Parul University
Faculty of Engineering and Technology
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Unit 7: Profit & Loss, partnerships, S.I & C.I

1) **Cost Price:** It is the price at which a product is purchased.
2) **Selling Price:** It is the price at which a product is sold.
3) **Profit or gain:** If the selling price of a product is more than the cost price, there will be profit in the deal.
Therefore, Profit or Gain = S.P. - C.P.
4) **Loss:** If the selling price of a product is less than the cost price, the seller will incur a loss.
Therefore, Loss = C.P. - S.P.

Some Basic Formula:

1) Profit % Or Gain % = $\frac{Profit\ X\ 100}{C.P}$

2) Loss% = $\frac{Loss\ X\ 100}{C.P}$

3) If there is a profit or gain in the deal or transaction;

Selling Price (S.P.) = $\frac{100+Profit\%}{100}$ X C.P

And, the Cost Price (C.P.) = $\frac{100}{100+Profit\%}$ X S.P.

4) If there is a loss in the deal or transaction;

Selling Price (S.P.) = $\frac{100-Loss\%}{100}$ X C.P

And, the Cost Price (C.P.) = $\frac{100}{100-Loss\%}$ X S.P.

5) If an article is sold at a gain of say X%, then S.P. = [100 + X] % of C.P.

6) If an article is sold at a loss of say, X% then S.P. = [100 – X] % of C.P.

7) When a seller sells two similar items one at X% gain and another one at same X % loss, the seller always incurs a loss in the deal which is given by:

Loss % = $(\frac{X}{10})^2 = \frac{X^2}{100}$ %

8) If a seller claims that he is selling goods at cost price but uses false weight to earn profit;

Profit % = [$(\frac{True\ Weight - False\ Weight}{False\ Weight})$ X 100] %

Questions:

1) Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:

Cost Price (C.P.) = Rs. (4700 + 800) = Rs. 5500.
Selling Price (S.P.) = Rs. 5800.
Gain = (S.P.) - (C.P.) = Rs.(5800 - 5500) = Rs. 300.

Gain %= $(\frac{300}{5500}$ x 100) % = 5 $\frac{5}{11}$ %

2) A shopkeeper sold an article for Rs. 2500. If the cost price of the article is 2000, find the profit percent.
C.P. = Rs. 2000
S.P. = Rs. 2500
Profit or Gain = S.P. -C.P.
= 2500 - 2000 = 500.
Gain %= $(\frac{500}{2000}$ x 100) % = 25%

3) A man purchases a TV for Rs. 8000 and sells it at 10% loss. What is the selling price of T.V?

C.P. of the TV = Rs. 8000

S.P. of the TV =?
Loss incurred = 10%
Apply formula:
Selling Price (S.P.) = $\frac{100 - Loss\%}{100}$ X C.P

Therefore, S.P. = 7200 Rs.

4) Ramesh bought a chair for Rs. 1540 and sold it to Suresh. If Ramesh earned a profit of 25%, find the selling price of chair.
C.P. of the chair = Rs. 1540
S.P. of the chair =?
Profit earned = 25%
Selling Price (S.P.) = $\frac{100 + Profit\%}{100}$ X C.P
Therefore, S.P. = 1925 Rs.

5) A shopkeeper purchases a table and sells it for Rs. 4200. If he incurs a loss of 20%, find the cost price of table.

S.P. of the table = Rs. 4200

C.P. of the table =?

Loss incurred = 20%

Cost Price (C.P.) = $\frac{100}{100-Loss\%}$ X S.P.

C.P = 5250 Rs.

6) Suresh bought a cell phone from a shop. If he sells it at Rs. 8400 to Mahesh and earns a profit of 12%, find the price at which Suresh bought the cell phone.
S.P of the cell phone = Rs. 8400
C.P. of the cell phone =?
Profit earned = 12 %

Cost Price (C.P.) = $\frac{100}{100+Profit\%}$ X S.P.

C.P = 7500 Rs.

7) If selling price is doubled then, the profit triples. What is profit per cent?

Let the C.P be Rs.100 and S.P be Rs.x,
ThenThe profit is (x−100).
Now the S.P is doubled, then the new S.P is 2x.
New profit is (2x−100).
Now as per the given condition;
=> 3(x−100) = 2x−100.
By solving, we get, x = 200.
Then the Profit percent = [(200−100)/100]
= 100.
Hence the profit percentage is 100%.

8) On selling 15 balls at Rs 400 there is loss equal to Cost Price of 5 balls. The cost price of a ball is?
Let the cost price of 1 ball be x.
According to the problem, the loss incurred on selling 15 balls at Rs 400 is equal to the cost price of 5 balls.
This can be written as:
Loss = Cost price of 5 balls.
15x−400 = 5x
10x = 400
x = 40.
Therefore, the cost price of 1 ball is Rs 40.

9) A person buys 18 pens for 12 Rs and sells 12 pens for 18 rupees. Find his profit percentage.

Let the cost price of 1 pen be x.
The person buys 18 pens for 12 Rs,
so the cost of 1 pen is:

x = 12/18
= 2/3 Rs.
The selling price of 12 pens is 18 Rs, so the selling price of 1 pen is: 18/12 = 3/2 Rs.
The profit made on selling 1 pen is: Profit = Selling price−Cost priceProfit = 3/2−2/3
Profit = 5/6 Rs.
The profit percentage can be calculated using the formula: Profit percentage = (Profit/Cost price)×100.
Substituting the values, we get:
Profit percentage = [(5/6)/ (2/3)] ×100.
Profit percentage = 125%.
Therefore, the profit percentage is 125%.

10) Cost price of 12 articles is equal to the selling price of 8 articles. Find the profit / loss %?

Let the cost price of 1 article be x.
Therefore, the cost price of 12 articles will be 12x.
Given that the cost price of 12 articles is equal to the selling price of 8 articles.
So, the selling price of 1 article will be $\frac{12x}{8} = \frac{3x}{2}$.

Profit% = $\frac{S.P-C.P}{C.P}$ X 100

= $\frac{\frac{3x}{2}-x}{x}$ X 100

Profit% = 50%.

Therefore, the profit percentage is 50%.
11) The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:
Let C.P. of each article be Re. 1 C.P. of *x* articles = Rs. *x*.
S.P. of *x* articles = Rs. 20.
Profit = Rs. (20 - *x*).

$\frac{20-x}{x}$ X 100 = 25

$\Rightarrow$ *x* = 16.

12) In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit?

Let C.P.= Rs. 100. Then, Profit = Rs. 320, S.P. = Rs. 420.
New C.P. = 125% of Rs. 100 = Rs. 125
New S.P. = Rs. 420.
Profit = Rs. (420 - 125) = Rs. 295.

Required % = $\frac{295}{420}$ X 100 = 70% (Approx)

13) A vendor bought toffees at 6 for a rupee. How many for a rupee must he sell to gain 20%?

C.P. of 6 toffees = Rs. 1.

S.P Of 6 toffees = 120% of Rs 1 = Rs. $\frac{6}{5}$.

For Rs $\frac{6}{5}$, toffees sold = 6.

For 1 Rs, toffees sold = 6 X $\frac{6}{5}$ = 5.

14) The percentage profit earned by selling an article for Rs. 1920 is equal to the percentage loss by selling the same article for Rs. 1280. At what price should the article be sold to make 25% profit?

Let the cost price of the article be C.

According to the question, the percentage profit earned by selling the article for Rs.1920 is
equal to the percentage loss by selling the same article for Rs. 1280. Mathematically, we can write:

$\frac{1920-C}{C}$ X 100 = $\frac{C-1280}{C}$ x 100

Simplifying the above equation, we get:

1920−C = C−1280

2C = 3200

C = 1600

So, the cost price of the article is Rs. 1600.

Now, we need to find the selling price that will give a 25% profit.

Let the selling price be S.

Profit percentage = $\frac{S-C}{C}$ ×100.

We need to find the selling price 'S' that will give a profit of 25%.

Therefore,25 = $\frac{S-1600}{1600}$ x 100.

Solving for 'S',

we get S = Rs.2000.

Therefore, the article should be sold for Rs.2000 to make a 25% profit.

15) A dishonest shopkeeper pretends to sell his goods at cost price but uses false weights and gains $11^1/9$%. Find the false weight he is using instead of 1kg weight.

Let the false weight be x gm.

Gain % = [(True weight – False weight)/ False weight] × 100

⇒ 100/9 = [(1000 – x)/x] × 100

⇒ 10 x = 9000

⇒ x = 900

∴ the shopkeeper is using weights of 900 gm instead of 1kg.

16) A dishonest shopkeeper professes to sell pulses at the 20% profit , also he uses a false weight of 800gm for a kg, His actual gain is____%.

Let CP of 1000g item =Rs.1000.

CP of 800g item =Rs.800.

SP of 800g item =Rs.1000.

Profit by false weight = 1000−800 = 200.
Profit by selling = 20% of 1000 = 200.
P% = [400/800] × 100
=50%.

Partnership:

Working partner: A partner who is actively involved in the business and manages the business is known as an active partner.

Sleeping partner: A partner who invests money but does not involve or look after the business is known as a sleeping partner.

If two partners invest capital C1 and C2 for the periods T1 and T2, respectively, the ratio of their profits is given by:

$$\frac{\text{Profit of A}}{\text{Profit of B}} = \frac{C1*T1}{C2*T2}$$

Similarly, if three partners A, B, and C invest Rs. C1, Rs. C2 and Rs. C3 for different periods T1, T2, and T3 respectively then the ratio of their profits is given by:
Profit of A: Profit of B: Profit of C = C1*T1: C2*T2: C3*T3.

If three partners invest capital in the ratio C1: C2: C3 and earn a profit in the ratio P1:P2: P3, the ratio of the time for which they have invested capital is given by:

T1: T2: T3=$\frac{P1}{C1}:\frac{P2}{C2}:\frac{P3}{C3}$.

Questions:

1) A, B and C are partners. They have invested Rs.35000, Rs. 25000 and 10,000 respectively for the same period. If the total profit is Rs. 18000, find the share of A.

Profit of A: Profit of B: Profit of C = C1*T1: C2*T2:C3*T3
So, Profit of A: Profit of B: Profit of C = C1: C2: C3
= 35000:25000:10000
= 7:5:2
A's share = (A's ratio/ sum of all three ratios)* total profit

$$\text{So, share of A: } \frac{7}{14} * 18000 = 9000$$

2) Arun, Kamal and Vinay invested Rs. 8000, Rs. 4000 and Rs. 8000 respectively in a business. Arun left after six months. If after eight months, there was a gain of Rs. 4005, then what will be the share of Kamal?

Profit Ratio Of Arun : Kamal : Vinay = (8,000 x 6) : (4,000 x 8) : (8,000 x 8)

= 48 : 32 : 64

= 3 : 2 : 4

Kamal's Share = $\frac{2}{5}$ X 4005 = Rs 890.

3) Simran started a software business by investing Rs. 50,000. After six months, Nanda joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit?

Simran : Nanda = (50000 x 36) : (80000 x 30) = 3 : 4.

Simran's Share = $\frac{4}{7}$ X (24,500) = Rs. 10,500

4) A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?

A : B : C = (20,000 x 24) : (15,000 x 24) : (20,000 x 18) = 4 : 3 : 3.

B's Share = $\frac{3}{10}$ X (25,000) = Rs 7500

5) A and B started a partnership business investing some amount in the ratio of 3 : 5. C joined then after six months with an amount equal to that of B. In what proportion should the profit at the end of one year be distributed among A, B and C?

Let the initial investments of A and B be 3x and 5x.
A : B : C = (3x x 12) : (5x x 12) : (5x x 6) = 36 : 60 : 30 = 6 : 10 : 5.

6) A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is:

Let the total profit be Rs. 100.

After paying to charity, A's Share = 95 x $\frac{3}{5}$ = 57 Rs.

If A's share is Rs. 57, And total profit = Rs. 100, So
If A's share is Rs. 855, then total profit = $\frac{(100 \times 855)}{57}$ = 1500.

7) A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.

For managing, A received = 5% of Rs. 7400 = Rs. 370.
Balance = Rs. (7400 - 370) = Rs. 7030.
Ratio of their investments = (6500 x 6) : (8400 x 5) : (10000 x 3)
= 39000 : 42000 : 30000
= 13 : 14 : 10

B's Share = 7030 X $\frac{14}{37}$ = Rs 2660.

8) Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?

Let their investments be Rs. *x* for 14 months, Rs. *y* for 8 months and Rs. *z* for 7 months respectively.
Then, 14*x* : 8*y* : 7*z* = 5 : 7 : 8.

Now $\frac{14x}{8y} = \frac{5}{7}$ & $\frac{14x}{7z} = \frac{5}{8}$

Y = $\frac{49x}{20}$ & z = $\frac{16x}{5}$

X: Y: Z = X: $\frac{49x}{20} : \frac{16x}{5}$ = 20:49:64.

9) The profit – sharing ratio of A to B is 4 : 11. If A invests 12000 rupees on the first day of the business, what should B invest after 6 months to maintain the profit – sharing ratio.

The profit – sharing ratio = 4 : 11 The investment of A = 12000 for 12 months
Let the investment of B be x rupees for 6 months.
(12000 * 12) : (6*x) = 4 : 11
144000 / 6x = 4 / 11
X = 144000 / 24 * 11 = 66000 rupees.

10) A began a business with Rs. 85,000. He was joined afterwards by B with Rs. 42,500. For how much period does B join, if the profits at the end of the year are divided in the ratio of 3 : 1?

Suppose B joined for *x* months. Then,

Then $\frac{85000\ X\ 12}{42500\ X\ x} = \frac{3}{1}$

X = 8.
So B joined for 8 months.

Simple interest

The borrower has to pay interest according to some percent(interest rate) of principle for the fixed period of time. This percentage is known as Interest Rate. For example, the rate of interest is 10% per annum means the interest payable on Rs 100 for one year is Rs 10.

Some Basic Formulas

If A = AmountP = Principle
I = Interest
T = Time in years
R = Rate of interest per year, thenAmount = Principle + Interest
A = P + I

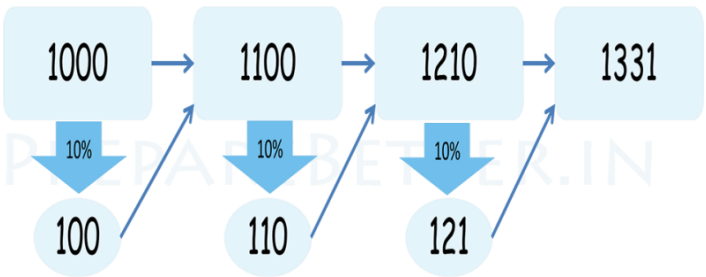
$$\text{Simple Interest} = \frac{\text{Principle} \times \text{Rate} \times \text{Time}}{100}$$

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

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

Compound Interest

In Compound Interest, every year interest value is added to principle and then interest is calculated on the amount.
To understand compound interest clearly, let's take an example.
Ram borrowed Rs 1000 from Sham for 3 years. What will be the interest value ?



Year	Principle	Interest (10%)	Amount
1st	1000	100	1100
2nd	1100	110	1210
3rd	1210	121	1331

Some Basic Formulas

If A = Amount
P = Principle
C.I. = Compound Interest
T = Time in years
R = Interest Rate Per Year

$$C.I. = P\left[\left(1 + \frac{R}{100}\right)^{T} - 1\right]$$

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

Shortcut Formulas

If rate of interest is R1% for first year, R2% for second year and R3% for third year,
Then

$$A = P\left(1 + \frac{R_1}{100}\right)\left(1 + \frac{R_2}{100}\right)\left(1 + \frac{R_3}{100}\right)$$

Rule

If principle = P, Rate = R% and Time = T years, then

1. **If the interest is compounded annually:**

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

2. **If the interest is compounded half yearly (two times in year)**:

$$A = P\left(1 + \frac{R/2}{100}\right)^{2T}$$

3. If the interest is compounded quarterly (four times in year):

$$A = P\left(1 + \frac{R/4}{100}\right)^{4T}$$

Example 1:

Find the simple interest on Rs. 7000 at 50/3% for 9 months.

Solution:

S.I. $= \frac{P \times R \times T}{100} = \frac{7000 \times 50 \times 9}{100 \times 12 \times 3} = 875$

Example 2:

If A lends Rs.3500 to B at 10% p.a. and B lends the same sum to C at 11.5% p.a., then thegain of B (in Rs.) in a period of 3 years is

Solution:

Gain of B $= \frac{3500 \times 11.5 \times 3}{100} - \frac{3500 \times 10 \times 3}{100}$

$= 157.50$

Example 3:

An automobile financier claims to be lending money at simple interest, but he includes the interest every six months for calculating the principal. If he is charging an interest of10%, the effective rate of interest becomes:

Solution:

Let the sum be Rs.100 , then

S.I. for first 6 months = Rs. $\left[\frac{100 \times 10 \times 1}{100 \times 2}\right]$ = Rs.5

S.I. for last 6 months = Rs. $\left[\frac{105 \times 10 \times 1}{100 \times 2}\right]$ = Rs. 5.25

So, amount at the end of 1 year = Rs. (100 + 5 +5.25) = Rs.110.25

So, effective rate = (110.25 - 100) = 10.25%

Example 4:

A lent Rs. 5000 to B for 2 years and Rs. 3000 to C for 4 years on simple interest at the same rate of interest and received Rs. 2200 in all from both of them as interest. The rate of interest per annum is:

Solution:

Let the rate be R% per Annum

Then $\left[\frac{5000\times2\times R}{100}\right] + \left[\frac{3000\times4\times R}{100}\right]$ = 2200

∴100R + 120R = 2200

R= $\frac{2200}{220}$ = 10

So, rate = 10%

Example 5:

A sum of Rs. 725 is lent in the beginning of a year at a certain rate of interest. After 8 months, a sum of Rs. 362.50 more is lent but at the rate twice the former. At the end of the year, Rs. 33.50 is earned as interest from both the loans. What was the original rate of interest?

Solution:

Let the original rate be R%. Then, new rate = (2R)%

Note: Here original rate is for 1 year (s); the new rate is for only 4 months, i.e $\frac{1}{3}$ year

So, $\left[\frac{725\times1\times R}{100}\right] + \left[\frac{362.50\times1\times2R}{100\times3}\right] = 33.50$

(2175 + 725)R = 33.50 × 100 × 3

(2175 + 725)R = 10050

(2900)R = 10050

R= 3.46

Example 6 : What is the difference between the compound interests on Rs. 5000 for $1\frac{1}{2}$ years at 4% per annum compounded yearly and half-yearly?

Solution:

C.I. when interest compounded yearly $= Rs.\left[5000 \times \left(1+\frac{4}{100}\right) \times \left(1+\frac{\frac{1}{2}\times 4}{100}\right)\right]$

$= Rs.\left(5000 \times \frac{26}{25} \times \frac{51}{50}\right)$

= Rs. 5304.

C.I. when interest is compounded half-yearly $= Rs.\left[5000 \times \left(1+\frac{2}{100}\right)^3\right]$

$= Rs.\left(5000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}\right)$

= Rs. 5306.04

Difference = Rs. (5306.04 - 5304) = Rs. 2.04

Example 7 : The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is:

Solution: Amount = Rs. (30000 + 4347) = Rs. 34347.

Let the time be *n* years.

Then, $30000\left(1+\frac{7}{100}\right)^n = 34347$

$\Rightarrow \left(\frac{107}{100}\right)^n = \frac{34347}{30000} = \frac{11449}{10000} = \left(\frac{107}{100}\right)^2$

n = 2 years.

Example 8 : At what rate of compound interest per annum will a sum of Rs. 1200 become Rs. 1348.32 in 2 years?

Solution: Let the rate be R% p.a.

Then, 1200 x $\left(1+\frac{R}{100}\right)^2 = 1348.32$

$\Rightarrow \left(1+\frac{R}{100}\right)^2 = \frac{134832}{120000} = \frac{11236}{10000}$

$\left(1+\frac{R}{100}\right)^2 = \left(\frac{106}{100}\right)^2$

$\Longrightarrow \quad 1+\frac{R}{100} = \frac{106}{100}$

$\Longrightarrow$ **R = 6%**

Example 9 : Albert invested an amount of Rs. 8000 in a fixed deposit scheme for 2 years at compound interest rate 5 p.c.p.a. How much amount will Albert get on maturity of the fixed deposit?

Solution:

Amount = Rs. $\left[8000 \times \left(1+\frac{5}{100}\right)^2\right]$

$= Rs.\left(8000 \times \frac{21}{20} \times \frac{21}{20}\right)$

= Rs. 8820.

EXERCISE:

1. A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:

a) Rs. 650 b) Rs. 690 c) Rs. 698

d) Rs. 700 e) None of these

2. Mr. Thomas invested an amount of Rs. 13,900 divided in two different schemes A and B at the simple interest rate of 14% p.a. and 11% p.a. respectively. If the total amount of simple interest earned in 2 years be Rs. 3508, what was the amount invested in Scheme B?

a) 6400 b) 6500 c) 7200 d) 7500

3. How much time will it take for an amount of Rs. 450 to yield Rs. 81 as interest at 4.5% per annum of simple interest?

a) 3.5 years b) 4 years c) 4.5 years d) 5 years

4. Reena took a loan of Rs. 1200 with simple interest for as many years as the rate of interest. If she paid Rs. 432 as interest at the end of the loan period, what was the rate of interest?

a) 3.6 b) 6 c) 18 d) Data indequate

5. A sum of Rs. 12,500 amounts to Rs. 15,500 in 4 years at the rate of simple interest. What is the rate of interest?

a) 3% b) 4% c) 5% d) 6%

6. An amount of Rs.1,00,000 is invested in two types of shares. The first yields an interest of 9% p.a. and the second, 11% p.a. If the total interest at the end of one year is $9\frac{3}{4}$%, then the amount invested in each share was :

a) Rs.52,500, Rs.47,500 b) Rs.62,500, Rs.37,500

c) Rs.72,500, Rs.27,500 d) Rs.82,500, Rs.17.500

e) None of these

7. The compound interest on a sum of money for 2 years is Rs.832 and the simple interest on the same sum for the same period is Rs.800. The difference between the compound Interest and the simple interest for 3 years will be;

a) Rs.4 b) Rs.66.5 c) Rs.98.56 d) Data inadequate e) None of these

8. On a sum of money, the simple interest for 2 years is Rs.660, while the compound interest is Rs.696.30, the rate of interest being the same in both the cases. The rate of interest is :

a) 10% b) 10.5% c) 12%
d) Data inadequate e) None of these

9. A lends Rs.2500 to B and a certain sum to C at the same time at 7% p.a. simple interest. If after 4 years, A altogether receives Rs.1120 as interest from B and C, then the sum lent to C is :
a) Rs.700 b) Rs.1500 c) Rs.4000
d) Rs.6500 e) None of these

10. If a sum of money at simple interest doubles in 6 years, it will become 4 times in :
a) 12 years b) 14 years c) 16 years
d) 18 years e) None of these

ANSWERS :

1) C 2) A 3) B 4) B 5) D 6) B 7) C 8) E (11%) 9) B 10) D