**Problems – Cost & Feasibility**

**PROBLEMS - COST APPROACH**

1. The subject is an office building situated on "2.5 acres", according to the owner. A legal description was provided as follows:
   
   Beginning at a point at the northeast corner of the ROW line of Third and Main Street,
   
   Thence N 280';
   
   Thence E 400';
   
   Thence S 280';
   
   Thence W 400' to the Point of Beginning.
   
   Save and except a 20 foot fee strip along the eastern boundary line, transferred to XYZ Light Co. by recorded deed.

   The land value is estimated to be worth $4.50 psf.

   The building is a four-story structure with 75,000 square feet, which cost $70 per square foot to construct, 4 years earlier, including indirect costs. The cost included the cost of the parking lot.

   The parking lot is in need of repair and is estimated to cost $30,000, as of the date of the appraisal. Short-lived items include roof (15 year life), A/C equipment (10 year life), carpet (5 year life) and "other" (10 year life). The costs to replace are $50,000, $45,000, $150,000, and $200,000 respectively.

   At the time the building was constructed, the cost index was 110, and currently is 145. The replacement cost of the building is currently $85 per square foot, which would include a typical parking lot. The building was constructed with a foundation to accommodate a larger building. Additionally, the parking lot is twice as big as needed and cost $190,000 when constructed and currently would cost $250,000 if included in reproduction cost, today. The difference between replacement and reproduction cost is the excess foundation and parking area. The additional lighting and security requirement is an extra $1,000 per month for the excess parking. The cost to remove the excess parking (and to landscape) would be $60,000. No other obsolescence is noted.

   The improvements have an effective age of 4 years, a total estimated economic life of 40 years, and a total estimated physical life of 60 years.

   **What is the indicated value of the property assuming a discount rate of 12% was used to value the cash flows in the income approach?**

   **Show a replacement and reproduction cost schedule.**

2. An office/warehouse was constructed 3 years ago for $25 psf for direct costs. The land was purchased for $250,000, and the building contained 30,000 sf. At the time the building was constructed, the eave height could have been raised from the existing 12' to 16' for a cost of an extra $3.50 psf of building area. Currently, the cost would be $5.00 psf more. Additionally, the property, "as is", would cost $30 psf, direct costs only, to build today.

   Construction interest was let out in four level draws over a 4 month construction period and was based upon 80% of cost, excluding interest.

   Assume the following:

   (1) Construction interest based upon 1% per month of the outstanding balance, assume interest is compounded.

   (2) Physical curable depreciation = $10,000

   (3) Cost of short-lived items - $20,000; depreciation = $2,000

   (4) Indirect costs (other than interest) = 15% of direct costs

   (5) Additional market rent if 16' eave = $.04/month

   (6) Rg = 10%

   (7) Effective age = 2 years; total physical life = 40 years

   (8) No change in land value over the holding period.

   **Prepare a Cost Approach Schedule.**
3. LAND VALUATION - ALLOCATION METHOD

<table>
<thead>
<tr>
<th>Data #</th>
<th>Land Value</th>
<th>Replacement Cost</th>
<th>Profit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$22,000</td>
<td>$68,000</td>
<td>$10,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>2</td>
<td>$26,000</td>
<td>$81,000</td>
<td>$13,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>3</td>
<td>$28,000</td>
<td>$122,000</td>
<td>$30,000</td>
<td>$180,000</td>
</tr>
<tr>
<td>4</td>
<td>$48,000</td>
<td>$127,000</td>
<td>$25,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>5</td>
<td>$60,000</td>
<td>$150,000</td>
<td>$30,000</td>
<td>$240,000</td>
</tr>
<tr>
<td>6</td>
<td>$65,000</td>
<td>$143,000</td>
<td>$32,000</td>
<td>$240,000</td>
</tr>
</tbody>
</table>

(1). Should a portion of the profit be allocated to land before a ratio of land to total value is derived?
   a. Yes
   b. No

(2). What is the indicated value of a site if it is determined that a property may be sold for $150,000?
   a. $28,500
   b. $33,000
   c. $37,500
   d. $40,000

4. LAND VALUATION - EXTRACTION

The subject property is a 10 year old warehouse with a remaining economic life of 30 years. A comparable warehouse in the area sold for $250,000. The comparable is identical to the subject in all respects except the effective age of the comparable improvements is 20 years. The replacement cost of the comparable is $200,000. What is the indicated value of the comparable land?
   a. $50,000
   b. $100,000
   c. $150,000
   d. $183,333

5. LAND VALUATION - SUBDIVISION DEVELOPMENT

A 50 acre site is on the market for $3,000,000. A developer believes that 250 single family lots can be sold for $25,000 per lot over a three year period. Marketing and commission costs are estimated to be 7% of sales. Development costs are estimated at $25,000 per acre and will be incurred in year one. Assume taxes to be $25,000 in year one, $20,000 in year two and $10,000 in year three. The "typical" developer's overhead and profit for the area is 20% of retail sales.

(1). Given a discount rate of 13% and annual accounting, what is the indicated value of the raw land?
   a. $2,800,000
   b. $3,000,000
   c. $2,250,000
   d. $2,400,000

(2). If a loan was given for 80% of land value, should a line item for interest be included?
   a. Yes
   b. No
Problem 1.

Land Value:

\[
280' \times 380' = 106,400 \text{ sf. (2.4426 Acres)}
\]
\[
\times \$4.50
\]
\[
\frac{}{\text{----------}}
\]
\[
\$478,800
\]

SCHEDULES - Problem 1 cont.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Replacement Cost</th>
<th>Reproduction Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$6,375,000</td>
<td>$6,920,455</td>
</tr>
<tr>
<td>Less: Depreciation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curable</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Incurable Short-Lived</td>
<td>231,333</td>
<td>231,333</td>
</tr>
<tr>
<td>Incurable Long-Lived</td>
<td>394,333</td>
<td>430,697</td>
</tr>
<tr>
<td>Functional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curable</td>
<td>60,000</td>
<td>176,625</td>
</tr>
<tr>
<td>Incurable</td>
<td>$Ø</td>
<td>$392,425</td>
</tr>
<tr>
<td>External</td>
<td>$Ø</td>
<td>$Ø</td>
</tr>
<tr>
<td>Total Depreciation</td>
<td>$700,666</td>
<td>$1,246,080</td>
</tr>
<tr>
<td>Contributory Value of Improvements</td>
<td>$5,674,000(R)</td>
<td>$5,674,000(R)</td>
</tr>
<tr>
<td>+ Land Value</td>
<td>478,800</td>
<td>478,800</td>
</tr>
<tr>
<td>Total</td>
<td>$6,152,800</td>
<td>$6,152,800</td>
</tr>
</tbody>
</table>
CALCULATIONS - Problem 1 cont.

Replacement Cost = 75,000 sf. x $85 = $6,375,000
Reproduction Cost = 75,000 sf. x ($70 x 145/110) = $6,920,455

Physical Curable: $30,000 x 1/2 lot = $15,000

Physical Incurable Short-Lived:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>x</th>
<th>Age/Life</th>
<th>=</th>
<th>Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>$50,000</td>
<td>x</td>
<td>4/15</td>
<td>=</td>
<td>$13,333</td>
</tr>
<tr>
<td>A/C Equip.</td>
<td>$45,000</td>
<td>x</td>
<td>4/10</td>
<td>=</td>
<td>$18,000</td>
</tr>
<tr>
<td>Carpet</td>
<td>$150,000</td>
<td>x</td>
<td>4/5</td>
<td>=</td>
<td>$120,000</td>
</tr>
<tr>
<td>Other</td>
<td>$200,000</td>
<td>x</td>
<td>4/10</td>
<td>=</td>
<td>$80,000</td>
</tr>
</tbody>
</table>

$445,000           $231,333

Physical Incurable Long-Lived:

Replacement: ($6,375,000 - 15,000 - 445,000) x 4/60 = $394,333
Reproduction: ($6,920,455 - 15,000 - 445,000) x 4/60 = $430,697

Functional Curable:

[Note: PV of $1,000/mo. 36 years x 12 months, @ 12% = $98,641]

Replacement: $60,000

Reproduction: (125,000 - (125,000 x 4/60)+ 60,000) = $176,625

Functional Incurable:

Replacement Cost = $0 [Because no cost of added ownership]
Reproduction Cost =

$6,920,455

-6,375,000

$545,455 [Foundation & Parking]

-125,000 [Parking]

$420,455 [Foundation]

-28,030 [Depreciation Charged: 4/60 x $420,455]

$392,425 Functional Incurable

External: None
COST SCHEDULE - Problem 2

Computations:

1. Direct Cost = 30,000 sf x $30 = $900,000
2. Indirect Cost (other than interest) = $135,000
3. Total Direct & Indirect (other than interest) = $1,035,000

(4) Construction Interest:

<table>
<thead>
<tr>
<th>Month</th>
<th>Land (80%)</th>
<th>+</th>
<th>Indirect (80%)</th>
<th>+</th>
<th>Interest</th>
<th>=</th>
<th>Total Drawn</th>
<th>x</th>
<th>Rate</th>
<th>=</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$200,000</td>
<td>+</td>
<td>$207,000</td>
<td>+</td>
<td>$0</td>
<td>=</td>
<td>$407,000</td>
<td>x</td>
<td>.01</td>
<td>=</td>
<td>$4,070</td>
</tr>
<tr>
<td>2</td>
<td>200,000</td>
<td>+</td>
<td>414,000</td>
<td>+</td>
<td>4,070</td>
<td>=</td>
<td>618,070</td>
<td>x</td>
<td>.01</td>
<td>=</td>
<td>6,181</td>
</tr>
<tr>
<td>3</td>
<td>200,000</td>
<td>+</td>
<td>621,000</td>
<td>+</td>
<td>10,251</td>
<td>=</td>
<td>831,251</td>
<td>x</td>
<td>.01</td>
<td>=</td>
<td>8,313</td>
</tr>
<tr>
<td>4</td>
<td>200,000</td>
<td>+</td>
<td>828,000</td>
<td>+</td>
<td>18,564</td>
<td>=</td>
<td>1,046,564</td>
<td>x</td>
<td>.01</td>
<td>=</td>
<td>10,466</td>
</tr>
</tbody>
</table>

(5) Total Reproduction Cost = $1,064,070

(6) Functional Obsolescence:

$(.04 x 12) ÷ .10 = $4.80 psf additional value as opposed to $5.00 psf cost. Therefore, no functional obsolescence because the added height is not feasible in new construction.

COST APPROACH

Reproduction Cost $1,064,070
Less: Depreciation

<table>
<thead>
<tr>
<th></th>
<th>$10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Curable</td>
<td>$1,064,070</td>
</tr>
<tr>
<td>Physical Incurable (long-lived)</td>
<td>(10,000)</td>
</tr>
<tr>
<td>Total Depreciation</td>
<td>(20,000)</td>
</tr>
</tbody>
</table>

$1,034,070

x 3/40

$77,555

Physical Incurable (short-lived) $2,000

Total Depreciation $(89,555) $974,515

Plus: Land Value 250,000

Indicated Value $1,224,515

3. LAND VALUATION - ALLOCATION METHOD

<table>
<thead>
<tr>
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<th>Replacement Cost</th>
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<th>Value</th>
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<td>1</td>
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<td>$10,000</td>
<td>$100,000</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>$26,000</td>
<td>$81,000</td>
<td>$13,000</td>
<td>$120,000</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>$28,000</td>
<td>$122,000</td>
<td>$30,000</td>
<td>$180,000</td>
<td>16</td>
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<td>4</td>
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<td>$127,000</td>
<td>$25,000</td>
<td>$200,000</td>
<td>24</td>
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<tr>
<td>5</td>
<td>$60,000</td>
<td>$150,000</td>
<td>$30,000</td>
<td>$240,000</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>$65,000</td>
<td>$143,000</td>
<td>$32,000</td>
<td>$240,000</td>
<td>27</td>
</tr>
</tbody>
</table>

Sale 3 was omitted by judgment because it is an outlier and not explained by the other comparables. The other comparables seem to explain the market. Appraisers must be able to omit as well as include data to make judgment calls concerning value.
(1). Should a portion of the profit be allocated to land before a ratio of land to total value is derived?
a. Yes
b. No
   No, profit is attributed to the improvements only.

(2). What is the indicated value of a site if it is determined that a property may be sold for $150,000?
a. $28,500
b. $33,000
   The best answer is probably $34,500 (23%) which is closest to b.
c. $37,500
   The solution assumed that it was reasonable to delete the 16%
d. $40,000
   indication of data 3 because it was outside of the range of sales.

4. LAND VALUATION - EXTRACTION
The subject property is a 10 year old warehouse with a remaining economic life of 30 years. A comparable
warehouse in the area sold for $250,000. The comparable is identical to the subject in all respects except the
effective age of the improvements is 20 years. The replacement cost of the comparable is $200,000. What is the
indicated value of the comparable land?
a. $ 50,000
b. $100,000
c. $150,000
   $250,000 - ($200,000 x 20/40)]
d. $183,333

5. LAND VALUATION - SUBDIVISION DEVELOPMENT
A 50 acre site is on the market for $3,000,000. A developer believes that 250 single family lots can be sold for
$25,000 per lot over a three year period. Marketing and commission costs are estimated to be 7% of sales.
Development costs are estimated at $25,000 per acre and will be incurred in year one. Assume taxes to be $25,000
in year one, $20,000 in year two and $10,000 in year three. The "typical" developer's overhead and profit for the
area is 20% of retail sales.

(1). Given a discount rate of 13% and annual accounting, what is the indicated value of the raw land?
a. $2,800,000
b. $3,000,000
c. $2,250,000
d. $2,400,000

Sales per year = 250 x $25,000 ÷ 3 = $2,083,333

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales: $2,083,333</th>
<th>1</th>
<th>$2,083,333</th>
<th>2</th>
<th>$2,083,333</th>
<th>3</th>
<th>$2,083,333</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expenses:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td>25,000</td>
<td>20,000</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing/comm. (7%)</td>
<td>145,833</td>
<td>145,833</td>
<td>145,833</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td>1,250,000</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dev OH &amp; Profit (20%)</td>
<td>416,666</td>
<td>416,666</td>
<td>416,666</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Net Proceeds | 245,834 | 1,500,834 | 1,510,834 |

f CLR REG
245,834 g CFj
1,500,834 g CFj
1,510,834 g CFj
13 i
f NPV [Display: 2,440,009]
PV at 13% = $2,440,009, therefore the best answer is d.

(2). If a loan was given for 80% of land value, should a line item for interest be included?
a. Yes
b. No
   No, any interest would be included in the discount rate.
COST APPROACH PROBLEM

Problem:
Base Cost $45 psf  
Height Multiplier 1.05  
Regional Multiplier .92  
Profit 15% of cost  
Land value $2.00 psf  
Building area 20,000 sf  
Land area 4.5 acres  
Physical curable due to painting $20,000  

Short-lived items:
<table>
<thead>
<tr>
<th>Item</th>
<th>Age</th>
<th>Life</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet</td>
<td>8</td>
<td>8</td>
<td>$15,000</td>
</tr>
<tr>
<td>Carpet</td>
<td>5</td>
<td>8</td>
<td>$20,000</td>
</tr>
<tr>
<td>Roof</td>
<td>8</td>
<td>15</td>
<td>$40,000</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>10</td>
<td>$60,000</td>
</tr>
</tbody>
</table>

Remaining life = 38 years.

A rent loss is experienced because of externalities. The site would have sold for $2.25 psf except for the externalities. The total loss in rent is 24.5¢ psf per year. The overall rate is 10%.

1. What is the reproduction cost?
2. What is the physical curable depreciation?
3. What is the physical incurable depreciation?
4. What is the physical incurable short-lived depreciation?
5. What is the external obsolescence to the buildings?
6. What is the value?

SOLUTIONS – COST APPROACH PROBLEM

| Cost: $45 psf x 1.05 x .92 x 1.15 (profit) x 20,000 sf = | $999,810 |
| Depreciation: | Physical curable - paint (20,000) & carpet (15,000) (35,000) |
|               | Physical incurable short-lived: |
| ITEM         | COST  | AGE | LIFE | DEPRECIATION |
| Carpet       | $20,000 | 5   | 8    | $12,500      |
| Roof         | $40,000 | 8   | 15   | $21,333      |
| Other        | $60,000 | 8   | 10   | $48,000      |
| Totals       | $120,000 |     |     | $81,833      |

Total physical incurable short-lived: $(81,833)

Physical incurable long-lived:  
($999,810 - 35,000 - 120,000) x 8/46 = (146,923)

Total Physical Depreciation: ($263,756)

Value of improvements: $736,054

Value of site (4.5 acres x 43,560 x $2.00 psf): $392,040

Total value via cost approach: $1,128,094

1. $999,810  
2. $35,000  This includes the painting plus the 100% depreciated carpet.  
3. $228,756  This includes the physical incurable short-lived ($81,833), plus the long-lived items ($146,923).  
4. $81,833  
5. The total loss due to external forces is $.245 psf x 20,000 divided by 10% = $49,000 (this results in loss to the property because the rent loss is overall and the capitalization rate is an overall rate). The loss to the land is 25¢ psf x 4.5 acres x 43,560 sf = $49,000. Therefore, the loss to the buildings is $0. There are external losses that are totally in the land as a location adjustment. This appears to be one of them. In summary, the total loss to the property (land and building) is $49,000. The loss to land is $49,000. The loss to the building has to be $0, and external obsolescence by definition is loss to improvements due to outside forces.  
6. $1,128,094
Depreciation Problems - Breakdown Method

Reproduction Cost $1,000,000

Physical Curable

Paint $10,000
Appliance replacements $20,000

Short-lived items

Total cost = $100,000
Depreciation = $45,000

Actual age 10 years
Remaining physical life 40 years

Obsolescence concerns: (Assume all items below are in physical incurable long-lived)

1. Curable, requiring an addition. Example - Needs a sprinkler system (new fire code), cost to add = $45,000. Cost in new construction if the building was being built new = $25,000.

2. Curable, requiring substitution. Example - A playground area needs to be replaced with a volleyball court area. (Change of tenant mix). The playground cost $10,000. It will cost $2,000 to take away, there is $500 in salvage value for the equipment, and the volleyball court area will cost $1,000 to build. Net rents will increase enough to justify.

3. Curable, super adequacy. Example - A swimming pool cost $30,000 in new construction, would cost $4,000 to fill and landscape over it, adds $500 to expenses each year (RB = 11%), and adds nothing to rents or occupancy. There is $250 in salvage value to the pool equipment.

4. No functional, but there is a rent loss - Net income could be increased $4,000 if a recreation building were built for a cost of $50,000, including exercise equipment. The building would have cost $48,000 if built during original construction, as of the date of the appraisal. (This is the example of no functional obsolescence, see calculations following).

5. Incurable, deficiency (item not in the building) - The apartment could use an elevator for the second floor. Rents are affected, net $5,000 per year. The elevator would have cost $30,000 if the property was being built, but would cost $70,000 to add to the existing structure.

6. Incurable, deficiency (item in the building) - The club room has inadequate air-conditioning and therefore does not rent for parties as much as other rec rooms in the area. The lost income is $600 per year, the existing A/C unit cost $3,000 in new construction and would currently cost $10,000 to replace and redo the duct system. The proper A/C unit in new construction would have cost $5,000.

7. Incurable, superadequacy - The apartments have covered parking that cost $34,000 in new construction. The income is affected, net $2,000 per year (positively). The cost to tear down the covered parking would be $10,000.

8. Incurable, superadequacy - The apartments also have hallways that are too large, compared to market standards and cost $5,000 more in new construction than smaller hallways. In addition, the extra utility bills and maintenance contribute $1,100 in expenses per year over and above what smaller hallways would cost.

9. External - The market is soft and net income is depressed $20,000. The market is expected to recover fully in 5 years. The Ro = 10% and Y = 14%. Assume a land-to-value ratio of 20% and that the land value is depressed $40,000 because of the poor market.

10. External - The apartments are next to an industrial plant and the net rents are affected $3,500 per year. The land is losing $35,000 in value because of its proximity to the plant.
## Solutions - DEPRECIATION PROBLEMS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical curable</td>
<td>$30,000</td>
</tr>
<tr>
<td>Physical incurable short-lived</td>
<td>45,000</td>
</tr>
<tr>
<td>Physical incurable long-lived ($1,000,000 - 30,000 - 100,000) x 10/50</td>
<td>174,000</td>
</tr>
</tbody>
</table>

### Functional

1. **Cost of existing item**: 0
   - **Less depreciation previously charged**: 0
     - **Cost to cure (all costs)**: $45,000
       - or
       - **Value of the loss**: $25,000
         - **Less cost if installed new**: $20,000
           - **Indicated obsolescence (Sprinkler system)**: $20,000

2. **Cost of existing item**: $10,000
   - **Less depreciation previously charged**: $2,000
     - **Cost to cure (all costs)**: $2,500
       - or
       - **Value of the loss**: $2,500
         - **Less cost if installed new**: $2,500
           - **Indicated obsolescence (Playground to Volley ball)**: $10,500

3. **Cost of existing item**: $30,000
   - **Less depreciation previously charged**: $6,000
     - **Cost to cure (all costs)**: $3,750
       - or
       - **Value of the loss**: $3,750
         - **Less cost if installed new**: $3,750
           - **Indicated obsolescence**: $27,750

   **Note:** The rental loss is $500/.11=$4,545. This indicates that it is curable (The present value of the loss exceeds the cost to cure), and is no longer an expense when the pool is filled.

4. **Cost of existing item**: 0
   - **Less depreciation previously charged**: 0
     - **Cost to cure (all costs)**
       - or
       - **Value of the loss**: $36,364
         - **Less cost if installed new**: $48,000
           - **Indicated obsolescence**: $0

   **Notice the result of using the functional format would be a negative number. This is an example of a rent loss that is in fact no obsolescence. The present value of the building would be $4,000/.11=$36,364, but $50,000 would have to be spent to get the income. Therefore, there is no obsolescence. The cost was not reflected in reproduction cost and the building should not be built.**

5. **Cost of existing item**: 0
   - **Less depreciation previously charged**: 0
     - **Cost to cure (all costs)**
       - or
       - **Value of the loss ($5,000/.11)**: $45,455
         - **Less cost if installed new**: $30,000
           - **Indicated obsolescence (no elevator)**: $15,455

   **The loss to the building is $45,455, but the reproduction cost already is lower because the cost of the elevator was not included in the cost. Therefore, the functional obsolescence is the difference. The $70,000 cost to add is only used to determine that the obsolescence was in fact incurable because it would not be prudent to spend $70,000 to make $45,455.**
6. Cost of existing item
   Less depreciation previously charged ($3,000 x 10/50)  
   plus 
   Cost to cure (all costs)  
   or 
   Value of the loss ($600/.11)  5,455  
   Less cost if installed new  2,000  
   Indicated obsolescence (rec room A/C)  $3,455  
   The A/C cost $2,000 less than the needed size in new construction and loses $5,455 on a present value basis.  
   Therefore, the property loses net $3,455, which is the difference between the added cost and the PV of the rents.

7. Cost of existing item  $34,000  
   Less depreciation previously charged ($34,000 x 10/50)  -6,800  
   plus 
   Cost to cure (all costs)  
   or 
   Value of the loss (gain - $2,000/.11)  (18,182)  
   Less cost if installed new  
   Indicated obsolescence (covered parking)  $9,018  
   The covered parking cost $34,000, but only contributes $18,182 to value.  Therefore, it is functional superadequacy.  
   The cost to remove would be $10,000, but no prudent owner would spend money to take away something that contributes to value.  The format does not particularly fit for this type of problem, except the loss is a gain and therefore a subtraction to cost.  The net affect of the calculation above is to give the covered parking the worth and not the cost of the item.  $34,000 - 6,800, 9,018 = $18,182 which is the calculated value of the item.

8. Cost of existing item  $5,000  
   Less depreciation previously charged  -1,000  
   plus 
   Cost to cure (all costs)  
   or 
   Value of the loss ($1,100/.11)  10,000  
   Less cost if installed new  
   Indicated obsolescence (large hallways)  $14,000  
   The indicated range is $34,331 to $60,000, which is significantly below the $200,000 indicated by using the overall rate.  You should be able to find a reasonable answer on the examination within the range no matter what your assumptions, the indicated present value of loss is significantly less than capitalizing the stream with an overall capitalization rate.

9. Total loss to land & buildings using the overall capitalization rate and total rent loss: $20,000/.10 = $200,000  
   However, this would grossly overstate the loss over the 5 year period.  The loss is $20,000 in year one and should decline over the next 5 years until there is no loss.  The pattern is reasonably derived to be as follows:
   Year 1  $20,000  
   Year 2  $17,500  
   Year 3  $15,000  
   Year 4  $10,000  
   Year 5  $5,000  
   Note: The above cash flows were purely made up from judgment that the loss will decline over the 5 years as the market recovers.  The present value discounted at 14% is $49,652.  Another theory holds to discount the negative cash flows at a safe rate.  The present value at 5% is $60,000.  One could also discount a level income of $20,000 / 2 = $10,000 to present value under the theory that in income stream beginning at $20,000 and decreasing to $0 over five years will be on average $10,000.  The present value at 14% is $34,331 and at 5% is $43,295.  The indicated range is $34,331 to $60,000, which is significantly below the $200,000 indicated by using the overall rate.  You should be able to find a reasonable answer on the examination within the range no matter what theory you hold to.  The main point is - DO NOT USE AN OVERALL CAPITALIZATION RATE FOR A LOSS IN INCOME OVER A DEFINED SHORT PERIOD OF TIME, USE A DISCOUNT RATE AND DISCOUNT TO PRESENT VALUE.  NO MATTER WHAT YOUR ASSUMPTIONS, THE INDICATED PRESENT VALUE OF LOSS IS SIGNIFICANTLY LESS THAN CAPITALIZING THE STREAM WITH AN OVERALL CAPITALIZATION RATE.
   The external obsolescence to the building is $50,000 - 40,000, or $10,000.

10. The total loss is $3,500/.10 = $35,000, which is also how much the land lost.  Therefore, the allocation is $35,000 to the land and $0 to the improvements.  This is an example of a loss that is all in the site.
Problems – Feasibility

1. A residential lot was purchased for $25,000. The developer can build a house with a market value of $150,000 that would cost $125,000 (direct and indirect costs, only) or could build a house for $180,000 (direct and indirect costs, only) that would have a market value of $200,000, if built. The above costs figures do not include developer's or contractor's profit. Which house should be constructed?

2. A developer is considering two potential sites for development. Site #1 would cost $150,000 and would support a 5,000 square foot retail building that would cost $100 per square foot to build. The potential NOI would be from $60,000 to $65,000 on site #1.

Site #2 would cost $200,000 and would support a retail building of 6,000 square feet that would cost $80 per square foot. Potential net operating income would be from $68,000 to $75,000 on site #2.

Site #1 is expected to be worth $5,000,000 in 30 years (land only) and site #2 is expected to be worth $2,500,000 in 30 years (land only).

Which site should the developer choose assuming level income?

3. Given the following:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$12,000</td>
</tr>
<tr>
<td>2</td>
<td>$14,000</td>
</tr>
<tr>
<td>3</td>
<td>$17,000</td>
</tr>
<tr>
<td>4</td>
<td>$5,000</td>
</tr>
<tr>
<td>5</td>
<td>$11,500</td>
</tr>
<tr>
<td>6</td>
<td>$10,000</td>
</tr>
<tr>
<td>7</td>
<td>$115,000</td>
</tr>
</tbody>
</table>

a. With an investment of $100,000 for the cash flows above, what is the payback period?

b. Assuming a discount rate of 10%, what is the profitability index if $100,000 was paid for the rights to the cash flows?

c. Given a discount rate of 8%, what is the net present value, if $100,000 was paid for the property?

d. Given the net present value calculated above, what would the sales price need to be to achieve the discount rate specified for the net present value calculation?

e. Given a reinvestment rate to the cash flows of 10%, and a $100,000 purchase price, what is the indicated modified internal rate of return?

4. Possible Outcomes

<table>
<thead>
<tr>
<th>Probability</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>100,000</td>
<td>100</td>
</tr>
<tr>
<td>200,000</td>
<td>200</td>
</tr>
<tr>
<td>300,000</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Probability</th>
<th>Utility Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000</td>
<td>25</td>
</tr>
<tr>
<td>150,000</td>
<td>150</td>
</tr>
<tr>
<td>200,000</td>
<td>200</td>
</tr>
</tbody>
</table>

a. What are the expected values of each alternative?

b. What is the utility function of each alternative

c. Which would be the preferred investment?
1. A residential lot was purchased for $25,000. The developer can build a house with a market value of $150,000 that would cost $125,000 (direct and indirect costs, only) or could build a house for $180,000 (direct and indirect costs, only) that would have a market value of $200,000, if built. The above costs figures do not include developer's or contractor's profit. Which house should be constructed?

<table>
<thead>
<tr>
<th>House 1</th>
<th>House 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Price</td>
<td>$150,000</td>
</tr>
<tr>
<td>Cost</td>
<td>$125,000</td>
</tr>
<tr>
<td>Lot Price</td>
<td>$25,000</td>
</tr>
<tr>
<td>Profit (loss)</td>
<td>$Ø</td>
</tr>
</tbody>
</table>

Therefore, neither House 1 or House 2. However, to avoid carrying costs, probably house 1.

2. A developer is considering two potential sites for development. Site #1 would cost $150,000 and would support a 5,000 square foot retail building that would cost $100 per square foot to build. The potential NOI would be from $60,000 to $65,000 on site #1.

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Which site should the developer choose assuming level income?

<table>
<thead>
<tr>
<th>Site 1</th>
<th>Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>$150,000</td>
</tr>
<tr>
<td>+ Cost</td>
<td>$500,000</td>
</tr>
<tr>
<td>Investment</td>
<td>$650,000</td>
</tr>
<tr>
<td>Potential NOI:</td>
<td>$60,000 to $65,000</td>
</tr>
</tbody>
</table>

\[ R_0 = 0.0923 \text{ to } 0.10 \text{ to } 0.1103 \]
\[ Y_0 = 0.120 \text{ to } 0.125 \text{ to } 0.1211 \]

Therefore, site 1, if held for the long-term return.

[Note: Assumes level income]

3. Given the following:

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>4</td>
<td>$5,000</td>
</tr>
<tr>
<td>5</td>
<td>$11,500</td>
</tr>
<tr>
<td>6</td>
<td>$10,000</td>
</tr>
<tr>
<td>7</td>
<td>$115,000</td>
</tr>
</tbody>
</table>

a. With an investment of $100,000 for the cash flows above, what is the payback period?

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-100,000</td>
<td>-100,000</td>
</tr>
<tr>
<td>1</td>
<td>12,000</td>
<td>-88,000</td>
</tr>
<tr>
<td>2</td>
<td>14,000</td>
<td>-74,000</td>
</tr>
<tr>
<td>3</td>
<td>17,000</td>
<td>-57,000</td>
</tr>
<tr>
<td>4</td>
<td>5,000</td>
<td>-52,000</td>
</tr>
<tr>
<td>5</td>
<td>11,500</td>
<td>-40,500</td>
</tr>
<tr>
<td>6</td>
<td>10,000</td>
<td>-30,500</td>
</tr>
<tr>
<td>7</td>
<td>115,000</td>
<td>84,500</td>
</tr>
</tbody>
</table>

Payback Period = 7 years
b. Assuming a discount rate of 10%, what is the profitability index if $100,000 was paid for the rights to the cash flows?

\[
\text{Profitability Index} = \frac{\text{PV of Inflows}}{\text{PV of Outflows}}
\]

<table>
<thead>
<tr>
<th>PV of Inflows</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000 g CF\text{j}</td>
</tr>
<tr>
<td>14,000 g CF\text{j}</td>
</tr>
<tr>
<td>17,000 g CF\text{j}</td>
</tr>
<tr>
<td>5,000 g CF\text{j}</td>
</tr>
<tr>
<td>11,500 g CF\text{j}</td>
</tr>
<tr>
<td>10,000 g CF\text{j}</td>
</tr>
<tr>
<td>115,000 g CF\text{j}</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
10 & \text{i} \\
\text{f NPV} & \longrightarrow 110,465 \\
\end{align*}
\]

\[
\text{Profitability Index} = \frac{110,465}{100,000} = 1.1047
\]

c. Given a discount rate of 8%, what is the net present value, if $100,000 was paid for the property?

\[
\begin{align*}
100,000 & \text{CHS g CF}_0 \\
12,000 & \text{g CF}_j \\
14,000 & \text{g CF}_j \\
17,000 & \text{g CF}_j \\
5,000 & \text{g CF}_j \\
11,500 & \text{g CF}_j \\
10,000 & \text{g CF}_j \\
115,000 & \text{g CF}_j \\
8 & \text{i} \\
\text{f NPV} & \longrightarrow 21,514
\end{align*}
\]

d. Given the net present value calculated above, what would the sales price need to be to achieve the discount rate specified for the net present value calculation?

\[
\$100,000 + 21,514 = \$121,514
\]

e. Given a reinvestment rate to the cash flows of 10%, and a $100,000 purchase price, what is the indicated modified internal rate of return?

\[
\begin{align*}
(1) & \quad 12,000 \text{ g CF}_j \\
(2) & \quad 7 \text{ N} \quad \text{FV} \\
(3) & \quad 100,000 \quad \text{PV} \\
(4) & \quad \text{i} \quad \longrightarrow 11.58\%
\end{align*}
\]
4.  **Possible Outcomes** | **Probability** | **Utility Function**
--- | --- | ---
Alternative 1: | 100,000 | .70 | 100
200,000 | .15 | 200
300,000 | .15 | 300
Alternative 2: | 50,000 | .20 | 25
150,000 | .35 | 150
200,000 | .45 | 200

a. What are the expected values of each alternative?

Alternative 1:  
$100,000 \times .70 = 70,000$
$200,000 \times .15 = 30,000$
$300,000 \times .15 = 45,000$
$145,000$

Alternative 2:  
$50,000 \times .20 = 10,000$
$150,000 \times .35 = 52,500$
$200,000 \times .45 = 90,000$
$152,500$

b. What is the utility function of each alternative?

Alternative 1:  
$100,000 \times .70 \times 100 = 7,000,000$
$200,000 \times .15 \times 200 = 6,000,000$
$300,000 \times .15 \times 300 = 13,500,000$
$26,500,000$

Alternative 2:  
$50,000 \times .20 \times 25 = 250,000$
$150,000 \times .35 \times 150 = 7,875,000$
$200,000 \times .45 \times 200 = 18,000,000$
$26,125,000$

c. Which would be the preferred investment?

Alternative 2, given expected value, and alternative 1, given the utility function.
Mixed Problem Set One

1. What is the modified internal rate of return if $190,000 is invested and the purchaser received $0 for the first year, $25,000 for the second year, $50,000 (third year), $75,000 (fourth year), $125,000 (fifth year) and $45,000 (sixth year) if the cash flows are reinvested at 9%?
   a). 12%
   b). 13%
   c). 14%
   d). 17%

Assume the following for questions 2 - 6:

<table>
<thead>
<tr>
<th>Cost (5 Years earlier):</th>
<th>$55 psf [Direct &amp; Indirect Costs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Index:</td>
<td>5 Years earlier 1.05</td>
</tr>
<tr>
<td>Current</td>
<td>1.30</td>
</tr>
<tr>
<td>Entrepreneurial profit:</td>
<td>5 years earlier 10%</td>
</tr>
<tr>
<td>Current</td>
<td>12%</td>
</tr>
<tr>
<td>Capital additions:</td>
<td>2 years earlier $10,000 [Expanded parking]</td>
</tr>
<tr>
<td>Short lived items:</td>
<td></td>
</tr>
<tr>
<td>Parking</td>
<td>20,000 sf @ $2.00/psf [3 year effective age, 10 year life]</td>
</tr>
<tr>
<td>Carpet</td>
<td>2,000 sf @ $9.00/yd. [5 year effective age, 5 year life]</td>
</tr>
<tr>
<td>Roof</td>
<td>15,000 sf @ $1.50/psf [5 year age, 15 year life]</td>
</tr>
</tbody>
</table>

Building Size: 12,000 sf
Semi-dock can be converted to full dock for $10,000 and this would increase rent by 7.5¢ psf per year.
Office needs painted at $500. [Assume is curable]
Land value: 75,000 sf @ $5.00 psf [The highest and best use has changed to office]
Industrial sites sell for $2.00 to $3.00 psf for similar locations.
The applicable overall rate for similar properties is 11%.
Effective age is 5 years, remaining economic life 25 years, and 35 years remaining physical life.

2. What is the indicated curable physical depreciation?
   a). $2,500
   b). $18,500
   c). $10,500
   d). $500

3. What is the indicated reproduction cost?
   a). $915,200
   b). $932,100
   c). $926,400
   d). $909,850

4. What is the measure of functional curable depreciation?
   a). $10,000
   b). The excess cost to add
   c). None
   d). Cannot be determined from information given.

5. What is the measure of functional incurable depreciation?
   a). $10,000
   b). The excess cost to add
   c). None
   d). Cannot be determined from information given.
6. What is the indicated value via the cost approach assuming only physical depreciation, and excluding all other forms of obsolescence?
   a). 1,140,000
   b). 1,175,000
   c). 800,000
   d). 760,000

7. The difference between value and cost is ......
   a). Depreciation
   b). Accrued depreciation
   c). Obsolescence
   d). Deficiencies

8. The least expensive and quickest method to estimate cost is:
   a). Replacement
   b). Comparative unit.
   c). Unit-in-place
   d). Cost service.

**Use the following to answer questions 9 and 10.**
Height restrictions 30 feet (eave height). (Assume 10' per story)
Building lines:
   (A) Front 30 feet
   (B) Sides 15 feet
   (C) Back 10 feet or height of building (the higher).
Parking:
   Zoning requirement - 10 spaces per 1,000 sf (350 sf needed per space)
   Market - 12 spaces per 1,000 sf
Land Area: 130' deep by 500' feet along street.
Assume parking can be placed on setback lines, but there is no parking within 5 feet of the building, and there is surface parking only. Assume optimal bay depths of 60', and market acceptance of 3 stories.

9. What size building should be built assuming the market can adequately absorb the space?
   a). 14,340
   b). 14,088
   c). 14,000
   d). 14,500

10. What is the square footage of parking that will be placed on the site?
    a). 58,800
    b). 61,220
    c). 65,230
    d). 56,930

11. A loss in value due to an overimprovement of the site during a down cycle in an area is an example of ...
    a). Functional obsolescence
    b). External obsolescence
    c). Negative entrepreneurial profit
    d). No obsolescence

12. Given total employment in an area of 30,000 persons, with a population of 65,000 persons, and occupancy in apartments of 80%. What is the best estimate of growth in population needed to reach stable occupancy if demolition represents .25% of total inventory each year, stabilization is considered to be 95%, and the market is expected to be stable in 5 years?
    a). 15.9%
    b). 7.9%
    c). 37.2%
    d). 17.2%
13. What is the expected value if there is a 20% probability that a reversion will be $1,000,000 and an investor assigns a utility rating of 50 to the possibility of occurrence, 30% probability that a reversion will be $1,200,000 and an investor assigns a utility rating of 150 to the possibility of occurrence, 15% probability that a reversion will be $1,400,000 and an investor assigns a utility rating of 200 to the possibility of occurrence, and 35% probability that a reversion will be $1,600,000 and an investor assigns a utility rating of 250 to the possibility of occurrence?
   a). 400,000,000
   b). 1,300,000
   c). 1,330,000
   d). The expected value cannot be outside of the possible choices and therefore, cannot be determined from the information given.

Use the following to answer questions 14 through 19:
Assume the following:
  Subject: Apartments, 230 Units, 183,000 N.R.A. on 10 acres, all are two-story.
  Actual Cost (5 Years earlier): $60 psf [Direct & Indirect Costs]
  Cost Index: 5 Years earlier 1.15
  Current replacement cost: $75 psf
  Profit = 12% of cost
The subject is in need of both exterior and interior painting. The interior paint is cracking and will cost $20,000 to paint. The subject is also in need of exterior painting because of the purple and green outside trim. The exterior paint is beginning to show signs of age (it is original) normally has an 8 year life, but management has decided to paint because prospective tenants often comment about the poor choice of colors. Short-lived items include carpet (5 year life, 5 year age) for 30 units and 3 year age, for remaining carpets; appliances with 12 year expected life and 5 year age; and a roof of 15 year life (5 year age) that currently costs $70 per square (100 SF/square) to replace (assume two-story with 20% overhang). The remaining economic life of the improvements is 35 years with the remaining physical life 10 years longer. The highest and best use of the land is as "apartment", but the subject is adjacent to an industrial facility. The land value is 5¢ psf less because of the facility. NOI is 1¢ psf less per month and occupancy is currently 95%. The RL is 10%, and RO = 11%. Current costs: carpet $750 per unit; appliances $1,500 per unit; exterior paint $23,000. Do not allocate profit to curable items (or short-lived incurable). Land is worth $1.95 psf.

14. What is the indicated curable physical depreciation?
   a). $42,500 or less
   b). $51,125
   c). $63,000
   d). $65,500 or more

15. What is the current cost index?
   a). 1.2500
   b). 0.9200
   c). 1.4375
   d). Cannot be determined

16. What is the measure of functional obsolescence?
   a). $8,625 or less
   b). $14,375
   c). $20,529
   d). $23,000 or more

17. What is the measure of total physical incurable depreciation?
   a). $273,745
   b). $594,860
   c). $1,473,464
   d). $1,747,209
18. What is the measure of total physical depreciation?
   a). $1,353,782 or less
   b). $1,496,464
   c). $1,473,464
   d). $1,789,709 or more

19. What is the indicated value for the subject via the cost approach?
   a). $13,750,000 or less
   b). $14,000,000
   c). $14,250,000
   d). $15,000,000 or greater

20. Which depreciation method requires an estimate of curable depreciation?
   a). Economic age-life
   b). Modified economic age-life
   c). Extraction from sales comparison
   d). Highest and best use analysis, as improved

21. External obsolescence:
   a). is loss in value due to changing market conditions and preferences.
   b). is always allocated between loss to the site and loss to improvements.
   c). is measured directly from sales.
   d). is always measured with a capitalization rate or yield rate, depending upon the expected time the loss will be incurred.

Use the following to answer questions 22 and 23.
An office building of 50,000 sf is feasible for new construction. The owners would like to know how much additional parking should be built, if any, given the following data. The garage is to be built adjacent to the office building.

1. Space per car = 325 sf if 8.5' width (per space) & 350 sf per space if 9.0' width
2. The rent per space is $70 per month for the 9.0' width, & $64 per month for the 8.5'
3. The office building requires 4 spaces per 1,000 sf of rentable area per zoning and 5 spaces per 1,000 sf of rentable area per the market.
4. Assume an area per floor of 30,000 sf and the maximum height of the garage of 6 floors, including the top deck. The top deck should rent for $10 per month less than the covered floors.
5. Expenses are 30% of income.
6. The direct & indirect cost per square foot for the garage is $12 (assuming an open top deck and two stories), and increases overall 5%, compounded, for every floor added. The land value is currently $250,000.
7. Assume an overall rate of 9.5%, and a building capitalization rate of 50 basis points higher. The market requires entrepreneurial profit of 10%. Rents should increase 5% per year.

22. What size parking garage should be built assuming the market can adequately absorb the parking spaces?
   a). 3-level (including top deck)
   b). 4-level (including top deck)
   c). 5-level (including top deck)
   d). 6-level (including top deck)

23. What floor addition resulted in diminishing returns?
   a). 3rd-level (including top deck)
   b). 4th-level (including top deck)
   c). 5th-level (including top deck)
   d). 6th-level (including top deck)
24. A loss in value due to litigation involving fraudulent construction (use of materials) is an example of...
   a). Functional obsolescence
   b). External obsolescence
   c). Cannot be determined
   d). No obsolescence

25. Given total employment in an area of 1,400,000 persons, office inventory of 175,000,000, occupancy of 80%, and a ratio of one employee per 300 sf. What is the best estimate of years to a stable occupancy (assume stable is 93%), if the space per employee, overall, is expected to shrink to one employee per 250 sf as rents rise, no construction should begin until after the market is 93% occupied, and employment growth is expected to be 7%, compounded per year?
   a). 3 years
   b). 5 years
   c). 8 years
   d). 10 years

26. What is the range of indicated yield to the property, if the garage is built?
   a). 7 to 8.5%
   b). 8.51 to 10%
   c). 10.1 to 11.5%
   d). Greater than 11.5%

27. Should the garage be built?
   a). Yes
   b). No
   c). Yes, if financing can be obtained for less than 10% interest, and 30 year payout.
   d). Cannot be determined from the information given.
Use the following to answer questions 28 - 33:

A building was built in 1986 with materials that were in shortage at the time. The cost was $60 psf for direct costs, including parking and all other direct costs except tenant finish. The building could have been built for $48 psf with substitute materials. Since that time, the materials are no longer in shortage and the cost of the building today would be $58 psf for direct costs, including parking and all other direct costs except tenant finish. The materials originally used are currently the predominant materials used in construction of similar office. The cost index was 178 and is currently 215. Tenant finish is $10 psf for new, unfinished space, including indirect costs and profit. To date, 3,000 sf in the building has never been finished. Indirect costs are typically 20% of direct costs. Entrepreneurial profit is 10% of direct and indirect costs. The date of the appraisal is 1991. The following are summarized from inspection and file notes.

(1) The remaining life of the improvements is 45 years.
(2) The site is 3.25 acres with the value being $5.50 psf. The highest and best use of the site is office.
(3) The following are items noted by inspection.

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Cost per item</th>
<th>Age</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>20,000 sf</td>
<td>$2.50 psf</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Interior paint</td>
<td>10,000 sf</td>
<td>$2.50 psf</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Unfinished space</td>
<td>3,000 sf</td>
<td>$10 psf</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Parking</td>
<td>60,000 sf</td>
<td>$2.00 psf</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Parking</td>
<td>10,000 sf</td>
<td>$2.50 psf</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Interior finish</td>
<td>57,000 sf</td>
<td>$10 psf</td>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>

(4) The building has a rentable area of 60,000 sf and all costs were based upon rentable area.
(5) The building is in typical condition and functional utility as compared to other similar office buildings constructed in 1986. There is 2,500 sf vacant but previously finished that will cost $4 psf to finish (market finish allowance is $4, owner paid) and the space is leased at market. The 2,500 sf space has only typical depreciation, but the tenant that will occupy the space is having new carpet installed that matches company colors.
(6) All leases are at market.

28. What is the total reproduction cost of the office building?
   a). $4,176,000
   b). $4,593,600
   c). $5,163,600
   d). $5,275,300

   Assume the cost is $5,163,600 for questions 29 - 33:

29. What is the measure of curable physical depreciation?
   a). $25,000
   b). $27,500
   c). $2,500
   d). $154,667

30. What is the measure of incurable short-lived depreciation?
   a). $27,500
   b). $740,000
   c). $154,667
   d). $621,777

31. What is the classification of the unfinished space?
   a). Curable physical depreciation
   b). Curable functional depreciation
   c). Incurable functional depreciation
   d). No depreciation

32. What is the measure of incurable physical depreciation?
   a). $154,667
   b). $439,610
   c). $594,277
   d). $1,139,610
33. What is the value via the cost approach?
   a). $5,200,000
   b). $5,300,000
   c). $5,400,000
   d). $5,500,000

Use the following information for questions 34 - 36:
Apartments, in the past year, averaged 80% occupancy with 50¢ psf per month rents. No new construction is needed until occupancy is 95% and cost feasible rents, at today's costs, are 70¢ psf. However, feasible rent levels change as construction and land costs rise. Multi-family sites in the past year were $3,000 per unit with average unit sizes being typically 800 sf. Multi-family sites are expected to increase at a rate of 10% per year. Construction costs for "typical" apartments were $38 psf on average in the past year inclusive of all profits and indirect costs. Market expense levels averaged in the past year $3.00 psf per year and are expected to increase 5% per year, except expenses will increase 1¢ per 1% increase in occupancy, over and above the 5% increase due to inflation. Costs are expected to increase 5% per year, and rents 10% per year for 6 years, then 5% thereafter. Occupancy is expected to improve 3% overall per year.

34. What are the expected expense levels in year 3?
   a). $3.00
   b). $3.25
   c). $3.50
   d). $3.75

35. What is the market required capitalization rate before construction is feasible?
   a). 9.00%
   b). 10.00%
   c). 11.00%
   d). 14.00%

36. What is the indicated time before new construction is feasible?
   a). 2 to 4 years
   b). 5 to 7 years
   c). 8 to 10 years
   d). Over 10 years

Use the following to answer questions 37 - 39:
A lender needs an appraisal of a proposed commercial subdivision of 50 acres with 10 tracts for a total of 40 net acres. The market anticipates a 5 year sell-out. The tracts include 40% office and 60% multi-family uses. The developer's profit (management) is typically accounted for as 10% of retail sales. Expenses include taxes of $150,000 in the first year, $120,000 in the second year, $80,000 in the third year, $60,000 in the fourth year and $30,000 in the fifth year. Other expenses are 9% of retail sales for marketing, 1% of retail sales for closing costs, and 5% of retail sales for overhead and miscellaneous expenses. It is anticipated that multi-family tracts will sell over the first 3 years, with 8% increases, compounded in value, beginning in the second year. Office should sell in the last 2 years and should increase 8% per year, compounded, beginning in the second year. Office sites are currently selling for $8.50 psf and multi-family sites are selling for $4.00 psf. The subdivision will cost a total of $50,000 per acre to improve the development. The overall yield rate applicable to developments similar to the subject is 14.5%. The lender informs you that interest payments will be $150,000 per year. The site, as vacant, is being purchased for $2.25 psf.

37. What are the anticipated gross sales in year 5?
   a). $1,009,076
   b). $1,140,552
   c). $2,991,322
   d). $4,028,429
38. What is the indicated value of the subdivision?
   a). $5,000,000
   b). $5,500,000
   c). $6,000,000
   d). $6,500,000

39. What can be concluded concerning the equity yield rate if the subdivision is developed?
   a). It will be positive
   b). It will be negative
   c). It cannot be determined from the information given
   d). It will be positive or negative, depending upon the loan terms

40. What is the modified rate of return for an investment that is expected to yield $12,500 in the first year, increase 7% straight-line for 4 years, and is to be sold at the end of the fifth year for $125,000? Assume a reinvestment rate of 7% and an original investment of $120,000.
   a). 7.0%
   b). 9.6%
   c). 10.4%
   d). 11.4%

End of Mixed Problem Set One
1. a) 12%  
   0  CFj  
   25,000  CFj  
   50,000  CFj  
   75,000  CFj  
   125,000  CFj  
   45,000  CFj  
   9  i  
   f NPV  6  N  FV  
   190,000  PV  i  [Display 11.7%]

2. a) $2,500  [$500 paint + (2,000 sf carpet ÷ 9 x $9.00)]

3. c) $926,400 [12,000 sf x $55 x 1.30/1.05] + 10,000] x 1.12]

4. c) None [7.5¢ x 12,000 = 900 ÷ .11 = $8,181, vs. $10,000] The value added is not justified by the cost.

5. d) Cannot be determined from information given  
The theory of consistent use states that you do not value land on the basis of one use and the improvements on the basis of another use. Therefore, the improvements have obsolescence, but there is not enough information to determine how much. Additionally, the cost of a dock in new building is needed to determine if the dock reflects functional obsolescence.

6. b) 1,175,000  
   [926,400 - 2,500 - 40,000 (parking) - $22,500 (roof) = 861,400  
   [861,400 x 5/40 = 107,675 physical incurable long-lived]  
   [$926,400 - 2,500 - 12,000 - 7,500 - 107,675] + 375,000 (land) = $1,171,725

7. a) Depreciation  
   [This is the best answer among the alternatives. Accrued depreciation is the second best answer. The 11th ed. does not use the term “accrued depreciation.”]

8. b) Comparative unit.

9. c) 14,000

Solution: Set up the problem to solve for all constraints. X represents the square footage of the improvements. 1/3x is the footprint of the improvements. (1/3x ÷ 60 x 2) is the sum of two sides of the building, and 120 is the sum of the known two sides. (x ÷ 1,000 x 12 x 350) is the parking required in square feet of land area.

65,000 SF = 1/3 x [Building] + [(1/3 x ÷ 60 x 2) + 120] 5 [Perimeter of building] +  
(x ÷ 1,000 x 12 x 350) [Parking]  
65,000 SF = .3333 x + (.011111 x + 120) 5 + 4.2 x  
65,000 SF = .3333 x + .055555 x + 600 + 4.2 x  
64,400 SF = 4.588889 x  
14,033 SF = x
Test:
14,033 ÷ 3 = 4,678 SF [Building]
(4,678 ÷ 60) x 2 + 120 x 5 = 1,380 SF [Perimeter]
14,033 ÷ 1000 x 12 x 350 = 58,939 SF [Parking]
58,939 ÷ 350 = 168,397143
168,397143 x 350 = 139 SF
139 ÷ 4.2 = 33 SF less of building, (therefore, 14,000 SF)

10. a) 58,800 168 spaces x 350 sf = 58,800 sf

11. a) Functional obsolescence (By definition, an overimprovement is functional obsolescence).

12. d) 17.2% 95% - 81.25% = 13.75% needed from growth (net of demolition)
812.5 x 13.75 = 11,172 persons
11,172 ÷ 65,000 = 17.2%

13. c) 1,330,000
Solution:
20% X 1,000,000 = 200,000
30% X 1,200,000 = 360,000
15% X 1,400,000 = 210,000
35% X 1,600,000 = 560,000

$1,330,000

For questions 14 - 20:

Cost:
$75 X 183,000 = $13,725,000
Profit @ 12% = 1,647,000
Replacement Cost = $15,372,000

Depreciation:
Physical Curable: 30 Units X $750 = $22,500
Interior Paint = 20,000
Total Curable = $42,500

Incurable:

(Short Lived):
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Age/Life</th>
<th>Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint</td>
<td>23,000</td>
<td>X 5/8</td>
<td>$14,375</td>
</tr>
<tr>
<td>Carpet</td>
<td>(200 x 750)</td>
<td>X 3/5</td>
<td>90,000</td>
</tr>
<tr>
<td>Appliances</td>
<td>(1,500 x 230)</td>
<td>X 5/12</td>
<td>143,750</td>
</tr>
<tr>
<td>Roof</td>
<td>[183,000 ÷ 2 x 1.2]</td>
<td>X 5/15</td>
<td>25,620</td>
</tr>
<tr>
<td></td>
<td>70 x 100</td>
<td></td>
<td>$273,745</td>
</tr>
</tbody>
</table>

$594,860 (Total cost of short-lived items)

(Long Lived):
(15,372,000 - 42,500 - 594,860) X 5/50 = $1,473,464

Functional: 23,000 - 14,375 (Physical depreciation previously charged) $8,625

External: (1¢ X 12) X .95 X 183,000 = 20,862 ÷ .11 = 189,654
[435,600 sf X 5¢ psf] = - 21,780 = 167,874

The actual historical cost is excess information. Current replacement cost is all that is needed for a current cost estimate. Physical curable depreciation includes carpet that should be replaced (30 units @ $750) and interior
paint ($20,000). The exterior paint is in need of replacement because of color. A portion of the paint is physically depreciated (incurable) because of physical reasons (5/8), but the replacement of paint is because of functional reasons (color) and the difference between the cost to replace and the physically depreciated cost is $8,625, charged to functional curable. The long-lived depreciation is derived by cost new minus physical curable minus the cost of the short-lived items (not the physical depreciation short-lived), and times age divided by total physical life.

External obsolescence was developed with an overall rate. Therefore, the total present value of rent loss is divisible between that attributable to land and the remaining to the building. The total present value of rent loss is $189,654. A portion of the total ($21,780) is loss to the land, and the remainder is loss to the buildings. The allocation avoids double counting the loss that has already been deducted from the land value.

<table>
<thead>
<tr>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
</tr>
<tr>
<td>Physical</td>
</tr>
<tr>
<td>Curable:</td>
</tr>
<tr>
<td>Incurable:</td>
</tr>
<tr>
<td>Short-lived:</td>
</tr>
<tr>
<td>Long-lived:</td>
</tr>
<tr>
<td>Total Incurable:</td>
</tr>
<tr>
<td>Total Physical:</td>
</tr>
<tr>
<td>Functional</td>
</tr>
<tr>
<td>External</td>
</tr>
<tr>
<td>Total Depreciation</td>
</tr>
<tr>
<td>Depreciated Cost</td>
</tr>
<tr>
<td>Land: 10 acres x 43,560 sf/acre x $1.95 psf</td>
</tr>
<tr>
<td>Indicated Value</td>
</tr>
</tbody>
</table>

14. a). $42,500 or less
15. c). 1.4375 (60 x Current = 75; Current = 1.4375)
16. a). 8,625 or less
17. d). $1,747,209
18. d). $1,789,709 or more
19. c). $14,250,000
20. b). Modified economic age-life
Modified economic age-life requires estimating curable depreciation and obsolescence and deducting curable depreciation before applying the age-life percentage to the remainder of cost to determine total incurable depreciation.
21. b). External obsolescence is always allocated between loss to the site and loss to improvements. The allocation may, however, be by using a method that would only measure loss to the buildings.
22. c). 5-level (including top deck)

**Solution:** Although the fifth floor represents the point of diminishing returns the rate of return is sufficient at that point.

Office Parking: $50,000 \text{s.f.} \div 1,000 \times 5 \text{ cars} = 250 \text{ spaces needed}

Spaces Per Floor: 
- 30,000 s.f. $\div 325 \text{ s.f. (if 8.5') = 92 cars} 
- 30,000 s.f. $\div 350 \text{ s.f. (if 9.0') = 85 cars}$

Income Per Floor: 
- If 8.5' then 92 \times $64 = $ 5,888 
- (Not Top) If 9.0' then 85 \times $70 = $5,950 (so build with 9.0'/space)

Note: Need at least 3-level to accommodate the office.

**Income:**

<table>
<thead>
<tr>
<th>Level</th>
<th>Months</th>
<th>Expenses</th>
<th>Total</th>
<th>Lower Levels</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>12</td>
<td>$70\times x</td>
<td>$(60 \times 85) + (2 \times 70 \times 85) = $142,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>$70\times x</td>
<td>$(60 \times 85) + (3 \times 70 \times 85) = $192,780</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>$70\times x</td>
<td>$(60 \times 85) + (4 \times 70 \times 85) = $242,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>$70\times x</td>
<td>$(60 \times 85) + (5 \times 70 \times 85) = $292,740</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Level** | **Size** | **Cost PSF** | **Profit** | **Total Cost** | **Investment** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>90,000</td>
<td>$12.60</td>
<td>$13.86</td>
<td>$1,247,400 + 250,000 = $1,497,000</td>
<td>$1,503,158</td>
</tr>
<tr>
<td>4</td>
<td>120,000</td>
<td>$13.23</td>
<td>$14.55</td>
<td>$1,746,300 + 250,000 = $1,996,000</td>
<td>$2,030,000</td>
</tr>
<tr>
<td>5</td>
<td>150,000</td>
<td>$13.89</td>
<td>$15.28</td>
<td>$2,291,850 + 250,000 = $2,542,000</td>
<td>$2,555,000</td>
</tr>
<tr>
<td>6</td>
<td>180,000</td>
<td>$14.59</td>
<td>$16.05</td>
<td>$2,888,820 + 250,000 = $3,139,000</td>
<td>$3,081,000</td>
</tr>
</tbody>
</table>

23. c). 5th-level (including top deck)

**Solution:** The point of diminishing returns occurs when the fifth floor is added.

(1) Value $= \text{NOI} \div \text{Ro (9.5%)}$

<table>
<thead>
<tr>
<th>Income</th>
<th>Investment</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>142,800</td>
<td>1,497,000</td>
<td>9.54%</td>
</tr>
<tr>
<td>192,780</td>
<td>1,996,000</td>
<td>9.65%</td>
</tr>
<tr>
<td>242,700</td>
<td>2,542,000</td>
<td>9.55%</td>
</tr>
<tr>
<td>292,740</td>
<td>3,139,000</td>
<td>9.33%</td>
</tr>
</tbody>
</table>

24. b). External obsolescence

**Solution:**

(This is the best answer because if it is in litigation it may or may not be found to have an actual loss because of construction, but the value would probably be affected).

25. b). 5 years

**Solution:**

Total Space = 175,000,000
Space to 93% = 162,750,000
Occupied = 140,000,000
Current Employees: $140,000,000 \div 300 = 466,667$
Employees for 93%: $162,750,000 \div 250 = 651,000$

<table>
<thead>
<tr>
<th>Years</th>
<th>N</th>
<th>i</th>
<th>PV</th>
<th>PMT</th>
<th>FV</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>7</td>
<td>-466,667</td>
<td></td>
<td>651,000</td>
</tr>
</tbody>
</table>
For Questions 26 & 27

Cost:  
200 spaces @ $5,500/space + 35,000 sf land @ $75 = $3,725,000

Revenue:  
200,000 sf x $.75 (increase in rents) x .95 = $142,500 increase in rental inc.  
200 spaces x ($100/month x 12 months) x (1 - 20% expenses) x .95 = $182,400

Total income:  
$142,500 + $182,400 = $324,900

Capitalization rate:  
$324,900 / $3,725,000 = 8.7% (This would be attained after leases roll)

Yield rate (Y = R + CR):  
8.7% + 4% (growth factor in rents) = 12.7% (approximate)

Note:  The yield would be lower because the rental rates could not be immediately raised.
The garage should be built if the yield is acceptable.
Not enough information is given to ascertain the required level of yield.

26.  d).  Greater than 11.5%

27.  d).  Cannot be determined from the information given.

28.  c).  $5,163,600

29.  b).  $27,500

30.  c).  $154,667

31.  d).  No depreciation

32.  c).  $594,277  [439,610 + 154,667]

33.  b).  $5,300,000

Use the following information for questions 34 - 36:

<table>
<thead>
<tr>
<th>Year</th>
<th>Rents</th>
<th>Occupancy</th>
<th>EGI</th>
<th>Expenses (\text{current $}^*)</th>
<th>Expenses (\text{**}^*)</th>
<th>NOI</th>
<th>Cost</th>
<th>Land</th>
<th>Total</th>
<th>Ro</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$6.60</td>
<td>83%</td>
<td>$5.47</td>
<td>$3.03</td>
<td>$3.18</td>
<td>$2.29</td>
<td>$39.90</td>
<td>4.13</td>
<td>$44.03</td>
<td>5.2%</td>
</tr>
<tr>
<td>2</td>
<td>7.26</td>
<td>86%</td>
<td>6.24</td>
<td>3.06</td>
<td>3.37</td>
<td>2.87</td>
<td>41.90</td>
<td>4.54</td>
<td>46.44</td>
<td>6.2%</td>
</tr>
<tr>
<td>3</td>
<td>7.99</td>
<td>89%</td>
<td>7.11</td>
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<td>3.58</td>
<td>3.53</td>
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<td>48.99</td>
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<td>92%</td>
<td>8.08</td>
<td>3.12</td>
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<td>3.79</td>
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<td>9.18</td>
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<td>95%</td>
<td>11.34</td>
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<td>4.65</td>
<td>56.15</td>
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*Expenses increase 1¢ per 1% increase in occupancy  
** Expenses are increased 5% per year compounded.

Feasible rents:  
70¢ psf x 12 x 95% = $7.98 psf per year

Expenses \(\frac{3.15}{\text{psf}}\) if the market was 95%

NOI \(\$4.83\)

Feasible Ro:  
\(\frac{4.83}{41.75} \times 100\% = 11.6\%\)
34.  c) $3.50

35.  c) 11.00%

36.  d) Over 10 years

Use the following to answer questions 37 - 39:

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<th>Office</th>
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<td>$10.71</td>
<td></td>
<td>$11.56</td>
<td>$11.56</td>
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</tbody>
</table>

| Sales | $1,393,920 | $1,505,434 | $1,627,402 | $3,732,221 | $4,028,429 |
| Taxes | $150,000   | $120,000   | $80,000    | $60,000    | $30,000   |
| Other Expenses | $209,088 | $225,815 | $244,110 | $559,833 | $604,265 |
| Profit | $139,392  | $150,543  | $162,740  | $373,222  | $402,843  |
| Net Proceeds | $895,440 | $1,009,076 | $1,140,552 | $2,739,166 | $2,991,322 |

37.  d) $4,028,429

38.  b) $5,500,000 Use NPV Routine @ 14.5% = $5,425,163

39.  b) It will be negative

Cost: $50,000 x 50 acres = $2,500,000
Land Cost: 50 acres x 43,560 x $2.25 psf = 4,900,500
Total Investment $7,400,500 (compared to $5,500,000 value)

40.  d) 11.4%

F CLR REG
12,500 g CF;
13,375 g CF;
14,250 g CF;
15,125 g CF;
16,000 Enter 125,000 + g CF;
7 i f NPV [147,066] 5 N FV [-206,268]
120,000 PV i [11.44237]

End of Mixed Problem Set One
Mixed Problem Set Two

Use the following to answer questions 1 - 4

Change in population in market area 14,500 persons
Average household size 3.02 persons
Average household income $38,000
Capture rate of household income in retail 37%
Sales psf of retail $270
Normal vacancy 8%
PE (Population-to-employment) ratio of area 2.75
% office employees 25%
Average space per employee 180 sf
Vacant space in area (office) 20,000 sf
Normal office vacancy in area (5%) 15,000 sf
Apartment vacancy (normal vacancy is 5%) 320 units (market is in balance)
Percent to occupy apartments 20%

1. How much retail space will be needed because of the growth in the area?
   a. 250,025 sf
   b. 271,766 sf
   c. 289,765 sf
   d. 291,903 sf

2. How much office will be occupied by the growth in population?
   a. 197,272 sf
   b. 229,761 sf
   c. 237,272 sf
   d. 249,761 sf

3. How many apartments will be needed in this market?
   a. None
   b. 691 units
   c. 960 units
   d. 1,011 units

4. What percent of the population is employed?
   a. 31.4%
   b. 33.1%
   c. 36.4%
   d. 40.1%

5. What is “frictional vacancy”?
   a. normal vacancy
   b. temporary vacancy
   c. interim vacancy
   d. vacancy resulting from dissatisfied tenants

6. What is “leakage”?
   a. Loss in office demand due to tenant’s moving up to higher class office
   b. Loss in retail sales to another market or retail type
   c. Loss due to normal vacancy
   d. Industrial environmental concerns due to turnover
7. You are appraising a proposed 100 lot subdivision with an average price of $40,000 per lot. Profit is 15% of sales, absorption is expected to be level over 10 quarters, and expenses are 25% of retail values. Assume costs of $750,000 (with costs spread equally over the first 4 quarters). What is the "as is" value of the property if the appropriate discount rate is 17%?
   a. $1,000,000
   b. $1,250,000
   c. $1,500,000
   d. $1,750,000

Use the following to answer questions 8 - 13
Population in area 108,000
Employment in area 60,500
Basic employment in area 25,000
Employment in industrial 4,000
Industrial employment in country 25%
Employment in retail 5,000
Employment retail in country 15%
Forecast basic employment change 5,000 (over next 4 years)

8. What is the PE ratio for this market?
   a. .56
   b. 1.67
   c. 1.79
   d. 2.42

9. What is the EB multiplier in this market?
   a. .56
   b. 1.67
   c. 1.79
   d. 2.42

10. What is the location quotient for retail?
    a. .45
    b. .55
    c. 1.55
    d. 1.79

11. What is the percent basic employment in industrial in this market?
    a. 0%
    b. -10%
    c. 10%
    d. 26%

12. What is the forecast population growth over the next three years?
    a. 5,234 persons
    b. 11,390 persons
    c. 16,244 persons
    d. 21,659 persons

13. What can be said about the make up of basic employment in this area?
    a. It is primarily industrial
    b. It is primarily retail
    c. It is primarily retail and industrial
    d. It is primarily office and service
Use the following to answer questions 14 - 24:

Reproduction Cost: $2,575,000 (Suburban office building)

**Physical Curable:**
- Parking lot repair: $150,000
- HVAC repair: $40,000
- Other: $75,000

**Short-lived items:**
- Total cost = $490,000
- Depreciation = $100,000

**Actual age:** 11 years
**Remaining physical life:** 44 years

*Obsolescence concerns:* 
Assume all items below are in physical incurable long-lived

1. The building needs finish out of previously unfinished space; cost to add =$100,000. NOTE: An “as is” appraisal is requested and the finish out is to be completed after a tenant signs a lease, expected in two months.

2. The building needs new restroom fixtures to meet ADA requirements for prospective tenants. The new fixtures will cost $45,000. The existing fixtures and configuration cost $30,000, total, in reproduction cost. The fixtures and configuration would have cost $55,000 if put into a new building as of the appraisal date. It will cost $12,000 to take away the existing, there is $5,000 in salvage value for the fixtures, and it will cost $30,000 to add the fixtures and alter the restrooms. The building is not rentable in the future without the renovation.

3. A service elevator cost $50,000 in new construction, would cost $4,000/yr to maintain (RB = 12%), and adds little to rents or occupancy. There is $3,500 in salvage value to the elevator equipment. The elevator will cost $3,000 to remove. The space on the bottom floor of the elevator will be used for storage and will cost $2,000 to convert. Assume the storage portion of the analysis as feasible.

4. Net income could be increased $6,000/yr if covered parking were available. The parking would have cost $50,000 of direct and indirect costs if built during original construction and more to add to the existing surface parking.

5. The office building could use a different floor in the lobby to conform with other office buildings in the area. Rents are affected, net $4,500 per year. The higher quality floor would cost $20,000 more than the existing floor (the existing floor would cost $40,000 to construct as of the appraisal date), but would cost $70,000 to add to the existing structure.

6. The building has an expensive tenant finish from a previous tenant that would cost $50 psf to build-out today while the typical tenant finish is $18 psf. A current tenant pays $1 psf per year more because of the excess finish. The tenant occupies 10,000 sf.

7. The building is inefficient compared to other office buildings due to a significant amount of open areas. Expenses are $20,000 more per year, but rents are $4,000/yr higher because of this amenity. The open areas cost $50,000 more than comparable buildings.

8. The market is soft and net income is depressed $100,000. The Ro = 10%. Assume a land-to-value ratio of 20% and that the land value is depressed $100,000 because of the poor market. The market should gradually recover in 3 years and it is expected there will be no loss after that time.

9. The building is next to a billboard that partially hinders the visibility of the building and the net rents are affected $30,500 per year. The land is losing $250,000 in value because of its proximity to the billboard. Attempts to purchase the billboard have been exhausted. Assume no purchase of The billboard.

10. The office building has excess rent of $30,000/yr from 3 tenants and below market rents of $5,000/yr from 2 tenants.
14. What is the amount of physical depreciation attributable to the office building?
   a. $265,000
   b. $442,000
   c. $729,000
   d. $807,000

15. What is the amount of functional obsolescence due to the unfinished space?
   a. $0
   b. $80,000
   c. $88,000
   d. $100,000

16. What is the obsolescence due to the restrooms not being up to ADA requirements?
   a. $51,000
   b. $57,000
   c. $106,000
   d. $126,700

17. What is the amount of obsolescence due to the service elevator?
   a. $37,500
   b. $41,500
   c. $47,500
   d. $50,000

18. What is the measure of obsolescence due to not having covered parking?
   a. $0
   b. $50,000
   c. $60,000
   d. Cannot be determined from the information given

19. What is the measure of obsolescence due to the floor?
   a. $7,500
   b. $17,500
   c. $50,000
   d. $77,500

20. What is the measure of obsolescence due to the 10,000 sf of excess tenant finish?
   a. $136,667
   b. $172,667
   c. $320,000
   d. $500,000

21. What is the measure of obsolescence due to excess open areas?
   a. $40,000
   b. $50,000
   c. $133,000
   d. $173,000

22. What is the measure of obsolescence due to a soft market?
   a. $70,000
   b. $320,000
   c. $400,000
   d. $500,000
23. What is the measure of external obsolescence due to the billboard?
   a. $55,000  
   b. $105,000  
   c. $250,000  
   d. $305,000

24. What is the relationship of the fee simple to leased fee value via the cost approach in this example?
   a. They are equal  
   b. Fee simple value exceeds leased fee value  
   c. Leased fee value exceeds fee simple value  
   d. Cannot be determined from the information given

Use the following information to answer questions 25 - 27.
Lender terms include a DCR = 1.25, and the interest rate 8.5%, with monthly payments for 360 months.
The following are three potential uses of a property with the market required rates for each use. The cost includes land value & excludes profit.
Use 1: Cost = $500,000, Vo = $600,000, Ro = 8%, and Yo = 12%
Use 2: Cost = $440,000, Vo = $480,000, Ro = 10%, and Yo = 12%
Use 3: Cost = $375,000, Vo = $360,000, Ro = 12%, and Yo = 12%

25. Which use requires the least down payment?
   a. Use 1  
   b. Use 2  
   c. Use 3  
   d. Cannot be determined

26. If the buildings were built, which use would have the most perceived risk of achieving the Ro?
   a. Use 1  
   b. Use 2  
   c. Use 3  
   d. They are equal

27. Which use has the highest profit as a percentage of building value?
   a. Use 1  
   b. Use 2  
   c. Use 3  
   d. Cannot be determined

Use the following to answer questions 28 - 30.
Land: 250’ X 350’ deep  
Setbacks: 50’ front; 20’ back; and 10’ on the sides  
Zoning: 10% of building sf required for open space over and above setback areas & no improvements are allowed in the setbacks including parking  
Zoning-Parking: At least 1 space per 275 sf of retail & at least 1 space per 375 sf of office  
Market-Parking: At least 1 space per 250 sf of retail & at least 1 space per 350 sf of office  
Building: 2-story, 1/2 office & 1/2 retail, surface parking only (325 sf is needed per space).
28. What is the maximum building size that can be built on the site?
   a. 38,257 sf
   b. 40,250 sf
   c. 76,515 sf
   d. 87,500 sf

29. How much land area will there be, as a minimum, with no improvements?
   a. 23,100 sf
   b. 26,926 sf
   c. 34,879 sf
   d. 43,567 sf

30. How many parking spaces will be required to adequately serve the maximum building size?
   a. 120 spaces
   b. 124 spaces
   c. 128 spaces
   d. 145 spaces

Use the following to answer questions 31 - 34.

Employment growth: 5,000 over the next 4 years
PE ratio: 2.75
Average household income: $40,000
Average household size: 3.10 persons
Percentage of spending: 30% taxes; 42% nonretail; 5% savings; balance retail
Average sales PSF: $235
Primary market leakage: 24% (Compute the leakage on the sf of primary retail space needed)
Secondary market capture: 10% of primary retail sf (Do not apply the leakage to the secondary space)
Frictional vacancy: 7%
Proposed supply in market: 93% current occupancy; 210,000 sf proposed

31. What is the projected growth in population per year in the market?
   a. 500 persons
   b. 1,250 persons
   c. 1,719 persons
   d. 3,438 persons

32. What is the projected growth in total households over the next 4 years?
   a. 1,109 households
   b. 2,789 households
   c. 4,435 households
   d. 5,636 households

33. How much total space will be demanded as a result of the total growth in this market area before frictional vacancy?
   a. 173,645 sf
   b. 191,009 sf
   c. 205,386 sf
   d. 225,605 sf

34. What is the residual demand for retail over the next 4 years in this market?
   a. 0 sf
   b. 191,009 sf
   c. 205,386 sf
   d. 225,605 sf
Use the following information to answer questions 35 - 39:

Construction costs = $43 psf (Unadjusted base cost)
Height multiplier = 1.05
Perimeter multiplier = .95
Local multiplier = .93
Time multiplier = 1.02
Profit as a percent of base cost = 12%
Building size = 12,000; Land size = 50,000 sf (worth $4.50 psf)
Site improvements: Parking - 3.00 sf parking to 1 sf building ratio @ $2.00 psf; other site = $20,000 (the parking and site improvement costs are replacement cost)
Indirect costs not in base cost = $50,000
Remaining life = 41 years (remaining physical life is 10 years longer)

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<th>Life</th>
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<td>15</td>
</tr>
<tr>
<td>Roof</td>
<td>$15,000</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>A/C</td>
<td>$ 7,000</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Paint</td>
<td>$10,000</td>
<td>9</td>
<td>9</td>
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</table>

There is no loading dock at the rear. The market would like a door, and the direct and indirect cost to add a door is $12,000, including a ramp. The market rent would increase 1¢ psf per month and overall rates in the area are 12 to 13%. The building is occupied with a AAA tenant with 20 years remaining on the lease.

35. What is the cost of the improvements?
   a. $546,844
   b. $596,844
   c. $612,844
   d. $688,844

36. What is the amount of physical incurable depreciation?
   a. $10,000
   b. $27,250
   c. $95,527
   d. $122,776

37. What is the measure of functional curable obsolescence?
   a. $0
   b. $12,000
   c. $11,076 to $12,000
   d. Cannot be determined from the information given

38. What is the amount of total depreciation?
   a. $27,250
   b. $95,527
   c. $105,527
   d. $132,776

39. What is the indicated value (rounded)?
   a. $550,000
   b. $775,000
   c. $810,000
   d. $850,000

40. What is the purpose of property productivity analysis?
   a. To determine optimum building on a site, and thus land allocation unit (LAU)
   b. To determine the number of animal units on a site
   c. To determine the crops that produce the greatest yields
   d. To determine a land residual based upon building value
Use the following to answer questions 41 - 45.

Population growth: 10,000 over the next 6 years
PE ratio: 2.75
Average household size: 2.50 persons
Percentage of single-family: 70%
Subject home prices: $125,000 to $175,000
Mortgage terms: 30 years (monthly payments); i = 8%, M = 80%
Qualify: 30% of income to PITI (assume taxes & insurance = 20% of principal & interest)
Household income: Median = $35,000; 25% ± $15,000; and 30% make $50,000 - $100,000
Subject capture rate: 15% of households that would qualify given the above criteria for affordability considering income & payments (PITI)
Number homes in subject: 10 existing and 50 proposed

41. What is the expected growth in households per year?
   a. 500
   b. 667
   c. 2,400
   d. 4,000

42. What is the income range that would qualify for the subject homes?
   a. $35,000 to $50,000
   b. $40,000 to $55,000
   c. $42,500 to $57,500
   d. $45,000 to $60,000

43. What percentage of households should qualify within the subject price range?
   a. 10%
   b. 11%
   c. 12%
   d. 13%

44. What should the subject capture as a percent of the total population change?
   a. 1.8%
   b. 2.1%
   c. 3.4%
   d. 5.0%

45. How many homes should be started at the current time?
   a. none
   b. 5
   c. 10
   d. 62

46. Which of the following appears as a series of circles from a central area (CBD)?
   a. Concentric zone
   b. Sector
   c. Multiple-nuclei
   d. Radial-Corridor Structure

47. Which of the following would tend to look like a city that grew along a river and two interstate highway systems?
   a. Concentric zone
   b. Sector
   c. Multiple-nuclei
   d. Radial-Corridor Structure
48. Given a location quotient of 2.0 and E=5%, what is e?
   a. 5%
   b. 10%
   c. 15%
   d. 20%

49. Is the industry in #48 a basic or support industry in the area?
   a. Basic
   b. Support
   c. Neither
   d. Cannot be determined

50. What is the highest and best use of a property that may be sold, “as vacant” for $200,000 for retail, $150,000 for office, and $250,000 for residential if the current NOI is $40,000, the appropriate capitalization rate is 11%, it is used for industrial and is a legally non-conforming use?
   a. Residential
   b. Office
   c. Retail
   d. Industrial

End of Mixed Problem Set Two
1. **(b)** Households: $14,500 \div 3.02 = 4,801$
   Retail sales: $4,801 \times 38,000 \times 37\% = 67,506,623$
   Retail occupied: $67,506,623 \div 270 = 250,025$ sf
   Plus vacancy: $250,025 \div (1 - 8\%) = 271,766$ sf needed

2. **(c)** Office employees: $14,500 \div 2.75 \times .25 = 1,318$
   Office occupied: $1,318 \times 180 = 237,240$ sf

3. **(d)** Apartments occupied: $4,801$ (households) \times .20 = 960 units to be occupied
   Plus vacancy: $960 \div (1 - 5\%) = 1,011$ units

4. **(c)** The reciprocal of the PE ratio (population to employment) is the percentage of the population that is employed.
   $1 \div 2.75 = .3636$, or 36.4%

5. **(a)**

6. **(b)**

7. **(b)** The total retail value is 100 lots $\times 40,000 = 4,000,000$, or $400,000/quarter.
   The expenses are 25% + 15% profit = 40%. The net is $400,000 \times (1 - 40\%) = 240,000$ per quarter for 10 quarters. The present value of $240,000 over 10 quarters discounted at 17% per year (17% \div 4 per quarter = 4.25\%) is $1,922,613 (10\ N, 4.25\ i, 240,000\ PMT, solve PV). The present value of the costs of $187,500 per quarter over 4 quarters is $676,614 (4\ N, 4.25\ i, 187,500\ PMT, solve PV).
   Therefore, the value is $1,922,613 - 676,614 = 1,245,999$. *Note: The "as is" value is of vacant land.*

8. **(c)** $108,000 \div 60,500 = 1.79$

9. **(d)** $60,500 \div 25,000 = 2.42$

10. **(b)** $(5,000 \div 60,500) \div .15 = .55$

11. **(a)** LQ for industrial = $(4,000 \div 60,500) \div .25 = .26$, therefore this is not a basic industry in this area.

12. **(c)** $5,000 \times 2.42 (EB) \times 1.79 (PE) = 21,659$ persons over the next 4 years
    $21,659 \div 4 \times 3 = 16,244$ persons over the next 3 years

13. **(d)** Both retail and industrial have LQs lower than 1. Therefore, the basic employment cannot be those industries. (d) is therefore the best answer.

14. **(c)**
    Physical curable $(150,000 + 40,000 + 75,000) = 265,000$
    Physical incurable short-lived = 100,000
    Physical incurable long-lived:
    $(2,575,000 - 265,000 - 490,000) \times 11/(44+11) = 364,000$
    Total physical depreciation $= 729,000$

*Note: 11/55 = 20%. This will be used to get the depreciation previously charged for all subsequent calculations.*

15. **(a)** The reproduction cost, by definition, would not have included the cost of the unfinished space.
    Furthermore, an "as is" appraisal would reflect the current value as though unfinished. Therefore, there is no functional obsolescence deduction.
16. (a) 
Cost of existing item $30,000  
Less depreciation previously charged (20%) -6,000  
plus 
Cost to cure (all costs) 82,000  
or 
Value of the loss 
Less cost if installed new -55,000  
**Indicated obsolescence** $51,000  
The cost to cure is $45,000 (fixtures) + 12,000 (remove existing) + 30,000 (to add) - 5,000 salvage value = $82,000

17. (b) 
Cost of existing item $50,000  
Less depreciation previously charged (20%) -10,000  
+ Cost to cure (all costs) (3,000+2,000-3,500) 1,500  
or 
+ Value of the loss (or - gain) 
Less cost if installed new  
**Indicated obsolescence** $41,500

18. (a) 
The present value of the parking would be $6,000 / .12 = $50,000. The capitalization rate is from note 3, page 39. The direct and indirect, without profit would be $50,000. Therefore, the covered parking would not be feasible for even new construction. Since the parking should not be there, and it is not there, then there is no obsolescence.

19. (b) 
The floor would contribute and extra $37,500 to value if in place as of the appraisal date ($4,500 / .12). It would cost $70,000 to install now and therefore is not feasible to add. It is incurable economically. It would cost $20,000 more to have the better floor than the current floor if built in a new building. Therefore, there is functional obsolescence because the extra value is higher than the extra cost. The loss is therefore the difference between the value loss and the extra cost.

Cost of existing item
Less depreciation previously charged (20%) 
+ Cost to cure (all costs)  
or 
+ Value of the loss (or - gain) [marginal loss] 37,500  
Less cost if installed new -20,000  
**Indicated obsolescence** $17,500

20. (b) 
Cost of existing item (excess cost) $320,000  
Less depreciation previously charged (20%) -64,000  
+ Cost to cure (all costs)  
or 
+ Value of the loss (or - gain) -83,333  
Less cost if installed new  
**Indicated obsolescence** $172,667  
The $83,333 value ($10,000 / .12) that the excess finish adds offsets some of the excess cost of the finish. I only put the excess cost of tenant finish because this is the obsolescence. The excess was depreciated 20%. To avoid double counting, this was deducted. The value added was also deducted.
21. (d) Cost of existing item $50,000
   Less depreciation previously charged (20%) -10,000
   + Cost to cure (all costs) 133,000
   or
   + Value of the loss (or - gain) (4,000-20,000)/.12 133,000
   Less cost if installed new
   Indicated obsolescence $173,000

22. (a) There is a loss in income for the next three years beginning at $100,000 and declining until there is no loss after the third year. The present value of $100,000 (year 1), $66,000 (year 2) and $33,000 (year 3) at 7% is $178,043. The land is losing $100,000 and therefore the loss to the improvements is the difference or $78,043 and the best answer is (a). The $66,000 and $33,000 is based upon the market recovering and the loss declining over 3 years. The 7% is also based upon judgment. However, regardless of the incomes or discount rate selected, the best answer would be (a). It would be incorrect to use the Ro of 10% because that would overstate the loss in value.

23. (a) $30,500 ÷ .10 = $305,000 loss to the property.
   The loss to the land is $250,000.
   Therefore, the loss to the buildings is $305,000 - 250,000 = $55,000

24. (c) From note 10, the owners are receiving excess rent. Therefore, there is an intangible value created by the excess rent and leased fee value exceeds fee simple value.

25. (c) Loan Use 1: $600,000 x 8% ÷ 1.25 ÷ .09227* = $416,170
   Loan Use 2: $480,000 x 10% ÷ 1.25 ÷ .09227* = $416,170
   Loan Use 3: $360,000 x 12% ÷ 1.25 ÷ .09227* = $375,000

   * 360 N, 8.5g i, -1 PV, solve PMT x 12 [.09227]

   Use 3 would cost $375,000, including land and would have a 100% loan.

26. (d) They all have a market perceived risk of 12% at the values given.

27. (a) Use 1 has $100,000 in profit, use 2 $40,000, and use 3 no profit. All uses were analyzed on the same land value. Therefore, use 1 would have the highest percentage of profit.

<table>
<thead>
<tr>
<th>10 ft</th>
<th>10 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>20 ft back setback</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>350 ft deep</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>50 ft front setback</td>
<td>250’</td>
</tr>
</tbody>
</table>

The area in setbacks is: (50 + 20) x 250 = 17,500
(10 + 10) x 280 = 5,600 (The 280’ is 350 - 50 - 20)
Total area 23,100 sf
28. (a) \[87,500 - 23,100 = .10X + X/2 + (X/300)325 \]
\[64,400 = .10X + .50X + 1.08333X \]
\[X = 38,257 \text{ sf} \]
.X/2 is because the building is 2-story (it is the footprint)
.X/300 is the spaces needed. Note that the market requires more than zoning. It is multiplied by the space to construct each space.

29. (b) \[23,100 (setbacks) + 38,257 \times .10 (open areas) = 26,926 \text{ sf minimum, no improvements} \]

30. (c) \[38,257 / 300 \text{ sf} = 128 \text{ spaces} \]

31. (d) \[5,000 \times 2.75 \div 4 = 3,438 \]

32. (c) \[5,000 \times 2.75 \div 3.10 = 4,435 \]

33. (a) \[4,435 (households) \times 40,000 \times (1-30\%-42\%-5\%) \div 235 = 173,626 \text{ sf} \]

34. (a) \[173,626 \div (1 - 7\%) = 186,694 \text{ is needed if no leakage} \]
\[186,694 \times (1 - 24\%) = 141,887 \text{ sf needed with leakage} \]
\[141,887 \times 1.10 = 156,076 \text{ sf needed with secondary capture} \]
There is 210,000 sf proposed, the market is currently in balance, and therefore, no additional space will be needed.

The following is used for questions 35 - 39:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COST</th>
<th>AGE</th>
<th>LIFE</th>
<th>DEPRECIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet</td>
<td>$20,000</td>
<td>9</td>
<td>15</td>
<td>$12,000</td>
</tr>
<tr>
<td>Roof</td>
<td>$15,000</td>
<td>9</td>
<td>12</td>
<td>$11,250</td>
</tr>
<tr>
<td>A/C</td>
<td>$7,000</td>
<td>4</td>
<td>7</td>
<td>$4,000</td>
</tr>
<tr>
<td>Totals</td>
<td>$42,000</td>
<td></td>
<td></td>
<td>$27,250</td>
</tr>
<tr>
<td>Physical incurable short-lived:</td>
<td></td>
<td></td>
<td></td>
<td>(27,250)</td>
</tr>
<tr>
<td>Physical incurable long-lived:</td>
<td></td>
<td></td>
<td></td>
<td>(95,526)</td>
</tr>
<tr>
<td>($688,844 - 10,000 - 42,000) x 9/60 =</td>
<td></td>
<td></td>
<td></td>
<td>($132,776)</td>
</tr>
<tr>
<td>Total Physical Depreciation</td>
<td></td>
<td></td>
<td></td>
<td>($556,068)</td>
</tr>
<tr>
<td>Value of improvements</td>
<td></td>
<td></td>
<td></td>
<td>$225,000</td>
</tr>
<tr>
<td>Value of site (50,000 x $4.50 psf)</td>
<td></td>
<td></td>
<td></td>
<td>$781,068</td>
</tr>
</tbody>
</table>

35. (d) The cost included the base cost with adjustments, profit, site improvements and indirect costs.

36. (d) Physical incurable depreciation includes incurable depreciation to the short-lived items as well as long-lived items. ($27,250 + 95,526)

37. (a) The ramp and dock would cost $12,000 without profit, but would add only $11,076 [(1¢ psf/ mo. x 12 months x 12,000 sf) \div .13] to $12,000 [(1¢ psf/ mo. x 12 months x 12,000 sf) \div .12] in value.
38.  (d) \((10,000 + 27,250 + 95,526)\)
39.  (b) \((688,844 - 132,776 + 225,000)\), rounded to $775,000.
40.  (a)
41.  (b) \(10,000 \div 2.50 \div 6 = 667\)
42.  (a) \([80\% \times 125,000 \times .08805 \text{ (Rm:360 months; } i=8) \times 1.20 \text{ (taxes&insurance)}] \div .30 = 35,220\)
\([80\% \times 175,000 \times .08805 \text{ (Rm:360 months; } i=8) \times 1.20 \text{ (taxes&insurance)}] \div .30 = 49,308\)
43.  (c) There is 25\% of income \(\pm 15,000\) of the median, or 12.5\% make $35,000 to $50,000, and 12.5\% make $20,000 to $35,000. The 12.5\% is between (c) & (d). Because the calculated range of income is actually $35,220 to $49,308, this range is less than 12.5\% and the answer is closer to 12\% than 13\%.
44.  (a) 12\% of incomes qualify X 15\% subject capture in this income range
45.  (a) There is 667 households per year X 70\% SFR = 467
The subject should capture 467 X 1.8\% = 8.4 per year
With 10 existing there should be no starts.
46.  (a)
47.  (d)
48.  (b) \(e/E = \text{LQ}, \text{ therefore } e/.05 = 2.0, \text{ and } e = .10 \text{ or 10}\%\)
49.  (a) The location quotient is greater than 1, therefore it is basic.
50.  (d) The value as industrial is \(40,000 \div .11 = 363,600\). This is a higher value than as vacant and therefore the highest and best use of the property is continued industrial use.
Mixed Problem Set Three

1. Which of the following is the purpose for productivity analysis?
   a. Market appeal & use implications for a site
   b. Valuation alternatives
   c. Locational alternatives
   d. Physical alternatives

2. What is considered in productivity analysis?
   a. Physical attributes
   b. Legal attributes
   c. Locational attributes
   d. All of the above

3. Which of the following is false?
   a. Inferred demand studies include an emphasis on instinctive knowledge
   b. Inferred demand studies include an emphasis on historical data
   c. Fundamental demand studies include an emphasis on quantifiable data and forecast models and judgment
   d. Judgment is not used in inferred demand studies and fundamental demand analysis uses judgment of the analyst

4. Given the following data, estimate the **useful life** for the long-lived components of a building.
   - Sale price: $1,500,000
   - Land value: $400,000
   - Cost: $1,750,000
   - Short-lived cost: 30%
   - % depreciation to short-lived: 55%
   - Age (yrs): 15
   a. 30 years
   b. 40 years
   c. 50 years
   d. 60 years

**Use the following to answer questions 5 - 7.**
All properties sold with **short term leases** in place.

```
GIM High
• A

• B

• C

• D
```

```
OER High
0
```
5. Which property is at the end of its economic life?
   a. A  
   b. B  
   c. C  
   d. D  

6. Which property has triple net expenses to the owner?
   a. A  
   b. B  
   c. C  
   d. D  

7. Which property has likely been renovated?
   a. A  
   b. B  
   c. C  
   d. D  

8. Use the following data to estimate the external obsolescence as a percentage of physically depreciated costs.
   Sale price $2,500,000
   Land value $400,000
   Cost $3,000,000
   Short-lived cost 25%
   % depreciation to short-lived 30%
   Age (yrs) 5
   Physical life 75
   a. 12.5%
   b. 15.0%
   c. 17.5%
   d. 20.0%

9. Assuming the external obsolescence is $500,000, what is the implied discount rate used by the market if the following shortfalls are expected?
   Year 1 $200,000
   Year 2 $160,000
   Year 3 $95,000
   Year 4 $75,000
   Year 5 $30,000
   a. 5%
   b. 6%
   c. 7%
   d. 15%

10. An extensive playground and pool area was built at a 300 room hotel for $200,000. Physical depreciation of 10% has been taken on the improvements. The added expenses of maintenance are $50 per room, net, per year. The typical pool and play area costs $125,000. It would cost $150,000 to convert the pool and play area to typical and expenses would then be $50 per room, net, per year less. The Ro = 13%. What is the functional obsolescence?
    a. $115,385
    b. $145,000
    c. $170,385
    d. $295,385
11. Refer to problem 10. What would the functional obsolescence be if the cost to cure was $90,000 instead of the $150,000?
   a. $115,385
   b. $145,000
   c. $170,385
   d. $295,385
   e. Answer 12 - 14 based on the following graph:

   The subject is a 10 year old office building with functional obsolescence in a soft market.

   LINE C REPRESENTS THE RELATIONSHIP OF % OF VALUE AND AGE CONSIDERING A SOFT MARKET.
   EITHER LINE A OR B REPRESENTS JUST PHYSICAL DEPRECIATION, AND EITHER LINE A OR B
   REPRESENTS FUNCTIONAL OBSOLESCENCE IN A BUILDING.

   Value
   100%
   90%
   80%
   70%
   60%
   50%
   40%
   30%
   20%
   10%
   0%

   0  5  10  15  20  25  30  35  40  45
   Age

   12. What does line A represent?
      a. Depreciation from cost new (time 0) to the end of the life of the building
      b. Physical depreciation from cost new (time 0) to the end of the life of the building
      c. Functional obsolescence from cost new (time 0) to the end of the life of the building
      d. External obsolescence from cost new (time 0) to the end of the life of the building

   13. What does line B represent?
      a. Depreciation from cost new (time 0) to the end of the life of the building
      b. Physical depreciation from cost new (time 0) to the end of the life of the building
      c. Functional obsolescence from cost new (time 0) to the end of the life of the building
      d. External obsolescence from cost new (time 0) to the end of the life of the building
14. What is the indicated life of the building?
   a. 30 years
   b. 35 years
   c. 40 years
   d. 45 years

15. A sprinkler system in a retail center costs $20,000. The system is inadequate and landscaping is lost at a rate of $6,000 per year because it is not sufficient for the property. The landscaping must be maintained by city ordinance. The proper system would cost $35,000 in new construction and the replacement of the current system would cost $45,000. The Ro = 11%. What is the functional obsolescence?
   a. $20,000
   b. $30,000
   c. $35,000
   d. $65,000

Problems 16 - 19 are based on the following:

Total cost: $3,500,000

Less depreciation:
   Physical curable: $200,000
   Physical incurable short-lived: 25,000
   Physical incurable long-lived: 225,000
   Functional curable: 110,000
   Functional incurable: 190,000
   External: 500,000

Total depreciation: $1,250,000

Total depreciated value of improvements: $2,250,000

Plus site value: $750,000

Total value: $3,000,000

The property is 5 years old with a 60 year physical life.

16. Given an economic life of 40 years, what is the indicated effective age?
   a. 5 years
   b. 11.9 years
   c. 14.3 years
   d. Cannot be determined from the information given

17. Using the modified economic age-life method and an economic life of 40 years, what is the effective age?
   a. 5 years
   b. 11.9 years
   c. 14.3 years
   d. Cannot be determined from the information given

18. If the effective age was 9 years what is the indicated economic life?
   a. 25 years
   b. 30 years
   c. 45 years
   d. 60 years

19. What is the indicated cost of the short-lived items?
   a. $500,000
   b. $600,000
   c. $700,000
   d. $800,000
20. A 30,000 sf warehouse does not have an overhead crane. The crane would cost $50,000 to install in new construction and $75,000 to add to the existing building. The rents are $.25 less (net) per year because there is no crane. The Ro = 12.5%. What is the functional obsolescence?
   a. $10,000
   b. $50,000
   c. $60,000
   d. There is no functional obsolescence.

**Answer questions 21 - 24 based upon the following:**
A 25,000 sf building (maximum allowed) would cost $50 psf to build on a 2 acre tract costing $3.50 psf. The rentable-to-gross ratio is 88%. Expenses are expected to be $3.00 psf and management expenses are expected to be 5% of effective gross income. Additionally, other expenses are expected to be 10% of effective gross income. Stabilized vacancy is 5% and the required Ro is 9%. Land values are expected to grow at 7%, building costs at 3%, and rents at 8%. Gross market rents are $11.00 psf.

21. What is the net rent required to build the building?
   a. $5.60 psf
   b. $6.36 psf
   c. $11.02 psf
   d. $11.60 psf

22. What is the gross rent required to build the building?
   a. $5.60 psf
   b. $6.36 psf
   c. $11.02 psf
   d. $11.60 psf

23. When should the building be built?
   a. 1 year
   b. 2 years
   c. 3 years
   d. 4 years

24. What would the load factor (add-on or core factor) be if the usable-to-gross area is 75%?
   a. 12%
   b. 17%
   c. 25%
   d. Cannot be determined from the information given

**Answer questions 25 - 27 based upon the following:**
The following are rankings of sales by retail category in 4 different neighborhoods. The 1 indicates the neighborhood sells the most in the particular category, 2 is second, and 3 indicates the neighborhood ranks last in sales in the category.

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building materials</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>General merchandise</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Food</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Automotive</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Service Stations</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Apparel</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Furniture &amp; appliances</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Drugs</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Jewelry</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Radio, TV &amp; music</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Liquor</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
25. Which neighborhood is primarily industrial?
   a. 1
   b. 2
   c. 3
   d. 4

26. Which neighborhood has a regional shopping center?
   a. 1
   b. 2
   c. 3
   d. 4

27. Which neighborhood is a downtown CBD?
   a. 1
   b. 2
   c. 3
   d. 4

**Answer 28 & 29 based upon the following:**
Assume the following have the same area in square feet.

28. Which of the following would have the least perimeter?
   a. A
   b. B
   c. C
   d. D

29. Which of the following would have the most perimeter?
   a. A
   b. B
   c. C
   d. D

30. A property that is 50 years old has a remaining economic life of 5 years. There is sufficient data to establish a reliable land value. Which of the following statements is most true?
   a. A cost approach is not reliable because of significant depreciation.
   b. A cost approach would be reliable because of the well established land value.
   c. An income approach would appear to be most useful.
   d. Only the sales comparison approach is applicable to this appraisal.

31. Land that is not salable but is in excess of what is needed for a particular building size is which of the following?
   a. excess
   b. surplus
   c. outside storage
   d. industrial
Use the following to answer questions 32 - 35:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in population in market area</td>
<td>14,500 persons</td>
</tr>
<tr>
<td>Average household size</td>
<td>3.02 persons</td>
</tr>
<tr>
<td>Average household income</td>
<td>$38,000</td>
</tr>
<tr>
<td>Capture rate of household income in retail</td>
<td>37%</td>
</tr>
<tr>
<td>Sales psf of retail</td>
<td>$270</td>
</tr>
<tr>
<td>Normal vacancy</td>
<td>8%</td>
</tr>
<tr>
<td>PE (Population-to-employment) ratio of area</td>
<td>2.75</td>
</tr>
<tr>
<td>% office employees</td>
<td>25%</td>
</tr>
<tr>
<td>Average space per employee</td>
<td>180 sf</td>
</tr>
<tr>
<td>Vacant space in area (office)</td>
<td>20,000 sf</td>
</tr>
<tr>
<td>Normal office vacancy in area (5%)</td>
<td>15,000 sf</td>
</tr>
<tr>
<td>Apartment vacancy (normal vacancy is 5%)</td>
<td>320 units (market is in balance)</td>
</tr>
<tr>
<td>Percent to occupy apartments</td>
<td>20%</td>
</tr>
</tbody>
</table>

32. How much retail space will be needed because of the growth in the area (Factor in frictional vacancy)?
   a. 250,025 sf
   b. 271,766 sf
   c. 289,765 sf
   d. 291,903 sf

33. How much office will be occupied by the growth in population (Do not factor in frictional vacancy)?
   a. 197,272 sf
   b. 229,761 sf
   c. 237,272 sf
   d. 249,761 sf

34. How many apartments will be needed in this market?
   a. None
   b. 691 units
   c. 960 units
   d. 1,011 units

35. What percent of the population is employed?
   a. 31.4%
   b. 33.1%
   c. 36.4%
   d. 40.1%

36. What is “frictional vacancy”??
   a. normal vacancy
   b. temporary vacancy
   c. interim vacancy
   d. vacancy resulting from dissatisfied tenants

37. What is “leakage”?
   a. Loss in office demand due to tenant’s moving up to higher class office
   b. Loss in retail sales to another market or retail type
   c. Loss due to normal vacancy
   d. Industrial environmental concerns due to turnover
Use the following to answer questions 38 - 43
Population in area 108,000
Employment in area 60,500
Basic employment in area 25,000
Employment in industrial 4,000
Industrial employment in country 25%
Employment in retail 5,000
Employment retail in country 15%
Forecast basic employment change 5,000 (over next 4 years)

38. What is the PE ratio for this market?
   a. .56
   b. 1.67
   c. 1.79
   d. 2.42

39. What is the EB ratio in this market?
   a. .56
   b. 1.67
   c. 1.79
   d. 2.42

40. What is the location quotient for retail?
   a. .45
   b. .55
   c. 1.55
   d. 1.79

41. What is the percent basic employment in industrial in this market?
   a. 0%
   b. -10%
   c. 10%
   d. 26%

42. What is the forecast population growth over the next three years?
   a. 5,000 persons
   b. 11,300 persons
   c. 16,200 persons
   d. 21,600 persons

43. What can be said about the make up of basic employment in this area?
   a. It is primarily industrial
   b. It is primarily retail
   c. It is primarily retail and industrial
   d. It is primarily office and service

44. What has the most detail for the same property?
   a. Plat
   b. Survey
   c. Site Plan
   d. Flood map
Use the following to answer questions 45 - 47.

Land: 250' X 350' deep
Setbacks: 50' front; 20' back; and 10' on the sides
Zoning: 10% of building sf required for open space & no improvements in setbacks
Zoning-Parking: At least 1 space per 275 sf of retail & at least 1 space per 375 sf of office
Market-Parking: At least 1 space per 250 sf of retail & at least 1 space per 350 sf of office
Building: 2-story, 1/2 office & 1/2 retail, surface parking only (325 sf is needed per space).

45. What is the maximum building size that can be built on the site?
   a. 38,257 sf
   b. 40,250 sf
   c. 76,515 sf
   d. 87,500 sf

46. How much land area will there be, as a minimum, with no improvements?
   a. 23,100 sf
   b. 26,926 sf
   c. 34,879 sf
   d. 43,567 sf

47. How many parking spaces will be required to adequately serve the maximum building size?
   a. 120 spaces
   b. 124 spaces
   c. 128 spaces
   d. 145 spaces

Use the following to answer questions 48 - 51.

Employment growth: 5,000 over the next 4 years
PE ratio: 2.75
Average household income: $40,000
Average household size: 3.10 persons
Percentage of spending: 30% taxes; 42% nonretail; 5% savings; balance retail
Average sales PSF: $235
Primary market leakage: 24%
Secondary market capture: 10% of primary retail sf
Frictional vacancy: 7%
Proposed supply in market: 93% current occupancy; 210,000 sf proposed

48. What is the projected growth in population per year in the market?
   a. 500 persons
   b. 1,250 persons
   c. 1,719 persons
   d. 3,438 persons

49. What is the projected growth in total households over the next 4 years?
   a. 1,109 households
   b. 2,789 households
   c. 4,435 households
   d. 5,636 households
50. How much total space will be demanded as a result of the total growth in this market area before frictional vacancy?
   a. 173,645 sf  
   b. 191,009 sf  
   c. 205,386 sf  
   d. 225,605 sf

51. What is the residual demand for retail over the next 4 years in this market?
   a. 0 sf  
   b. 191,009 sf  
   c. 205,386 sf  
   d. 225,605 sf

Use the following information to answer questions 52 - 56:
Construction costs = $43 psf (Unadjusted base cost)
Height multiplier = 1.05
Perimeter multiplier = .95
Local multiplier = .93
Time multiplier = 1.02
Profit as a percent of base cost = 12%
Building size = 12,000; Land size = 50,000 sf (worth $4.50 psf)
Site improvements: Parking - 3.00 sf parking to 1 sf building ratio @ $2.00 psf; other site = $20,000 (the parking and site improvement costs are replacement cost & include all profits)
Indirect costs not in base cost = $50,000
Remaining life = 51 years

<table>
<thead>
<tr>
<th>Short-lived items</th>
<th>Cost</th>
<th>Age</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet</td>
<td>$20,000</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Roof</td>
<td>$15,000</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>A/C</td>
<td>$7,000</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Paint</td>
<td>$10,000</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

52. What is the cost of the improvements?
   a. $546,844  
   b. $596,844  
   c. $612,844  
   d. $688,844

53. What is the amount of physical incurable depreciation?
   a. $10,000  
   b. $27,250  
   c. $95,527  
   d. $122,776

54. What is the measure of functional curable obsolescence?
   a. $0  
   b. $12,000  
   c. $11,076 to $12,000  
   d. Cannot be determined from the information given

55. What is the amount of total depreciation?
   a. $27,250  
   b. $95,527  
   c. $105,527  
   d. $132,776
56. What is the indicated value (rounded)?
   a. $550,000
   b. $775,000
   c. $810,000
   d. $850,000

57. Which of the following appears as a series of circles from a central area (CBD)?
   a. Concentric zone
   b. Sector
   c. Multiple-nuclei
   d. Radial-Corridor Structure

58. Which of the following would tend to look like a city that grew along a river and two interstate highway systems?
   a. Concentric zone
   b. Sector
   c. Multiple-nuclei
   d. Radial-Corridor Structure

59. Given a location quotient of 2.0 and E=5%, what is e?
   a. 5%
   b. 10%
   c. 15%
   d. 20%

60. A building has a swimming pool that costs $30,000, but contributes only $5,000 in value. What type of depreciation or obsolescence is this?
   a. Physical curable
   b. Physical incurable
   c. Functional, curable
   d. Functional, incurable

End of Mixed Problem Set Three
1. A Productivity analysis is the first step in the market analysis process. The first step is to define the product. This requires a determination of the market appeal for the site. Ultimately, potential and alternative uses of the site are identified from the property productivity analysis.

2. D Physical, legal and locational attributes are considered when determining the potential use of the site.

3. D Judgment must be exercised for both inferred and fundamental demand studies. The difference is the detail of data collected and the detail of analysis. However, the conclusions must be an exercise of judgment.

4. C

Value of building = $1,500,000 – 400,000 = $1,100,000
Cost of long-lived = $1,750,000 x (1 – 30%) = $1,225,000
Cost of short-lived = $1,750,000 x 30% = $525,000
Value of short-lived = $525,000 x (1-55%) = $236,250
Value of long-lived = $1,100,000 – 236,250 = $863,750
Depreciation to long-lived = ($1,225,000 – 863,750) = $361,250
Life of long-lived = $1,225,000 x 15/Life = $361,250 = 50.9 years

For problems 5 – 7:
There is a relationship between the GIM (gross income multiplier) & OER (operating expense ratio). Remember the NIR (net income ratio) is 1 – OER. This relationship is expressed in the formula, \( \text{Ro} = \frac{\text{NIR}}{\text{EGIM}} \). Make up numbers on the graph. Example: Make the GIM range from 0 to 8 & the OER from 0 to 100%. Place the numbers on the graph by spacing the lines to be somewhat proportional. My lines show the OER (all made up) for A & B to be 50%, C to be 15% and D to be 80%. The GIM is indicated at 8 for A, 5.5 for B, 3 for C and 1.5 for D. Then calculate Ro for all properties. Use \( \text{Ro} = \frac{\text{NIR}}{\text{EGIM}} \).

Property A: \( \text{Ro} = \frac{.50}{8} = 6.25\% \)
Property B: \( \text{Ro} = \frac{.50}{5.5} = 9.09\% \)
Property C: \( \text{Ro} = \frac{.85}{3} = 28.3\% \)
Property D: \( \text{Ro} = \frac{.20}{1.5} = 13.3\% \)
Depending upon your made up ranges of GIM & OER, you would get different indicated rates. However, the order should be the same as above.

5. D This property has the highest expense ratio and lowest GIM. [Note: if the x & y axis are marked, you could determine an Ro for each property by \( \text{Ro} = (1 - \text{OER})/\text{GIM} \). This would be preferable to use over just GIM or OER.]

6. C This property has the lowest expense ratio.

7. A Property A has both the highest GIM. It seems to be the best answer to indicating a renovated property relative to the others.

8. D Value of building = $2,500,000 – 400,000 = $2,100,000
Total depreciation = $3,000,000 – 2,100,000 = $900,000
Depreciation to SL = $3,000,000 x 25% x 30% = $225,000
Depreciation to LL = $3,000,000 x 75% x 5/75 = $150,000
External obsolescence = $900,000 – 225,000 – 150,000 = $525,000
% of physically depreciated cost = 525,000/(3,000,000 – 375,000) = 20%

9. A 500,000 CHS g Cfo
200,000 g CFj
160,000 g CFj
95,000 g CFj
75,000 g CFj
30,000 g CFj
f IRR [5.28%]
10. C
   1. $200,000
   2. - 20,000
   3A. + 150,000
   3B. +115,385 \[= (300 \times 50)/.13 = 115,385\]
   4. - 125,000
   **Total** $170,385

   Note: Use the smaller of 3A (cost to cure) or 3B (present value of loss). The inclusion of both 3A and 3B facilitates the test if an item is curable or incurable. In this case the functional is incurable.

   The 20,000 is depreciation previously charged and the $125,000 is the cost for a typical pool.

11. B
   1. $200,000
   2. - 20,000
   3A. + 90,000
   3B. +115,385 \[= (300 \times 50)/.13 = 115,385\]
   4. - 125,000
   **Total** $145,000

   Note: In this case the cost to cure is less than the present value of the loss. Therefore, the problem would be cured and the total obsolescence is less.

12. B
   Line A would represent physical depreciation because it starts at 100% for a new building. The other two lines could not represent physical depreciation because at age = 0, the value is < 100%.

13. C
   Line B has to be functional because the problem gave line C as representing external obsolescence.

14. C
   It is where the graph shows 0% of cost is the value, or 40 years.

15. B
   1. $20,000
   2. No information
   3A. + 45,000
   3B. +54,545 \[= 6,000/.11 = 54,545\]
   4. - 35,000
   **Total** $30,000

16. C
   % Depreciation = 1,250,000/3,500,000 = 35.7%
   Age/40 = .357, therefore age = 14.3

17. B
   Depreciation to curables (& cost) = 200,000 + 110,000 = 310,000
   Depreciation to incurables = 1,250,000 – 310,000 = 940,000
   Cost of incurables = 3,500,000 – 310,000 = 3,190,000
   % depreciation to incurables = 940,000/3,190,000 = 29.5%
   Age/40 = 29.5%, therefore age = 11.9 years

18. A
   9/Life = 35.7%, therefore life = 25.2 years

19. B
   (3,500,000 – 200,000 – cost of short-lived) x 5/60 = 225,000
   Therefore, the cost of short-lived items = $600,000
   Note: If you have trouble solving the math above, simply test the answers by plugging an answer in and see if the cost – curables – cost of short-lived x age/life = 225,000.
20. A 1. 0
2. 0
3A. + $25,000 [cost to cure]
3B. + $60,000 [(30,000 x .25)/.125 = 60,000]
4. - $50,000
Total $10,000

Note: The lack of crane is a functional problem. The loss exceeds the cost if included in a new building being built. The building loses $60,000 because there is not a crane and it would have represented $50,000 in new construction. Therefore, the cost already represents $50,000 less than a building with a crane and the extra loss is $10,000 over and above the cost.

For problems 21 – 24:
Cost = $50 + (3.50 x 2 x 43,560)/25,000 = $62.20 psf
NOI needed: (62.50 x .88)/.09 = $6.36 psf
EGI needed: (6.36 + 3.00) / (1 – 15%) = $11.01 psf
PGI needed: 11.01 / (1 – 5%) = $11.59 psf

Market rent = $11.00
Land = 12.20/62.20 = 20%, and therefore the building is 80% of rent
$11.59 x 80% = $9.27 for building
$11.59 x 20% = $2.32 for land

<table>
<thead>
<tr>
<th>Year</th>
<th>Building(3%)</th>
<th>Land(7%)</th>
<th>Total</th>
<th>Market(8%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$9.27</td>
<td>$2.32</td>
<td>$11.69</td>
<td>$11.00</td>
</tr>
<tr>
<td>1</td>
<td>9.55</td>
<td>2.48</td>
<td>12.03</td>
<td>11.88</td>
</tr>
<tr>
<td>2</td>
<td>9.83</td>
<td>2.66</td>
<td>12.49</td>
<td>12.83</td>
</tr>
</tbody>
</table>

Build in year 1 because market rent will exceed feasible rent shortly after year 1.

21. B
22. D
23. A
24. B
Rentable = 25,000 x .88 = 22,000
Usable = 25,000 x .75 = 18,750
Load = (22,000 – 18750) / 18,750 = 17.3%

25. D
The least retails sales would probably be in an industrial area.

26. C
Neighborhood 3 sells the most jewelry, apparel, furniture, radios & TVs, as well as general merchandise.

27. B
Neighborhood 2 does not sell much automotive, service station, furniture and building materials.

28. A
A circle has the least perimeter, followed by the square, then rectangle, then multisided figure.

29. D
Although not part of the question, the most expensive to build would probably be the circle, then multisided, then square, then rectangle. The rectangle would be the least expensive because of load requirements for the roof, etc. The least expensive house is a to build is a rectangle.

30. B
The land value would comprise most of the total value. Therefore, the cost approach reliability would not depend upon an accurate measure of depreciation because little value is coming from the improvements.
31. **B** Surplus land is land that is not needed for improvements, but is not saleable. Excess land is saleable.

32. **B**
   
   \[4,801 \times 38,000 = 182,450,333\]
   
   \[\$182,450,333 \times 37\% = \$67,506,623\]
   
   \[\$67,506,623 / 270 = 250,025 \text{ sf}\]
   
   \[250,025 / (1 - 8\%) = 271,766 \text{ sf}\]

33. **C**
   
   \[14,500 / 2.75 \times 25\% = 1,318 \text{ employees}\]
   
   \[1318 \times 180 = 237,272 \text{ sf}\]
   
   [Note: Usually you will have to factor in frictional vacancy. This problem tells you not to factor in the vacancy, but compute what will be actually occupied by the growth.]

34. **D**
   
   \[4,801 \times 20\% = 960 \text{ units}\]
   
   \[960 \text{ units} / (1 - 5\%) = 1,011 \text{ units}\]

35. **C**
   
   \[1 / 2.75 = 36.4\%\]

36. **A** Frictional vacancy is like frictional unemployment. It is the vacancy that results from normal turnover even in good markets. In fact, turnover is common in good markets as rents increase.

37. **B** Leakage is used to describe the loss of retail sales to another area.

38. **C**
   
   \[108,000 / 60,500 = 1.79\]

39. **D**
   
   \[60,500 / 25,000 = 2.42\]

40. **B**
   
   \[5,000 / 60,500 = .0826\]
   
   \[.0826 / .15 = .55\]

41. **A**
   
   \[4,000 / 60,500 = .0661\]
   
   \[.0661 / .25 = .2645\]

42. **C**
   
   \[5,000 \text{ (basic employment)} \times 60,500/25,000 \times 108,000/60,500 \times 3 \text{ years/4 years} = 16,200 \text{ persons}\]

43. **D** The best answer D. The LQs show the basic employment is not retail or industrial. Therefore, the best answer is from an industry that no data is given.

44. **B** A plat shows the lines for a proposed subdivision or boundary change. A site plan shows the boundaries and generally at least the placement of buildings. A survey is more detailed and may show the boundaries, elevations, building measurements and other detailed information. The flood map merely shows the flood designations and not specific properties.

45. **A**
   
   \[64,400 = X/2 + (X/300 \times 325) + .10X \text{ [Note: The 300 SF is (250 SF + 350 SF)/2]}\]
   
   \[64,400 = .5X + 1.083333X + .10X\]
   
   \[64,400 = 1.683333X\]
   
   \[X = 38,020\]

46. **B**
   
   \[(38,257 \times .10) \text{ open areas} + 23,100 \text{ setbacks} = 26,926\]

47. **C**
   
   \[38,257 / 300 = 128 \text{ spaces}\]

48. **D**
   
   \[5,000 \times 2.75 / 4 = 3,438 \text{ persons}\]

49. **C**
   
   \[5,000 \times 2.75 / 3.10 = 4,438 \text{ households}\]
50. **A**

   \[\frac{[4,435 \times 40,000 \times (1 - 30\% - 42\% - 5\%)]}{235} = 173,626\]

   \[173,626 \times .76 \times 1.10 = 145,151 \text{ sf}\]

   This is an example of the best answer being A.

51. **A**

   Needed: \(\frac{173,645}{.93} = 186,694\) (& 210,000 proposed).

52. **D**

   \[12,000 \times 43 \times 1.05 \times .95 \times .93 \times 1.02 \times 1.12 \text{ (profit)} = \$546,844\]

   \[12,000 \times 3 \times \$2 = 72,000\]

   \[20,000\]

   \[50,000\]

   Total cost \(\$688,844\)

   **Note:** The parking and site improvement costs include profit.

53. **D**

   Physical curable is the paint (100\% depreciated) \(10,000\)

   Physical incurable short-lived (from schedule) \(27,250\)

   Physical incurable long-lived

   \[(688,844 - 10,000 - 42,000 \text{ cost of short-lived}) \times \frac{9}{60} = 95,527\]

   Therefore, the incurable is the \(27,250 + 95,527 = 122,776\)

54. **A OR D** There is no evidence in the problem of functional obsolescence.

55. **D**

   \($122,776 + 10,000 = \$132,776\)

56. **B**

   \($688,844 - 132,776 + (50,000 \times 4.50) = \$781,068\)

57. **A**

58. **D**

59. **B**

   \(e/E = LQ; \text{ therefore, } e/.05 = 2.0.\)

60. **D**

   It is not physical or external and you would not get rid of it if it contributes value. Therefore, it is incurable.
Cost Approach – Mixed Problem Set Four

1. A parking lot will be built with concrete that will cost $1.50 psf for labor, $75 per cubic yard for concrete, and $1.00 psf for forms and rebar. Assume the parking lot is 200 feet by 150 feet and will be poured 5.5 inches thick. What is the cost of the parking lot per square foot?
   a. $2.50 psf
   b. $3.25 psf
   c. $3.75 psf
   d. $4.00 psf

2. A market has 100,000 sf of office available for lease, 150,000 sf being added, 20,000 scheduled to be demolished and total office space is 1,000,000. Assume stabilized vacancy at 5%, what is residual demand in this market?
   a. 0 sf
   b. 56,500 sf
   c. 180,000 sf
   d. Cannot determine from the information given

3. NOI = $0. Taxes are $2,000, insurance is $1,000 and maintenance is $2,000 per year. The taxes are broken into $1,500 for the land and $500 per year for the building. Ro = .12. Assume the land is worth $125,000, but is not developable until a road is completed in the area in two years and a change of zoning from R-1 to C-2 is achieved. The change in zoning is likely prior to the road being completed. Demolition of the building will cost $15,000. What is the value of the improvements?
   a. $0
   b. -$12,000
   c. -$15,000
   d. -$30,000

4. In the above example, what is the highest and best use of the property?
   a. Commercial
   b. Residential
   c. To hold for future commercial development
   d. Research and development

5. What has the most affect on apartment leasing?
   a. Household size
   b. Population change
   c. Employment change
   d. Students

6. There is an announcement that a company will employ 150 employees and sell computer keyboards to a distributor located in another state. The company will build a building of 50,000 sf of office, manufacturing and storage area. The expectations are that 400 more jobs will result because this company. Assume that the growth will result in a need for more office with a market that has 5,000 sf in excess of what is needed for typical frictional vacancy. Average employment in office is 180 sf per employee and 18% of the growth is expected to be in employment that needs office. What is the residual office demand after the company locates in the market?
   a. 7,960 sf
   b. 12,960 sf
   c. 15,820 sf
   d. 17,820 sf
7. What is the likely growth in population from the company locating in this market?
   a. 550 persons
   b. 1,100 persons
   c. 2,200 persons
   d. 3,300 persons

8. What is the classification of the 150, 400 and 550 employees in problem 6?
   a. Basic, ancillary, total
   b. Basic, service, total
   c. Service, basic, total
   d. Service, additional, speculative

9. A property has above market leases. How would you adjust for this feature in the cost approach?
   a. You would not, the cost approach values fee simple interests
   b. You would add the present value of the excess rent as a bottom-line item
   c. You would subtract the present value of the excess rent as a bottom-line item
   d. You would add the difference between the leasehold and leased fee values as a bottom-line item

Answer questions 10 – 13 based upon the following information.

Office building 1: Built within the last two years for $1,000,000 total construction costs and with a land value of $275,000. The building is 13,000 sf and the land is 52,000 sf.

Office building 2: Built within the last year for $1,200,000 total construction costs and with a land value of $380,000. The building is 15,100 sf and the land area is 75,000 sf.

Office building 3: Built within the last three years for $1,400,000 total construction costs and with a land value of $380,000. The building is 19,000 sf and the land area is 78,000 sf.

Office building 4: Built within the last year for $1,150,000 total construction costs and with a land value of $375,000. The building is 15,000 sf and the land area is 63,000 sf.

Assume all sites have a highest and best use with office development.

10. Which of the above is likely to have an irregular site?
    a. Office building 1
    b. Office building 2
    c. Office building 3
    d. Office building 4

11. Which building is likely to have the highest rent psf?
    a. Office building 1
    b. Office building 2
    c. Office building 3
    d. Office building 4

12. If all leased for the same rental psf, which building likely has functional obsolescence?
    a. Office building 1
    b. Office building 2
    c. Office building 3
    d. Office building 4

13. What is the increase in land value in the above office sites?
    a. 4% per year
    b. 7% per year
    c. 9% per year
    d. 11% per year
14. A building has a component that cost $125,000 in new construction and is 10% depreciated. A high quality component would cost $150,000 in new construction and $275,000 to add in the existing building. There is no salvage value to the existing component. The expenses are $11,000 more per year because the higher quality component was not installed. The overall rate is .11. What is the amount of functional obsolescence?
   a. $0
   b. $62,500
   c. $125,000
   d. $175,000

15. Which of the following is true?
   a. The cost approach sets the upper limit of value.
   b. The cost approach is used for fee simple valuations only.
   c. The cost approach is the best approach for special purpose properties.
   d. The cost approach is best used with very old properties.

16. A retail property leases in a strip center for $25 psf and percentage rents of 6% with a natural break. Vacancy in the retail center is overall at 5%. What would the rent be psf if sales were $400 psf per year?
   a. $24 psf
   b. $25 psf
   c. $25 + $24 psf
   d. $25 / (1 - .05) psf

17. Of the following, which is likely to have the highest sales psf?
   a. Restaurants
   b. Jewelry
   c. Footwear
   d. Apparel

18. Which of the following is likely to have the highest turn ratio?
   a. Grocery
   b. Jewelry
   c. Footwear
   d. Gifts

19. If the footprint coverage on the site is 4 to 1 and a 3-story building has a footprint of 15,000 sf, what is the FAR?
   a. 45,000/60,000
   b. 60,000/45,000
   c. 15,000/60,000
   d. 60,000/15,000

20. A property has land worth $500,000. The improvements will be demolished in one year for $25,000. The improvements are being used for storage and generate enough income to offset expenses. The NOI is zero. Assume the property would be developed today except the lease for the storage encumbers the property. What is the value of the property including the improvements?
   a. $450,000
   b. $475,000
   c. $500,000
   d. $525,000
1. A parking lot will be built with concrete that will cost $1.50 psf for labor, $75 per cubic yard for concrete, and $1.00 psf for forms and rebar. Assume the parking lot is 200 feet by 150 feet and will be poured 5.5 inches thick. What is the cost of the parking lot per square foot?
   a. $2.50 psf
   b. $3.25 psf
   c. $3.75 psf
   d. $4.00 psf
   \[(1.50 + 1.00) \times 200 \times 150 = 75,000.00\]
   \[75 \times \frac{200}{3} \times \frac{150}{3} \times \frac{5.5}{36} = 38,194.44\]
   Total Cost: \$113,194.44
   Cost psf: \$113,194.44 / (200 \times 150) = \$3.77

2. A market has 100,000 sf of office available for lease, 150,000 sf being added, 20,000 scheduled to be demolished and total office space is 1,000,000. Assume stabilized vacancy at 5%, what is residual demand in this market?
   a. 0 sf
   b. 56,500 sf
   c. 180,000 sf
   d. Cannot determine from the information given
   Frictional vacancy needed: \((1,000,000 + 150,000 - 20,000) \times 5\% = 56,500\) sf
   Vacancy in market = 100,000, therefore there is no residual demand, but excess space of 43,500 sf.

3. NOI = $0. Taxes are $2,000, insurance is $1,000 and maintenance is $2,000 per year. The taxes are broken into $1,500 for the land and $500 per year for the building. Ro = .12. Assume the land is worth $125,000, but is not developable until a road is completed in the area in two years and a change of zoning form R-1 to C-2 is achieved. The change in zoning is likely prior to the road being completed. Demolition of the building will cost $15,000. What is the value of the improvements?
   a. $0
   b. -$12,000
   c. -$15,000
   d. -$30,000
   When NOI is $0 and there is an interim use, the improvements are at least offsetting taxes, some insurance and some property upkeep (mowing, etc.). Therefore, the improvements would not be demolished until the new improvements can be built. The improvements contribute $1,500 x 2 years, but cost $15,000 to remove. Therefore, the improvements are worth at least a -$12,000. Note the property would be more valuable as totally vacant.

4. In the above example, what is the highest and best use of the property?
   a. Commercial
   b. Residential
   c. To hold for future commercial development
   d. Research and development
   The highest and best use is not necessarily what is currently zoned.

5. What has the most affect on apartment leasing?
   a. Household size
   b. Population change
   c. Employment change
   d. Students
   The major components of housing demand study are population, household size and income levels. Population change is the best answer.
6. There is an announcement that a company will employ 150 employees and sell computer keyboards to a distributor located in another state. The company will build a building of 50,000 sf of office, manufacturing and storage area. The expectations are that 400 more jobs will result because this company. Assume that the growth will result in a need for more office with a market that has 5,000 sf in excess of what is needed for typical frictional vacancy. Average employment in office is 180 sf per employee and 18% of the growth is expected to be in employment that needs office. What is the residual office demand after the company locates in the market?
   a. 7,960 sf
   b. 12,960 sf
   c. 15,820 sf
   d. 17,820 sf

   Note that the basic employer of 150 employees will build their own building. The problem requires translating the 400 jobs into potential residual demand. The office need is (400 x 18% x 180)/(1 – frictional vacancy). Note that frictional vacancy is not given. Ignoring the frictional vacancy there will be a need for 12,960 sf. There is a need for 12,960 less the 5,000 in excess, or 7,960 plus what would be needed for the frictional vacancy. Answer (a) is the best answer.

7. What is the likely growth in population from the company locating in this market?
   a. 550 persons
   b. 1,100 persons
   c. 2,200 persons
   d. 3,300 persons

   Approximately 48% of Americans are employed. There are one working spouse families, children and retired that do not work. Therefore, the ratio is about 2:1 population to employment.

8. What is the classification of the 150, 400 and 550 employees in problem 6?
   a. Basic, ancillary, total
   b. Basic, service, total
   c. Service, basic, total
   d. Service, additional, speculative

9. A property has above market leases. How would you adjust for this feature in the cost approach?
   a. You would not, the cost approach values fee simple interests
   b. You would add the present value of the excess rent as a bottom-line item
   c. You would subtract the present value of the excess rent as a bottom-line item
   d. You would add the difference between the leasehold and leased fee values as a bottom-line item

   Answer questions 10 – 13 based upon the following information.

   Office building 1: Built within the last two years for $1,000,000 total construction costs and with a land value of $275,000. The building is 13,000 sf and the land is 52,000 sf.

   Office building 2: Built within the last year for $1,200,000 total construction costs and with a land value of $380,000. The building is 15,100 sf and the land area is 75,000 sf.

   Office building 3: Built within the last three years for $1,400,000 total construction costs and with a land value of $380,000. The building is 19,000 sf and the land area is 78,000 sf.

   Office building 4: Built within the last year for $1,150,000 total construction costs and with a land value of $375,000. The building is 15,000 sf and the land area is 63,000 sf.

   Assume all sites have a highest and best use with office development.

<table>
<thead>
<tr>
<th>Building</th>
<th>LTB ratio</th>
<th>Cost psf</th>
<th>Land psf (bldg)</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (2 years)</td>
<td>4.00:1</td>
<td>$76.93</td>
<td>$21.15</td>
<td>$98.08</td>
</tr>
<tr>
<td>2 (1 year)</td>
<td>4.97:1</td>
<td>$79.47</td>
<td>$25.16</td>
<td>$104.63</td>
</tr>
<tr>
<td>3 (3 years)</td>
<td>4.11:1</td>
<td>$73.68</td>
<td>$20.00</td>
<td>$93.68</td>
</tr>
<tr>
<td>4 (1 year)</td>
<td>4.20:1</td>
<td>$76.67</td>
<td>$25.00</td>
<td>$101.67</td>
</tr>
</tbody>
</table>
10. Which of the above is likely to have an irregular site?
   a. Office building 1
   b. **Office building 2**
   c. Office building 3
   d. Office building 4

The land-to-building ratio is highest with building 2.

11. Which building is likely to have the highest rent psf?
   a. Office building 1
   b. **Office building 2**
   c. Office building 3
   d. Office building 4

The newest and highest cost psf is building 2.

12. If all leased for the same rental psf, which building likely has functional obsolescence?
   a. Office building 1
   b. **Office building 2**
   c. Office building 3
   d. Office building 4

   If all had the same rental rate psf, the highest cost would most likely have the functional obsolescence.

13. What is the increase in land value in the above office sites?
   a. 4% per year
   b. 7% per year
   c. 9% per year
   d. **11% per year**

The oldest building site was $20 psf of building area, then the next $21.15 and the newer buildings site cost was about $25 psf. The prices went up $5 over 2 years or 25%/2 = 12.5%. Therefore, (d) is the best answer.

14. A building has a component that cost $125,000 in new construction and is 10% depreciated. A high quality component would cost $150,000 in new construction and $275,000 to add in the existing building. There is no salvage value to the existing component. The expenses are $11,000 more per year because the higher quality component was not installed. The overall rate is .11. What is the amount of functional obsolescence?
   a. $0
   b. **$62,500**
   c. $125,000
   d. $175,000

<table>
<thead>
<tr>
<th>Cost of existing item</th>
<th>$125,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less: Depreciation charge</td>
<td>10% of $125,000</td>
</tr>
<tr>
<td>3A: If curable</td>
<td>$275,000</td>
</tr>
<tr>
<td>3B: If incurable</td>
<td>$11,000/.11 = $100,000</td>
</tr>
<tr>
<td>Cost of “correct item”</td>
<td>(150,000)</td>
</tr>
<tr>
<td>Total Depreciation</td>
<td><strong>$62,500</strong></td>
</tr>
</tbody>
</table>

15. Which of the following is true?
   a. The cost approach sets the upper limit of value.
   b. The cost approach is used for fee simple valuations only.
   c. **The cost approach is the best approach for special purpose properties.**
   d. The cost approach is best used with very old properties.
This represents the best answer. Answer (d) could also be correct because a property with a large land value to total value ratio would result in a cost approach that is useful.

16. A retail property leases in a strip center for $25 psf and percentage rents of 6% with a natural break. Vacancy in the retail center is overall at 5%. What would the rent be psf if sales were $400 psf per year?
   a. $24 psf
   b. $25 psf
   c. $25 + $24 psf
   d. $25 / (1 - .05) psf

Natural break: $25/.06 = $416.67 psf of sales. At $400, the tenant would pay the base rate.

17. Of the following, which is likely to have the highest sales psf?
   a. Restaurants
   b. Jewelry
   c. Footwear
   d. Apparel

It would either be jewelry or food. Regional malls report jewelry as the highest sales psf.

18. Which of the following is likely to have the highest turn ratio?
   a. Grocery
   b. Jewelry
   c. Footwear
   d. Gifts

Grocery has the highest turn because of perishable items and because the average good is the least.

19. If the footprint coverage on the site is 4 to 1 and a 3-story building has a footprint of 15,000 sf, what is the FAR?
   a. 45,000/60,000
   b. 60,000/45,000
   c. 15,000/60,000
   d. 60,000/15,000

If is (3 x 15,000)/(4 x 15,000), or 45,000/60,000

20. A property has land worth $500,000. The improvements will be demolished in one year for $25,000. The improvements are being used for storage and generate enough income to off-set expenses. The NOI is zero. Assume the property would be developed today except the lease for the storage encumbers the property. What is the value of the property including the improvements?
   a. $450,000
   b. $475,000
   c. $500,000
   d. $525,000

$500,000 – 25,000 + offset for carrying some land costs – delay for development because of the encumbrance of the lease. Therefore, either $450,000 or $475,000. Because of risk and delay, (a) is the best answer.