## Arithmetic

## RATIO AND PROPORTION

## Ratio

A ratio is a comparison of the sizes of two or more quantities of the same kind by division.

## Remarks

- Both terms of a ratio can be multiplied or divided by the same (non-zero) number. Usually a ratio is expressed in lowest terms (or simplest form).
- Ratio exists only between quantities of the same kind.
- Quantities to be compared (by division) must be in the same units.
- To compare two ratios, convert them into equivalent like fractions.

The fraction by which the original quantity is multiplied to get a new quantity is called the multiplying ratio (or factor).

## Inverse Ratio

One ratio is the inverse of another if their product is 1 . Thus $a: b$ is the inverse of $b: a$ and vice-versa.

1. A ratio $a: b$ is said to be of greater inequality if $a>b$ and of less inequality if $a>b$.
2. The ratio compound of the two ratios $\mathrm{a}: \mathrm{b}$ and $\mathrm{c}: \mathrm{d}$ is $\mathrm{ac}: \mathrm{bd}$.
3. A ratio compounded of itself is called its duplicate ratio.

Thus $a^{s}: b^{2}$ is the duplicate ratio of $a: b$. Similarly, the triplicate ratio of $a: b$ is $a^{3}: b^{3}$.
4. The sub-duplicate ratio of $a: b$ is $\sqrt{a}: \sqrt{b}$ and the sub triplicate ratio of $a: b$ is $\sqrt[3]{a}: \sqrt[3]{b}$
5. Continued Ratio is the relation (or compassion) between the magnitudes of three or more quantities of the same kind. The continued ratio of three similar quantities $a, b, c$, is written as $a: b: c$.
6. If $a=b$, the ratio $a: b$ is known as "ratio of equality".

## Proportion

An equality of two ratios is called a proportion. Four quantities $a, b, c$,

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d are said to be in proportion if $\mathrm{a}: \mathrm{b}=\mathrm{c}: \mathrm{d}$ (also written as $\mathrm{a}: \mathrm{b}:: \mathrm{c}: \mathrm{d}$ ) i.e. if $a / b=c / d$ i.e. if $\quad a d=b c$.

If $a: b=c: d$ then $d$ is called fourth proportional
If $a: b=c: d$ are in proportion then $a / b=c / d$ i.e. $a d=b c$
i.e. product of extremes = product of means
(a) This is called cross product rule or cross product property.
(b) Reciprocal Property: If 2 ratio's are equal, then their reciprocals are also equal.
If $a, b, c$ are in continuous proportion, then the middle term $b$ is called the mean proportional between a and $c$, $a$ is the first proportional and $c$ is the third proportional.

## Properties of Proportion

1. If $a: b=c: d$, then $a d=b c$

Proof. $\frac{a}{b}=\frac{c}{d} ; \quad \backslash a d=a c($ By cross - multiplication)
2. If $a: b=c: d$, then $b: a=d: c$ (Invertendo)

Proof $\cdot \frac{a}{b}=\frac{c}{d}$ or $1 / \frac{a}{b}=1 / \frac{c}{d}$, or $\frac{b}{a}=\frac{d}{c}$
3. If $\mathrm{a}: \mathrm{b}=\mathrm{c}: \mathrm{d}$, then $\mathrm{a}: \mathrm{c}=\mathrm{b}: \mathrm{d}$ (Alternendo)

Proof. $\frac{a}{b}=\frac{c}{d}$ or, $a d=b c$
Dividing both sides by cd, we get
$\frac{\mathrm{ad}}{\mathrm{cd}}=\frac{\mathrm{bc}}{\mathrm{cd}}, \mathrm{or} \frac{\mathrm{a}}{\mathrm{c}}=\frac{\mathrm{b}}{\mathrm{d}}$, i.e. a:c $=\mathrm{b}: \mathrm{d}$
4. If $\mathrm{a}: \mathrm{b}=\mathrm{c}: \mathrm{d}$, then $\mathrm{a}+\mathrm{b}: \mathrm{b}=\mathrm{c}+\mathrm{d}: \mathrm{d}$ (Componendo)

Proof. $\frac{a}{b}=\frac{c}{d}$, or, $\frac{a}{b}+1=\frac{c}{d}+1$
or, $\frac{a+b}{b}=\frac{c+d}{d}$, i.e. $a+b: b=c+d: d$
5. If $\mathrm{a}: \mathrm{b}=\mathrm{c}: \mathrm{d}$, then $\mathrm{a}-\mathrm{b}: \mathrm{b}=\mathrm{c}-\mathrm{d}: \mathrm{d}$ (Divenddo)

Proof. $\frac{a}{b}=\frac{c}{d}$, or, $\frac{a}{b}-1=\frac{c}{d}-1$
$\frac{a-b}{b}=\frac{c-d}{d}$, i.e. $a-b: b=c-d: d$
6. If $\mathrm{a}: \mathrm{b}=\mathrm{c}: \mathrm{d}$, then $\mathrm{a}+\mathrm{b}: \mathrm{a}-\mathrm{b}=\mathrm{c}+\mathrm{d}: \mathrm{c}-\mathrm{d}$
(Compoendo and Dividendo)
$\operatorname{Pr}$ oof. $\cdot \frac{a}{b}=\frac{c}{d}, o r, \frac{a}{b}+1=\frac{c}{d}+1, \operatorname{or} \frac{a+b}{b}=\frac{c+d}{d}$.
$\operatorname{Again} \frac{a}{b}-1,=\frac{c}{d}-1$, or $\frac{a-b}{b}=\frac{c-d}{d}$2

Dividing (1) and (2) we get
$\frac{a+b}{a-b}=\frac{c+d}{c-d}$, i.e. $a+b: a-b=c+d: c-d$
7. If $a: b=c: d=e: f=$ $\qquad$
ratios (Addendo) is equal ( $\mathrm{a}+\mathrm{c}+\mathrm{e}+$ $\qquad$ .) : (b + d + f + ........)
proof. $\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=$ $\qquad$ (say) $k$,
$\therefore \mathrm{a}=\mathrm{bk}, \mathrm{c}=\mathrm{dk}, \mathrm{e}=\mathrm{fk}$, $\qquad$
Nowa $+c+e \ldots \ldots \ldots . .=k(b+d+f) \ldots \ldots \ldots \ldots$ or $\frac{a+c+e \ldots \ldots}{b+d+f \ldots . .}=k$
Hence, $(a+c+e+$ $\qquad$ ): $(b+d+f+$ $\qquad$
8. Continued Proportions: If $a, b, c$, are in continued proportion, then

| $\mathrm{b}^{2}=\mathrm{ac}$ | $\mathrm{b}= \pm \sqrt{a c}$ |
| :--- | :--- |

9. Compound Proportion: If two or more ratio are multiplied together, thus $a^{1} a^{2} a^{3}: b^{1} b^{2} b^{3}$ is a continued ratio of the ratios $a_{1}: b_{1} ; a_{2}: b_{2} ; a_{3}: b_{3}$. This method is known as "Compound rule of three".

## SIMPLE AND COMPOUND INTEREST INCLUDING ANNUITY-

 APPLICATION
## FORMULAE

## Simple Interest

$I=\frac{P \times R \times T}{100}$

1. Int. is payable halfyearly, quarterly, monthly.
2. $A=P+1=P+P \times i \times n=P(1+i n)$
i.e., $A=P(1+n . i)$

Compound Interest
C.I. $=P\left(1+\frac{R}{100}\right)^{n}-P$

1. $A=P(1+i)^{n}$
2. $P=\frac{A}{(1+i)^{n}}=A(1+i)^{-n}$
3. 

Amount

$$
1=A-P
$$

(a) Annual

$$
A=P(1+i)^{n}
$$

$$
1=P\left[(1+i)^{n}-1\right]
$$

(b) Half - Yearly $A=P\left(1+\frac{i}{2}\right)^{2 n}$
$A=P\left(1+\frac{i}{4}\right)^{4 n}$
$1=P\left[\left(1+\frac{i}{2}\right)^{2 n}-1\right]$
(c) Quarterly
$1=P\left[\left(1+\frac{i}{4}\right)^{4 n}-1\right]$

## Future Value

$F . V$. $=$ P.V. $\left(1+\frac{R}{100}\right)^{n}$
where $n$ is number of periods

## Effective Rate of Interest

$$
E=\left(1+\frac{R}{100}\right)^{n}-1
$$

where $n$ is number of periods in a year

$$
E=\frac{R e}{100}
$$

## ANNUITY

Annuity can be defined as a sequence of periodic payments (or receipts) regularly over a specified period of time.

To be called annuity a series of payments (or receipts) must have following features:

1. Amount paid (or received) must be constant over the period of annuity and
2. Time interval between two consecutive payments (or receipts) must be the same.

## Types of Annuity

- Ordinary Annuity - An ordinary annuity is an annuity the first payment of which is made at the end of the first payment interval.
- Annuity Due - An annuity due is an annuity the first payment of which is made at the beginning of the first payment interval.
Thus the amount of an ordinary annuity of ₹ $P$ per period for $n$ periods at the rate I per period is given by

$$
A=P\left[\frac{(1+i)^{n}-1}{i}\right]
$$

## PRESENT VALUE OF AN ORDINARY ANNUITY: AMORTIZATION

The present value of an annuity represents the amount of money that must be invested how to purchase the payments due in the future.

The present value $P$ of the amount an due at the end of $n$ interest period at the rate of $R \%$ may be obtained by solving for $P$ the equation

$$
P=\frac{A_{n}}{\left(1+\frac{R}{100}\right)^{n}}
$$

The present value $(\mathrm{V})$ of periodic payment $(\mathrm{A})$ is

$$
\begin{aligned}
& A=\frac{V}{P(n, i)} \quad \text { where, } i=\frac{R}{100} \\
& \text { and } P(n, i)=\frac{(1+i)^{n}-1}{i(1+i)^{n}}
\end{aligned}
$$

$A=\frac{V}{P(n, i)}$ can be used to compute the amount of periodic payments if we have present value $(\mathrm{V})$ and ' $n$ ' the no. of time period and rate of interest. AMOUNT OF AN ANNUITY DUE

Hence the formula for the amount of an annuity due is

$$
A=P\left[\frac{(1+i)^{n+1}-1}{i}-1\right]
$$

## Sinking Fund

It is the fund credited for a specified purpose by way of sequence of periodic payments over a time period at a specified interest rate. Interest is compounded at the end of every period. Size of the sinking fund deposit is computed from $A=P . A(n, i)$ where $A$ is the amount to be saved $P$ the periodic payment in the payment period.

## AVERAGE DUE DATE AND ACCOUNT CURRENT

Account current is a running statements / account of transaction between parties for a given period of time which includes interest allowed or charged on various items.
Account current is generally prepared if the frequency of transaction between two parties is very high. Some situation are:
(a) Manufacture who sells goods frequently to a merchant on credit and revives payment from him in installments at different intervals and charges interests on the amount of which remains outstanding.
(b) Banker setting out the transaction taking place between him and his customer.
Account current has two parties - one who renders the account and the other to whom the account is rendered. So the heading of an account current should be understood as -"A in account current with $B$ " implies that the account is prepared in B's Books, $B$ is the persons rendering the account is rendered by him to $A$.
WAY IN WHICH AN ACCOUNT CURRENT IS PREPARED

| Interest tables <br> method | Products method | Product of balance <br> method |
| :--- | :--- | :--- |
| Interest is computed <br> with the help of | Interest computed for a <br> day on the total product <br> readymade tables. <br> (simple Interest com- <br> (i.e amount x days) the <br> patance for each <br> patane | on thebit or credit <br> product, after arriving <br> at (usually in case of <br> transaction. |

[^0]

## Note:

1. If no specific date is mentioned as the date in which payment is due the date of the transaction of the itself is presumed to be the due date.
2. Number of days is counted from the due date of each transaction to the date of rendering the account.
3. Interest column is filled up from the readymade tables (simple interest tables). Interest due on different amounts at given rates for different period of times is fund out and this is entered against each item separately. The interest columns of both the sides are totalled up and the net balance is computed.

## PREPARATION OF ACCOUNT CURRENT BY THE METHOD OF PRODUCTS

| Debit side |  |  |  |  |  | Credit side |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Trans date | Due date | Particulars | Amt | No. of days | Product | Trans date | Due date | Particular | Amt | No. of days | Product |
|  | Note <br> 1 |  |  | $\begin{aligned} & \text { Note } \\ & 2 \end{aligned}$ | Note 3 |  | Note <br> 1 |  |  | Note $2$ | Note3 |

Note:

1. If no specific date is mentioned as the date on which payment is due, the date of the transaction itself is presumed to be the due date.
2. Number of days is counted from the due date of each transaction to the date of rendering the account.
3. Each entry in product column = Entry in amount column $\times$ No of days.
4. At the end of the period the product column in balanced and the net product is the amount on which interest is to be computed. This is called 'Product Balance'.
5 Interest = product to balance x rate of interest x $1 / 365$ this interest amount is posted to the account current on the side opposite to the side where the product balance stands.
Note:
This method computes the net interest directly i.e. interest payable and interest. Due are mutually.

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5 explain the preparation of account current by the method of product of balances.

This method is also known as periodic balance method and is usually adopted in case of banks where the balance of the account is taken out every transaction.
FORMAT OF ACCOUNT CURRENT

| Trans <br> date | Particulars | Dr. | Cr. | Nature of <br> balance <br> (Dr. /Cr.) | Balance <br> Amt | No. of <br> days | Dr. <br> Product | Cr. <br> Product |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | Note1 | Note1 | Note2 | Note3 | Note4 | Note5 | Note6 |

Note:

1. Debits / credits to the account are entered in the dr. /cr. Columns respectively.
2. Nature of the balance i.e. whether the account has a dr. / cr. Balance is written in nature of balance column.
3. Amount of balance is written in the balance amount column.
4. The number of days from the date of transaction to the next transaction is recorded in the "No. of Days" column.
5. "Dr. Product"/ "cr. product" consists of the product of the dr. /cr. Column and the no. of days column.
6. Interest is the first computed separately for Dr. and Cr. Products at the appropriate rates of interest. Interest = product total $x$ rate of interest $x$ 1/ 365 Dr. and Cr. Interest are then netted - off to arrive at the net interest.
7. If the Dr. Product is greater than the Cr. Product the net interest is posted to the debit of the account else it is posted to the credit of the account.
RED INK INTEREST
Meaning: If the due date of all bill falls after the date of closing the account no interest is allowed for that amount. However interest should be dedicated for that amount for the number of days the due date falls after the date of the account current. This interest is generally referred to as red ink interest.
Recording: Interest from the date of closing to such due date is written in red ink in the appropriate side of the account current and is hence called red ink interest. This red interest is treated as negative interest. However
in actual practice the product of such bill [value of bill x (due date - closing date) is written on the opposite side on which the bill is entered.
Example: If the closing date of the account current is $31^{\text {st }}$ December and amount of $₹ 10,000$ from a debtor falls due on $7^{\text {th }}$ January interest on the product date i.e. ( $7 \times ₹ 10,000$ ) should be deducted from interest chargeable i.e. it will be credited to the account.

## Example 1

Prepare account current for Jagan in respect of the following transaction with Sunder.

|  | Particulars | $₹$ | Due date |
| :--- | :--- | :--- | :--- |
| $20 \times 1$ September 16 | Goods sold to Sunder | 200 | Due $1^{\text {st }}$ Oct |
| October 1 | Cash received from Sunder | 90 |  |
| October 21 | Goods purchased from Sunder | 500 | Due $1^{\text {st }}$ Dec. |
| November 1 | Paid to Sunder | 330 |  |
| December 1 | Paid to Sunder | 330 |  |
| December 5 | Goods purchased from Sunder | 500 | Due $1^{\text {st }}$ Jan. |
| December 10 | Goods purchased from Sunder | 200 | Due $1^{\text {st }}$ Jan. |
| 20 x2 January 1 | Paid to Sunder | 600 |  |
| January 9 | Goods sold to Sunder | 20 | Due $1^{\text {st }}$ Feb. |

The account is to be prepared upto1st February. Compute interest at $6 \%$ per annum.

## Solution:

In the books of Jagan (ledger 16 ${ }^{\text {th }} 20 \times 1$ to $1^{\text {st }}$ Feb. 20x2)
Sundry account current with Jagan
(interest upto $1^{\text {st }}$ February at 6\% p.a.)

| Dt | Due | Particular | $₹$ | Days | Inter- <br> est | Dt | Due | Particular | $₹$ | Days | Inter- <br> est |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 200x1 <br> sep 16 | Oct 1 | To sale | 200.00 | 123 | 4.40 | $20 \times 1$ <br> Oct 1 | Oct <br> 1 | By cash | 90.00 | 123 | 1.82 |
| Nov 1 | Nov 1 | To cash | 330.00 | 92 | 5.00 | Oct 21 | Dec <br> 1 | By purchase <br> a/c | 500.00 | 62 | 5.10 |
| Dec 1 | Dec 1 | To cash | 330.00 | 62 | 3.36 | Dec <br> 5 | Jan <br> 1 | By purchase | 500.00 | 31 | 2.55 |
| 200x2 <br> Jan 1 | Jan 1 | To cash | 600.00 | 31 | 3.06 | Dec 10 | Jan <br> 1 | By purchase <br> a/c | 200.00 | 31 | 1.02 |
| Jan 9 | Feb 1 | To sales | 20.00 |  |  | $20 \times 2$ <br> Feb 1 | Feb <br> 1 | By bal. of <br> interest |  |  | 4.97 |
| Feb 1 |  | To interest | 4.97 |  |  | Feb 1 | Feb <br> 1 | By balance <br> c/d | 194.97 |  |  |
|  |  | Total | $1,484,97$ |  | 15.46 |  |  | Total | $1,484,97$ | 15.46 |  |

Note:

Interest for sale made on $16^{\text {th }}$ sep= $₹ 200 \times 6 \% \times 123 / 265=₹ 4.04$.interest is computed similarly for other entries.

## Example 2:

From the following particular, prepare the account current to be rendered by Harbhjan to Sunil as on $31^{\text {st }}$ August. Interest must be computed at 10\% P.A.(amount in ₹)

| June 11 | Goods sent to Sunil | 1,020 | July 7 | Gods sent to Sunil | 700 |
| :--- | :--- | ---: | :--- | :--- | :--- |
| June 15 | Cash received from Sunil | 500 | Aug 8 | Cash received from Sunil | 1,100 |
| June 20 | Goods sent to Sunil | 650 |  |  |  |

## Solution:

## In the books of Harbhjan

Sunil in account current with Harbhjan (interest upto 31 ${ }^{\text {st }}$ August at 10\% p.a.) cr.
Dr.
Cr.

| Dt | Due | Particular | $₹$ | Days | product | Dt | Due | Particular | $₹$ | Days | Product |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| 11 <br> Jun | 11 <br> Jun | To sales <br> a/c | 1,020 | 81 | 82,620 | 15 <br> Jun | 15 <br> Jun | By cash <br> a/c | 500 | 77 | 38,500 |
| 20 <br> Jun | 20 <br> Jun | To sales <br> a/c | 650 | 72 | 46,800 | 08 <br> Aug | 08 <br> Aug | By cash <br> a/c | 1,100 | 23 | 25,300 |
| 7 <br> Jul | 7 Jul | To sales <br> a/c | 700 | 55 | 38,500 | 31 <br> Aug | 31 <br> Aug | By <br> balance <br> of product |  |  | $1,04,120$ |
| 15 <br> Mar | 15 <br> Mar | To <br> interest | 29 |  |  | 31 <br> Aug | 31 <br> Aug | By bal. <br> c/d | 799 |  |  |
|  |  | Total | 2,399 |  | $1,67,920$ |  |  | Total | 2,399 | $1,67,920$ |  |

Note: interest = ₹ $1,04,120 \times 10 \% \times 1 / 365=₹ 29$ (approx)

## Example 3:

From the following transaction is the book of Balasubramaniam an account current, by means of product and by means of product of balances to be sent by him to $\mathrm{M} / \mathrm{s}$ for the quarter ending $31^{\text {st }}$ March. Interest is to be charged and /or allowed at 12\% p.a.
(amount in ₹)

| Jan 1 | Balance in Mini's <br> account (credit) | 3,500 | Feb 1 | Cash received | 40,000 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Jan 12 | Sold goods to Mini(due | 30,000 | Feb 20 | Cash received | 7,500 |


|  | $1^{\text {st }}$ February) |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Jan 31 | Sold goods to Mini(due <br> 15rh February) | 27,500 | Mar 10 | Goods returned by <br> Mini | 7,000 |
|  |  |  | Mar 25 | Cash received | 6,500 |

Solution :
In the book of Balasubramaniam(ledger $1^{\text {st }}$ Jan. to $31^{\text {st }}$ March)
Mini in account current with Balsubramaniam (interest upto $31^{\text {st }}$ March at $12 \%$ p.a.)

| Dt | Due | Particular | ₹ | Days | product | Dt | Due | Particular | ₹ | Days | Product |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Jan } \\ & 12 \end{aligned}$ | Feb1 | To sale a/c | 30,000 | 58 | 17,40,00 | $\begin{aligned} & \text { Jan } \\ & 1 \end{aligned}$ | $\begin{aligned} & \text { Jan } \\ & 1 \end{aligned}$ | By <br> balance <br> bld | 3,500 | 90 | 3,15,000 |
| $\begin{aligned} & \text { Jan } \\ & 31 \end{aligned}$ | $\begin{aligned} & \text { Feb } \\ & 15 \end{aligned}$ | To sales a/c | 27,500 | 44 | 12,10,000 | $\begin{aligned} & \text { Feb } \\ & 15 \end{aligned}$ | $\begin{aligned} & \text { Feb } \\ & 15 \end{aligned}$ | By cash a/c | 40,000 | 44 | 17,60,000 |
| $\begin{aligned} & \text { Mar } \\ & 31 \end{aligned}$ | $\begin{aligned} & \text { Mar } \\ & 31 \end{aligned}$ | To interest a/c | 130 |  |  | $\begin{aligned} & \text { Feb } \\ & 20 \end{aligned}$ | $\begin{aligned} & \text { Feb } \\ & 20 \end{aligned}$ | By cash a/c | 7,500 | 39 | 2,92,500 |
| Mar $31$ | Mar <br> 31 | To bal. bld | 6,870 |  |  | $\begin{aligned} & \text { Mar } \\ & 10 \end{aligned}$ | $\begin{aligned} & \text { Mar } \\ & 10 \end{aligned}$ | By sales return | 7,000 | 21 | 1,47,000 |
|  |  |  |  |  |  | $\begin{aligned} & \text { Mar } \\ & 25 \end{aligned}$ | $\begin{aligned} & \text { Mar } \\ & 25 \end{aligned}$ | By cash a/c | 6,500 | 6 | 39,000 |
|  |  |  |  |  |  | $\begin{aligned} & \text { Mar } \\ & 31 \end{aligned}$ | $\begin{aligned} & \text { Mar } \\ & 31 \end{aligned}$ | By <br> purchase <br> of product |  |  | 3,96,500 |
|  |  | Total | 64,500 |  | 29,50,000 |  |  | total | 64,500 |  | 29,50,000 |

Note: Interest = ₹ 3,96,500x12\%x1/365 = ₹ 130(approx)

| Date | Particular | Dr. | Cr. | Dr./Cr.balance | Net <br> cum <br> balance | Days | Dr. <br> product | Cr. <br> product |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Jan 1 | Balance bld | - | 3,500 | Cr. | 3,5000 | 11 | - | 38,500 |
| Jan <br> 22 | Sale(due <br> date 1 feb) | Na | - | Cr. | 3,500 | (note)20 | - | 70,000 |
| Jan <br> 31 | Sale(due <br> date 15 feb) | Na | - | Cr. | 3,500 | (note)1 | - | 3,500 |
| Feb 1 | Invoice of <br> jan 31 | 30,000 | - | Dr. | 26,500 | 14 | $3,71,000$ | - |
| Feb <br> 15 | Invoice of <br> jan 31 | 27,500 | - | Dr. | 54,000 | - | - | - |
| Feb <br> 15 | Cash <br> received | - | 40,000 | Dr. | 14,000 | 5 | 70,000 | - |
| Feb <br> 20 | Cash <br> received | - | 7,500 | Dr. | 6,500 | 18 | $1,17,000$ | - |
| Mar <br> 10 | Sales return - 7,000 Cr. 500 15 - |  |  |  |  |  |  |  |

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| Mar <br> 25 | Cash <br> received | - | 6,500 | Cr. | 7,000 | 6 | - | 42,000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Mar31 | Interest(see <br> note below) | 130 |  |  |  |  |  |  |
| Mar <br> 31 | Closing <br> balance | 6,870 |  |  |  |  |  |  |
|  | Total | 64,500 | 64,500 |  |  | Total | $5,58,000$ | $1,61,500$ |

Note: since rate of interest on Dr. and Cr. Balance uniform at 12\% interest can be directly calculated on the next balance of ₹ $5,58,000-₹ 1,61,500=$ ₹ $3,96,500$. So , interest = ₹ $3,96,500 \times 12 \% \times 1 / 365 ₹ 130$ (approx.)
Invoices dated 12th Jan and $31^{\text {st }}$ Jan are due only form $1^{\text {st }}$ Feb and $15^{\text {th }}$ Feb respectively. Hence, number of days from $12^{\text {th }}$ Jan to $1^{\text {st }} \mathrm{Feb}=20$ days, and from $31^{\text {st }}$ Jan to 15 Feb (next due date)=20days and 1 days.

## MATHEMATICAL REASONING

## Mathematical Statement:

In our daily life we use different types of sentences like Assertive, Interrogative, Exclamatory, Imperative, Optative etc. Among them only assertive sentences are called Mathematical statement. But it is to be noted that all assertive sentences are not Mathematical Statements.
For example:
'The earth moves round the sun': - This is a Mathematical statement. It is true always.
'The sun rises in the west': - This is also a Mathematical statement. But its truth value is 'False'. Again we take the example of assertive sentence:
'Girls are more clever than boys' - This is an assertive sentence but we cannot say whether this sentence is always true or false. For this reasons this sentence is not a mathematical Statement.
Hence, we give the following definition of Mathematical Statement.
A sentence is called a mathematically acceptable statement or simply mathematical statement of it is true or false but not both.

Example 1: The followings are the examples are Mathematical statements.
(i) $2+3=5 . \quad$ (ii) $3+4=6$.

Example 2 : The followings are not the Mathematical Statements:
(i) $X^{2}-3 X+2=0$. (ii) Open the door.

## Negation of a Statement:

Negation of a statement implies the denial or contradiction of the statement. If ' $p$ ' be a statement, then
' $\sim p$ ' denotes the Negation of the statement.

## For example:

'Manas is a teacher': It is a mathematical statement. Its negation is 'Manas is not a teacher' or it is false that Manas is a teacher'.
Again 'Delhi is the capital of India' is a mathematical statement. Its negation statement is 'Delhi is not the capital of India' or, 'It is false that Delhi is the capital of India'.

## Simple and compound Statements:

If the truth value of a statement does not depend on any other statement, then the statement is called a Simple Mathematical Statement. Simple statement cannot be subdivided into simple statements.

A compound statement is a combination of two or more simple statements connected by the words "and", "or", etc.
A compound statement can be subdivided into two or more simple statements.
Example 3: The followings are simple statements and they cannot be sub-divided into simpler statements.
(i) The earth moves round the sun.
(ii) The Sun is a star.
(iii) Sweta reads in class $X$.

## Example 4:

The followings are compound statements and each of them can be subdivided into two or more simple statements.
(i) 2 is a rational number and 2 is an irrational number.
(ii) A rhombus is a parallelogram and its four sides are equal.

## Connectives:

Some connecting words are used to form compound statements. These connecting words are called connectives. The connectives are the words namely: "and", "or", "if-then", "only if", "if and only if".

## The word "and"

Any two simple statements can be combined by using the word "and" to form compound statements which may be true or false.

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If each simple mathematical statements belonging to a compound mathematical statements are true then the compound mathematical statement is only True. But if one or more simple statements connected with a compound mathematical statement is are false, then the compound mathematical statement must be False.

## Example 5 :

(i) r : Delhi is a big city and it is the capital of India.

The statement $r$ is a compound mathematical statement and is formed by connecting two simple mathematical statements $p \& q$ using the connective "and" where
p: Delhi is a big city.
$\mathbf{q}$ : Delhi is the capital of West Bengal.
Here both $p$ and $q$ are true, so the truth value of the compound mathematical statement is "True".
(ii) $r: 41$ is a prime number and it is an even number.

Here $r$ is a compound mathematical statement and is formed by connecting two simple mathematical statements $p$ and $q$ using the connective "and" where
$p: 41$ is a prime number.
$q: 41$ is an even number.
Here $p$ is true but $q$ is false. So the truth value of $r$ is "False".

## The word "or":

Any two simple mathematical statements can be combined by using "or" to form compound mathematical statements whose truth value may be true or false.

If both "or" any one of the component simple mathematical statements of a compound mathematical statements when formed using the connective "or" are / is true then the truth value of the compound mathematical statement is true. If both compound simple mathematical statements are false, then the truth value of the compound mathematical statement is "false".

If both the component simple mathematical statements of a compound mathematical statement formed by using the connective "or" are true, then the "or" is called Inclusive "or". Again if one is true and other is false, then the "or" used in compound mathematical statement is called Exclusive "or".

Example 6 : Let p: Rhombus is a quadrilateral.
$q$ : Rhombus is a parallelogram.
Here p \& q both are simple mathematical statements and both are true.
$r$ : Rhombus is a quadrilateral or a parallelogram.
Hence $r$ is a compound mathematical statement which is obtained by connecting $p$ and $q$ with the connective "or". Since both $p$ and $q$ are true, the truth value of $r$ is "True" and here "or" is Inclusive "or".
Example 7 : Let $\mathbf{p}$ : Two straight lines intersect at a point.
q: Two straight lines are parallel.
Here both $p$ and $q$ are simple mathematical statement. If $p$ is true, then $q$ is false or if $p$ is false, then $q$ is true but $p$ and $q$ cannot be both true or cannot be both false. Only one of $p$ and $q$ is true. So the truth value of $r$ is true where
r: Two straight lines either intersect at a point or they are parallel.
Here "or" use is Exclusive "or".

## Implications:

A compound mathematical statement is formed connecting two simple mathematical statements using the connecting words "if - then", "only if" and "if and only if". These connecting words are called Implications.
(i) The word "if - then":

Let $p$ and $q$ be two simple mathematical statements. If a compound mathematical statement is formed with $p$ and $q$ using "if $p$ then $q$ " - then its meaning is "if $p$ is true then $q$ must be true". Symbolically it is written as $p \Rightarrow q$ of $p \Rightarrow q$. (We read this as $p$ implies $q$ )
Example 8 : "If 42 is divisible by 7 , then sum of the digits of 42 is divisible by 7 ". - It is a compound mathematical statement.
p: 42 is divisible by 7 . $\mathbf{Q}$ : The sum of the digits of 42 is divisible by 7 .
Here $p$ is true but $q$ is not true.
$\therefore \mathrm{p} \times \mathrm{q}$ is false.
$\therefore$ The truth value of the given statement is false.
Example 9 : "If 123 is divisible by 3 , then the sum of the digits of 123 is not divisible by $3 "$. - It is a compound mathematical statement.
$\mathbf{p}: 123$ is divisible by 3 . $\mathbf{q}$ : the sum of the digits of 123 is not divisible by 3. Here $p$ is true and $q$ is not true.

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- $\quad p \Rightarrow q$ is false.
- The truth value of the given statement is false.

Example 10 : "If anybody is born in India, then he is a citizen of India". It is compound mathematical statement.
p : Anybody is born in India. Q: He is a citizen of India.
Here if $p$ is true, then $q$ is true. So $p \sum q$ is true.

## Contrapositive and converse statement:

If a compound mathematical statement is formed with two simple mathematical statements p and q using the connective "if-then" then the contrapositive and converse statements of compound statement can also be formed.

The contrapositive statement of "if $p$, then $q$ " is "if $-q$, then $-p$ " and the converse statement is "if $q$ then $p$ ". Example: "If a number is divisible by 6 , then it is divisible by 3 ". - It is a compound mathematical statement. Its contrapositive statement is "If a number is not divisible by 3 , then it cannot be divisible by 6 ".

## The converse statement is

"If the require of a number is an even number, then the number is even".
The word "only if":
Let $p$ and $q$ be two given simple mathematical statements. If a compound mathematical statement is formed with $p$ and $q$ using the connective word "only if" then it implies that $p$ only if $q$ that is $p$ happens only if $q$ happens.
Example 11 : "The triangle $A B C$, will be equilateral only if $A B=B C=C A$."
Here, $p$ : The triangle $A B C$ is equilateral.
q : In the triangle $\mathrm{ABC}, \mathrm{AB}=\mathrm{BC}=\mathrm{CA}$.
Example 12 : "A number is an even integer only if the number is divisible by 2."

Here, p:A number is an even integer.
$q$ : The number is divisible by 2
Example 13: Obtain the truth value of
(i) If $5+6=11$, then $11-6=5$.
(ii) If $5+8=12$, then $12+8=20$.
(iii) If $6+9=14$, then $14-7=8$
(iv) If $7+8=15$, then $8-7=2$

## Solution:

(i) Since $\mathrm{p}: 5+6=1$ is true and $\mathrm{q}: 11-6=5$ is true, so $p \Rightarrow$ q i.e., the given statement is true.
(ii) Since $p: 5+8=12$ is false and $q: 12+8=20$ is true, so $p \Rightarrow q$ i.e., the given statement is true.
(iii) Since $p: 6+9=14$ is false and $q: 14-7=8$ is false, so $p \Rightarrow q$ i.e., the given statement is true.
(iv) Since p: $7+8=15$ is true and $8-7=2$ is false, so $p \Rightarrow q$ i.e., the given statement is false.

## The word "if and only if":

When a compound mathematical statement is formed with two simple mathematical statements using the connecting words "if and only if" then the statement is called Biconditional statement. Let $p$ and $q$ be two simple mathematical statements. The compound statement formed with pand q using "if and only if" then the biconditional statement can be written symbolically as $p \Rightarrow q$ and $q \Rightarrow p$ or $p \Leftrightarrow q$. In short "if and only if" is written as "iff".
The biconditional statement $p \Leftrightarrow q$ is true only when both $p$ and $q$ are true or both $p$ and $q$ are false.

## Quantifiers:

In some mathematical statements some phrases like "There exists", "For all" (or for every) are used. These are called Quantifiers.
For example "There exists a natural number such that $x+6>9$ ";"There exists a quadrilateral whose diagonals bisect each other"; "For all natural numbers $x, x>0$ "; "For every real number $x \neq 0, x 2>0$ ".

In the above statements "There exists", "For all", "For every" etc phrases are Quantifiers.
"There exists", "For some", "For at least" are called Existential Quantifier and they are expresses as E. "For all", "For every" are called Universal Quantifiers and they are expressed by the symbol A.
Example 14: Indicate the Quantifiers from the following statements and write the truth value in case;
(i) For every natural number $x, x+1>0$
(ii) For at least one natural number $x, x \in A$ where $A=\left\{-1,2,3,0,-3^{\prime}\right\}$
(iii) There exists a natural number $\mathrm{n}, \mathrm{n}-2>5$.
(iv) For all real number $x, x^{2}>0$.

## Solution :

(i) The quantifier is "For every". The truth value of the statement is "truth" because for any natural number $\mathrm{x}, \mathrm{x} 10+*$ is always true.
(ii) "For at least" is the quantifier. The truth value of the statement is "true" because A $2 \in$, A $3 \in$ and 2,3 are natural number.
(iii) "There exists" is the quantifier. The truth value of the statement is "true" because for any natural number $n>8$, the relation $n-2) 5$.
(iv) "For all" is the quantifier. The truth value of the statement is "True", because $x=0$ is a real number and $x^{2}>0$.
Example 15 : Using Quantifiers, express the following in equations into a statement:
(i) $n+2>n, n \in N$. (ii) $x^{2}<0, x \in I$
(Where I denote the set of all negative integers) (iii) $x+1>3, \quad x \in R$.

## Solution :

(i) There exists a natural number $\mathrm{N} \mathrm{n} \in$ such that $\mathrm{n} 2 \mathrm{n}>+$. The statement is true. The quantifier is "There exists".
(ii) For all negative integers $x \in I, x^{2}<0$. The statement is false because the square of any negative integer is greater than zero. The quantifier is "For all".
(iii) There exists a real number $x \in R$ such that $x+1>3$. The statement is true because for all real number $x>2$, the relation $x+1>3$ is true. The quantifier is "There exists".

## Questions and Answers of September 2014

1. The monthly salaries of two persons are in the ratio of $3: 5$. If each receives an increase of ₹ 20 in salary, the ratio is altered to 13:21. Find the respective salaries
(a) ₹ 300 , ₹ 500
(b) ₹ 130 , ₹ 210
(c) ₹ 240 , ₹ 400
(d) ₹ 400 , ₹ 240

Answer: (c)
2. If the two numbers 20 and $x+2$ are in the ratio of $2: 3$; Find $x$
(a) 14
(b) 28
(c) 32
(d) 29

Answer: (b)
3. The simple interest on a sum of money of the end of 8 years is $\frac{2}{5}$ th of the sum itself. Find the rate percent p.a.
(a) $15 \%$
(b) $5 \%$
(c) $20 \%$
(d) $10 \%$

Answer: (b)
4. In what time will be the S.I. on ₹ 900 at $6 \%$ be equal to S.I. on ₹ 540 for 8 years at 5\%.
(a) 4 years
(b) 10 years
(c) 8 years
(d) 6 years

Answer: (a)
5. The difference between interest and true discount on a sum due 73 days at $5 \%$ p.a. is ₹ 1 . Find the sum.
(a) ₹ 5,000
(b) ₹ 15,000
(c) ₹ 20,000
(d) ₹ 10,000

Answer: (d)

## Questions and Answers of December 2014

1. What must be subtracted from each of the numbers $17,25,31,47$ so that the remainders may be in proportion.
(a) 12
(b) 6
(c) 9
(d) 3

Answer: (d)
2. The ratios of 200 gm to 2 kg . is:
(a) $100: 1$
(b) $10: 1$
(c) $1: 1$
(d) $1: 10$
Answer: (d)
3. The difference between interest and true discount on a sum due in 73 days at $5 \%$ p.a. is ₹ 1 . Find the sum.
(a) ₹ 10,000
(b) ₹ 8,000
(c) ₹ 6,000
(d) ₹ 12,000

Answer: (a)
4. Write the truth value of each of the following sentences and comment whether a mathematical statement or not:
(i) Tomorrow is Wednesday
(ii) Every rectangle is a square
(iii) $\sqrt{2}$ is an irrational number
(iv) Alas! I am undone
(v) There are 31 days in the month of July and August in each year
(vi) Mathematics is an interesting subject.
(a) (ii) and (iii)
(b) (i) and (iv)
(c) (v) and (vi)
(d) (iii) and (v)

Answer: (d)
5. If the 5th and 11th terms is an A.P. be 41 and 20 , then find its first terms and the sum of first $11^{\text {th }}$ terms.
(a) $65,410.5$
(b) $55,412.5$
(c) $50,412.5$
(d) $53,400.5$

Answer: (b)

## Questions and Answers of March 2015

1. The Ratio of 5 kg 55 gm to 35 kg 50 gm :
(a) $5: 7$
(b) $1,011: 7,010$
(c) $111: 710$
(d) None of these

Answer: (b)
2. If $A: B=3.4, B: C=2: 5$ then $A: B: C$ :
(a) $3: 4: 5$
(b) $3: 4: 10$
(c) $4: 3: 10$
(d) $3: 4: 8$

Answer: (b)
3. Gulshan Kumar borrows ₹ 300 at $5 \%$ and ₹ 450 at $6 \%$ at the same time and on the condition that the whole loan will be repaid when the total interest amounts to ₹ 126 . The loan will have to be repaid after how many years:
(a) 2
(b) 3
(c) 4
(d) 5

Answer: (b)
4. To find out the total compound interest accrued on a sum of money after 5 years, which of the following information given in the statements $P$ and $Q$ will be sufficient?
P: The sum was ₹ 20,000

Q: The total amount of simple interest on the sum after 5 years was ₹ 4,000 .
(a) Only P is sufficient
(b) Only Q is sufficient
(c) Either P or Q is sufficient
(d) Both P \& Q are needed.

## Answer: (c)

5. If $\frac{\sqrt{a+\sqrt{b}}}{\sqrt{a-\sqrt{b}}}=\frac{2}{1}$ then $\frac{a+b}{a-b}$ is equal to:
(a) $5 / 4$
(b) $4 / 5$
(c) 3
(d) None of these.

Answer: (a)

## Questions and Answers of June 2015

1. If $A: B=2: 3, B: C=4: 5$, then $A: C=$
(a) $6: 7$
(b) $7: 6$
(c) $8: 15$
(d) $15: 8$

Answer: (c)
2. The ratio of two numbers is $11: 15$. The sum of 3 times the first number and twice the second number is 630 . The H.C.F. of the number is:
(a) 10
(b) 12
(c) 15
(d) None of these.

Answer: (a)
3. If $a^{1 / 3}+b^{1 / 3}+c^{1 / 3}=0$, then $(a+b+c)^{3}$ :
(a) 3 abc
(b) 27 abc
(c) -27 abc
(d) None of these.

Answer: (b)
4. The simple interest on ₹ 10 for 4 months at the rate of 3 paise per rupee per month is:
(a) ₹ 1.20
(b) ₹ 12
(c) ₹ 120
(d) ₹ 1200

Answer: (a)

## Questions and Answers of September 2015

1. A machine the useful life of which is estimated to be 10 years costs ₹ 10,000 . Rate of depreciation is $10 \%$ p.a. The scrap value at the end of its life is
(a) ₹ $3,486.78$
(b) ₹ 43,833
(c) ₹ 3,400
(d) None of these.

Answer: (a)
2. A sum of money doubles itself in 10 years. The number of years it would triples itself is
(a) 25 years
(b) 15 years
(c) 20 years
(d) 10 years

Answer: (c)
3. The fourth proportional of ₹ 5 , ₹ $3.50,150 \mathrm{gm}$ is:
(a) 100 gm
(b) 105 gm
(c) 125 gm
(d) None of these.

Answer: (b)
4. If $2 A=3 B=4 C$, then $A: B: C$ is:
(a) $2: 3: 4$
(b) $4: 3: 2$
(c) $6: 4: 3$
(d) $3: 4: 6$.

Answer: (c)
5. A person borrowed ₹ 500 at the rate of $5 \%$ per annum S.I. what amount will he pay to clear the debt after 4 years?
(a) ₹ 200
(b) ₹ 550
(c) ₹ 600
(d) ₹ 700

## Arithmetic

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Answer: (c)
6. A sum of money at compound interest amounts to thrice itself in 3 years. In how many years will it be 9 times itself in?
(a) 12
(b) 9
(c) 6
(d) 8

Answer: (c)

## Questions and Answers of December 2015

1. The C.I. on $₹ 40,000$ at $10 \%$ p.a. for 1 year when the interest is payable quarterly is:
(a) ₹ 4,000
(b) ₹ 4,100
(c) ₹ $4,15,251$
(d) None of these

Answer: (c)
2. If $A: B=2: 3 \quad B: C=4: 5$ then $A: C$
(a) $6: 7$
(c) $7: 6$
(c) $8: 15$
(d) $15: 8$

Answer: (c)
3. The third proportional of 1 hour 20 minutes 1 hour 40 minutes is:
(a) 1 hours 50 minutes
(b) 2 hours
(c) 2 hours 5 minutes
(d) 2 hours 25 minutes

Answer: (c)
4. If $15 \%$ of $x$ is the same as $20 \%$ of $y$, then $x: y$ is
(a) $3: 4$
(b) $4: 3$
(c) $17: 16$
(d) $16: 17$

Answer: (b)
5. A friction which bears the same ratio to $\frac{1}{27}$ that $\frac{3}{11}$ does to $\frac{5}{9}$ is:
(a) $\frac{1}{55}$
(b) 55
(c) $\frac{1}{11}$
(c) 14

Answer: (a)
6. The simple interest on ₹ 10 for 4 months at the rate of 3 paise per rupee per months is:
(a) ₹1.20
(b) ₹12
(c) $₹ 120$
(d) ₹1,200

Answer: (a)
7. To find out the total compound interest accrued on a sum of money after 5 years, which of the following information given in the statements P and Q will be sufficient?
$P$ : The sum was ₹ 20,000 .
Q: The total amount of simple interest on the sum after 5 year was ₹ 4,000 .
(a) Only P is sufficient
(b) Only Q is sufficient
(c) Either P or Q is sufficient
(d) Both P \& Q is necessary.

Answer: (d)

## Questions and Answers of March 2016

1. If $A: B=2: 3, B: C=4: 5$, then $A: C=$
(a) $6: 7$
(b) $7: 6$
(c) $8: 15$
(d) $15: 8$

Answer: (c)
2. The inverse ratio of $1 \frac{3}{4}: 2 \frac{1}{4}$ is $\qquad$ .
(a) $32: 45$
(b) $45: 32$
(c) $18: 5$
(d) $5: 18$

Answer: (b)
3. The ratio $\frac{5}{3}: 2 \frac{1}{4}$ is:
(a) Ratio of lesser inequality
(b) Ratio of greater inequality
(c) $20: 9$
(d) $5: 27$

## Answer: (a)

4. The ratio of 5 kg . 55 gm . to 35 kg . 50 gm .:
(a) $5: 7$
(b) 1,011:7010
(c) $111: 710$
(d) None of these

Answer: (b)
5. The ratio is 1 year 6 months : 2 years : 2 years 6 months:
(a) $3: 4: 5$
(b) $2: 3: 5$
(c) $2: 4: 5$
(d) None of these

Answer: (a)
6. $\left[\frac{1}{2}+\frac{1}{3}\right]:\left[\frac{1}{2} \times \frac{1}{3}\right]$
(a) $2: 3$
(b) $3: 2$
(c) $5: 1$
(d) $1: 5$

Answer: (c)
7. The mean proportional of $4 X$ and $16 X^{3}$ is $\qquad$ .
(a) $10 \times 2$
(b) $12 \times 2$
(c) $8 \times 2$
(d) $64 \times 4$

Answer: (c)
8. If $\frac{1}{5}: \frac{1}{x}=\frac{1}{x}: \frac{1}{1.25}$ the value of $x$ is:
(a) 1.5
(b) 2
(c) 2.5
(d) 3.5

Answer: (c)
9. If $\frac{a=b=c}{34}$, then $\frac{a+b+c}{c}$ is equal to:
(a) 7
(b) 2
(c) $\frac{1}{2}$
(d) $\frac{1}{7}$

Answer: (b)
10. The total number of factors of 210 (excluding 1 and 210) is $\qquad$ .
(a) 14
(b) 16
(c) 18
(d) 20

Answer: (a)
11. If $\frac{\sqrt{a+\sqrt{b}}}{\sqrt{a-\sqrt{b}}}=\frac{2}{1}$ then $\frac{a+b}{a-b}$ is equal to:
(a) $5 / 4$
(b) $4 / 5$
(c) 3
(d) None of these

Answer: (a)

## Questions and Answers of June 2016

1. The fourth proportional of $0.2,0.12$ and 0.3 is:
(a) 0.13
(b) 0.15
(c) 0.18
(d) 0.8

Answer: (c)
2. The third proportional to $\left(x^{2}-y^{2}\right)$ and $(x-y)$ is:
(a) $\frac{x+y}{x-y}$
(b) $\frac{x-y}{x+y}$
(c) $x+y$
(d) $(x-y)$

Answer: (b)
3. A friction which bears the same ratio to $\frac{1}{27}$ that $\frac{3}{11}$ does to $\frac{5}{9}$ is:
(a) $\frac{1}{55}$
(b) 55
(c) $\frac{1}{11}$
(d) $\frac{3}{11}$

Answer: (a)
5. The mean proportional between $\sqrt{11}-\sqrt{5}$ and $13 \sqrt{11}+19 \sqrt{5}$ is:
(a) $\sqrt{33}-\sqrt{15}$
(b) $\sqrt{33}+\sqrt{15}$
(c) $\sqrt{11}+\sqrt{5}$
(d) None of these

Answer: (b)
6. A friction which bears the same ratio to $\frac{1}{27}$ and $\frac{3}{11}$ does to $\frac{5}{9}$ is:
(a) $\frac{1}{55}$
(b) 55
(c) $\frac{1}{11}$
(d) $\frac{3}{11}$

Answer: (a)
7. The time, in which the ture discount on amount $₹ 550$ due is ₹ 50 at $4 \%$ per annum, is:
(a) 2 years
(b) 3 years
(c) 2.5 years
(d) None of them

Answer: (a)

## MULTIPLE CHOICE QUESTIONS

1. S.I. on ₹ 3,500 for 3 years at $12 \%$ per annum is
(a) ₹ 1,200
(b) ₹ 1,260
(c) ₹ 2,260
(d) None of these

Answer:
2. $P=5,000 \quad R=15 \quad T=41 / 2$ using $I=P R T / 100 I$ will be
(a) ₹ 3,375
(b) ₹ 3,300
(c) ₹ 3,735
(d) None of these

Answer:
3. If $P=5,000 \mathrm{~T}=1 \mathrm{I}=₹ 300 \mathrm{R}$ will be
(a) $5 \%$
(b) $4 \%$
(c) $6 \%$
(d) none of these

Answer: $\square$
4. $P=₹ 12,000 A=₹ 16500 \mathrm{~T}=21 / 2 \%$ year. Rate percent per annum simple interest will be
(a) $15 \%$
(b) $12 \%$
(c) $10 \%$
(d) none of these

Answer:
5. $P=₹ 10,000 I=₹ 2,500 R=121 / 2 \% \mathrm{SI}$. The number of years $T$ will be
(a) $1 \frac{1}{2}$ years
(b) 2 years
(c) 3 years
(d) none of these

## Answer:

6. $P=₹ 8,500, A=₹ 10,200 R=121 / 2 \%$ SI I will be
(a) 1 yr .7 mth .
(b) 2 years
(c) $1 \frac{1}{2} 2 \mathrm{yr}$.
(d) none of these

Answer:

7. The sum required to earn a monthly interest of ₹ 1,200 at $18 \%$ per annum is
(a) ₹ 50,000
(b) ₹ 60,000
(c) ₹ 80,000
(d) none of these

Answer:
8. A sum of money amount to ₹ 6,200 in 2 years and ₹ 7,400 in 3 years. The principal and rate of interest are
(a) ₹ 3,800 \& $31.57 \%$
(b) ₹ $3,000 \& 20 \%$
(c) ₹ $3,500 \& 15 \%$
(d) none of these

Answer:
9. A sum of money doubles itself in 10 years. The number of years it would triples itself is
(a) 25 years
(b) 15 years
(c) 20 years
(d) 10 Years

Answer:
10. $P=₹ 1,000 R=5 \%$ p.a $n=4$ and $C l$
(a) ₹ $1,215.5$ \& ₹ 215.5
(b) ₹ 1,125 \& ₹ 125
(c) ₹ 2,115 \& ₹ 115
(d) none of these

Answer: $\square$
11. ₹ 100 will become after 20 years at $5 \%$ p.a compound interest calculated annually
(a) ₹ 250
(b) ₹ 265
(c) ₹ 265.33
(d) None of these

Answer: $\square$
12. The effective rate of interest corresponding to a nominal rate $3 \%$ p.a payable half yearly in
(a) $3.2 \%$ p.a
(b) $3.25 \%$ p.a
(c) $3.0225 \%$ p.a
(d) none of these

Answer: $\square$
13. A machine is depreciated the rate of $20 \%$ on reducing balance. The original cost of the machine was ₹ $1,00,000$ and its ultimate
scrap value was ₹ 30,000 . The effective life of the machine is
(a) 4.5 years (appx.)
(b) 5.4 years (appx.)
(c) 5 years (appx.)
(d) none of these

## Answer:

$\square$
14. If $A=₹ 1,000 n=2$ years $R=6 \%$ p.a compound interest payable half-yearly then principal ( P ) is
(a) ₹ 888.49
(b) ₹ 880.00
(c) ₹ 800.00
(d) none of these

Answer: $\square$
15. The population of a town increases every year by $2 \%$ of the population at the beginning of that year. The number of years by which the total increase of population be $40 \%$ is
(a) 7 years
(b) 10 years
(c) 17 years (app)
(d) none of these
[Hint $\log (1.4)=0.1461, \quad \log (1.02)=.0086]$
Answer: $\qquad$
16. The difference between S.I and C.I on a certain sum of money interested for 3 years at $6 \%$ p.a is $₹ 110.16$. the sum is
(a) ₹ 3,000
(b) ₹ 3,700
(c) ₹ 12,000
(d) ₹ 10,000

Answer: $\square$
17. A machine the useful life of which is estimated to be 10 years costs ₹ 10,000 . Rate of depreciation is $10 \%$ p.a. The scrap value at the end of its life is
(a) ₹ $3,486.78$
(b) ₹ 43,833
(c) ₹ 3,400
(d) none of these

Answer: $\square$
18. The effective rate of interest corresponding a nominal rate of $7 \%$ p.a convertible quarterly is
(a) $7 \%$
(b) $7.5 \%$
(c) $7.19 \%$
(d) none of these

Answer: $\square$
19. The C.I. on ₹ 16,000 for $1 \frac{1}{2}$ years at $10 \%$ p.a. payable half yearly is
(a) ₹ 2,222
(b) ₹ 2,522
(c) ₹ 2,500
(d) none of these

Answer: $\square$
20. The C.I. on $₹ 40,000$ at $10 \%$ p.a. for 1 year when the interest is payable quarterly is
(a) ₹ 4,000
(b) ₹ 4,100
(c) ₹ $4,152.51$
(d) none of these
Answer: $\square$

## Answer

| $\mathbf{1}$ | (b) | $\mathbf{2}$ | (a) | $\mathbf{3}$ | (c) | $\mathbf{4}$ | (a) | $\mathbf{5}$ | (b) | $\mathbf{6}$ | (a) |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 7 | (c) | $\mathbf{8}$ | (a) | $\mathbf{9}$ | (c) | 10 | (a) | 11 | (c) | 12 | (c) |
| 13 | (b) | 14 | (a) | 15 | (c) | 16 | (d) | 17 | (a) | 18 | (c) |
| 19 | (b) | 20 | (c) |  |  |  |  |  |  |  |  |


[^0]:    PREPARATION OF ACCOUNT CURRENT BY THE METHOD OF INTEREST TABLES

    | Debit side | Credit side |
    | :--- | :--- |

