33 Banker's Discount

IMPORTANT CONCEPTS

I. Banker's Discount : Suppose a merchant A buys goods worth, say ₹ 10,000 from another merchant B at a credit of say 5 months. Then, B prepares a bill, called the bill of exchange. A signs this bill and allows B to withdraw the amount from his bank account after exactly 5 months.

The date exactly after 5 months is called *nominally due date.* Three days (known as *grace days*) are added to it to get a date, known as *legally due date.*

Suppose B wants to have the money before the legally due date. Then he can have the money from the banker or a broker, who deducts S.I. on the face value (i.e., ₹ 10,000 in this case) for the period from the date on which the bill was discounted (*i.e.*, paid by the banker) and the legally due date. This amount is known as ***Banker's Discount* (*B.D.*)**

Thus, **B.D.** *is the S.I. on the face value for the period from the date on which the bill was discounted and the legally due date.*

II. Banker's Gain (B.G.) = (B.D.) – (T.D.) *for the unexpired time.*

Note : When the date of the bill is not given, grace days are not to be added.

IMPORTANT FORMULAE

1. B.D. = S.I. on bill for unexpired time.

2. B.G. = (B.D.) – (T.D.) = S.I. on T.D. = $\frac{(\text{T.D.})^2}{\text{P.W.}}$.

3. T.D. = $\sqrt{\text{P.W.} \times \text{B.G.}}$

4. T.D. = $\left(\frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100}\right)$.

5. T.D. = $\left[\frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100 + (\text{Rate} \times \text{Time})}\right]$.

6. Amount = $\left(\frac{\text{B.D.} \times \text{T.D.}}{\text{B.D.} - \text{T.D.}}\right)$.

7. T.D. = $\left(\frac{\text{B.G.} \times 100}{\text{Rate} \times \text{Time}}\right)$.

SOLVED EXAMPLES

Ex. 1. ***A bill for ₹ 6000 is drawn on July 14 at 5 months. It is discounted on 5th October at 10%. Find the banker's discount, true discount, banker's gain and the money that the holder of the bill receives.***

Sol. Face value of the bill = ₹ 6000.

Date on which the bill was drawn = July 14 at 5 months.

Nominally due date = December 14. Legally due date = December 17.

Date on which the bill was discounted = October 5.

Unexpired time : Oct. + Nov. + Dec.

$$26 + 30 + 17 = 73 \text{ days} = \frac{1}{5}\text{ year}.$$

$\therefore$ B.D. = S.I. on ₹ 6000 for $\frac{1}{5}$ year = ₹ $\left(6000 \times 10 \times \frac{1}{5} \times \frac{1}{100}\right)$ = ₹ 120.

$$\text{T.D.} = ₹\left[\frac{6000\times 10\times\frac{1}{5}}{100+\left(10\times\frac{1}{5}\right)}\right] = ₹\left(\frac{12000}{102}\right) = ₹\,117.64.$$

$\therefore$ B.G. = (B.D.) – (T.D.) = ₹ (120 – 117.64) = ₹ 2.36.

Money received by the holder of the bill = ₹ (6000 – 120) = ₹ 5880.

Ex. 2. ***If the true discount on a certain sum due 6 months hence at 15% is ₹ 120, what is the banker's discount on the same sum for the same time and at the same rate?***

Sol. B.G. = S.I. on T.D. = $₹\left(120\times 15\times\frac{1}{2}\times\frac{1}{100}\right) = ₹\,9.$

$\therefore$ (B.D.) – (T.D.) = ₹ 9.

$\therefore$ B.D. = ₹ (120 + 9) = ₹ 129.

Ex. 3. ***The banker's discount on ₹ 1800 at 12% per annum is equal to the true discount on ₹ 1872 for the same time at the same rate. Find the time.***

Sol. S.I. on ₹ 1800 = T.D. on ₹ 1872.

$\therefore$ P.W. of ₹ 1872 is ₹ 1800.

$\therefore$ ₹ 72 is S.I. on ₹ 1800 at 12%.

$\therefore$ Time = $\left(\frac{100\times 72}{12\times 1800}\right)\text{year} = \frac{1}{3}\text{ year} = 4\text{ months}.$

Ex. 4. ***The banker's discount and the true discount on a sum of money due 8 months hence are ₹ 120 and ₹ 110 respectively. Find the sum and the rate percent.***

Sol. Sum = $\left(\frac{\text{B.D.}\times\text{T.D.}}{\text{B.D.}-\text{T.D.}}\right) = ₹\left(\frac{120\times 110}{120-110}\right) = ₹\,1320.$

Since B.D. is S.I. on sum due, so S.I. on ₹ 1320 for 8 months is ₹ 120.

$\therefore$ Rate = $\left(\frac{100\times 120}{1320\times\frac{2}{3}}\right)\% = 13\frac{7}{11}\%.$

Ex. 5. ***The present worth of a bill due sometime hence is ₹ 1100 and the true discount on the bill is ₹ 110. Find the banker's discount and the banker's gain.***

Sol. T.D. = $\sqrt{\text{P.W.}\times\text{B.G.}}$

$\therefore$ B.G. = $\frac{(\text{T.D.})^2}{\text{P.W.}} = ₹\left(\frac{110\times 110}{1100}\right) = ₹\,11.$

$\therefore$ B.D. = (T.D. + B.G.) = ₹ (110 + 11) = ₹ 121.

Ex. 6. ***The banker's discount on ₹ 1650 due a certain time hence is ₹ 165. Find the true discount and the banker's gain.***

Sol. Sum = $\frac{\text{B.D.}\times\text{T.D.}}{\text{B.D.}-\text{T.D.}} = \frac{\text{B.D.}\times\text{T.D.}}{\text{B.G.}}.$

$\therefore$ $\frac{\text{T.D.}}{\text{B.G.}} = \frac{\text{Sum}}{\text{B.D.}} = \frac{1650}{165} = \frac{10}{1}.$

Thus, if B.G. is Re 1, T.D. = ₹ 10.

If B.D. is ₹ 11, T.D. = ₹ 10. If B.D. is ₹ 165, T.D. = $₹\left(\frac{10}{11}\times 165\right) = ₹\,150.$

And, B.G. = ₹ (165 – 150) = ₹ 15.

Ex. 7. ***What rate percent does a man get for his money when in discounting a bill due 10 months hence, he deducts 10% of the amount of the bill?***

Sol. Let, amount of the bill = ₹ 100. Money deducted = ₹ 10.

Money received by the holder of the bill = ₹ (100 – 10) = ₹ 90.

∴ S.I. on ₹ 90 for 10 months = ₹ 10.

∴ Rate = $\left(\frac{100\times10}{90\times\frac{10}{12}}\right)\% = 13\frac{1}{3}\%$.

EXERCISE

(OBJECTIVE TYPE QUESTIONS)

Directions: *Mark (✓) against the correct answer:*

1. The true discount on a bill of ₹ 540 is ₹ 90. The banker's discount is

(*a*) ₹ 60 (*b*) ₹ 108

(*c*) ₹ 110 (*d*) ₹ 112

2. The present worth of a certain bill due sometime hence is ₹ 800 and the true discount is ₹ 36. The banker's discount is

(*a*) ₹ 37 (*b*) ₹ 37.62

(*c*) ₹ 34.38 (*d*) ₹ 38.98

3. The present worth of a certain sum due sometime hence is ₹ 1600 and the true discount is ₹ 160. The banker's gain is

(*a*) ₹ 20 (*b*) ₹ 24

(*c*) ₹ 16 (*d*) ₹ 12

4. The banker's gain of a certain sum due 2 years hence at 10% per annum is ₹ 24. The present worth is

(*a*) ₹ 480 (*b*) ₹ 520

(*c*) ₹ 600 (*d*) ₹ 960

5. The banker's gain on a bill due 1 year hence at 12% per annum is ₹ 6. The true discount is

(*a*) ₹ 72 (*b*) ₹ 36

(*c*) ₹ 54 (*d*) ₹ 50

6. The banker's discount on a bill due 4 months hence at 15% is ₹ 420. The true discount is

(*a*) ₹ 400 (*b*) ₹ 360

(*c*) ₹ 480 (*d*) ₹ 320

7. The banker's gain on a sum due 3 years hence at 12% per annum is ₹ 270. The banker's discount is

(*a*) ₹ 960 (*b*) ₹ 840

(*c*) ₹ 1020 (*d*) ₹ 760

8. The present worth of a sum due sometime hence is ₹ 576 and the banker's gain is ₹ 16. The true discount is

(*a*) ₹ 36 (*b*) ₹ 72

(*c*) ₹ 48 (*d*) ₹ 96

9. The banker's discount on ₹ 1600 at 15% per annum is the same as true discount on ₹ 1680 for the same time and at the same rate. The time is

(*a*) 3 months (*b*) 4 months

(*c*) 6 months (*d*) 8 months

10. The banker's discount on a sum of money for $1\frac{1}{2}$ years is ₹ 558 and the true discount on the same sum for 2 years is ₹ 600. The rate percent is

(*a*) 10% (*b*) 13%

(*c*) 12% (*d*) 15%

11. The banker's discount of a certain sum of money is ₹ 72 and the true discount on the same sum for the same time is ₹ 60. The sum due is

(*a*) ₹ 360 (*b*) ₹ 432

(*c*) ₹ 540 (*d*) ₹ 1080

12. The banker's discount on a certain sum due 2 years hence is $\frac{11}{10}$ of the true discount. The rate percent is

(M.A.T., 2005)

(*a*) 11% (*b*) 10%

(*c*) 5% (*d*) 5.5%

13. The banker's gain on a certain sum due $1\frac{1}{2}$ years hence is $\frac{3}{25}$ of the banker's discount. The rate percent is :

(*a*) $5\frac{1}{5}\%$ (*b*) $9\frac{1}{9}\%$

(*c*) $8\frac{1}{8}\%$ (*d*) $6\frac{1}{6}\%$

ANSWERS

1. (*b*)	**2.** (*b*)	**3.** (*c*)	**4.** (*c*)	**5.** (*d*)	**6.** (*a*)	**7.** (*c*)	**8.** (*d*)	**9.** (*b*)	**10.** (*c*)
11. (*a*)	**12.** (*c*)	**13.** (*b*)							

SOLUTIONS

1. P.W. = ₹ (540 – 90) = ₹ 450.

∴ S.I. on ₹ 450 = ₹ 90.

S.I. on ₹ 540 = $₹\left(\frac{90}{450}\times 540\right) = ₹\,108.$

∴ B.D. = ₹ 108.

2. B.G. = $\frac{(\text{T.D.})^2}{\text{P.W.}} = ₹\left(\frac{36\times 36}{800}\right) = ₹\,1.62.$

∴ B.D. = (T.D. + B.G.) = ₹ (36 + 1.62) = ₹ 37.62.

3. B.G. = $\frac{(\text{T.D.})^2}{\text{P.W.}} = ₹\left(\frac{160\times 160}{1600}\right) = ₹\,16.$

4. T.D. = $\left(\frac{\text{B.G.}\times 100}{\text{Rate}\times\text{Time}}\right) = ₹\left(\frac{24\times 100}{10\times 2}\right) = ₹\,120.$

∴ P.W. = $\frac{100\times\text{T.D.}}{\text{Rate}\times\text{Time}} = ₹\left(\frac{100\times 120}{10\times 2}\right) = ₹\,600.$

5. T.D. = $\frac{\text{B.G.}\times 100}{\text{R}\times\text{T}} = ₹\left(\frac{6\times 100}{12\times 1}\right) = ₹\,50.$

6. T.D. = $\frac{\text{B.D.}\times 100}{100+(\text{R}\times\text{T})} = ₹\left[\frac{420\times 100}{100+\left(15\times\frac{1}{3}\right)}\right]$

$= ₹\left(\frac{420\times 100}{105}\right) = ₹\,400.$

7. T.D. = $\left(\frac{\text{B.G.}\times 100}{\text{R}\times\text{T}}\right) = ₹\left(\frac{270\times 100}{12\times 3}\right) = ₹\,750.$

∴ B.D. = ₹ (750 + 270) = ₹ 1020.

8. T.D. = $\sqrt{\text{P.W.}\times\text{B.G.}} = \sqrt{576\times 16} = 96.$

9. S.I. on ₹ 1600 = T.D. on ₹ 1680.

∴ ₹ 1600 is the P.W. of ₹ 1680, *i.e.*,

₹ 80 is S.I. on ₹ 1600 at 15%.

∴ Time = $\left(\frac{100\times 80}{1600\times 15}\right)\text{year} = \frac{1}{3}\text{ year} = 4\text{ months}.$

10. B.D. for $\frac{3}{2}$ years = ₹ 558. B.D. for 2 years

$= ₹\left(558\times\frac{2}{3}\times 2\right) = ₹\,744.$

T.D. for 2 years = ₹ 600.

∴ Sum = $\frac{\text{B.D.}\times\text{T.D.}}{\text{B.D.}-\text{T.D.}} = ₹\left(\frac{744\times 600}{144}\right) = ₹\,3100.$

Thus, ₹ 744 is S.I. on ₹ 3100 for 2 years.

∴ Rate = $\left(\frac{100\times 744}{3100\times 2}\right)\% = 12\%.$

11. Sum = $\frac{\text{B.D.}\times\text{T.D.}}{\text{B.D.}-\text{T.D.}} = ₹\left(\frac{72\times 60}{72-60}\right) = ₹\left(\frac{72\times 60}{12}\right) = ₹\,360.$

12. Let T.D. be ₹ 1. Then, B.D. = $₹\,\frac{11}{10}$ = ₹ 1.10.

∴ Sum = $₹\left(\frac{1.10\times 1}{1.10-1}\right) = ₹\left(\frac{110}{10}\right) = ₹\,11.$

∴ S.I. on ₹ 11 for 2 years is ₹ 1.10.

∴ Rate = $\left(\frac{100\times 1.10}{11\times 2}\right)\% = 5\%.$

13. Let, B.D. = ₹ 1. Then, B.G. = $₹\,\frac{3}{25}$.

∴ T.D. = (B.D. – B.G.) = $₹\left(1-\frac{3}{25}\right) = ₹\,\frac{22}{25}.$

Sum = $\left(\frac{1\times\frac{22}{25}}{1-\frac{22}{25}}\right) = ₹\,\frac{22}{3}.$

S.I. on $₹\,\frac{22}{3}$ for $1\frac{1}{2}$ years is ₹ 1.

∴ Rate = $\left(\frac{100\times 1}{\frac{22}{3}\times\frac{3}{2}}\right)\% = 9\frac{1}{9}\%.$