

32. TRUE DISCOUNT

IMPORTANT CONCEPTS

Suppose a man has to pay Rs. 156 after 4 years and the rate of interest is 14% per annum. Clearly, Rs. 100 at 14% will amount to Rs. 156 in 4 years. So, the payment of Rs. 100 now will clear off the debt of Rs. 156 due 4 years hence. We say that:

Sum due = Rs. 156 due 4 years hence;

Present Worth (P.W.) = Rs. 100;

True Discount (T.D.) = Rs. (156 - 100) = Rs. 56
(Sum due) - (P.W.).

We define : T.D. = Interest on P.W.

Amount = (P.W.) + (T.D.).

Interest is reckoned on P.W. and true discount is reckoned on the amount.

IMPORTANT FORMULAE

Let rate = R% per annum and Time = T years. Then,

$$1. \text{ P.W.} = [100 \times \text{Amount} / 100 + (R \times T)] \\ = 100 \times \text{T.D.} / R \times T$$

$$2. \text{ T.D.} = [(P.W.) \times R \times T / 100] \\ = [\text{Amount} \times R \times T / 100 + (R \times T)]$$

$$3. (S.I.) \times (T.D.) / (S.I.) - (T.D.)$$

$$4. (S.I.) - (T.D.) - S.I. \text{ on T.D.}$$

5. When the sum is put at compound interest, then

$$\text{P.W.} = \text{Amount} / [1 + R/100]^T$$

SOLVED EXAMPLES

Ex. 1. Find the present worth of Rs. 930 due 3 years hence at 8% per annum. Also find the discount.

Sol.

$$P.W = 100 \times \text{Amount} / [100 + (R \times T)]$$

$$= \text{Rs. } 100 \times 930 / 100 + (8 \times 3)$$

$$= (100 \times 930) / 124$$

$$= \text{Rs. } 750,$$

$$T.D. = (\text{Amount}) - (P.W.) = \text{Rs. } (930 - 750) = \text{Rs. } 180.$$

Ex. 2. The true discount on a bill due 9 months hence at 12% per annum is Rs. Find the amount of the bill and its present worth.

Sol. Let amount be Rs. x. Then,

$$x \times R \times T / 100 + (R \times T)$$

$$= T.D.$$

$$\Rightarrow x \times 12 \times 3/4 / [100 + [12 \times 3/4]]$$

$$= 540$$

$$x = 540 \times 109 = \text{Rs. } 6540$$

$$\text{Amount} - \text{Rs. } 6540. P.W. = \text{Rs. } (6540 - 540) = \text{Rs. } 6000.$$

Ex. 3. The true discount on a certain sum of money due 3 years hence is Rs. 250 and the simple interest on the same sum for the same time and at the same rate is Rs. 375. Find the sum and the rate percent.

Sol. T.D. = Rs. 250 and S.I. = Rs. 375.

$$\text{Sum due} = S.I. \times T.D. / S.I. - T.D.$$

$$= 375 \times 250 / 375 - 250$$

$$= \text{Rs. } 750.$$

$$\text{Rate} = [100 \times 375 / 750 \times 3] \% = 16 \frac{2}{3} \%$$

Ex. 4. The difference between the simple interest and true discount on a certain sum of money for 6 months at 12—% per annum is Rs. 25. Find the

sum.

Sol. Let the sum be Rs. x. Then,

$$\text{T.D.} = (x \cdot 25/2 \cdot 1/2) / (100 + (25/2 \cdot 1/2)) = x \cdot 25/4 \cdot 4/425 = x/17$$

$$\text{S.I.} = x \cdot 25/2 \cdot 1/2 \cdot 1/100 = x/16$$

$$x/16 - x/17 = 25$$

$$\Rightarrow 17x - 16x = 25 \cdot 16 \cdot 17$$

$$\Rightarrow x = 6800$$

Hence, sum due = Rs. 6800.

Ex. 5. A bill falls due in 1 year. The creditor agrees to accept immediate payment of the half and to defer the payment of the other half for 2 years. By this arrangement ins Rb. 40. What is the amount of the bill, if the money be worth 12-z% ?

Sol. Let the sum be Rs. x. Then,

$$[x/2 + (x/2 \cdot 100)/100 + (25/2 \cdot 2)] - [(x \cdot 100)/(100 + 25/2 \cdot 1)]$$

$$= 40$$

$$\Rightarrow x/2 + 2x/5 - 8x/9 = 40$$

$$\Rightarrow x = 3600$$

Amount of the bill - Rs. 3600.