Guided Exercises

1. Hannah’s financial advisor believes that she should spend no more than 26% of her gross monthly income for housing. She has determined that amount is $1,794 per month. Based on this amount and her advisor’s recommendation, what is Hannah’s annual salary?

Percentage = whole × rate as decimal

Rewrite to solve for the whole:
Whole = percentage ÷ rate
Whole = 1,794 ÷ 0.26 = __________
6,900 × 12 = __________

Hannah earns __________ a year.

2. The square footage and monthly rental of 10 similar one-bedroom apartments yield the linear regression \( y = 0.775x + 950.25 \) where \( x \) represents the square footage of the apartment and \( y \) represents the monthly rental price. Grace can afford $1,500 per month rent. Using the equation, what size apartment should she expect to be able to rent for that price?

Substitute for \( y \) and solve for \( x \).

\[
y = 0.775x + 950.25
\]

\[
1,500 = 0.775x + 950.25
\]

\[
549.75 = 0.775x
\]

\[
709.4 \approx x
\]

Grace can expect to rent an apartment that is about __________ square feet.
Exercises

3. Adina makes $53,112 per year and is looking to find a new apartment rental in her city. She searched online and found an apartment for $1,500 per month. The recommendation is to budget between 25% and 30% of your monthly income for rent. Can Adina afford this apartment based upon the recommended interval? Explain.

No; the interval is $1,106.50 – $1,327.80. The apartment is above the price range recommended.

4. Carla wants to rent a new apartment. She made a table listing the square footage of the apartments and their rents as shown. Use linear regression analysis to determine if there is a correlation between the square footage and the amount charged for the monthly rent.

<table>
<thead>
<tr>
<th>Square feet</th>
<th>600</th>
<th>790</th>
<th>800</th>
<th>850</th>
<th>925</th>
<th>980</th>
<th>1,050</th>
<th>1,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Rent ($)</td>
<td>795</td>
<td>1,523</td>
<td>1,600</td>
<td>1,800</td>
<td>2,000</td>
<td>2,100</td>
<td>2,300</td>
<td>3,000</td>
</tr>
</tbody>
</table>

What is the linear regression equation? Round the numbers to the nearest hundredth. Interpret the correlation coefficient.

\[ y = 2.67x – 575.6; \] 0.98; It is a strong positive correlation.

5. The square footage and monthly rental of 15 similar one-bedroom apartments yield the linear regression formula \( y = 1.3485x + 840.51 \), where \( x \) represents the square footage and \( y \) represents the monthly rental price. Round answers to the nearest whole number. Determine the monthly rent for an apartment with 1,200 square feet and then determine the square footage of an apartment with a monthly rent of $1,900.

$2,459; 786 sq. ft

6. Conan is moving into a two-bedroom apartment in Valley Oaks. The monthly rent is $2,000. His up-front fees are shown. How much can he expect to pay up front for this apartment?

$7,440

7. NuHome Movers charges $95 per hour for loading/unloading services and $80 per hour for packing/unpacking services. Their charge is $2.50 per mile for truck rental. Jay is moving a distance of 200 miles and needs 9 hours of loading/unloading and 7 hours of packing/unpacking. What will his moving cost be if the service also charges 7.25% tax on the total?

$2,053.84
**Guided Exercises**

1. Kim is building a large gazebo for her backyard. It is in the shape of a regular hexagon. Each side of the gazebo is 12 feet long. The apothem is 10.4 feet. She needs to purchase stones for the floor. It costs $9.50 per square foot for a special type of interlocking stone. Find the cost of the gazebo’s floor. Round to the nearest ten dollars.

   Find the perimeter. The gazebo is a hexagon; so, it has 6 sides.

   \[ \text{Perimeter} = 6 \times \text{side length} = 6 \times 12 = 72 \]

   \[ A = \frac{1}{2}ap \]

   \[ A = \frac{1}{2} (10.4)(72) = \frac{1}{2} (748.8) = 374.4 \]

   Cost = $9.50 per square foot; so, \( 9.5 \times 374.4 = 3,556.8 \)

   Kim will spend about \( \$3,560 \) for the gazebo’s floor.

2. The main meeting room of the Glen Oaks Community Center measures 46 feet by 34 feet and has a 12-foot ceiling. It is well-insulated and faces the east side of his house. The manager wants to purchase an air conditioner. How large of an air conditioner should he purchase? Round up to the next thousand BTUs.

   \[ \text{BTU rating} = \frac{\text{width}}{60} \]

   \[ \text{BTU rating} = \frac{46 \times 12 \times 10 \times 34 \times 17}{60} \]

   \[ \text{BTU rating} = \frac{3,190,560}{60} = 53,176 \]

   The air conditioner should be about \( 54,000 \) BTUs.
Exercises

3. The length of a room is $19\frac{1}{2}$ feet. When using $\frac{1}{4}$ inch = 1 foot scale, what would be the length of the wall on a floor plan?

$4\frac{7}{8}$ in.

4. A regular heptagon (7 sides) has perimeter 126 and area $A$. Express the apothem $a$ of the heptagon algebraically in terms of the area $A$.

$\frac{A}{63}$

A rectangular room measures 16 feet by 18 feet. The ceiling is 9 feet high. Answer Exercises 5-8.

5. Find the total area of the four walls in the room.

612 sq. ft

6. If a gallon of paint costs $37.99 and it covers 400 square feet on average, what is the cost of painting the room, including the ceiling, with two coats of paint? Explain your answer.

$189.95; to paint the room twice, you will need to cover 1,800 sq. ft. You need more than 4 gal of paint, so you have to buy 5 gal.

7. This room is well-insulated and is on the north side of the house. How large of an air conditioner would this room require? Round to the next highest thousand BTUs.

7,000 BTUs

8. A scale drawing is made of this room using the scale 1 sq ft = $\frac{1}{4}$ sq in. What are the dimensions of this room on the drawing?

4 in. × 4.5 in. × 2.25 in.
8-3 Mortgage Application Process

Key Math Concepts

- Monthly payment formula: \[ M = \frac{p \left( \frac{r}{12} \right) \left( 1 + \frac{r}{12} \right)^{12t} \left( 1 + \frac{r}{12} \right)^{12t} - 1 }{1 + \frac{r}{12} \left( 1 + \frac{r}{12} \right)^{12t} - 1} \]

- Front-end ratio: \[ \text{Front-end ratio} = \frac{\text{monthly housing expenses}}{\text{monthly gross income}} \]

- Back-end ratio: \[ \text{Back-end ratio} = \frac{\text{total monthly expenses}}{\text{monthly gross income}} \]

Guided Exercises

1. The assessed value of the Kreiner family’s house is $457,000. The annual property tax rate is 2.66% of assessed value. What is the annual property tax on the Kreiner’s home?

   \[ \text{Tax} = \text{taxable amount} \times \text{tax rate as a decimal} \]
   \[ \text{Tax} = 457,000 \times 0.0266 = \boxed{12,156.20} \]

   Write 2.66% as a decimal.

   The annual property taxes are $12,156.20.

2. The Jacobs family is planning to buy a home. They have some money for a down payment already. They see a home they like and compute that they would need to borrow $213,000 from a bank over a 30-year period. The APR is 6.75%. What is the monthly payment, to the nearest cent? What is the total of all of the monthly payments over the 30 years? What is her total interest for the 30 years?

   \[ M = \frac{213,000 \left( 0.0675 \right)}{12} \left( 1 + \frac{0.0675}{12} \right)^{12(30)} - 1 \approx 1,381.51 \]

   Substitute.

   Write the APR as a decimal.

   Total payments = 30 years \times 12 payments per year \times \boxed{1,381.51} = \boxed{497,343.60}

   Interest paid = total payments – principal

   Interest paid = \boxed{497,343.60} – 213,000 = 284,343.60

   The Jacob’s monthly payments are $1,381.51, which is $497,343.60 over 30 years. The total interest is $284,343.60.
Exercises

3. The market value of Jennifer and Neil’s home is $319,000. The assessed value is $280,000. The annual property tax rate is $19.70 per $1,000 of assessed value. What is the property tax on their home? How much do they pay monthly toward property taxes? Round to the nearest cent.

$5,516; $459.67

Tom and Gwen have an adjusted gross income of $144,112. Their monthly mortgage payment for the house they want would be $1,483. Their annual property taxes would be $9,330, and the homeowner’s insurance premium would cost them $1,099 per year. They have a monthly $444 car payment, and their credit card monthly payment averages $4,021. Answer Exercises 4-5.

4. Based on the front-end ratio, would the bank lend them $220,000 to purchase the house they want? Explain your answer.

Yes; their front-end ratio is about 19.6%, which is less than 28%.

5. Based on the back-end ratio, would the bank lend them $220,000 to purchase the house they want? Explain your answer.

No; their back-end ratio is about 56.8%, which is much greater than the 36% benchmark.

Ted has an adjusted gross income of $120,006. He wants a house with a monthly mortgage payment of $1,921 and annual property taxes of $7,112. His semiannual homeowner’s premium would be $897. Ted has a credit card bill that averages $300 per month.

6. What is the back-end ratio to the nearest percent? Assume that his credit rating is good. Based on the back-end ratio, would the bank offer him a loan? Explain.

27%; Yes, since the back-end ratio is less than 36%.

7. What is the the front-end ratio to the nearest percent? Based on the front-end ratio, would the bank offer him a loan? Explain.

30%; Yes, since the front-end ratio is less than 28%.
Guided Exercises

Liz and Nick are buying a $725,000 home. They have been approved for a 5.25% APR, 30-year mortgage. They made a 20% down payment and will be closing on March 11. Answer Exercises 1-2.

1. What is their interest on the loan for one year?

   Percentage = whole × rate as a decimal

   Down payment = 725,000 × 0.2 = 145,000
   Loan amount = principal – down payment
   Loan amount = 725,000 – 145,000 = 580,000

   Interest for one year = amount financed × APR
   Interest for one year = 580,000 × 0.0525 = 30,450

   The interest on the loan for one year is $30,450.

2. What is the daily interest? How much should they expect to pay in prepaid interest at the closing?

   Interest for one day = interest for one year ÷ 365
   Interest for one day = 30,450 ÷ 365 = 83.42

   There are 31 days in March = 31 – 11 = 20 days of prepaid interest
   Prepaid interest = daily interest × 20 days
   Prepaid interest = 83.42 × 20 = 1,668.40

   The daily interest is $83.42. Liz and Nick should expect to pay $1,668.40 in prepaid interest at closing.
Exercises

3. Lars has been approved for a $420,000, 20-year mortgage with an APR of 5.125%. What is his monthly payment? How much interest would he expect to pay on the loan in one month? How much of the monthly payment will go toward the principal?

$2,800.90; $1,793.75; $1,007.15

4. How much will be charged in prepaid interest on a $500,000 loan with an APR of 4.725% that was closed on August 26?

$323.65

5. Laura and Rich have been approved for a $325,000, 15-year mortgage with an APR of 5.3%. Using the mortgage and interest formulas, complete the two-month amortization table.

<table>
<thead>
<tr>
<th>Payment Number</th>
<th>Beginning Balance</th>
<th>Monthly Payment</th>
<th>Toward Interest</th>
<th>Toward Principal</th>
<th>Ending Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>325,000.00</td>
<td>2,621.15</td>
<td>1,435.42</td>
<td>1,185.74</td>
<td>328,814.26</td>
</tr>
<tr>
<td>2</td>
<td>323,814.26</td>
<td>2,621.15</td>
<td>1,430.18</td>
<td>1,190.98</td>
<td>322,623.29</td>
</tr>
</tbody>
</table>

6. Shay took out a $560,000, 10-year mortgage with an APR of 6%. The first month she made an extra payment of $1,200. What was the ending balance at the end of her first month?

$555,382.85

7. Randy took out an adjustable rate mortgage for $375,000 over 20 years. It had an introductory rate of 3.25% for the first year, and then it rose to 4.5%. Complete the chart for the 13th payment.

<table>
<thead>
<tr>
<th>Payment Number</th>
<th>Beginning Balance</th>
<th>Monthly Payment</th>
<th>Toward Interest</th>
<th>Toward Principal</th>
<th>Ending Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>362,608.15</td>
<td>2,126.98</td>
<td>982.06</td>
<td>1,144.92</td>
<td>361,463.23</td>
</tr>
<tr>
<td>13</td>
<td>361,463.23</td>
<td>2,361.33</td>
<td>1,355.49</td>
<td>1,005.84</td>
<td>360,457.39</td>
</tr>
</tbody>
</table>
Rentals, Condominiums, and Cooperatives

Key Math Concepts

- Percent co-op shares owned = \( \frac{\text{shares owned}}{\text{total number of shares}} \)
- Rent increase can be represented by \( R = A \left(1 + \frac{B}{100}\right)^{D-1} \), where \( R \) is the yearly rent, \( A \) is the initial rent, \( B \) is the rate of increase as a percent, and \( D \) is the year number.

Guided Exercises

1. The Sea Cottage Cooperative is owned by the shareholders. The co-op has a total of 32,000 shares. Linda has an apartment at Sea Cottage and owns 480 shares of the cooperative. What percentage of Sea Cottage does Linda own?

   Percent co-op shares owned = \( \frac{480}{32,000} = \frac{0.015}{1} \)

   Percent co-op shares owned = \( 0.015 \times 100 = 1.5\% \)

   Linda owns 1.5\% of Sea Cottage shares.

2. Beth moved into an apartment close to her new job. She will be paying $2,000 per month in rent and expects a 2.5\% rent increase each year.
   a. Express the rent \( y \) as an exponential function of the number of years rented, \( x \).

      \[
      R = 2,000 \left(1 + \frac{2.5}{100}\right)^x
      \]

      \[
      R = 2,000 (1.025)^x
      \]

      \[
      y = 2,000 (1.025)^x
      \]

   b. What can she expect the rent to be in the 10th year? Express the rent \( y \) as an exponential function of the number of years rented, \( x \). What can she expect the rent to be in the 10th year?

      \[
      y = 2,000 (1.025)^x
      \]

      \[
      y = 2,000 (1.025)^{10} = 2,560.17
      \]

      The exponential function for Beth’s rent is \( y = 2,000(1.025)^x \). She can expect the rent to be $2,560.17 in the 10th year.
Exercises

3. On March 1, Anton purchased a new condominium. He pays a monthly maintenance fee of $1,030. His monthly property taxes equal 13.5% of the monthly fee. How much will Anton pay in property taxes for this calendar year?

$1,668.60

4. Sarah purchased a condominium at Tulip Meadows. She pays $3,196.80 in property taxes each year. These taxes are taken out of her monthly maintenance fee of $1,480. What percentage of this monthly fee goes to property taxes?

18%

5. Petra has a co-op in Sunset Village. The cooperative consists of a total of 28,000 shares. If Petra owns $s$ shares, what percentage of the cooperative corporation does she own?

$$\frac{s}{280}\%$$

6. The South Hills Apartment Complex has just announced rate increases. All rents will increase by 3.2%, and the security deposit, which was formerly 50% of one month’s rent, must now equal 60% of the new rent. Eddie rented an apartment for $1,600. In what amount should he write a check to cover the new rent and the extra security deposit?

$1,841.92

The monthly rent amounts for Jillian’s one-bedroom apartment, at the North Haven Towers, for a 10-year period, are given in the table. Answer Exercises 7-9.

<table>
<thead>
<tr>
<th>Year</th>
<th>Monthly Rent ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,680</td>
</tr>
<tr>
<td>2</td>
<td>1,700</td>
</tr>
<tr>
<td>3</td>
<td>1,750</td>
</tr>
<tr>
<td>4</td>
<td>1,790</td>
</tr>
<tr>
<td>5</td>
<td>1,825</td>
</tr>
<tr>
<td>6</td>
<td>1,855</td>
</tr>
<tr>
<td>7</td>
<td>1,885</td>
</tr>
<tr>
<td>8</td>
<td>1,920</td>
</tr>
<tr>
<td>9</td>
<td>1,965</td>
</tr>
<tr>
<td>10</td>
<td>2,000</td>
</tr>
</tbody>
</table>

7. Write the exponential regression equation that models these rents. Round the numbers to the nearest hundredth.

$$y = 1,647.55(1.02)^x$$

8. According to your equation, what is the approximate yearly rent increase percentage?

2%

9. Using your equation, what will be the rent in 15 years?

$2,217.39