1. Identification: Simple interest rate

Savings worth at month 10 – move R9 000 from 2 month’s ago to 10 month’s in future:

\[ S = P(1 + rt) \]
\[ = 9000 \left(1 + 0.115 \times \frac{12}{12}\right) \]
\[ = 9000(1,115\ldots) \]
\[ = R10\,035.00. \]

Money Short:
R10\,035.00 – R10\,500 = −465.00
She shorts R465.00.

Option [3]

2. Identification: Simple discount rate

Money Short:
R10\,000 \rightarrow R5\,000
\[ P = S(1 - dt) \]
\[ 5000 = S \left(1 - 0.18 \times \frac{63}{365}\right) \]
\[ \frac{5000}{\left(1 - 0.18 \times \frac{63}{365}\right)} = S \]
\[ S = R5\,160.32. \]

Option [2]
3. Identification: Compound interest

\[ j_m = 12\% \]
\[ m = 12 \]
\[ P = P \]
\[ S = 2P \]
\[ t = ? \]

\[ S = P \left( 1 + \frac{j_m}{m} \right)^{tm} \]
\[ 2P = P(1 + \frac{0.12}{12})^{112} \]
\[ \frac{2P}{P} = \left( 1 + \frac{0.12}{12} \right)^{12t} \]
\[ \ln 2 = 12t \ln \left( 1 + \frac{0.12}{12} \right) \]
\[ \frac{\ln 2}{\ln \left( 1 + \frac{0.12}{12} \right)} = 12t \]
\[ t = \frac{\ln 2}{12 \ln \left( 1 + \frac{0.12}{12} \right)} \]
\[ t = 5.80506 \text{ years} \]
\[ t \approx 5.81. \]

Option [1]

4. Identification: Odd periods – method given

\[ S = P(1 + rt)(1 + r)^t(1 + rt) \]
\[ = 375\,000 \left( 1 + 0.1045 \times \frac{25}{365} \right) \left( 1 + 0.1045 \times \frac{12}{365} \right)^{\frac{7}{12}} \]
\[ = 404\,419.5870 \ldots \]
\[ \approx R404\,419.59. \]

Option [4]
5. Identification: Fractional compounding

\[ S = P \left( 1 + \frac{j_m}{m} \right)^{tm} \]
\[ = 375000 \left( 1 + \frac{0.1045}{12} \right)^{ \left( \frac{17}{36} + \frac{27}{36} \right) \times \frac{12}{12} } \]
\[ = R404\,415.85. \]

Option [4]

6. Identification: Compound interest

\[ S = P(1 + \frac{j_m}{m})^{tm} \]
\[ 50\,000 = P \left( 1 + \frac{0.1388}{52} \right)^{5 \times 52} \]
\[ P = R25\,001.79. \]

Option [2]

7. Identification: Continuous compounding rate

\[ S = Pe^{ct} \]
\[ P = \frac{S}{e^{ct}} \]
\[ = \frac{32\,412.87}{e^{(0.1015 \times \frac{57}{365})}} \]
\[ = R29\,000.00. \]

Option [1]
8. Identification: Equivalent compound interest rate

\[ j_n = n \left( \left(1 + \frac{j_m}{m} \right)^m - 1 \right) \]

\[ j_{52} = 52 \left( \left(1 + \frac{0.149}{4} \right)^{\frac{4}{52}} - 1 \right) \]

\[ = 0.14650 \]

\[ \approx 14.65\%. \]

Option [1]

9. Identification: Effective interest rate

\[ j_{eff} = 100 \left( \left(1 + \frac{j_m}{m} \right)^m - 1 \right) \]

\[ = 100 \left( \left(1 + \frac{0.165}{6} \right)^6 - 1 \right) \]

\[ = 17.67684 \]

\[ \approx 17.677\%. \]

Option [4]

10. Identification: Re-scheduling of debt - equation of value.

\[ 2,500,000 \left( 1 + \frac{0.1225}{4} \right)^{10 \times 4} = X \left( 1 + \frac{0.1225}{4} \right)^{6 \times 4} + 3X \]

\[ 2,500,000 \left( 1 + \frac{0.1225}{4} \right)^{10 \times 4} = X \left[ \left( 1 + \frac{0.1225}{4} \right)^{24} + 3 \right] \]

\[ 2,500,000 \left( 1 + \frac{0.1225}{4} \right)^{10 \times 4} = 5,06261X \]

\[ 2,500,000 \left( 1 + \frac{0.1225}{4} \right)^{10 \times 4} / 5,06261 = X \]

\[ X = R1 650 412.32 \]

\[ 3X = R4 951 236.95. \]

\[
X = 150000 \left( 1 + \frac{0.155}{12} \right)^{9 \times 12} + 250000 \left( 1 + \frac{0.164}{2} \right)^{-(2 \times 3)}
\]

\[
= 599863.8759 + 155803.23
\]

\[
= \text{R755 667,10.}
\]

12. Identification: Payments paid indefinitely – Perpetuity

\[
PMT = 3500 \quad i = 0.112/12
\]

\[
P = R/i
\]

\[
= 3500 \left/ (0.112/12) \right.
\]

\[
= \text{R375 000.}
\]

13. Identification: Equal payments in equal time intervals plus compound interest rate – annuity but time intervals of payments not equal to compounding periods thus change compound interest rate from quarterly to monthly.
\[ j_n = n \left( \left( 1 + \frac{j_m}{m} \right)^{\frac{m}{n}} - 1 \right) \]

\[ = 12 \left( 1 + \frac{0.0775}{4} \right)^{\frac{12}{4}} - 1 \]

\[ = 0.07700. \]

Thus

\[ S = Rs \bar{s}_{\bar{m}_t} \]

\[ = 1200s_{10 \times 12}^{0.077} \]

\[ = R215\,899.01. \]

Option [2]


\[ S = Pe^{ct} \]

\[ S \div P = e^{ct} \]

\[ \ln(S \div P) = \ln e^{ct} \]

\[ \ln(S \div P) = ct \ln e \]

\[ \frac{\ln(S \div P)}{t} = c \]

Option [5]

15. Identification: Payments that are made on equal time periods but payments increase each time period with a constant amount – increasing annuity.

\[ S = \left( R + \frac{Q}{i} \right) s_{\bar{m}_t} - \frac{nQ}{i} \]

\[ = \left( 3\,600 + \frac{360}{0.110} \right) s_{20|0.10} - \frac{20(360)}{0.1} \]

\[ = R340\,379.99 \]

\[ \approx R340\,380. \]

Option [2]

\[ A = Ra_{\frac{i}{m}} \]
\[ = 25000a_{\frac{0.169}{6 \times 6}} \]
\[ = \text{R}561\,047.91. \]

Option [4]

17. Identification: Moving money back in time – time value of money and compound interest.

\[ P = \frac{S}{(1 + \frac{j}{m})^{tm}} \]
\[ = \frac{\text{R}561\,047.91}{(1 + \frac{0.169}{6})^{5 \times 6}} \]
\[ = \text{R}243\,834.05. \]

Option [4]

18. Identification: Equal amount’s deposited in equal time periods + payments made immediately – annuity due.

\[ S = (1 + i)Rs_{\frac{i}{m}} \]
\[ = (1 + \frac{0.124}{12})5000s_{\frac{4}{12}}^{0.124} \]
\[ = \text{R}311\,882.75. \]

Amount needed still:
\[ = 350\,000 - 311\,882.75 \]
\[ = \text{R}38\,117.25. \]

Option [1]

\[ S = Rs \bar{m}_i \]
\[ 275\,000 = Rs \bar{m}_{5\times2|0.14} \]
\[ R = R19\,903.81 \]
\[ R \approx R19\,904. \]

Option [3]


\[ A = \text{payment} \]
\[ \text{Interest + principal repaid} = 3081.86 + 1119.21 \]
\[ = R4\,201.07. \]

Option [5]


Using your calculator:

\[ IRR = 15.23893\% \]
\[ \approx 15.24\%. \]

Option [5]

22. Identification: Equal payments in equal time intervals – annuity or armotisation

\[ A = R \bar{a}_{\bar{m}_i} \]
\[ = 5311.69a_{\frac{20}{12}\,1.075} \]
\[ = 559\,999.54 \]
\[ \approx R560\,000. \]

Option [3]

23. Identification: Percentage calculation.

\[ 560\,000 = 80\% \]
\[ \frac{560\,000}{1} \times \frac{100}{80} = R700\,000. \]

Option [4]
24. Identification: Total real cost

Total real cost = \( PV \) of annuity using inflation rate – \( PV \) of annuity

\[
PV = 5311.69 \times 12^{0.0467}
\]

\[
 = 827543.12.
\]

Real cost = \( 827543.12 - 560000 \)

\[
 = R267543.13.
\]

Option [2]

25. Identification: Correlation coefficient.

Using your calculator:

\[ r = -0.98185. \]

Option [2]


Using your calculator:

intercept \( a = 1021.13 \)

slope \( b = -207.59 \)

Option [1]

27. Identification: Bond

\[ n = 22.5 \text{ years} \]

\[
 = 22 \times 2 + 1
\]

\[
 = 44 + 1 = 45
\]
\[ P = da_{\overline{m}|z} + 100(1 + z)^{-n} \]
\[ = \frac{9.75}{2}a_{\overline{45}|0,1125/2} + 100 \left( 1 + \frac{0.1125}{2} \right)^{-45} \]
\[ = 87,80282 \]

Add coupon as number of days > 10 days between settlement date and next coupon date.

\[ 87,80282 + 4,8785 \]
\[ = 92,67782\% . \]

Move value to 15 Nov’12: \( R = 15 \text{ Nov’12} - 7 \text{ Feb’13} = 84 \)
\( H = 7 \text{ Aug’12} - 7 \text{ Feb’13} = 184 \)

Thus all-in-price is:

\[ 92,67782 \left( 1 + \frac{0.1125}{2} \right)^{\frac{84}{184}} \]
\[ = 90,39112\% . \]

Option [4]

28. Identification: Bond

\[ 107,55174 = da_{\overline{29}|0,135} + 100 \left( 1 + \frac{0.135}{2} \right)^{-29} \]
\[ 107,55174 - 100 \left( 1 + \frac{0.135}{2} \right)^{-29} = da_{\overline{29}|0,135} \]
\[ 92,50885 = da_{\overline{29}|0,135} \]

This looks like an annuity formula, thus use your calculator’s financial mode with \( 92,50885 = PV; N = 29; P/Y = 2; I/Y = 13.5 \) and solve for your payment which is \( d. \ c/2 = d = 7,35\% . \)

Option [2]

29. Identification: Profitability index Typing error in answers – Question ignored in October/November 2012 exams.

\[ PI = \frac{NPV + \text{initial}}{\text{initial}} \]
\[ 1,0514 = \frac{25,700 + x}{x} \]
\[ 1,0514x = 25,700 + x \]
\[ 0,0514x = 25,700 \]
\[ x = 500,000 . \]

30. Identification: \( NPV; PI \) and \( IRR \)
<table>
<thead>
<tr>
<th>Investment A</th>
<th>Investment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$NPV &lt; 0$ reject</td>
<td>$NPV &gt; 0$ accept</td>
</tr>
<tr>
<td>$PI &lt; 1$ reject</td>
<td>$PI &gt; 1$ accept</td>
</tr>
<tr>
<td>$IRR &lt; K$ reject</td>
<td>$IRR &gt; K$ accept</td>
</tr>
</tbody>
</table>

Accept Invest B

Option [2]