

GENERAL APTITUDE

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Averages

- **Simple Average :**

- An average of a set of values is the sum of values divided by the total number of values.
- Average of 'n' values = (Sum of the 'n' values)/n
- This is also called as Arithmetic Mean.
- Average (A) = Sum (S)/ Number(n)
- $S = A \times n$

- **Weighted Average :**

- When all values whose average we want to find do not have uniform occurrences we calculate the weighted average.
- If values $y_1, y_2, y_3 \dots$ occur $w_1, w_2, w_3 \dots$ times then
- Weighted Avg =
$$\frac{(w_1y_1 + w_2y_2 + w_3y_3 + \dots)}{(w_1 + w_2 + w_3 \dots)}$$



Averages

Q. In a class of 50 students, 24 secured 60 in Physics, 16 secured 70 marks and the rest secured 80. What is the average score for Physics in the class?

A. 64.8 B. 65.4 C. 67.2 D. 66.7

Soln :-

Students	24	16	10.
Marks	60	70	80
Average	$= \frac{24 \times 60 + 16 \times 70 + 10 \times 80}{24 + 16 + 10}$ $= 3360/50$ $= 67.2$		

Ans : C



Averages

- Only For Consecutive Numbers -

- Whenever, we have consecutive numbers or consecutive odd numbers or consecutive even numbers, then always remember the middle number is the Average.

- Examples-

- A. 5,6,7,8,9 → Avg = 7
- B. 5,6,7,8 → Avg = 6.5
- C. 1,3,5,7,9 → Avg = 5
- D. 21,23,25,27 → Avg = 24



Averages

Q. The average age of a class of 49 students is 16 years. A teacher joins the class as a result of which the average increases by 0.5. How old is the teacher?

- A. 16.5 B. 18 C. 32 D. 41

• **Solution 1:**

Before teacher, Average age of 49 students = 16 yrs

Total age of 49 students = $49 \times 16 = 784$.

After teacher joins , New total of class = $49 + 1 = 50$

New Average of class = $16 + 0.5 = 16.5$

New Total Age of class = $16.5 \times 50 = 825$

Age of teacher = Difference in total age = $825 - 784 = 41$

Ans : D



Averages

Q. The average age of a class of 49 students is 16 years. A teacher joins the class as a result of which the average increases by 0.5. How old is the teacher?

A. 16.5

B. 18

C. 32

D. 41

• **Solution 2:-**

• New value = old avg + $(n \pm 1)(\text{diff})$

• Where, n = total no. of students

• New value = $16 + (49+1)(0.5)$
= $16 + 25.0$
= 41 years

+ if member added
- If member removed

difference = | Old avg – new avg |



Averages

Q. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100 g. What is the weight of the student who left the class ?

- A. 45 kg. B. 47.9 kg. C. 49.9 kg. D. 50.1 kg.

Soln:

$$\text{New value} = \text{old avg} + (n - 1)(\text{diff})$$

$$= 45 + (50 - 1)(0.1)$$

$$= 45 + 49(0.1)$$

$$= 45 + 4.9$$

$$= 49.9 \text{ kg}$$

$$(\text{ as we convert } 100\text{g into kg} = \frac{100}{1000} = 0.1 \text{ kg })$$

Ans: C



Averages

Q. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100 g. What is the weight of the student who left the class ?

- A. 45 kg. B. 47.9 kg. C. 49.9 kg. D. 50.1 kg.

Soln:

Total weight of 50 students = $(45 \times 50) \text{ kg} = 2250 \text{ kg}$

Average weight of 49 students = $45\text{kg} - 100\text{g} = 44.9 \text{ kg}$

So, total weight of 49 students = $(44.9 \times 49)\text{kg} = 2200.1\text{kg}$

Weight of the students who left the class = $2250 - 2200.1 = 49.9 \text{ kg}$

Ans: C



Averages

Q. The average age of 16 men increases by 3 years when a person 27 years old is replaced by another. How old is the new person?

A. 75 B. 30 C. 48 D. 64

Soln:-

Number of men = 16

Let average age be a

→ Total age of 16 men = $16a$ (Old total)

New average = $a+3$

→ New total age of 16 men = $16(a+3) = 16a + 48$

New Total – Old Total = 48

→ Age of new man = $27 + 48 = 75$

Ans : A



Averages

Q. The average age of 16 men increases by 3 years when a person 27 years old is replaced by another. How old is the new person?

A. 75 B. 30 C. 48 D. 64

Soln:-

- Average of 16 men increases by 3 years means,
- total age increases by $16 \times 3 = 48$
- If the age of new person same as replaced person then there would have been no change in average.
- But average age of 16 men increased by 3 years
- So, total age of the person replacing another person = $27 + 48 = 75$ years

Ans : A



Averages

Q. The average age of 8 men is decreased by 2 years when two of them, whose ages are 22 and 28, are replaced by two new men.. What is the average age of two men?

A. 34years

B. 30years

C. 15years

D. 17years

Soln:

- Average of 8 men reduce by 2 years means total age reduces by 16 if two men leave.
- So, the total age of the new men replacing the old men = $22+28-16=34$
- \Rightarrow Average = $34/2 = 17$ years.

OR

- Total age decreased = $(8 * 2)$ years = 16 years.
- Sum of ages of two new men = $(22 + 28 - 16)$ years = 34 years
- Average age of two new men = $(34/2)$ years = 17 years.

• **Ans: D**



Averages

Q. The average of four consecutive even number is 27. Find the largest of these numbers

A. 50

B. 40

C. 20

D. 30

Soln:

The average of consecutive numbers = (1st no. + last no)/2

$$= (x + x+6) / 2$$

$$27 = 2x+6$$

$$x = 24 \text{ (smallest no.)}$$

$$x+6 = 24+6 = 30 \text{ (largest no)}$$

Ans: D



Averages

Q. The average of 11 numbers is 50. If the average of first six is 49 and of last 6 is 52 then what is the 6th number ?

A. 55 B. 56 C. 58 D. 60

Soln:

- Average of 11 nos = 50
- So total of 11 nos = $11 \times 50 = 550$
- Total of first six nos = $6 \times 49 = 294$
- Total of last six nos = $6 \times 52 = 312$
- So the sixth number = $294 + 312 - 550$
 $= 56$

Ans B



Averages(Assignment)

Q. Find average of all the numbers between 6 and 34 which are divisible by 5.

- A. 18
- B. 20
- C. 34
- D. 3

Ans: B



Averages(Assignment)

Q. The average age of students is 7 years and average age of 10 teachers is 50 years. If average age of group of all teachers and students is 8 years. Find the number of students?

- A. 420 B. 250 C. 300 D. 270

Soln:

We know, Total = avg x n

	S	T
No.	z	10
Avg	7	50

$$\begin{aligned}(\text{student} + \text{teacher}) \times \text{avg} &= (\text{student}) \times \text{avg} + (\text{teacher}) \times \text{avg} \\(z + 10) \times 8 &= (z) \times 7 + (10) \times 50\end{aligned}$$

$$8z + 80 = 7z + 500$$

$$Z = 420 \text{ students}$$

Ans :A



Averages(Assignment)

Q. The average age of a class of 22 students is 21 years. The average increased by 1 when the teacher's age also included. What is the age of the teacher?

- A. 48 B. 45 C. 43 D. 44

Ans: D



Averages(Assignment)

Q. The average weight of 16 boys in a class is 50.25 kg and that of the remaining 8 boys is 45.15 kg. Find the average weights of all the boys in the class.

A. 47.55 kg

B. 48 kg

C. 48.55 kg

D. 49.25 kg

Ans: C

$$\begin{aligned}\text{Average} &= \frac{50.25 \times 16 + 45.15 \times 8}{16 + 8} \\ &= (804 + 361.2) / 24 \\ &= 1165.2 / 24 \\ &= 48.55\end{aligned}$$



Averages(Assignment)

Q. The average age of a class of 39 students is 15 years. If the age of the teacher be included, then the average increases by 3 months. Find the age of the teacher.

- A. 20 years B. 25 years C. 30 years D. 27 years

Ans : B



Averages(Assignment)

Q. The average marks of a class of 87 students is 56. When a new student was added and average becomes 56.5. Find marks of new student.

- A. 56 B. 44 C. 100 D. 90

Ans: C



Averages(Assignment)

Q. Find the average of first 97 natural numbers.

A. 47

B. 37

C. 48

D. 49

E. 49.5

Ans: D



Averages(Assignment)

Q. The average age of a class of 30 students is 9 years. When teacher's age is also added, the average becomes 10. What is the age of the teacher?

- A. 41 years B. 40 years C. 39 years D. 42 years

Ans: B



Averages(Assignment)

Q. The average of 50 numbers is 30. If two numbers, 35 and 40 are discarded, then the average of the remaining numbers is nearly:

A. 28.32

B. 29.68

C. 28.78

D. 29.27

Ans: B



Averages(Assignment)

Q. The average age 8 men is increased by 2 years when two of them whose ages are 21 years and 23 years are replaced by two new men . The average age of the two new men is?

- A. 22 years B. 24 years C. 28 years D. 30 years

Ans: D



Averages(Assignment)

Q. The average weight of the students of a class is 60 kg. If eight new students of average weight 64 kg join the class, the average weight of the entire class becomes 62 kg. How many students were there in the class initially ?

- A. 8 students B. 16 students C. 10 students D. 12 students

Ans: A



Averages(Assignment)

Q. The average of ten numbers is 8. If the average of first nine numbers is 7. Find the 10th number?

- A. 17 B. 16 C. 15 D. 12

Ans: A



Averages(Assignment)

Q. The average marks obtained by 150 students is 30. If the average marks of passed candidates was 40 and that of failed candidates was 20. Find the number of candidates who passed the exam?

A. 25

B. 85

C. 75

D. 45

Ans: C



Averages(Assignment)

Q. The average expenditure of a man for the first five months is Rs. 3600 and for next seven months is Rs. 3900, if he saves Rs.8700 during the year, his average income per month is ?

A. Rs.4500

B. Rs.8500

C. Rs.7500

D. Rs.5400

Ans: A



Averages(Assignment)

Q. The average of first five multiples of 3 is:

A. 9

B. 10

C. 8

D. 11

Ans: A



Averages(Assignment)

Q. Find the average of first 100 positive numbers

A. 49.5

B. 50.5

C. 51

D. 100

Ans: B



Averages(Assignment)

Q. The average expenditure of a man for the first five months of a year is Rs. 5000 and for next seven months is Rs. 5400, if he saves Rs.2300 during the year, his average income per month is ?

A. Rs.5425

B. Rs.5446

C. Rs.5500

D. Rs.5600

Ans: A



Averages(Assignment)

Q. Average age of 40 students in a class is 15 years. When 10 new students are admitted the average increases by 0.2 years. Find the average age of the new students.

- A. 17 B. 16 C. 18 D. 19

Ans: B



Averages(Assignment)

Q. In a group of 5 if a man weighing 80 kg is replaced by another man the average weight of the group decreases by 3 kg. The weight of the new man is

- A. 77kg. B. 75 kg C. 60 kg D. 65 kg

Ans: D



Averages(Assignment)

Q. In a school there are 15 boys and 10 girls in class nine. The average age of the boys is 16, while the average age of the girls is 15. Find the average age of the students in the class.

A. 15.8

B. 15.6

C. 15.5

D. 15.7

Ans: B



Ages

Ram is at present some age(x) . Age 15 years ago or future age, then



'n' times of Ram's age means ,
= $n \times \text{age}$



Ages

Q. Karan's age after 15 years will be 5 times his age 5 years back. What is the present age of Karan?

A. 12 years

B. 10 years

C. 20 years

D. 25 years

Soln:

Present age = x

As given,

Future age = $x + 15$

Old age = $x - 5$ 5 times is that n times

So, $x + 15 = 5(x - 5)$

$$x + 15 = 5x - 25$$

$$x = 10 \text{ years (Karan's present age)}$$

Ans: B



Ages

Q. Present age of Sam & Ana are in the ratio 5:4 respectively. Three years hence ,their ratio will become 11:9 respectively. What is Ana's present age?

- A. 6 years B. 24 years C. 28years D. 32years

Soln:

Present age –

S -> 5x, A -> 4x

3 years hence means (+) as its future ratio given and so its fraction

$$\frac{5x+3}{4x+3} = \frac{11}{9}$$

$$45x+27 = 44x + 33$$

$$x = 6 \text{ years}$$

For A,

$$4x = 4 \times 6 = 24 \text{ years}$$

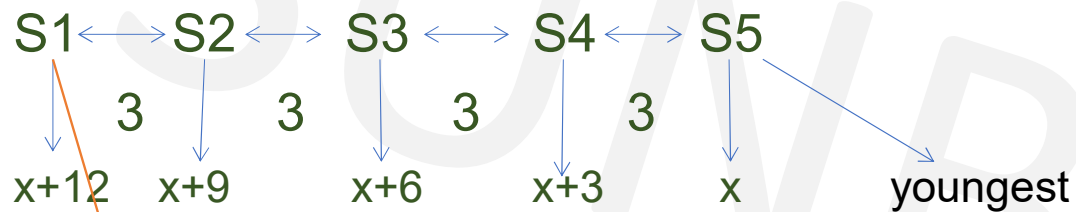
Ans: B



Ages

Q. Consider 5 siblings born apart by 3 years each. If the sum of the ages of all children is 50 years. What is the age of youngest child?

Soln :



Eldest

Given,

Sum of ages = 50 years

$$x+12+x+9+x+6+x+3+x = 50$$

$$5x + 30 = 50$$

$$x = 4 \text{ years (age of youngest child)}$$



Ages

Q. A mother said to her daughter “ I was as old as you are at the time of your birth”. If the mother’s age is 38 years now. What was the daughter’s age 5 years back?

- A. 14years B. 19years C. 38years D. None of these

Soln:

	M	D
Present	38	x
At birth time	38-x	0

“ I was as old as you are at the time of your birth” shows

M D

$$38 - x = x$$

$$38 = 2x$$

$$x = 19 \text{ years (present age of daughter)}$$

$$\text{5 years back, } 19 - 5 = 14 \text{ years}$$

$$\text{Mother's age at time of birth} = 38 - x$$

$$= 38 - 19$$

$$\text{Ans: A} \quad = 19 \text{ years}$$



Ages

Q. The sum of the ages of a father and son is 45 yr. Five years ago the product of their ages was 4 times the father's age at that time. The present ages of the father and son respectively are:

A. 36yrs,9yrs

B. 38yrs,7yrs

C. 37yrs,8yrs

D. None of these

Ans: A



Ages

Q. A man was asked to state his age in years. His reply was, "Take my age 3 years hence, multiply it by 3 and then subtract 3 times my age 3 years ago and you will know how old I am". What is the age of the man ?

- A. 18 years B. 20 years C. 24 years D. 32 years

Soln:

Let the present age of the man be x years

$$3(x+3)-3(x-3)=x$$

$$(3x+9)-(3x-9)=x$$

$$x=18$$

Ans: A



Ages

Q. Ten years ago, a man was seven times as old as his son. Two years hence, twice his age will be equal to five times the age of his son. What is the present age of the son ?

A. 12 years

B. 13 years

C. 14 years

D. 15 years

Ans: C



Ages(Assignment)

Q. A father had 3 sons and they were born at an interval of 3 years. The total age of three sons is 27 years. What is the age of the youngest son ?

A. 8 years

B. 6 years

C. 11 years

D. 5 years

Ans: B



Ages(Assignment)

Q. A is 2 years old than B who is twice as old as C. The total ages of A,B,C be 27. How old is B?

A. 5 years B. 12 years C. 10 years D. None of these

• **Soln:**

• So, we need to first find x here

• $A = 2 + B$

• $B = 2C$

• $C = x$

• So B becomes, $B = 2x$

• So A becomes,

• $A = 2 + B$

• $A = 2 + 2x$

• **Ans: C**

Given, the total age = $A + B + C = 27$

Substitute the values here for A,B,C

$$2 + 2x + 2x + x = 27$$

$$5x = 25$$

$$x = 5 \text{ years}$$

$$\text{Age of B} = 2x = 2 \times 5 = 10 \text{ years}$$



Ages(Assignment)

Q.A man who is 40 years old has three sons, ages 6, 3 and 1. In how many years will the combined age of his three sons equal 80% of his age?

A. 5 B. 10 C. 15 D. 20

Soln:

- Let the condition occur after y years.
- After y years
- Man's age = $(40+y)$
- Son's ages $(6+y)$, $(3+y)$, $(1+y)$
- Sum of sons' ages = $(10+3y)$
- $(10+3y) = 80/100(40+y)$
- $5(10+3y) = 4(40+y)$
- $50 + 15y = 160 + 4y$
- $11y = 110$
- $y = 10$

Ans : B



Ages(Assignment)

Q. The ratio of Present age of A and B is 6:7. A is 7 years younger than C. C's age after 8 years will be 51 years. Then what is the difference between the present ages of A and B?

A. 3 Years B. 4 Years C. 5 Years D. 6 Years E. Cannot be determined

Ans : D



Ages(Assignment)

Q. The average age of A, B, C, D and E is 40 years. The average age of A and B is 35 years and the average of C and D is 42 years. Age of E is :

A. 48 years

B. 46 years

C. 42 years

D. 45 years

Ans: B



Ages(Assignment)

Q. 10 years ago, age of father was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:

- A. 5:2 B. 7:3 C. 9:2 D. 13:4

Ans : B



Ages(Assignment)

Q. The average age of A, B and C is 28 years, if average age of B and C is 29 years. What is the age of A in years?

A. 24 years

B. 26 years

C. 28 years

D. 30 years

Ans: B



Ages(Assignment)

Q. Sachin is younger than Rahul by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Sachin?

A. 16 years B. 18 years C. 28 years D. 24.5 years E. None of these

Ans: D



Ages(Assignment)

Q. At present, the ratio between the ages of Arun and Deepak is 4 : 3. After 6 years, Arun's age will be 26 years. What is the age of Deepak at present ?

A. 12 years B. 15 years C. 19.5 years D. 21 years E. None of these

Ans: B



Ages(Assignment)

Q. The present ages of three persons in proportions 4 : 7 : 9. Eight years ago, the sum of their ages was 56. Find their present ages (in years).

- A. 8, 20, 28 years
- B. 16, 28, 36 years
- C. 20, 35, 45 years
- D. None of these

Ans: B



Ages(Assignment)

Q. The sum of the ages of two brothers 21 years hence will be twice the sum of their ages today. If the difference in their ages is 12 years, how old is the younger brother?

A. 27 years

B. 21 years

C. 17 years

D. 15 years

Ans : D

Soln-

Present age of elder brother = x

Present age of younger brother = y

After 21 years , elder brother = $x+21$ and younger brother = $y+21$

As per given condition,

$$x+21 + y+21 = 2(x + y) \quad \text{----- (1)}$$

$$x - y = 12 \quad \text{-----(2)}$$

Solving 1 and 2 , we get ,

$x = 27$ years and $y = 15$ years



Ages(Assignment)

Q. The sum of the present ages of the father and his son is 45 years. 5 years ago, the age of the father was 6 times that of son. What is the present age of the son ?

- A. 12 years B. 10 years C. 19 years D. 20 years

• **Ans: B**



Ages(Assignment)

Q. The present ratio of Mohan's and Sohan's age is 4 : 5. Twelve years hence this ratio becomes 5 : 6. What will be the age of Mohan (in years) after 6 years?

- A. 48 B. 54 C. 60 D. 66

Ans: B



Ages(Assignment)

Q. The ratio of A's and B's ages is 7 : 5. The sum of their ages is 36 years. What will be the ratio of their ages after 9 years?

A. 5 : 6

B. 4 : 3

C. 6 : 5

D. 5 : 4

Ans: D



Ratio & Proportion

- **Ratio** : Ratio is a comparison of two numbers (quantities) by division.
- The ratio of a to b is written as
- **$a : b = a/b = a \div b$.**

* Ratio is defined only for two values of same units
ratio between 20 kg & 50 kg is 2:5



Ratio & Proportion

- Some Useful Results

- If $a:b = c:d$ or $a/b = c/d$

1. $a \times d = b \times c$

2. $b/a = d/c$ (Invertendo)

3. $a/c = b/d$ (Alternendo)

4. $a+b/b = c+d/d$ (By Componendo)

5. $a-b/b = c-d/d$ (By Dividendo)

6. $(a+b)/(a-b) = (c+d)/(c-d)$ (By Componendo & Dividendo)



Ratio & Proportion

- **Proportion** : A proportion is an expression that states that two ratios are equal.

i.e. $a : b = c : d$ e.g $2 : 3 = 4 : 6$ or $2 : 3 :: 4 : 6$

a, b, c & d are called the 1st, 2nd, 3rd & 4th proportional.

1st & 4th proportionals are called extreme terms &

2nd & 3rd proportionals are called mean terms.

Product of means = Product of extremes. $bc = ad$

- **Continued Proportion**

Three quantities are said to be in continued proportion if

$$a : b = b : c \text{ or } a/b = b/c$$

If $a : b :: b : c$ then $b^2 = ac$ (b is the mean proportion of a & c)

$$a : b = b : c = c : d \text{ or } a/b = b/c = c/d$$



Ratio & Proportion(Assignment)

Q. If $A : B = 2 : 3$, $B : C = 4 : 5$ and $C : D = 5 : 9$ then $A : D$ is equal to:

A. $11 : 17$ B. $8 : 27$ C. $5 : 9$ D. $2 : 9$

Soln:

$$\frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}$$

$$\frac{A}{D} = \frac{2}{3} \times \frac{4}{5} \times \frac{5}{9}$$

$$\frac{A}{D} = \frac{8}{27}$$

Ans : B



Ratio & Proportion(Assignment)

Q. What is the value of $A+B / A-B$, if $A/B = 7$

A. $4/3$ B. $2/3$ C. $2/6$ D. $7/8$

Ans : A

$$A/B = 7/1$$

$$A+B/A-B = 7+1/7-1 = 8/6 = 4/3$$



Ratio & Proportion

If $X : Y = 3 : 4$ and $Y : Z = 8 : 9$ then $X : Z$ is

A. $3 : 4$

B. $5 : 4$

C. $2 : 3$

D. $8 : 9$

Soln:

$$X : Y = 3 : 4$$



(Inverted N)

$$Y : Z = 8 : 9$$

$$= 3 \times 8 : 8 \times 4 : 4 \times 9$$

$$= 24 : 32 : 36$$

$$= 6 : 8 : 9$$

Now, $X : Z$

$$6 : 9$$

$$2 : 3$$

Ans: C

$$\frac{X}{Z} = \frac{X}{Y} \times \frac{Y}{Z}$$

$$\frac{X}{Z} = \frac{3}{4} \times \frac{8}{9}$$

$$\frac{X}{Z} = \frac{2}{3}$$



Ratio & Proportion(Assignment)

If $A : B = 2 : 3$ and $B : C = 4 : 5$ then $A : B : C$ is

A. $2 : 3 : 5$

B. $5 : 4 : 6$

C. $8 : 12 : 15$

D. $6 : 4 : 5$

Ans : C

- $\frac{A}{B} = \frac{2}{3}$
- $\frac{B}{C} = \frac{4}{5}$

$$\begin{array}{ccc} A & : & B & : & C \\ 2 & : & 3 & & \\ & \searrow & \downarrow & \nearrow & \\ & 4 & : & 5 & \end{array}$$

- $A : B : C = 2 \times 4 : 3 \times 4 : 3 \times 5$
 $= 8 : 12 : 15$



Ratio & Proportion

Q. A sum of Rs. 1240 is distributed among A, B and C such that the ratio of amount received by A and B is 6 : 5 and that of B and C is 10 : 9 respectively. Find the share of C ?

A.Rs. 480

B.Rs. 360

C.Rs. 400

D.Rs. 630

• **Soln:**

• Given, $A : B = 6 : 5$, $B : C = 10 : 9$

• $A : B : C$

• 6 : 5

10 : 9

60 : 50 : 45

12 : 10 : 9

Ans : B

$$A : B : C = 12 : 10 : 9$$

$$12x + 10x + 9x = 1240$$

$$x = 40$$

$$C's \text{ share} = 9 \times 40 = \text{Rs. } 360$$



Ratio & Proportion

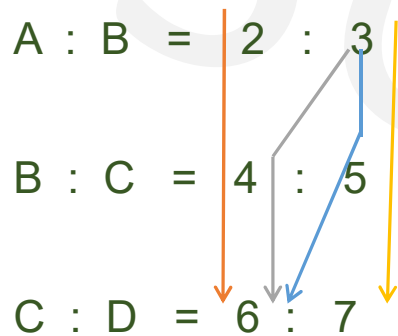
If $A : B = 2 : 3$, $B : C = 4 : 5$ and $C : D = 6 : 7$. Find $A:B:C:D$

A. $2 : 3 : 4 : 5$

B. $2 : 12 : 30 : 7$

C. $16 : 24 : 30 : 35$ D. $4 : 5 : 6 : 7$

Soln:

$$\begin{array}{lcl} A : B & = & 2 : 3 \\ B : C & = & 4 : 5 \\ C : D & = & 6 : 7 \end{array}$$


$$\begin{array}{lclcl} A & : & B & : & C & : & D \\ = & ABC & : & BBC & : & BCC & : & BCD \\ = & 2 \times 4 \times 6 & : & 3 \times 4 \times 6 & : & 3 \times 5 \times 6 & : & 3 \times 5 \times 7 \\ = & 48 & : & 72 & : & 90 & : & 105 \\ = & 16 & : & 24 & : & 30 & : & 35 \end{array}$$

Ans: C



Ratio & Proportion

Dividing a given number in the given Ratio :

Let T be the Total Amount . Let the given ratio be a:b:c

This means A is divided into three parts such that

$$\text{First Part} = T \times a/(a+b+c)$$

$$\text{Second Part} = T \times b/(a+b+c)$$

$$\text{Third Part} = T \times c/(a+b+c)$$

$$\text{And First Part} + \text{Second Part} + \text{Third Part} = T$$

$$\text{Any Part} = \text{Total Amount} \times (\text{Its related ratio term} / \text{Sum of Ratio Terms})$$



Ratio & Proportion

Q. Find B's share in Rs 6,300 if $A:B = 2:3$, $B:C = 4:5$, $C:D = 3:7$

A. Rs 1080

B. Rs 1800

C. Rs 810

D. Rs 1200

Soln:

$$\frac{A}{B} = \frac{2}{3}$$

$$\frac{B}{C} = \frac{4}{5}$$

$$\frac{C}{D} = \frac{3}{7}$$

$$A : B = 2 : 3$$

$$B : C = 4 : 5$$

$$C : D = 3 : 7$$

$$A : B : C : D$$

$$8 : 12 : 15 : 35$$

$$\text{So B's share} = 6300 \times \frac{12}{70} = 1080$$

Ans : A



Ratio & Proportion

Q. Which of the following is a ratio between a number and the number obtained by adding one-fifth of that number to it?

A. 4:5

B. 5:4

C. 5:6

D. 6:5

Ans: C



Ratio & Proportion

Q. Two numbers are in the ratio 7 : 11. If their HCF is 28, then sum of the two numbers is:

- A. 112 B. 308 C. 504 D. 196

Soln:

Ans: C

- Let the numbers be $7x$ and $11x$
- HCF of $7x$ and $11x$ is x
- $\text{HCF} = x = 28$
- The numbers will be 7×28 and 11×28
- The numbers will be 196 and 308
- Sum of numbers = $196 + 308$
- Sum of numbers = 504
- Sum of numbers is 504
- Let the numbers be $7x$ and $11x$.
- $7x + 11x = 18x$
- the final number must be the multiple of 18,
- Going by options only 504 is multiple of 18.
- The sum of two number is 504.



Ratio & Proportion

Q. The HCF and LCM of two numbers are 24 and 168 and the numbers are in the ratio 1 : 7. Find the greater of the two numbers.

- A. 168 B. 144 C. 108 D. 72

Ans: A

Soln:

- Product of numbers = LCM \times HCF
- Let numbers be x and $7x$.
- $x \times 7x = 24 \times 168$
- $x^2 = 24 \times 24$
- $x = 24$
- greatest number = $7x = 24 \times 7 = 168$.



Ratio & Proportion(Assignment)

Q. If $A:B = 2:3$, $B:C = 4:5$ and $C:D = 6:7$ Find $A:D$ is equal to:

A. $16 : 35$ B. $8 : 25$ C. $4 : 15$ D. $2 : 10$

Ans : A



Ratio & Proportion(Assignment)

Q. The difference between two positive numbers is 10 and the ratio between them is 5 : 3. Find the product of the two numbers.

A.375

B.175

C.275

D.125

E.250

Ans : A



Ratio & Proportion(Assignment)

Q. Two numbers are in ratio 4 : 5 and their LCM is 180. The smaller number is

A.9 B.15 C.36 D.45

Ans : C



Ratio & Proportion(Assignment)

Q. The average income of all employees is Rs. 20000. The average salary of male employees is Rs. 22000. The average salary of female employees is Rs. 15000. What is the ratio of male employees to female employees?

A. 2 : 5

B. 3 : 4

C. 5 : 2

D. 3 : 5

Ans: C



Ratio & Proportion(Assignment)

Q. The sum of 3 numbers is 98. If ratio between first and second numbers be 2 : 3 and between second and third be 5 : 8, then the second number is?

- A. 30 B. 40 C. 50 D. 60

Ans: A



Ratio & Proportion(Assignment)

Two numbers are in ratio 7 : 11. If 7 is added to each of the numbers, the ratio becomes 2 : 3. The smaller number is?

- A. 39 B. 49 C. 66 D. 77

Ans: B

Let the numbers be $7x$ and $11x$.

$$(7x+7)/(11x+7)=2/3$$

$$22x+14=21x+21$$

$$x=7$$

$$\text{Smaller number} = 7x = 7 \times 7 = 49$$



Ratio & Proportion(Assignment)

Q. What must be added to each of the numbers 7, 11 and 19, so that the resulting numbers may be in continued proportion?

- A. -3 B. -4 C. 3 D. 4

Ans: A



Ratio & Proportion(Assignment)

Q. The incomes of A & B are in the ratio 3:2. Their respective expenditures are in the ratio 5:3. If each of them saves Rs. 2000, what is the income of B?

A. Rs 12,000 B. Rs 8,000 C. Rs 16,000 D. Rs 6,000

Ans : B



Ratio & Proportion(Assignment)

Q. When a particular number is subtracted from each of 7, 9, 11 and 15, the resulting numbers are in proportion. The number to be subtracted is -

- A. 1 B. 2 C. 3 D. 5

Ans: C

Sol:

- Let the required number be x
- $\frac{7-x}{9-x} = \frac{11-x}{15-x}$
- $(7 - x)(15 - x) = (11 - x)(9 - x)$
- $105 - 22x + x^2 = 99 - 20x + x^2$
- $2x = 6$
- $x = 3$



Ratio & Proportion(Assignment)

Q. Average age of three boys is 22 years. If the ratio of their ages is 6 : 9 : 7, then the age of the youngest boy is-

- A. 1.8 years B. 9 years C. 18 years D. 16 years

Ans: C



Percentage

- Percentage is a fraction whose denominator is 100(per 100)

Fract ion x100	% ÷ 100	Fracti on	%	Fracti on	%	Fracti on	%	Fracti on	%
3/4	75%	5/4	125%	1/1	100%	1/6	16.66 %	1/11	9.09 %
4/5	80%	3/2	150%	1/2	50%	1/7	14.28 %	1/12	8.33 %
2/3	66.66 %	1/16	6.25%	1/3	33.33 %	1/8	12.5 %	1/13	7.69 %
5/6	83.33 %			1/4	25%	1/9	11.11 %	1/14	7.14 %
6/5	120%			1/5	20%	1/10	10%	1/15	6.66 %



Percentage

Q. x is 83.33% of y. So y is _____% of x

Solution:

$$x = 83.33y$$

$$x = \frac{5}{6} y$$

$$\text{So, } y = \frac{6}{5} x$$

y = 120% (from chart)

Fraction x100	% 100	Fraction	%
3/4	75%	5/4	125%
4/5	80%	3/2	150%
2/3	66.66 %	1/16	6.25%
5/6	83.33 %		
6/5	120%		



Percentage

Q. x is 80% of y. So y is ____% of x

Solution:

$$x = 80y$$

$$x = \frac{4}{5} y$$

$$\text{So, } y = \frac{5}{4} x$$

$$y = 125\%$$



Percentage

Q. A number x is increased by 20% then the number is decreased by 20%. Find the net % change.

- **Soln** :
- If a number is increased / decreased by x% then there is always a loss of $-(x/10)^2$
- Net % Change = $-(20/10)^2 = -(400/100) = -4\%$ (loss)
- **OR**
- Let the number be 100
- $100 \uparrow$ by 20% = 120
- So 20% \downarrow of 120 = 96

• 100 120 96

-4% = net change



Percentage

Q. A number x is increased by 50% then the number is increased by 20% and again by 10%. Find the net % change

Soln:

- Let the number be 100
- $100 \uparrow$ by 50% = 150
- Again, $150 \uparrow$ by 20% = 30, So $150 + 30 = 180$
- $10\% \uparrow$ of 180 = 18, So, $180 + 18 = 198$

• 100 150 180 198

98% = net change



Percentage

- **Two Step change of Percentage**

In first step if number is changed by a% and the result is again changed by b% the net percentage change of original number is given by

$$\text{Net \% Change in Number} = a + b + \frac{ab}{100} \quad (+ve \text{ or } -ve)$$



Percentage

Q. If a number is increased by 12 % & then decreased by 18% then the net % change in number is

Soln:

Net % Change in Number = $a + b + \frac{ab}{100}$ (+ve or -ve)

$$\begin{aligned}\% \text{ Change} &= 12 - 18 + (12 \times -18)/100 \\ &= -6 - 2.16 \\ &= -8.16\%\end{aligned}$$



Percentage

- Expenditure = Price x Consumption
- $P \propto \frac{1}{\text{Consumption}}$
- So, for expenditure to remain constant, when one quantity increases the other quantity should decrease proportionally.
- **Eg:** If the price of a commodity is decreased by 20% and its consumption is increased by 20%, what will be the increase or decrease in expenditure on the commodity?
- Soln:

$$\text{Net \% Change} = a + b + \frac{ab}{100} \quad (+\text{ve or } -\text{ve})$$

$$\begin{aligned}\% \text{ Change} &= -20 + 20 + \frac{(-20 \times 20)}{100} \\ &= 0 - 4 = -4\%\end{aligned}$$

OR

100 \implies 20% \downarrow (Decrease in Price) \implies 80 \implies 20% \uparrow (Increase in Consumption) \implies 96.

| Thus, there is a decrement of 4%



Percentage

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

A. 7:8

B. 3 : 5

C. 4 : 5

D. 6 : 7

Soln:-

- Let the third number be 100
- First number = 40% more than 100 = $100 + 40\% \text{ of } 100 = 100 + 40 = 140$
- Second number = 60% more than 100 = $100 + 60\% \text{ of } 100 = 100 + 60 = 160$
- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{140}{160} = \frac{7}{8} = 7 : 8$

Ans: A



Percentage using x

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

- A. 7:8 B. 3 : 5 C. 4 : 5 D. 6 : 7

Soln:-

- Let the third number be x.
- First number = 40% more than x = $x + 40\% \text{ of } x = x + \frac{40}{100}x = \frac{100x+40x}{100} = \frac{140x}{100}$
- Second number = 60% more than x = $x + 60\% \text{ of } x = x + \frac{60}{100}x = \frac{100x+60x}{100} = \frac{160x}{100}$
- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{\frac{140x}{100}}{\frac{160x}{100}} = \frac{140}{160} = \frac{7}{8} = 7 : 8$

Ans: A



Percentage(Assignment)

Q. If the price of sugar increases by 25%, by what percent will a housewife have to reduce her consumption to leave total expenditure on sugar unchanged?

- A. 25% B. 35% C. 20% D. 15%

Ans: C



Percentage(Assignment)

Q. If the radius of a circle is decreased by 50%, find the percentage decrease in its area.

- A. 55%
- B. 65%
- C. 75%
- D. 85%

• **Soln:**

- Area of a circle = πr^2 where r is the radius
=> Area is directly proportional to r^2
- Assume the old radius is = $r_1=100$
- $A_1 = \pi \times 100^2 = 10000\pi$

Assume the new radius is = $r_2=50$

$$A_2 = \pi \times 50^2 = 2500\pi$$

$$\text{Decrease in area} = 10000\pi - 2500\pi = 7500\pi$$

$$\text{Percentage decrease in area} = \frac{\text{difference}}{\text{old}} \times 100 = \frac{7500\pi}{10000} \times 100 = 75\%$$

• **Ans : C**



Percentage(Assignment)

Q. 1.14 expressed as a per cent of 1.9 is:

- A. 6% B. 10% C. 60% D. 90%

Ans: C



Percentage(Assignment)

Q. A number x is increased by 20% then the number is increased by 10% and again by 50%. Find the net % change.

- A. 77% B. 75% C. 88% D. 98% E. 99%

Ans : D



Percentage(Assignment)

Q. If the altitude of a triangle increases by 5% and the base of the triangle increases by 7%, by what percent will the area of the triangle increase?

- A. 12.25% B. 12.35% C. 6.00% D. 5.25%

Ans B



Percentage(Assignment)

Q. The length and breadth of a room are increased by 25% and 40% respectively. While the height is decreased by 20%. Find % change.

A. 16%

B. 40%

C. 60%

D. 30%

Ans B



Percentage(Assignment)

Q. If the length of a rectangle is increased by 37.5% and its breadth is decreased by 20%, find the change in its area.

A. 15% increase B. 13% decrease C. 10% increase D. 10% decrease

Ans: C



Percentage(Assignment)

Q. The ratio 5 : 4 expressed as a percent equals :

- A. 125% B. 80% C. 40% D. 12.5%

Ans: A

$$\text{Required \%} = 5/4 \times 100 = 125\%$$



Percentage(Assignment)

Q. 12% of 5000 = ?

A. 600

B. 620

C. 680

D. 720

Ans: A



Percentage(Assignment)

Q. 280% of 3940 = ?

A. 10132

B. 11032

C. 11230

D. 11320

Ans: B



Percentage(Assignment)

Q. 15% of 578 + 22.5% of 644 = ?

A. 231.4

B. 231.6


C. 231.8

D. 233.6

Ans: B



Calendar

- In Non Leap year –
 - 365 days
 - 1 year = 52 weeks + 1 odd day(extra day)
 - 28th February
- In Leap year –
 - 366 days
 - 1 year = 52 weeks + 2 odd days
 - 29th February 
- A **century leap year** is a **year** that is exactly divisible by 400
 - **years** 1600 and 2000 were **century leap years**; (400,800,1200,1600,2000 – century leap years till date)
 - **years** 1700, 1800, and 1900 were not **century leap years**.
- To find the day of a week on a given date we use the concept of “**odd days**”.
- 01/01/0001 A.D(Anno Domini) was a Monday and 1st day of week so 1st January 0001 was a Monday.



Calendar

- In a century,
 - 24 leap year
 - 76 non leap years

100 years

Leap year non leap year

$$\begin{array}{rcl} 24 \times 2 & + & 76 \times 1 \\ = \frac{48}{7} & & = \frac{76}{7} \\ \downarrow & & \downarrow \\ 6 & + & 6 \end{array}$$

remainder

$$= 12 \div 7 = 5 \leftarrow \text{remainder}$$

5 extra(odd) days in a century (100 years)

100 years = 5 odd days ← remainder

200 years = $10 \div 7 = 3$ odd days

300 years = $15 \div 7 = 1$ odd days

400 years = 0 odd days (as century leap year)



Calendar

Years	No. of odd
Ordinary year	1
Leap year	2
100 years	5
200 years	3
300 years	1
400 years	0

BEAM




Calendar

Day of week	No. of odd
Sunday	0
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6


BEAM



Calendar



Month		Remainder
January	$31 \div 7$	3
February	$28 \div 7$ or $29 \div 7$	0(non leap) or 1(leap)
March	$31 \div 7$	3
April	$30 \div 7$	2
May	$31 \div 7$	3
June	$30 \div 7$	2
July	$31 \div 7$	3
August	$31 \div 7$	3
September	$30 \div 7$	2
October	$31 \div 7$	3
November	$30 \div 7$	2
December	$31 \div 7$	3



Calendar

Q. What was the day of the week on 15th August, 1947?

Soln:

Completed till 1946

$$\begin{array}{l} 1946 \\ \swarrow \quad \searrow \\ \frac{1900}{400} = 300 \quad \frac{46}{4} = 11(\text{quotient}) \\ \downarrow \quad \quad \quad \downarrow \\ 1 \text{ odd day} \quad 46 + 11 = 57 \quad \frac{57}{7} = 1(\text{remainder}) \end{array}$$

In 1946, odd days are,

$$\begin{array}{rcl} 1900 & 46 & \\ 1 & + & 1 = 2 \text{ odd days} \end{array}$$

1946 month date

$$\text{Total odd days} = 2 + 2 + 1 = 5 \text{ odd days}$$

As per table for days of a week , 5 \longleftrightarrow Friday

As month is August, go till July as per table,

$$\begin{array}{cccccc} J & F & M & A & M & J & J \\ 3 & 0 & 3 & + & 2 & + & 3 & + & 2 & + & 3 = 16 \end{array}$$

$$\text{Now, } \frac{16}{7} = 2 \text{ (remainder)}$$

For date ,

$$\frac{15}{7} = 1 \text{ (remainder)}$$



Calendar

For Months -

J	F	M	A	M	J	J	A	S	O	N	D
0	3	3	6	1	4	6	2	5	0	3	5

For years -

1600 – 1699	6
1700 – 1799	4
1800 – 1899	2
1900 – 1999	0
2000 – 2099	6



Calendar

Q. What day of the week was 29 June 2010 ?

• Soln

1. Last 2 digits of the year → 10
 2. Divide by 4 ($10 \div 4$) = 2(quotient)
 3. Take the date → 29
 4. Take the no. of month → 4(from table)
 5. Take the no. of year → 6 (from table)
- | | |
|----|-------|
| 51 | (add) |
|----|-------|
6. Divide by 7 → $\frac{51}{7} = 2(\text{remainder})$

Check table for day of the week

2 \longleftrightarrow Tuesday



Calendar

Q. What was the day of the week on 29th February, 2012?

Soln:

1. Last 2 digits of the year → 12
2. Divide by 4 ($12 \div 4$) = 03(quotient)
3. Take the date → 29
4. Take the no. of month → 03 (from table)
5. Take the no. of year → 06 (from table)

53 (add)

6. Divide by 7 → $\frac{53}{7} = 4$ (remainder)

subtract 1 from remainder

In this case for all dates of **January & February** in a leap year , $4 - 1 = 3$

Check table for day of the week

3 \longleftrightarrow Wednesday



Calendar

It was Sunday on Jan 1, 2006. What was the day of the week Jan 1, 2010?

A. Sunday

B. Saturday

C. Friday

D. Wednesday

Ans: C

On 31st December, 2005 it was Saturday.

Number of odd days from the year 2006 to the year 2009 = $(1 + 1 + 2 + 1) = 5$ days.

On 31st December 2009, it was Thursday.

on 1st Jan, 2010 it is Friday.



Calendar

Q. If we have preserved the calendar of 2017. Find the next immediate year in which we can reuse.

A. 2027

B. 2023

C. 2025

D. 2029

Soln:

$x/4$ (x = given year)

$$\frac{2017}{4} = 1 \text{ (remainder)}$$

For any year divide by 4, the possibility of remainder is 0,1,2,3

If remainder = 0 $\rightarrow x + 28$

If remainder = 1 $\rightarrow x + 6$

If remainder = 2/3 $\rightarrow x + 11$

So, $\frac{2017}{4} = 1 \text{ (remainder)}$

$$2017 + 6 = 2023$$

Ans: B (2005,2007,2009)



Calendar

Q. Which of the following days can never be the last day of a century?

A. Sunday B. Monday C. Tuesday D. Wednesday

• **Soln:**

- The last day of century can be only
- 1 odd day(Monday)
- 3 odd days (Wednesday)
- 5 odd days (Friday)
- 7 or 0 odd days (Sunday)
- So, century can never end in **Tuesday , Thursday or Saturday.**

• **Ans: C**



Calendar(Assignment)

Q. What was the day of the week on 26th January, 1947?

Soln:

1. Last 2 digits of the year → 47
 2. Divide by 4 ($47 \div 4$) = 11(quotient)
 3. Take the date → 26
 4. Take the no. of month → 0 (from table)
 5. Take the no. of year → 0 (from table)
- 84

(add)
6. Divide by 7 → $\frac{84}{7} = 0$ (remainder)

Check table for day of the week

0 \longleftrightarrow Sunday



Calendar(Assignment)

- Q. The day on 5th April of a year will be the same day on 5th of which month of the same year?
- A. 5th July B. 5th August C. 5th June D. 5th October

• **Ans A**

- April & July for all years have the same calendar. So, a day on any date of April will be the same day on the corresponding date in July.
- The same day will fall on 5th July of the same year.



Calendar(Assignment)

Q. What was the day of the week on your birthdate?

Q. 13th October 2019 is a Sunday. Find the day on 13th October 1989?

A. Sunday B. Monday C. Friday D. Wednesday

Ans: C

Q. 1st March 2006 falls on a Wednesday .What day does 1st March 2010 fall on?

A. Tuesday B. Monday C. Friday D. Wednesday

Ans: B

Q. Today is Monday. Which day will be after 64 days?

A. Tuesday B. Monday C. Friday D. Wednesday

Ans: A

Q. Today is Monday. After 30 days it will be?

A. Tuesday B. Monday C. Friday D. Wednesday

B. Ans: D



Calendar(Assignment)

Q. 15th August 1947 was a Friday. Find the day on 15th August 1977?

• Soln:

$$\begin{array}{r} 1977 \\ - 1947 \\ \hline 30 \text{ years} \end{array}$$

Leap years between 1947 to 1977

1948	1964	} 8 years
1952	1968	
1956	1972	
1960	1976	

$$30 + 8 = 38$$

total years leap

$$\frac{38}{7} = 3 \text{ (remainder)}$$

As 15th August 1947 was a Friday ,

So, Friday + 3 days = **Monday**



Calendar(Assignment)

Q. 4th January 2016 falls on Monday. What day of the week does 4th January 2017 lies?

A. Wednesday

B. Thursday

C. Tuesday

D. Monday

Soln:

Normal year = 1 odd day

Leap year = 2 odd days

Jan 4, 2016 → Monday

+ 2 (as leap year)

Jan 4, 2017 → Wednesday

Ans: A



Calendar(Assignment)

Q. Wednesday falls on 5th of a month .So which day will fall 5 days after 22nd of the same month?

- A. Tuesday
- B. Friday
- C. Thursday
- D. Wednesday

Ans: B

5th = Wednesday

+7

12th = Wednesday

+7

19th = Wednesday

22nd = Saturday

+5

27th = Thursday

5 days after 22nd will be **Friday**



Calendar(Assignment)

Q. What dates of May 2002 did Monday fall on?

Soln:

Lets take date = 1st May 2002

1. Last 2 digits of the year → 02
2. Divide by 4 ($02 \div 4$) = 00(quotient)
3. Take the date → 01
4. Take the no. of month → 01 (from table)
5. Take the no. of year → 06 (from table)
10 (add)
6. Divide by 7 → $\frac{10}{7} = 3$ (remainder)

Check table for day of the week

3 \longleftrightarrow Wednesday

1st May 2002 falls on Wednesday

1	2	3	4	5	6
W	Th	F	Sa	Su	M

↑
first Monday

Now add 7 to it to find remaining Mondays

Dates on which Monday falls are -
6 , 13 , 20, 27



Calendar(Assignment)

Q. On what dates of April, 2001 did Wednesday fall?

A. 1st, 8th, 15th, 22nd, 29th

B. 2nd, 9th, 16th, 23rd, 30th

C. 3rd, 10th, 17th, 24th

D. 4th, 11th, 18th, 25th

Ans: D



Calendar(Assignment)

Q. What is the day on 22 April 2222?

A. Monday

B. Tuesday

C. Saturday

D. Sunday

Ans: A



Calendar(Assignment)

Which of the following is not a leap year?

- A. 700 B. 800 C. 1200 D. 2000

Ans: A

The century divisible by 400 is a leap year.
The year 700 is not a leap year.



Calendar(Assignment)

Q. Today is Monday. Which day will be on 61st day?

Soln:

1 week = 7 days. Taking the multiple of 7

56 - Monday	or	63 - Monday
57 - Tuesday		62 - Sunday
58 - Wednesday		61 - Saturday

59 - Thursday

60 - Friday

61 - Saturday

$56 + 5 = 61$ days

(add 5 days) or

$63 - 61 = 2$ days

(subtract 2 days)



Calendar(Assignment)

Q. January 1, 2007 was Monday. What day of the week lies on Jan. 1, 2008?

- A. Monday
- B. Tuesday
- C. Wednesday
- D. Sunday

Ans: B



