Chapter 2: Time Value of Money  
Practice Problems

**FV of a lump sum**

i. A company’s 2005 sales were $100 million. If sales grow at 8% per year, how large will they be 10 years later, in 2015, in millions?

**PV of a lump sum**

ii. Suppose a U.S. government bond will pay $1,000 three years from now. If the going interest rate on 3-year government bonds is 4%, how much is the bond worth today?

**Interest rate on a simple lump sum investment**

iii. The U.S. Treasury offers to sell you a bond for $613.81. No payments will be made until the bond matures 10 years from now, at which time it will be redeemed for $1,000. What interest rate would you earn if you bought this bond at the offer price?

**Number of periods**

iv. Addico Corp’s 2005 earnings per share were $2, and its growth rate during the prior 5 years was 11.0% per year. If that growth rate were maintained, how long would it take for Addico’s EPS to double?

**PV of an ordinary annuity**

v. You have a chance to buy an annuity that pays $1,000 at the end of each year for 5 years. You could earn 6% on your money in other investments with equal risk. What is the most you should pay for the annuity?

**Payments on an annual annuity**

vi. Suppose you inherited $200,000 and invested it at 6% per year. How much could you withdraw at the end of each of the next 15 years?
Payments on a monthly annuity

vii. You are buying your first house for $220,000, and are paying $30,000 as a down payment. You have arranged to finance the remaining $190,000 30-year mortgage with a 7% nominal interest rate and monthly payments. What are the equal monthly payments you must make?

PV of a perpetuity

viii. What’s the present value of a perpetuity that pays $100 per year if the appropriate interest rate is 6%?

Rate of return on a perpetuity

ix. What’s the rate of return you would earn if you paid $1,500 for a perpetuity that pays $105 per year?

PV of an uneven cash flow stream

x. At a rate of 8%, what is the present value of the following cash flow stream? $0 at Time 0; $100 at the end of Year 1; $300 at the end of Year 2; $0 at the end of Year 3; and $500 at the end of Year 4?
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
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<tbody>
<tr>
<td>i. FV of a lump sum</td>
<td>Answer: e EASY</td>
</tr>
<tr>
<td>ii. PV of a lump sum</td>
<td>Answer: c EASY</td>
</tr>
<tr>
<td>iii. Interest rate on a simple lump sum investment</td>
<td>Answer: e EASY</td>
</tr>
<tr>
<td>iv. Number of periods</td>
<td>Answer: a EASY</td>
</tr>
<tr>
<td>v. PV of an ordinary annuity</td>
<td>Answer: c EASY</td>
</tr>
<tr>
<td>vi. Payments on an ordinary annuity</td>
<td>Answer: c EASY</td>
</tr>
</tbody>
</table>

### i. FV of a lump sum
- **N**: 10
- **I/YR**: 8%
- **PV**: -$100.00
- **PMT**: $0.00
- **FV**: $215.89

### ii. PV of a lump sum
- **N**: 3
- **I/YR**: 4%
- **PV**: $889.00
- **PMT**: $0
- **FV**: -$1,000.00

### iii. Interest rate on a simple lump sum investment
- **N**: 10
- **I/YR**: 5.00%
- **PV**: -$613.81
- **PMT**: $0
- **FV**: $1,000.00

### iv. Number of periods
- **N**: 6.64
- **I/YR**: 11.00%
- **PV**: -$2.00
- **PMT**: $0
- **FV**: $4.00

### v. PV of an ordinary annuity
- **N**: 5
- **I/YR**: 6.00%
- **PV**: $4,212.36
- **PMT**: -$1,000
- **FV**: $0.00

### vi. Payments on an ordinary annuity
- **N**: 15
- **I/YR**: 6.00%
- **PV**: -$200,000
- **PMT**: $20,592.55
- **FV**: $0.00
vii. Mortgage payments

Answer: c MEDIUM

<table>
<thead>
<tr>
<th>N</th>
<th>360</th>
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<tbody>
<tr>
<td>I</td>
<td>0.5833%</td>
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<tr>
<td>PV</td>
<td>$190,000</td>
</tr>
<tr>
<td>PMT</td>
<td>-$1,264</td>
</tr>
<tr>
<td>FV</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

viii. PV of a perpetuity

Answer: e EASY

| I/YR | 6.00%       |
| PMT  | $100        |
| PV   | $1,666.67   |

Divide PMT by I.

ix. Rate of return on a perpetuity

Answer: b EASY

| Cost (PV) | $1,500 |
| PMT       | $105   |
| I/YR      | 7.00%  |

Divide PMT by Cost.

x. PV of an uneven cash flow stream

Answer: a EASY

| I/YR = 8% |
| CFs:      |
| $0 | $100 | $300 | $0 | $500 |
| PV of CFs:|
| $0 | $92.59 | $257.20 | $0 | $367.51 |

PV = $717.31
PV = $717.31

Find the individual PVs and sum them.

Automate the process using Excel or a calculator, by inputting the data into the cash flow register and pressing the NPV key.