability of drawing 3 red shirts if they are picked randomly?



- A. $1/8$
- B. $4/15$
- C. $4/455$
- D. $1/7$



Correct Answer: Option C (4/455)



<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

Q5. What is the possibility of having 53 Thursdays in a non-leap year?

- a. $6/7$
- b. $1/7$
- c. $1/365$
- d. $53/365$



Q5. What is the possibility of having 53 Thursdays in a non-leap year?

- a. $6/7$
- b. $1/7$ ✓
- c. $1/365$
- d. $53/365$

$$1 \text{ year} = 52 \text{ weeks}$$

$$1 \text{ week} = 7 \text{ days}$$

$$52 \times 7 = 364 \text{ days}$$

$$\begin{array}{r} - 365 \\ \hline 1 \text{ odd day} \end{array}$$

52 Sundays
52 Mondays
52 Tuesdays
52 Wednesdays
52 Thursdays
52 Fridays
52 Saturdays

$$P = \frac{1}{7}$$

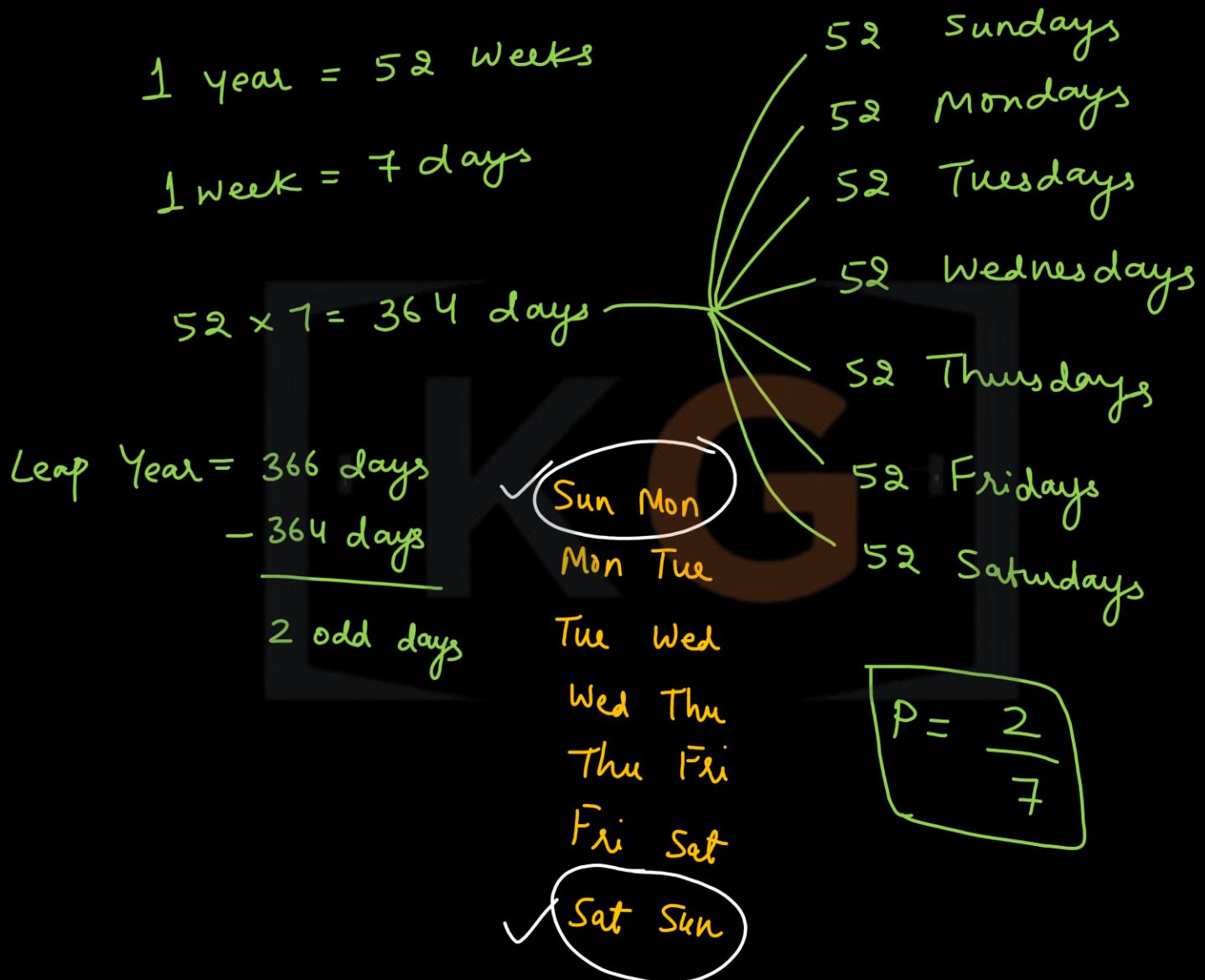
Q6. What is the possibility of having 53 Sundays in a leap year?

- a. $1/7$
- b. $2/7$
- c. $1/366$
- d. $53/366$



Q6. What is the possibility of having 53 Sundays in a leap year?

- a. $1/7$
- b. $2/7$ ✓
- c. $1/366$
- d. $53/366$





AGE PROBLEMS

Present Age = P

Age ' x ' years ago (Age ' x ' years before) = $P - x$

Age ' x ' years hence (Age ' x ' years later) = $P + x$

$$PA = 10 \text{ yrs}$$

$$2 \text{ yrs ago} = 10 - 2 = 8 \text{ yrs}$$

$$3 \text{ yrs hence} = 10 + 3 = 13 \text{ yrs}$$

Q1. The sum of ages of a father and a son is 90 years. 15 years ago, father's age was thrice the son's age. Find their present ages.



Q1. The sum of ages of a father and a son is 90 years. 15 years ago, father's age was thrice the son's age. Find their present ages.

$$\text{Father's PA} = F$$

$$\text{Son's PA} = B$$

15 years ago

$$\text{Father} = F - 15$$

$$\text{Son} = B - 15$$

$$\begin{array}{r} F + B = 90 \\ -F + 3B = 30 \\ \hline 4B = 120 \end{array}$$

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

$$F = 60$$

$$F - 15 = 3(B - 15)$$

$$F - 15 = 3B - 45$$

$$45 - 15 = 3B - F$$

$$3B - F = 30$$

Q2. The sum of ages of a father and a son is 60 years. 10 years later, father's age was thrice the son's age. Find their present ages.



Q2. The sum of ages of a father and a son is 60 years. 10 years later, father's age was thrice the son's age. Find their present ages.

$$\text{Father's PA} = F$$

$$\text{Son's PA} = B$$

10 years later

$$\text{Father} = F + 10$$

$$\text{Son} = B + 10$$

$$F + B = 60 \Rightarrow F = 60 - B$$

$$(F + 10) = 3(B + 10)$$

$$F + 10 = 3B + 30$$

$$(60 - B) + 10 = 3B + 30$$

$$70 - B = 3B + 30$$

$$70 - 30 = 3B + B$$

$$40 = 4B$$

$$B = \frac{40}{4} = 10$$

$$\underline{\underline{B = 10}}$$
$$\underline{\underline{F = 50}}$$

Q3: Three years ago, the age of father is 7 times as his son's age. At present the age of father is 5 times the age of his son then what is the sum of present ages of father and son?



Q3: Three years ago, the age of father is 7 times as his son's age. At present the age of father is 5 times the age of his son then what is the sum of present ages of father and son?



$$\text{Father's PA} = F$$

$$\text{Son's PA} = B$$

3 years ago

$$\text{Father} = F - 3$$

$$\text{Son} = B - 3$$

$$F = 5B$$

$$(F-3) = 7(B-3)$$

$$F-3 = 7B - 21$$

$$5B-3 = 7B-21$$

$$21-3 = 7B-5B$$

$$18 = 2B$$

$$B = \frac{18}{2} = 9$$

$$\begin{aligned} F &= 5B \\ &= 5 \times 9 \\ &= 45 \end{aligned}$$

$$F = 45, B = 9$$

$$F + B = 45 + 9 = 54$$

Q3: Three years ago, the age of father is 7 times as his son's age. At present the age of father is 5 times the age of his son then what is the sum of present ages of father and son?



$$\frac{3(7-1)}{7-5} = \frac{3(6)}{2} = \frac{18}{2} = 9 \leftarrow \begin{matrix} \text{Present age} \\ \text{of younger one} \end{matrix}$$

$$\boxed{\text{PA (Younger)} = \frac{(\text{YEAR}) [\text{TIMES} - 1]}{\text{TIMES} - \text{TIMES}}}$$

$$\boxed{\text{Son's PA} = 9}$$

$$\boxed{\text{Father's PA} = 9 \times 5 = 45}$$

Q4: At present, the age of father is 5 times the age of his son. After 3 years, the age of father will be 4 times the age of his son. Find the difference of present age of father and son?



Q4: At present, the age of father is 5 times the age of his son. After 3 years, the age of father will be 4 times the age of his son. Find the difference of present age of father and son?



$$\text{PA (Younger)} = \frac{(\text{YEAR})[\text{TIMES} - 1]}{\text{TIMES} - \text{TIMES}} = \frac{3(4-1)}{5-4} = \frac{3 \times 3}{1} = 9$$

PA of Son = 9

PA of Father = $9 \times 5 = 45$

Q5. 10 years ago, Goli's mother is 4 times old as Goli. 10 years later, the mother will be twice as old as his son. What is the present age of Goli's Mother ?



Q5. 10 years ago, Goli's mother is 4 times old as Goli. 10 years later, the mother will be twice as old as his son. What is the present age of Goli's Mother ?



$$\begin{aligned}
 PA(\text{Younger}) &= \frac{(YEAR)[\text{TIMES} - 1]}{\text{TIMES} - \text{TIMES}} = \frac{10(4-1) + 10(2-1)}{4-2} \\
 &= \frac{(10 \times 3) + (10 \times 1)}{2} = \frac{30+10}{2} = \frac{40}{2} = 20
 \end{aligned}$$

$$\text{Goli's PA} = 20$$

$$\text{Goli's age 10 yrs ago} = 20 - 10 = 10$$

$$\text{Mother's age 10 yrs ago} = 10 \times 4 = 40$$

$$\text{Mother's PA} = 40 + 10 = \underline{\underline{50}}$$

$$\text{Goli's PA} = 20$$

$$\text{Goli's age 10 years later} = 20 + 10 = 30$$

$$\text{Mother's age 10 years later} = 30 \times 2 = 60$$

$$\text{Mother's PA} = 60 - 10 = \underline{\underline{50}}$$

Q4: At present, the age of father is 5 times the age of his son. After 3 years, the age of father will be 4 times the age of his son. Find the difference of present age of father and son?



$$PA \text{ (Younger)} = \frac{(YEAR)[TIMES - 1]}{TIMES - TIMES} = \frac{3(4-1)}{5-4} = \frac{3 \times 3}{1} = 9$$

$$PA \text{ of Son} = 9$$

$$PA \text{ of Father} = 9 \times 5 = 45$$

$$\frac{3(4-1) + 0(5-1)}{5-4} = \frac{3(4-1)}{5-4}$$

Q6. Three years ago, the age of a mother was five times the age of her daughter. Two years hence, she will be thrice as old as her daughter. Find present age of daughter.



Q6. Three years ago, the age of a mother was five times the age of her daughter. Two years hence, she will be thrice as old as her daughter. Find present age of daughter.

$$\text{PA (Younger)} = \frac{(\text{YEAR})(\text{TIMES}-1)}{\text{TIMES} - \text{TIMES}} = \frac{3(5-1) + 2(3-1)}{5-3} = \frac{3(4) + 2(2)}{2} = \frac{12+4}{2} = 8$$

Daughter PA = 8

Daughter's age 3 years ago = $8-3=5$

Mother's age 3 years ago = $5 \times 5 = 25$

Mother's PA = $25+3=28$



Q7 (VK): Ram is 3 times as old as Shyam. After 15 years, Ram will be twice as old as Shyam. Find their present ages.



Q7 (VK): Ram is 3 times as old as Shyam. After 15 years, Ram will be twice as old as Shyam. Find their present ages.

Ram → elder

Shyam → younger

$$\text{Shyam's PA} = \frac{15(2-1)}{3-2}$$

Shyam's Present Age = 15

Ram's Present Age = 45



TRAIN PROBLEMS

BASIC CONCEPTS



UNIT CONVERSIONS (KMPH TO MPS)

18 km/hr = 5 m/s

- $1 \text{ km/hr} = 5/18 \text{ m/s}$
- $1 \text{ m/s} = 18/5 \text{ km/hr}$

CASE 1

(TRAIN CROSSING A POLE / SIGNAL / STATIONARY OBJECTS)



CASE 1

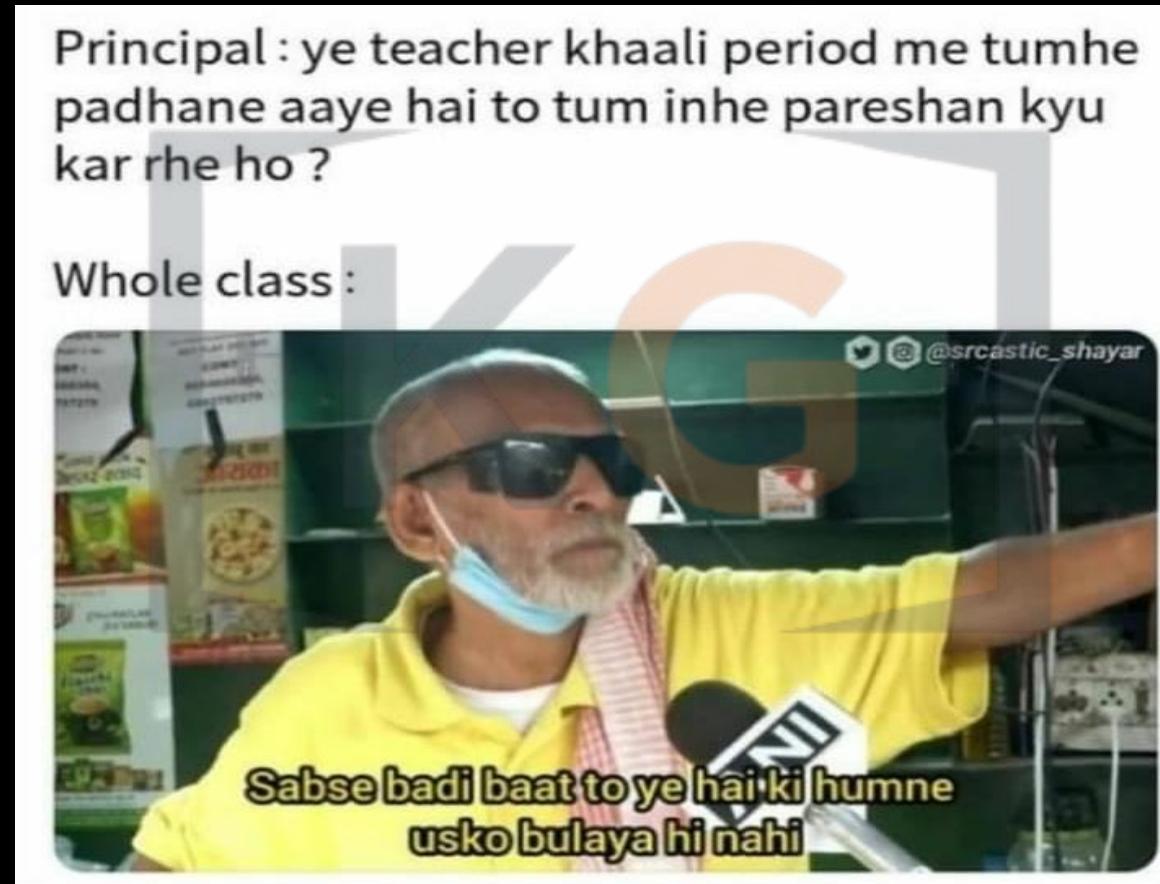
TRAIN CROSSING A POLE / SIGNAL / STATIONARY OBJECTS

$$S = \frac{d}{t}$$

$$S = \frac{\text{length of train}}{t}$$



Q1: Punjab Mail Express of length 80 meters goes to Delhi to visit Baba Ka Dhaba. Find the time taken (in seconds) by Punjab Mail Express to cross a pole if it is travelling with a speed of 80 km/hr?



Q1: Punjab Mail Express of length 80 meters goes to Delhi to visit Baba Ka Dhaba. Find the time taken (in seconds) by Punjab Mail Express to cross a pole if it is travelling with a speed of 80 km/hr?

$$\text{length of train} = 80$$

$$S = \frac{\text{length of train}}{t}$$

$$t = \frac{\text{length of train}}{S} = \frac{80}{\frac{5}{18} \times 80} = \frac{18}{5} = \frac{36}{10} = 3.6 \text{ seconds}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$$1 \text{ km/hr} = \frac{5}{18} \text{ m/s}$$

$$80 \text{ km/hr} = \frac{5}{18} \times 80 \text{ m/s}$$

CASE 2

TRAIN CROSSING A BRIDGE / PLATFORM / TUNNEL



CASE 2

TRAIN CROSSING A BRIDGE / PLATFORM / TUNNEL



CASE 2

TRAIN CROSSING A BRIDGE / PLATFORM / TUNNEL



CASE 2

TRAIN CROSSING A BRIDGE / PLATFORM / TUNNEL

$$S = \frac{d}{t}$$

S = length of train + length of platform

t

Q2: Bhopal Shatabdi Express (length 150 meters) crosses Mathura Junction (110 meters long) with a speed of 90 km/hr. Find the time taken to cross the platform (in seconds).



Q2: Bhopal Shatabdi Express (length 150 meters) crosses Mathura Junction (110 meters long) with a speed of 90 km/hr. Find the time taken to cross the platform (in seconds).

$$S = \frac{\text{length of train} + \text{length of platform}}{t}$$

$$25 = \frac{150 + 110}{t}$$

$$t = \frac{260}{25} = \frac{1040}{100} = 10.4 \text{ seconds}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$\downarrow \times 5$ $\downarrow \times 5$

$$90 \text{ km/hr} = 25 \text{ m/s}$$

Q3(VK): Hemkunt Express is travelling at a speed of 72 kmph. It crosses Kala Bakra Station's platform of length 220 meters in 15 seconds. Find the length of Hemkunt Express (in meters).



Q3(VK): Hemkunt Express is travelling at a speed of 72 kmph. It crosses Kala Bakra Station's platform of length 220 meters in 15 seconds. Find the length of Hemkunt Express (in meters).

$$S = \frac{\text{length of train} + \text{length of platform}}{t}$$

$$S = \frac{220 + P}{t}$$

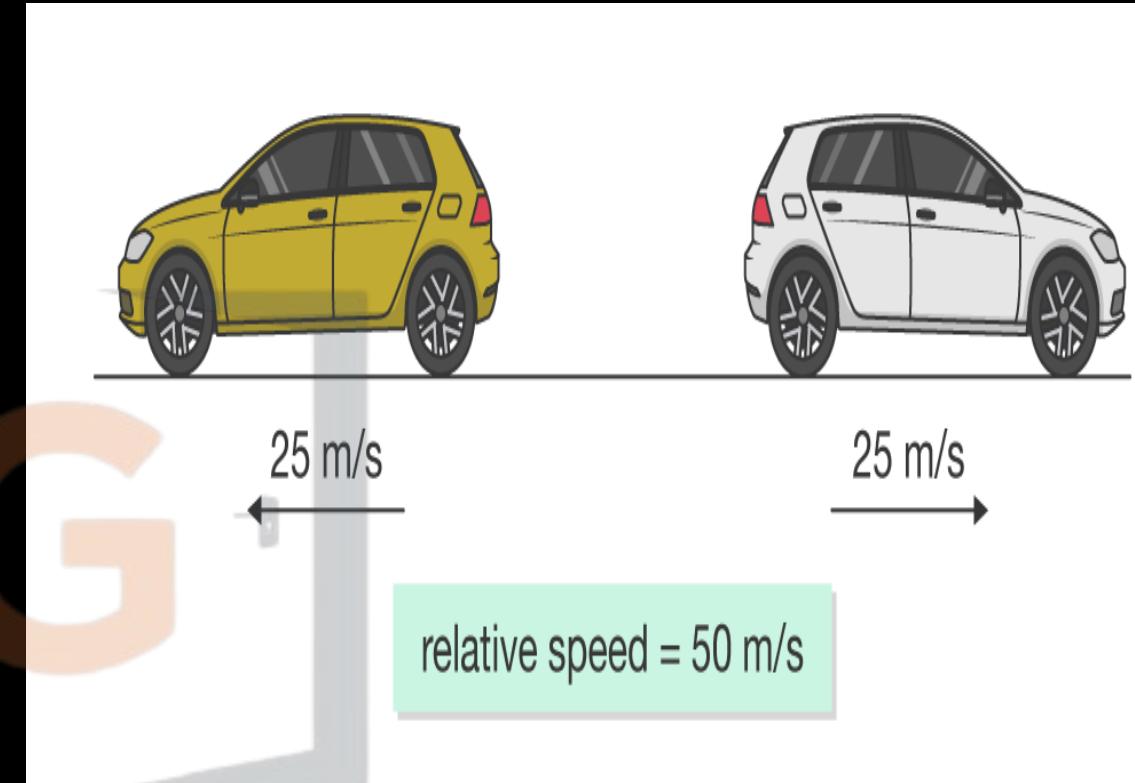
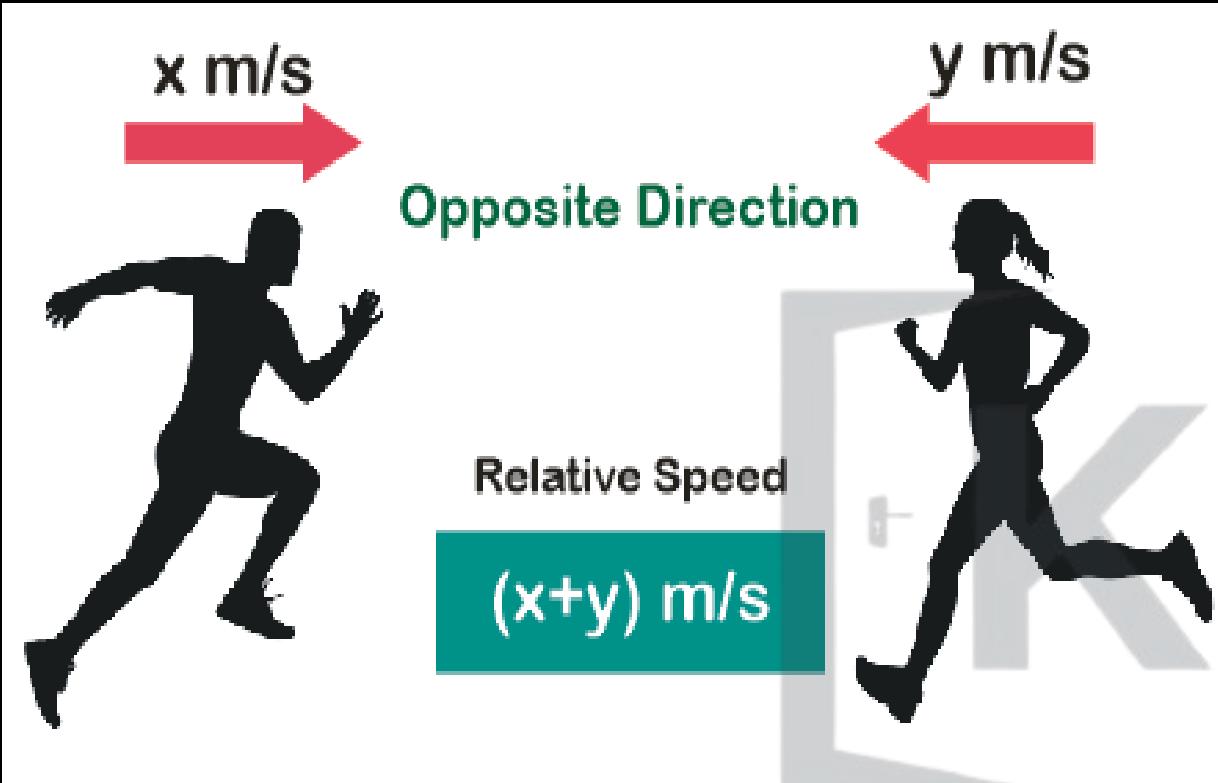
$S \checkmark$
 $t \checkmark$
 $P \sim$

Correct Answer: 80 meters

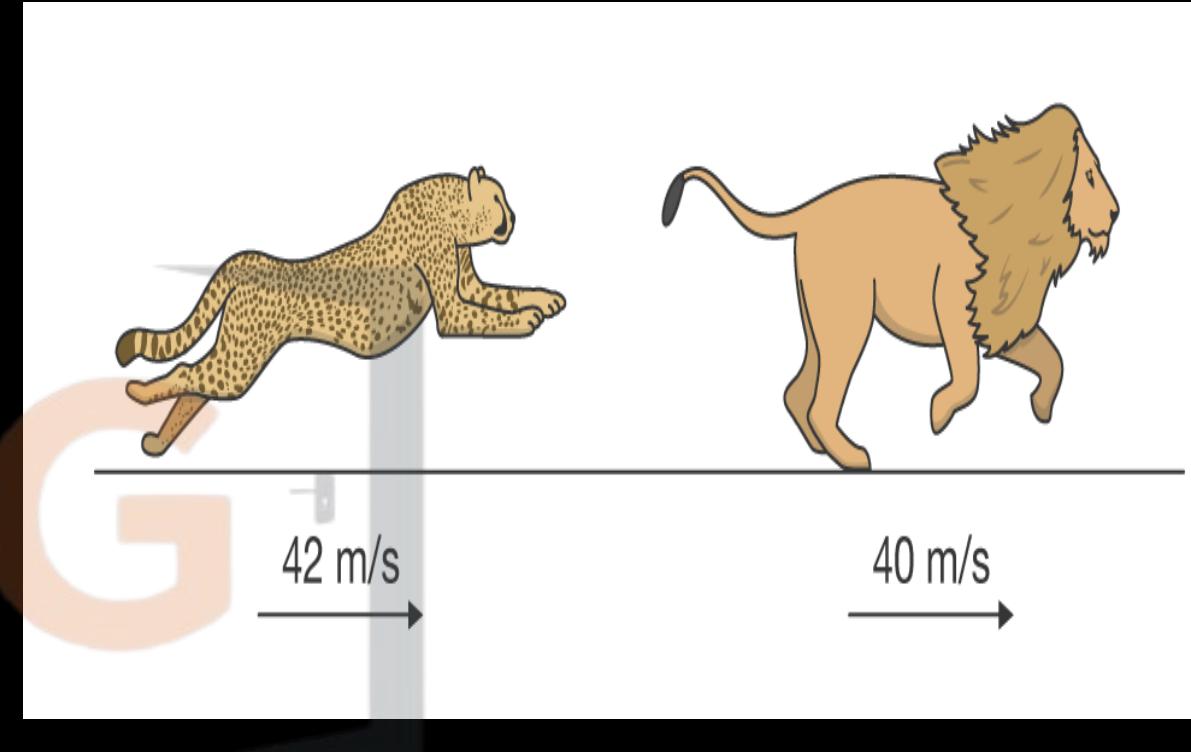
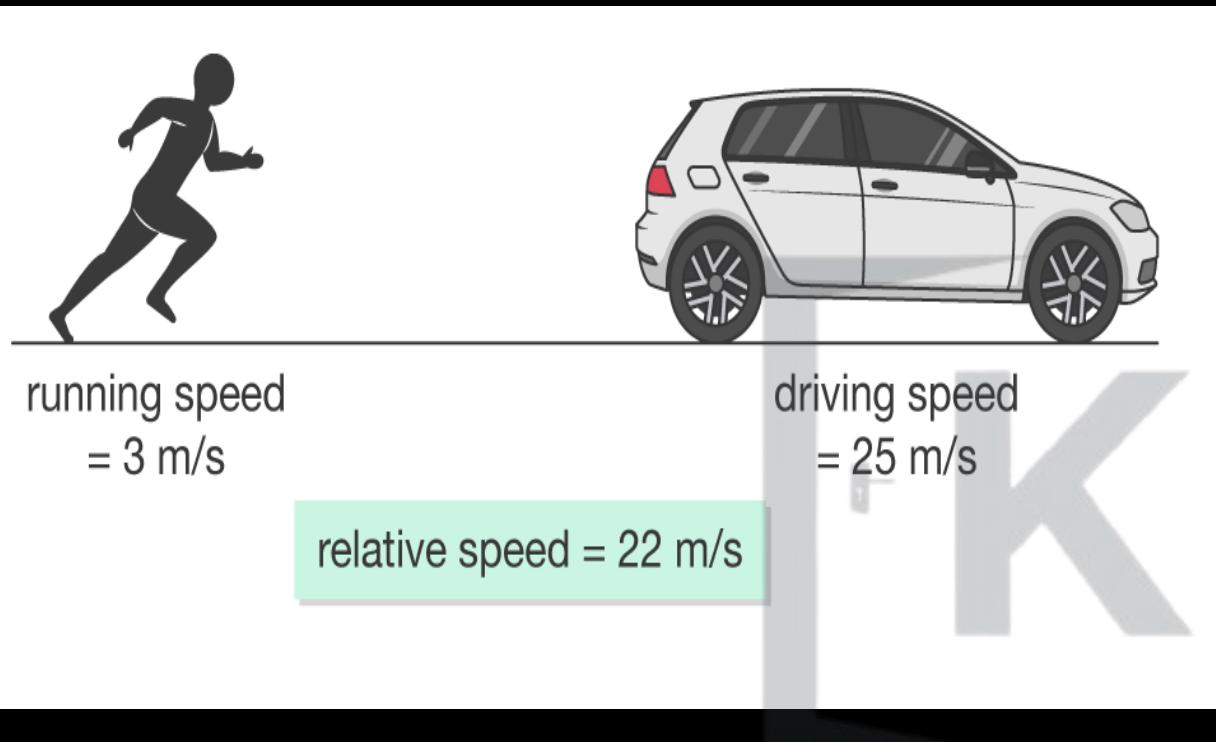


<https://www.knowledgegate.ai/courses/TCS-PREPARATION>

RELATIVE SPEED



RELATIVE SPEED



CASE 3

TWO TRAINS CROSSING EACH OTHER



CASE 3

TWO TRAINS CROSSING EACH OTHER

$$S = \frac{d}{t}$$

$\rightarrow s_1$
 $\leftarrow s_2$

Relative Speed $(s_1 + s_2) = \frac{\text{length of T1} + \text{length of T2}}{t_{\text{cross}}}$

Q4: Two trains Jhelum Express (length 100 meters) and Kamayani Express (length 80 meters) are moving in opposite directions with a speed of 60 km/hr and 48 km/hr. Find the time (in seconds) they take to cross each other completely?



Q4: Two trains Jhelum Express (length 100 meters) and Kamayani Express (length 80 meters) are moving in opposite directions with a speed of 60 km/hr and 48 km/hr. Find the time (in seconds) they take to cross each other completely?

$$RS(s_1+s_2) = \frac{l_{T_1} + l_{T_2}}{t_{cross}}$$

$$\frac{50}{3} + 15 = \frac{100+80}{t_{cross}}$$

$$\frac{50}{3} + \frac{45}{3}$$

$$\frac{95}{3} = \frac{180}{t_{cross}}$$

$$t_{cross} = \frac{180 \times 3}{95} = 6 \text{ seconds}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$\downarrow \times 3 \qquad \downarrow \times 3$

$$48 \text{ km/hr} = 15 \text{ m/s}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$$180 \text{ km/hr} = 50 \text{ m/s}$$

$$\frac{180}{3} \text{ km/hr} = \frac{50}{3} \text{ m/s}$$

$$60 \text{ km/hr} = \frac{50}{3} \text{ m/s}$$

CASE 4
TWO TRAINS MOVING IN SAME DIRECTION



CASE 4

TWO TRAINS MOVING IN SAME DIRECTION

$$S = \frac{d}{t}$$

$$\begin{array}{l} \rightarrow S_1 \\ \rightarrow S_2 \end{array}$$

$$\text{Relative Speed } (S_1 - S_2) = \frac{\text{length of } T_1 + \text{length of } T_2}{t_{\text{cross}}}$$

Q5: Two trains Bangalore Rajdhani (length 80 meters) and Gondwana Express (length 100 meters) are moving on parallel tracks in the same direction with speeds 90 kmph and 60 kmph. Find the time (in seconds) in which Bangalore Rajdhani will cross Gondwana Express completely.



Q5: Two trains Bangalore Rajdhani (length 80 meters) and Gondwana Express (length 100 meters) are moving on parallel tracks in the same direction with speeds 90 kmph and 60 kmph. Find the time (in seconds) in which Bangalore Rajdhani will cross Gondwana Express completely.

$$RS(s_1 - s_2) = \frac{l_{T_1} + l_{T_2}}{t_{cross}}$$

$$25 - \frac{50}{3} = \frac{80+100}{t_{cross}}$$

$$\frac{75}{3} - \frac{50}{3}$$

$$\frac{25}{3} = \frac{180}{t_{cross}} \Rightarrow t_{cross} = \frac{180 \times 3}{25} = \frac{180 \times 3 \times 4}{25 \times 4} = \frac{180 \times 12}{100} = \frac{2160}{100} = 21.6 \text{ seconds}$$

$$60 \text{ km/hr} = \frac{50}{3} \text{ m/s}$$

$$18 \text{ km/hr} = 5 \text{ m/s}$$

$$\downarrow \times 5 \quad \downarrow \times 5$$

$$90 \text{ km/hr} = 25 \text{ m/s}$$

CONVENTIONS FOR SOLVING PROBLEM ON TRAINS

1. When a train passes an object of negligible length (Example: pole, man, stone etc), it should travel a distance equal to its own length to cross the object.
2. When a train passes a bridge or a platform or a tunnel of given length, it should travel a distance equal to the sum of its own length and the length of the bridge/platform for crossing it.
3. When two trains are moving parallel on tracks, in opposite direction => They cross each other with a relative speed equal to sum of their speeds.
4. When two trains are moving parallel on tracks, in same direction => They cross each other with a relative speed equal to difference of their speeds.

VK - Vidhyarti Kartavya (Homework) Answers

Topic Name	Correct Option	Correct Answer
Percentage	A	14400
Elementary Statistics	C	1.1
Number System	-	5
Arithmetic	D	720
Data Interpretation	A	15552
Mensuration & Geometry	C	2.66
Profit & Loss	-	350
Ratio & Proportion	C	40
Time & Work	A	2+(1/11)
Simplification	4	3/22
Speed, Time & Distance	-	7
LCM HCF	D	12
Linear Equation	C	115
Mixture & Alligation	B	2:3
Permutation & Combination	D	27720
Simple & Compound Interest	B	136.4
Average	A	48
Partnership	-	50:45:48
Probability	C	4/455
Age Problems	-	Shyam – 15, Ram - 45
Train Problems	-	80