15 $15^2 + 8^3 + 3^4 + 18^2 + 2.82^3 + 9.53^4 =$ 9412.861644481

16 $\frac{16}{(2/5)} + \frac{18}{(3/8)} + \frac{19}{(5/7)} + \frac{28}{(3/11)} =$ 217.26666666

$\left(\frac{20}{8/7} + \frac{35}{1/8} + \frac{80}{2/7} + \frac{90}{8/11}\right) = 701.25$

$1.0193^{88} = 5.377471663356$

BELIEVE ME, YOU ARE THE REAL HERO OF YOUR OWN STORY!

CA VINOD REDDY

HEROES are made by the PATHS they CHOOSE not the POWER they are graced with!

Chapter 2

TIME VALUE OF MONEY

CA VINOD REDDY

Time Value of Money

1

Amount = Principle + Interest
Principle = Amount - Interest
Interest = Amount - Principle

2 Why is interest paid?

1. Time Value of Money
2. Opportunity Cost
3. Inflation
4. Liquidity Preference
5. Risk Factor

In other words interest is the rent to be paid by borrower to the lender for using lender's money.

3 Simple Interest = P · N · r

Amount = P + Simple Interest

= P + Pnr = P (1 + nr)

4 Compound Interest = $P\left[(1+r)^n - 1\right]$

Amount = $P(1+r)^n$

where
r = Rate of interest for the conversion period
n = no. of conversion periods

5 With Simple Interest

Amount Invested	Amount at the end of years						
	5	10	15	20	25	30	35
P	2P	3P	4P	5P	6P	7P	8P
P	3P	5P	7P	9P	11P	13P	15P

6 With Compound Interest

Amount Invested	Amount at the end of years					
	7	14	21	28	35	42
P	2P	4P	8P	16P	32P	64P
P	3P	9P	27P	81P	243P	729P
P	4P	16P	64P	256P	1024P	4096P

7 A = 50,00,000; r = 12% p.a.S.I; P = ?; n = 10 years

$\Rightarrow A = P(1+nr)$

$50,00,000 = P\left[1 + (10 \times 0.12)\right]$

$\therefore P = ₹\ 22,72,727$

8 A = 50,50,000; r = 13.50% p.a.S.I; P = 20,00,000 ; n = ____ years

$\Longrightarrow$ $A = P(1 + nr)$

$50150{,}000 = 20100{,}000\,(1 + n \times 0.1350)$

$n = 11.2963$ Years (approx)

9 A = ?; r = 18% p.a.S.I; P = 25,000 ; n = 8 years 3 months

$A = P(1 + nr)$

$= 25{,}000\,[1 + (8.25 \times 0.18)]$

$= ₹\ 62,1254$

10 A sum of money doubles itself with compound interest in 10 years. How many times it will become after 40 years?

Sum invested	After 10 Years	20 Years	30 Years	40 Years
P	2 P	4 P	8 P	16 P

Sum will become 16 times

11 Find the future value of ₹ 50,000 after 25 years @ 22% p.a.C.I

$\Longrightarrow$ Future value = present value $\times (1+r)^n$

$= 50{,}000 \times (1.22)^{25}$

$= ₹\ 72,10,5061$ (approx)

My Notes

① Amount = principle $\times (1+r)^n$

② Future value = present value $\times (1+r)^n$

③ present value = Future value $\times \frac{1}{(1+r)^n}$ dash

∴ present value = Future value $\times$ Discounting factor

12 Find present value of ₹ 20,00,000 receivable after 25 years if money is 18.50% effective.

⟹ present value = Future value × Discounting Factor

= 220,001000 × 0·014356257 53

= ₹ 28,712 51506

cross-check Future value = 28712 · 51506 × 1.18507 25

= 20,00,00,0004

13 A = ?; r = 14% p.a.C.Q; P = 20,00,000 ; n = 3 years 9 months

⟹ A = p (1 + its r)^h

A = 20,001000 (1 + 0.14 / 4)^15

A = 20,00 000 × (1.035)^15 = ₹ 33,50,6981

14 A = 80,00,000; r = 18.50% p.a.C.semiannually; P = ? ; n = 8 years 6 months

⟹ A = p (1 + its r)^h

80,00,000 = p [1 + 0.1850 / 2]^17 ∴ p = ₹ 17,77,974/

80,00,000 = p × (1.0925)^17 p 717 7,9741

15

Compounded	No. of conversion periods in a year
Annually	1
Semi-annually = Half Yearly = Bi-annually	2
Monthly	12
Quarterly	4
Weekly	52
Daily	365
Fortnightly	24

My Notes

① How to find discounting @ x% p.a.c.a for nth year?

⟹ [1 / (1+r)^n] then press '=' button till step count comes (n+2)

② Find Discounting factor for year 30 @ 12.571251% p.a

⟹ 0.028653359

16 **P = 20,000; r = 20% p.q.c.w; n = 3 months; A = ?**

$\Rightarrow$ $A = P\left(1+\frac{r}{n}\right)^n$

$= 20{,}000\left(1+\frac{0.20}{52}\right)^{13}$

$= 20{,}000\,(1.0038461538)^{13}$

$= 21{,}023$

17 **A = 2,00,000; r = 18% p.a.C.Q; P = 80,000 ; n = ____ years**

$\Rightarrow$ $A = P\left(1+\frac{r}{n}\right)^n$

$2{,}00{,}000 = 80{,}000\left(1+\frac{0.18}{4}\right)^{4x}$

$2.50 = 1.045^{4x}$

$\log 2.50 = \log 1.045^{4x}$

$\log 2.50 = 4x \times \log 1.045$

$4x = \frac{\log 2.50}{\log 1.045}$

$4x = \left(\frac{0.39794}{0.01912}\right)$ $x = 5.20$ years

18 **A = 20,00,000; r = ____% p.a.C.Q ; P = 5,00,000 ; n = 8 years**

$\Rightarrow$ $A = P\left(1+\frac{r}{n}\right)^n$

$20{,}00{,}000 = 5{,}00{,}000\left(1+\frac{r}{4}\right)^{32}$

$\left(1+\frac{r}{4}\right)^{32} = 4$

$1+\frac{r}{4} = 4^{1/32}$

$r = 17.7095129687\%$ p.a.c.q.

19

1.01^{35} = 1.41660275588

1.1025^{38} = 40.7743202164

1.10285^{45} = 81.8917474745

1.1826^{90} = 3592598.79256

My Notes

Question : $A = 10{,}000$, $P = 4{,}000$, $r =$ ____ % p.a.c.a., $n = 5$ years

$\Rightarrow$ $A = P(1+r)^n$

$10{,}000 = 4{,}000\,(1+r)^5$

$(1+r)^5 = 2.50$

$1+r = 2.50^{1/5}$

$r = 20.1144090017\%$ p.a.c.a.

20

$A = P(1+r)^n$

A = Amount = principle + compound interest

P = principal amount = sum invested

r = Rate of interest for the conversion period

n = No. of conversion periods

21

Discounting Factor = $1 \div (1+r)^n$

Present Value = (Future Value x Discounting Factor)

How to find discounting factor on calculator? (For nth year)

$1 \div (1+r)^2$ then press '=' button

till step count comes 'n+2'

22

Simple Annuity is a series of payment / receipts where

- Time Gap between 2 consecutive payment/receipts must be same
- Amount paid/received in every period must be same

23

Effective rate of interest = $\left(1+\frac{r}{n}\right)^n - 1$

where r = nominal rate of interest

n = No. of conversion periods in a year

P = ₹ 100, r = 12% p.a.c.q.

AT ?, n = 1 year

$\Rightarrow A = 100 \times (1.0374)^4$

$= ₹ 112.$

My Notes

Find Effective rate for 20% p.a.c.m.

$\Rightarrow$ Effective rate

$= \left(1+\frac{0.20}{12}\right)^{12} - 1$

$= (1.01666666)^{12} - 1$

$= 21.939108475\%$ p.a.c.a.

P = 80,000, A = ?, n = 2 years

r = 20% p.a.c.m.

AT 80,000 $\times \left(1+\frac{0.20}{12}\right)^{24}$

$= 80,000 \times (1.01666644)^{24}$

$= ₹ 1,18,9534$

s = 21.939108475% p.a.c.a.

$A = 80,000 \times (1.219391084 75)^2$

$= ₹ 1,18,9534$

24

Nominal Rate of Interest	Effective Rate of Interest
12% p.a.c.q	$\left(1+\frac{0.12}{4}\right)^{4}-1 = 1.034-1 = 12.550881\%$
14.50% p.a.c.m	$\left(1+\frac{0.1450}{12}\right)^{12}-1 = 1.01208333333^{12}-1 = 15.50351\%$
18% p.a.c.semiannually	$\left(1+\frac{0.18}{2}\right)^{2}-1 = 1.092-1 = 18.81\%$
26.26% p.a.c.weekly	$\left(1+\frac{0.2626}{52}\right)^{52}-1 = 1.0050553^{52}-1 = 29.94471\%$
22% p.a.c.monthly	$\left(1+\frac{0.22}{12}\right)^{12}-1 = 1.01833333^{12}-1 = 24.35971\%$

25

Effective Rate of Interest	Nominal Rate of Interest	
18% p.a.c.a.	16.90 % p.a.c.q	$0.18 = \left(1+\frac{r}{4}\right)^{4}-1 \therefore \left(1+\frac{r}{4}\right)^{4} = 1.18$
20% p.a.c.a.	18.37 % p.a.c.monthly	$0.20 = \left(1+\frac{r}{12}\right)^{12} \therefore \left(1+\frac{r}{12}\right) = 1.20^{1/12}$
28.56% p.a.c.a.	26.77 % p.a.c. half yearly	$0.2856 = \left(1+\frac{r}{2}\right)^{2}-1$ $\therefore \left(1+\frac{r}{2}\right) = 1.2856^{1/2}$

26 18.50% p.a.c.monthly is equivalent to ____r____ % p.a.c.q

$\Rightarrow$ 18.50 % p.a.c.m = r % p.a.q

$\left(1+\frac{0.1850}{12}\right)^{12}-1 = \left(1+\frac{r}{4}\right)^{4}-1$

$(1.01541666666)^{12} = \left(1+\frac{r}{4}\right)^{4}$

$1.20152123207 = \left(1+\frac{r}{4}\right)^{4}$

$1+\frac{r}{4} = (1.20152123207)^{1/4}$

$r = 18.7867\%$ p.a.c.q

27 20.86% p.a.c.q is equivalent to _____ % p.a.c. half yearly.

$\Rightarrow$ 20.861 % p.a.c.q = r % p.a.c. half yearly

$\left(1+\frac{0.2086}{4}\right)^{4}-1 = \left(1+\frac{r}{2}\right)^{2}-1$

$0.298111 = \left(1+\frac{r}{2}\right)^{2}-1$

$1.052154 = \left(1+\frac{r}{2}\right)^{2}$

$\left(1+\frac{r}{2}\right) = 1.052152$

$r = 21.40392951\%$ p.a.c. half yearly

28

a. Future Value of annuity regular = Future value of ordinary annuity =

$$= \left(\text{Periodical amount}\right) \times \left[\frac{(1+r)^n - 1}{r}\right]$$

a. Future Value of annuity due = Future value of annuity immediate =

$$= \left(\text{Periodical amount}\right) \times \left[\frac{(1+r)^n - 1}{r}\right] \times (1+r)$$

Initial city sits

29

Annuity Regular	Annuity Due / Immediate
ordinary annuity Payment/receipt is at the END of every period	Payment/receipt is at the BEGINNING of every period

If Type of annuity is not mentioned in question then By default it will be treated as annuity regular

By default annuity regular

30

Present Value of Annuity Regular = (Periodical Amount x Annuity Factor)

31

Present Value of Annuity Due = (Periodical Amount x Annuity Factor) x (1+r)

My Notes

set p.a.c.m. is equivalent to 18.5672 xp.a.c.p.

Find se.

$$\left(1 + \frac{se}{2}\right)^{12} = \left(1 + \frac{0.185672}{4}\right)^{4} - 1$$

$$\left(1 + \frac{se}{2}\right)^{12} = (1.046418)^{4}$$

$$1 + \frac{se}{2} = (1.046418)^{4/12}$$

$$se = 18.2871 \text{ Y.P.a.c.M.}$$

How to find annuity factor for n years @ x% p.a.

$$= \frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \cdots + \frac{1}{(1+r)^n}$$

j Fn

1 ÷ (1+r) then press '=' button till step count comes (n+2) then press GT button.

32 **Mr. A invested ₹ 500 at the end of each year for 30 years. Find amount to be received at the end of 30 years, if money is 16% effective.**

$\Rightarrow$

Future value of annuity regular = periodical amt $\times \left[\frac{(1+r)^n - 1}{r}\right]$

$= ₹\ 500 \times \left[\frac{(1.16)^{30} - 1}{0.16}\right]$

$= ₹\ 2,65,1564/-$

33 **A loan of ₹ 8,00,000 is to be repaid in 10 annual installments. Find amount of installment if interest rate is 12% p.a.**

$\Rightarrow$ Present value of annuity regular = P.A. $\times$ A. factor

Loan amount = installment amt $\times$ A. factory

8,00,000 = installment amt $\times$ 5.65022302825

$\therefore$ Installment amount = ₹ 1,41,5874/-

34 **A person desires to create a sinking fund to be invested @12% p.a.c.i. by saving some amount at the end of each year for 30 years to buy house worth ₹ 30,00,000. Find amount to be saved at the end of each year.**

$\Rightarrow$

Future value of annuity Regular = P.A. $\times \left[\frac{(1+r)^n - 1}{r}\right]$

30,00,000 = P.A. $\times \left[\frac{(1.12)^{30} - 1}{0.12}\right]$

P.A. = ₹ 2,12,431/-

He has to save ₹ 2,12,431/- at the end of each year.

My Notes

Find Effective rate of int. for 16.2624 % p.a.c.q.

$\Rightarrow$ Eff. rate $= \left(1 + \frac{0.162624}{4}\right)^4 - 1$

$= (1.040656)^4 - 1$

$= 17.28\ 1299\ \%\ p.a.c.a.$

Effective rate of 38% is Equivalent to ____ t.p.a. c.m.

$\Rightarrow$ $0.38 = \left(1 + \frac{r}{12}\right)^{12} - 1$

$1 + \frac{r}{12} = 1.38412^{1/12}$

$r = 32.64564211\ \%\ p.a.c.m.$

35 **Rahul invested ₹ 70,000 in a bank at the rate of 6.50% p.a.S.I. he received ₹ 85,925 at the end of term. Find out the period for which the sum was invested by Rahul.**

$\Longrightarrow$

$A = p(1 + nr)$

$85{,}925 = 70{,}000\,[1 + n \times 0.0650]$

$1.2275 = 1 + 0.0650n$

$n = 3.50$ Years

OR

$SI = P \cdot n \cdot r$

$85925 - 70{,}000 = Pnr$

$15925 = 70{,}000 \times n \times 6.5\%$

$15925 = 4550n$

$n = 3.50$ Years

36 **Kapil deposited some amount in a bank for 7½ years @ 6%p.a.S.I. Kapil received ₹ 1,01,500 at the end of term. Compute initial deposit of Kapil.**

$\Longrightarrow$

$A = p(1 + nr)$

$1{,}01{,}500 = p\,(1 + 7.50 \times 0.06)$

$1{,}01{,}500 = P \times 1.45$

$p = 70{,}000$

$\therefore$ Initial deposit by Kapil = ₹ 70,000/-

37 **A sum of ₹ 46,875 was lent out at simple interest and at the end of 1 year and 8 months the total amount was ₹ 50,000. Find rate of interest p.a.**

$\Longrightarrow$

$A = p(1 + nr)$

$50{,}000 = 46{,}875\,(1 + 1.6666666666\,r)$

$r = 4.00\%$ p.a. S.I.

My Notes

A loan of ₹ 5,00,00,000 is to be repaid to 90 EMI's Find EMI if r = 12% p.a. c.m.

$\Longrightarrow$

present value of annuity regular = 500,001000

EMI × A factor = 5,00,00,000

EMI × 59.16088 14663 = 5,00,00,000

EMI = 8,45,153

38 **What sum of money will produce ₹ 28,600 as an interest in 3 years and 3 months @2.50% p.a.S.I.**

⟹ Simple interest = P · n · r

₹ 28,600 = P × 3.25 years × 0.0250

P = ₹ 3,530004

A sum of ₹ 3,521000 will produce simple interest of ₹28,600 @ 2.501. P.a in 3.25 years.

728,600

39 **The sum required to earn monthly interest of ₹ 1,200 at 18% p.a.S.I is :**

⟹ SI = P · n · r

₹ 1200 = P × $\frac{1}{12}$ years × 18%

P = $\left(\frac{₹1200 \times 12}{18\%}\right)$ = ₹80,000/

712971

780,0001

40 **Compute the compound interest on ₹ 40,000 for 1.5 years @10% p.a. compounded half yearly.**

⟹ A = P(1+r)^n

patron

= 40,000 $\left(1 + \frac{0.10}{2}\right)^3$

= 40,000 × (1.05)^3

= 90,000 × log

= ₹ 46,305

compound interest

= ₹46,305 − ₹40,000

= 746,305 − 740,000

= ₹ 6,3051

My Notes

A loan of ₹80,000,000 is to be repaid in 60 monthly installments. Find EMI if rate of interest is 13.50% p.a.C.m.

⟹ present value of annuity regular = EMI × A factor

present value of annuity regular

80100,000 = EMI × 43.45965376

EMI = ₹ 1,84,079/

EMI

84,0791

41 What rate of interest p.a. doubles the investment in 7 years at compounded interest?

$\Rightarrow A = P(1+r)^n$

$2P = P(1+r)^7$

$(1+r)^7 = 2$

$1+r = 2^{1/7} = 2^{0.1429}$ $\therefore r = 10.40971\%$ p.a. c.q.

Money will be doubled in 7 years @ 10.40974 p.a. c.q.

42 In what time will ₹ 8,000 amount to ₹ 8,820 at 10% p.a. compounded half yearly?

$\Rightarrow A = P(1+r)^n$

$8{,}820 = 8{,}000\left(1+\frac{0.10}{2}\right)^{2n}$

$1.052h = 1.1025$

$1.05^{2n} = 1.05^2$ $\therefore 2n = 2$

$n = 1$ year

43 A certain sum invested at 4% p.a. compounded semi-annually amounts to ₹ 78,030 at the end of one year. Find the sum.

$\Rightarrow A = P(1+r)^n$

$78{,}030 = P\left(1+\frac{0.04}{2}\right)^2$

$78{,}030 = P(1.02)^2$

$P = 75{,}000$

44 The population of a town increases every year by 2%. The number of years by which the total increase in population be 40% is

a. 7 years b. 10 years c. 17 years (approx.) d. None

$\Rightarrow$ Suppose Today's Population $= P$

After some no. of years $= 1.40P = A$

$A = P(1+r)^n$

$1.40P = P(1.02)^n$

$(1.02)^n = 1.40 = 1.0217^{17}$

$\therefore n = 17$ years

45 The difference between simple interest & compound interest on a certain sum of money invested for 3 years at 6% p.a. is ₹ 110.16. The principle is -

a. 3,000 b. 3,700 c. 12,000 d. 10,000 e. None

$\Rightarrow$ Comp. Interest − Simple Interest = 110.16

$P\left[(1.06)^3 - 1\right] - P \times 3 \times 6\% = 110.16$

$0.191016P - 0.18P = 110.16$

$0.011016P = 110.16 \quad \therefore P = ₹\ 10,000$

46 The compound interest on ₹ 40,000 at 10% p.a. for 3 years when interest is payable quarterly is -

$\Rightarrow A = P(1+r)^n = 40,000 \times \left(1 + \frac{0.10}{4}\right)^{12}$

$= 40,000 \times (1.025)^{12} = 53,796$

C.I = 53,796 − 40,000

= ₹ 13,796

47 Use calculator and find answers for the following questions :

$(1.0135)^{28}$ = 1.455567721669

$(1.20635)^{48}$ = 8141.78763281

$(1.10935)^{72}$ = 1757.673944446

$(1.089123)^{66}$ = 279.94 7986975

48 Present value of Annuity Regular = Future value of annuity regular × Discounting factor

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

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

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

49 What is perpetuity?

Perpetuity is an annuity in which the periodic payments or receipts begin on a fixed date and continue indefinitely or perpetually. (For unlimited time)

$$\text{Present value of perpetuity} = \left(\frac{\text{Periodical amount}}{r}\right)$$

50 The present value of annuity of ₹ 3,000 for 15 years @4.50% p.a.c.i is

⟹ present value of annuity = P.A. × A factor
= 3,000 × 10.7395457256
= 32,219/-

(OR) present value of annuity = $P.A.\left[\frac{1-(1+r)^{-n}}{r}\right]$ = Pff = $3000\left(\frac{1-\frac{1}{(1+r)^{n}}}{r}\right)$ = 3 0450 Hoyts
= 32,219/-

51 A loan of ₹ 10,000 is to be paid back in 30 installments. The amount of each installment to cover principle and 4% p.a.c.i. is

a. 587.87 b. 587 c. 587.30 ~~d. None of these~~

⟹ present value of annuity regular = P.A. × A factor
10,000 = installment amt × 17.2920332979
installment amt = ₹ 578.30

52 A person invests ₹ 500 at the end of each year @10% p.a. The amount standing to his credit one year after he has made his yearly investment for 12th time is:

~~a. 11,761.36~~ b. 10,000 c. 12,000 d. None of these

⟹ Future value of annuity at the end of 12 years = $500 \times \left(\frac{1.10^{12}-1}{t.to\ 0.10}\right)$ = 10,692.14

Amt to his credit after one year = 10692.14 + 10% = ₹11,761

53 A person bought a house paying ₹ 20,000 cash down & ₹ 4,000 at the end of each year for 25 years, at 5% p.a.c.i. The cash down price of house is :

a. ₹ 75,000 b. ₹ 76,000 ~~c. ₹ 76,376~~ d. None of these

payment	Fresent value
Today	20,000
4000 at the end of every year for 25 years	4000 × 14.0939445696 = 56376
cash down price	₹ 76,376

54 The difference between simple interest and compound interest at 5% p.a. for 4 years on ₹ 20,000 is _____

⟹ compound interest − simple interest
= $P\left[(1+r)^{n}-1\right]$ − P.n.r
= 20,000 [1.054 − 1] − 20,000 × 4 × 5%
= 4310.125 − 4000 = ₹ 310.125

55 The compound interest on half yearly rests on ₹ 10,000, if rate for 1st and 2nd year being 6% and for third year being 9% p.a. is ₹ _____

a. 2,200 b. 2,287 c. 2,285 d. None of these

$\Rightarrow A = [10,000 \times (1.03)^4] \times 1.0452 = ₹ 12,291$

compound interest = ₹ 12,291 − ₹ 10,000 = ₹ 2291

56 Vinod borrows ₹ 6 lakhs housing loan at 6% p.a. repayable in 20 annual equal installments commencing at the end of first year. How much annual payment is necessary.

a. ₹ 52,420 b. ₹ 52,400 c. ₹ 52,310 d. None of these

$\Rightarrow$ Present value of annuity regular = Installment amt × Annuity factor

6,00,000 = installment amt × 11.4699212774

installment amt = 52,3104

57 Raja aged 40 years wishes his wife Rani to have ₹ 40 lakhs at his death. If expectation of life is another 30 years & he starts making equal annual investments commencing now at 3% c.i.p.a. How much should he invest annually?

a. 88,448 b. 84,450 c. 84,449 d. 84,080

$\Rightarrow$ Future value of annuity regular $= P.A. \times \left[\frac{(1+r)^n - 1}{r}\right]$

$40100,000 = P.A. \times \left[\frac{1.033^{30} - 1}{0.03}\right]$

P.A. = ₹ 7840771

58 A TV can be purchased by paying ₹ 10,000 now and ₹ 20,000, ₹ 50,000, ₹ 90,000, ₹ 80,000 at the end of years 1,2,3,4 respectively. Find cash down price of TV if money is 12% effective.

a. ₹ 1,83,816 b. ₹ 1,82,618 c. ₹ 1,86,218 d. ₹ 1,62,861

At the end of Year	payment	present value
now	10,000	10,000 × 1.00 = 10,000
1	20,000	20,000 × 0.8929 = 17857
2	50,000	50000 × 0.79719 = 39860
3	90,000	90,000 × 0.71178 = 64060
4	80,000	80,000 × 0.635518 = 50841

= 1,82,618/-

59 Effective rate of 21.94% is equivalent to _____ % p.a.c.monthly

a. 21.94% b. 20% c. 20.66% d. 22.77%

$\Rightarrow$ Eff. rate $= \left(1 + \frac{r}{n}\right)^n - 1$

$0.2194 = \left(1 + \frac{r}{12}\right)^{12} - 1$

$\left(1 + \frac{r}{12}\right) = 1.2194412^{1/12}$

r = 20% p.a.c.m.

Rest = P − P/3 − P/6 = (6P − 2P − P)/6 = 3P/6 = P/2

60 Out of certain money (1/3)rd is invested at 3% , (1/6)th is invested at 6% and rest at 8% for 2 years. Simple Interest from all these investments is ₹ 600. The original sum is :

a. ₹ 3,500 b. ₹ 4,000 c. ₹ 5,000 d. ₹ 4,500

⟹ P/2 × 3% × 2 = 0.03P
P/6 × 6% × 2 = 0.02P
P/2 × 8% × 2 = 0.08P
Total = 0.12P

0.12P = 600
P = ₹ 5,000

61 Population of a village is 10,000. If it increases at 10% p.a. What will be its population after 3 years?

a. 13,310 b. 14,220 c. 17,908 d. 13,000

⟹ A = 10,000 × (1.1)^3
A = 10,000 × 1.1073
= 13,310

62 On a certain sum simple interest at the end of 6.25 years become (3/8)th of sum. The rate of interest is _____

a. 7% b. 9% c. 5% d. 6%

⟹ SI = Prt
3P/8 = P × 6.25 × r
0.375 = 6.25r

r = 0.06
r = 6% p.a.s.t.

63 The amount of certain sum of money with simple interest at certain rate of interest is ₹ 2,660 in 3 years and ₹ 3,100 in 5 years. The rate of interest is :

a. 12% b. 11% c. ₹ 13% d. 10%

P(1 + 3r) = 2660
P(1 + 5r) = 3100
P(1+5r)/P(1+3r) = 3100/2660

2660 + 1330r = 3100 + 930r
400r = 440
r = 0.11
r = 11% p.a.s.t.

My Notes

Present value of annuity Regular

= (Periodical amount × Annuity Factor) = Periodical amount × [1 − (1+r)^−n]

64 At what rate of compound interest money will amount to 8 times in 20 years?

a. 12.75% b. 11.22% ~~c. 10.96%~~ d. None of these

$\Rightarrow A = P(1+r)^n$ ito

$8P = P(1+r)^{20}$

$\therefore (1+r)^{20} = 8$

$1+r = 8^{1/20}$

$r = 10.95971\%$ p.a.c.f.

65 At what rate of simple interest money will become 8 times in 20 years?

~~a. 35%~~ b. 40% c. 30% d. None of these

$\Rightarrow A = P(1+nr)$ litho

$8P = P(1+20r)$

$7 = 20r$

$r = 35\%$ p.a.s.f.

66 In what time ₹ 1,00,000 will become ₹ 8,00,000, If rate of interest is 10% p.a.s.i

a. 77 years b. 7 years ~~c. 70 years~~ d. 17 years

$\Rightarrow A = P(1+nr)$ ltar

$8,00,000 = 1,00,000(1+n \times 0.10)$

$8 = 1+0.1n$

$7 = 0.1n$ $\therefore n = 70$ years

67 A sum of money triples itself with compound interest in 9 years. How many times it will become after 81 years?

a. 27 times b. 6,561 times c. 81 times ~~d. 19,683 times~~

After — years								
9	18	27	36	45	54	63	72	81
3P	9P	27P	81P	243P	729P	2187P	6561P	19683P

Pspap T p p as pass agg

OR org

$A = 3P$ 011 039

$\therefore (1+r)^9 = 3$

$A = P(1+r)^{81}$

$= P[(1+r)^9]^9$ lpx 39

$= 19683P$

My Notes

A sum of money invested at compound interest becomes 5 times in 16 years. Find rate of interest.

$\Rightarrow A = P(1+r)^n$ fits

$5P = P(1+r)^{16}$ sp

$(1+r)^{16} = 5$ ltr

$1+r = 5^{1/16}$

$1+r = 5416$

$r = 10.58237\%$ p.a.c.f.

68 A machine costs ₹ 5,20,000 with an estimated life of 25 years. A sinking fund is created to replace it by a new model at 25% higher cost after 25 years with a scrap value of realisation of ₹ 25,000. What amount should be set aside every year if money is 3.50% effective?

a. ₹ 16,000 b. ₹ 16,564 c. ₹ 16,046 d. ₹ 16,005

$\Rightarrow$ (5,20,000 + 25% − 25,000) = 6,25,000

Future value of annuity regular = $P \cdot A \cdot \times \left[\frac{(1+r)^n - 1}{r}\right]$

$6,25,000 = P \cdot A \cdot \times \left[\frac{1.035025 - 1}{0.0350}\right]$

$P \cdot A \cdot = 16,046$

69 A sum of ₹ 80,000 invested in a bank @10% p.a.s.i. for 5 years. Find amount, simple interest.

Year	Opening Balance (₹)	Interest (₹)	Closing Balance (₹)
1	80,000	80,000 × 10% = 8,000	88,000
2	88,000	80,000 × 10% = 8,000	96,000
3	96,000	80,000 × 10% = 8,000	1104,000
4	1,04,000	80,000 × 10% = 8,000	1,12,000
5	1,12,000	80,000 × 10% = 8,000	1120,000

Amount receivable at the end of 5 years = ₹ 1,20,000

Simple interest for 5 years = ₹1,20,000 − 280,000 + 740,000

240,000 = 780,000 × 10% × 5

SI = P · N · R

Amount = P + pnr = P (1 + nr)

My Notes

simple interest = P · n · r

Amount when interest is simple = P (1 + nr)

compound interest = P [(1+r)^n − 1]

Amount when interest is compound = P (1 + r)^n

70 **Mr. A deposited ₹ 80,000 in a bank @10% p.a.c.i. for 5 years. Find amount receivable after 5 years and compound interest.**

Year	Opening Balance (₹)	Interest (₹)	Closing Balance (₹)
1	80,000	80,000 × 10/100 = 8,000	88,000
2	88,000	88,000 × 10/100 = 8,800	96,800
3	96,800	96,800 × 10/100 = 9,680	1,06,480
4	1,061480	1106,480 × 10/100 = 10,648	1,17,128
5	1,17,128	117,128 × 10/100 = 11712.80	1,28,840.80

Amount receivable at the end of 5 years = ₹ 1,28,840.80

Compound Interest = ₹ 1,28,840.80 − 280,000 = 248,840.80

1,28,840.80 = 280,000 × 1.10 × 1.10 × 1.10 × 1.10 × 1.10

1,28,840.80 = 80,000 × (1 + r)^5 ⟹ r = 0.1075

$$A = P \times (1 + r)^n$$

71 **P = ₹ 1,00,000; r = 12% p.a.c.q; n = 2 years, A = ?**

		Opening Balance (₹)	Interest (₹)	Closing Balance (₹)
Year 1	Q1	1,00,000	1100,000 × 12/100 × 1/4 = 3,000	1,03,000
	Q2	1,03,000	1,03,000 × 3/100 = 3,090	1,06,090
	Q3	1,06,090	1,06,090 × 3/100 = 3,183	1,09,273
	Q4	1,09,273	3278	1,12,551
Year 2	Q1	1,12,551	3377	1,15,928
	Q2	1,15,928	3478	1,19,406
	Q3	1,19,406	3582	1122,988
	Q4	1,22,988	3689	1,26,6774

Amount to be received after 2 years = ₹ 1,26,678

$$A = P(1+r)^n = 1100{,}000\left(1 + \frac{0.12}{4}\right)^{2\times4} = 1{,}001000 \times (1.0378)^8$$

= 1,26,6771

My Notes

Question :

P = 8,50,000,8 @ 13% p.a.c.Q., n = 9 years 3 months

$$\Longrightarrow A = P(1+r)^n$$

$$= 8150{,}000 \times \left(1 + \frac{0.13}{4}\right)^{39} = 8150{,}000 \times (1.0325)^{39}$$

= ₹ 2958,9071