

Really? Really!

Revisited

REALLY? REALLY! REVISITED

Have the students go online to look up weights of other heavy objects, including an airplane, the Space Shuttle, a whale, and so on. Comparisons can be made to the Fu Gang Building and the Abu Simbel temples.

At the beginning of the chapter, you were given the weights of the heaviest buildings ever moved. The Fu Gang Building in China was quoted in metric tons. A metric ton is about 10% heavier than an English standard ton. Let's try to get a feeling for how much that building really did weigh.

1. How many pounds are in an English standard ton? **2,000 pounds**
2. What do you get when you increase that amount by 10%? **2,200 pounds**
3. The answer to Exercise 2 is the approximate number of pounds in a metric ton. If the Fu Gang Building weighed approximately 15,140 metric tons, what is its approximate weight in pounds? **33,308,000 pounds**
4. The Abu Simbel rock temples in Egypt were relocated during the creation of an artificial reservoir in 1968. They weighed approximately 31,000 English standard tons. What is this weight in metric tons (approximately)? **28,180**
5. Assuming that the average weight of an elephant is 9,000 pounds, what was the approximate weight of the Abu Simbel rock temples in average elephants? **6,900 elephants**

Applications

1. A rectangular room measures 18 feet by 25 feet. It is going to be covered with carpeting that sells for \$8.45 per square foot.
 - a. What is the area of the room in square feet? **450 sq ft**
 - b. If the room is drawn to a scale of $\frac{1}{4}$ inch represents 1 foot, give the dimensions of the room in inches on the scale drawing. **4.5" by 6.25"**
 - c. This room is well insulated and on the south side of the house. It has an 8-foot-high ceiling. How large an air conditioner would this room require? Round up to the nearest thousand BTUs. **11,000**
2. Ricky took out a \$268,000, 30-year mortgage at an APR of 4.34%.
 - a. What is the monthly payment to the nearest cent? **\$1,332.56**
 - b. What will be his total interest charges after 30 years, to the nearest thousand dollars? **\$212,000**
3. Adam is taking out a \$197,000 mortgage. His bank offers him an APR of 4.45%. He wants to compare monthly payments on 20- and 30-year mortgages. Find, to the nearest \$10, the difference in the monthly payments for these two mortgages. **\$250**
4. Eduardo owns a co-op. This year his monthly maintenance fee is m dollars. Twenty-seven percent of this fee pays for Eduardo's property taxes and 11% pays for the mortgage on the entire development. Both of these expenses are tax deductible. Express the amount that is tax deductible algebraically. **$0.38m$**
5. A gazebo in the shape of a regular decagon (10 sides) has side length s and apothem a . Express the area of the floor A , algebraically. **$5as$**
6. Brianna just signed a lease on a rental apartment. The current rent is \$1,330 per month, and she estimates a 6% increase each year. Use her estimate to predict the sum of the next 5 years' worth of monthly rental expenses. Round to the nearest thousand dollars. **\$90,000**
7. The Bricely family borrowed \$176,000 from Glen Bank several years ago when they bought their co-op for \$246,000. The price dropped d dollars since they bought it. After making years of payments and paying some of the principal, they now owe the bank b dollars, which is more than the price for which they could sell the co-op.
 - a. Write an inequality that expresses the fact that the new, decreased price of the co-op is less than what the Bricelys owe the bank. **$246,000 - d < b$**
 - b. Express the amount of extra money the Bricelys need to raise to pay the bank if they wanted to sell their co-op for d dollars less than the price for which they could sell the co-op. **$b - (246,000 - d)$**

8. The Maxwell family took out a \$275,000, 20-year mortgage at an APR of 4.1%. The assessed value of their house is \$9,400. Keep in mind that assessed value is the value used for property tax purposes, and not necessarily an indication of the market value. The annual property tax rate is 90.82% of assessed value. What is the annual property tax? **\$8,537.08**
9. The market value of a home is \$311,000. The assessed value is x dollars. The annual property tax rate is a dollars per \$1,000 of assessed value. Express the semi-annual property tax bill algebraically. $\frac{ax}{1,000}$
10. Katherine and Alex had an adjusted gross income of g dollars. Katherine just got a \$2,000 raise. They are considering moving to a new house with monthly mortgage payment m dollars, semiannual property taxes s dollars, and quarterly homeowner's premium q dollars. Express their front-end ratio algebraically. **See margin.**
11. The Xiomaras have an adjusted gross income of \$137,865. They are looking at a new house that would have a monthly mortgage payment of \$1,687. Their annual property taxes would be \$7,550 and their semi-annual homeowner's premium would be \$835.
- Find their front-end ratio to the nearest percent. **21%**
 - Assume that their credit rating is good. Based on the front-end ratio, would the bank offer them a loan? Explain. **See margin.**
 - The Xiomaras have a \$344 per month car loan and their average monthly credit card bill is \$420. Compute the back-end ratio to the nearest percent. **28%**
 - Based on the back-end ratio, would the bank offer them a loan? Explain. **See margin.**
12. Lexi moved into an apartment in the suburbs and pays \$1,975 rent per month. The landlord told her that the rental has increased 3.6% per year on average. Express the rent y as an exponential function of x , the number of years she rents the apartment. $y = 1,975(1.036)^{x-1}$
13. Harley built a concrete patio in her backyard. It is a free-form shape and she needs to find the area of it for property tax purposes using the Monte Carlo method.
- She takes a diagram of the patio and places it inside a 30-foot by 25-foot rectangle. What is the area of the rectangle? **750 sq ft**
 - She then has a graphing calculator generate 20,000 random points inside the rectangle. She finds that 12,451 of these points land in the patio outline. What percent of the points landed in the patio? Round to the nearest percent. **62%**
 - What is the area of the patio, to the nearest square foot? **465 sq ft**
14. Ivonne has a gross bimonthly income of \$2,900. She pays 16% in federal and state taxes, puts aside 12% of her income to pay off her school loan, and puts 5% of her income aside for savings. She is considering an apartment that will rent for \$1,700 per month.
- Does this monthly rental fee fall within the recommended 25–30% housing expense range? **Yes.**
 - Based on her expenses, can she make the monthly payments? How much will remain after she pays for the rent and other expenses? **Yes, \$2,186.**
15. The square footage and monthly rental price of 15 similar two-bedroom apartments in Martha's Cove yield the following linear regression equation: $y = 1.137x + 598.98$, where x represents the square footage of the apartment and y represents the monthly rental price.
- Use the formula to determine the monthly rent for an apartment that has 1,800 square feet. **\$2,645.58**
 - Using the recommendation that you should spend no more than 28% of your monthly gross income on housing, can Stephanie afford this rental if she makes \$9,800 per month? Explain. **Yes, she can spend up to \$2,744 to be within the recommendations.**

ANSWERS

$$10. \frac{m + \frac{s}{6} + \frac{q}{3}}{(g + 2,000)} \cdot 12$$

11b. Yes; because the front-end ratio is less than 28%

11d. Yes, because the back-end ratio is less than 36%.

16. Johnny took out a \$500,000, 30-year mortgage with an APR of 4.15%. The first month he made an extra payment of \$1,000. What was his balance at the end of that first month? **\$498,298.65**
17. James rents an apartment with an initial monthly rent of \$1,600. He was told that the rent goes up 1.75% each year. Write an exponential function that models this situation to calculate the rent after 15 years. Round the monthly rent to the nearest dollar. **The rent was \$2,040 during the 15th year; after the 15th year, it was \$2,076; $1600(1.0175)^x$**
18. Elizabeth is moving from a one-bedroom apartment in one city to a similar apartment in another city. She has been quoted a flat fee for the truck rental and has two estimates for wages of the movers she will hire depending on her needs and when she moves.

Weekday Move	Weekend Move
5 hours of loading and unloading services	4 hours of loading and unloading services
4 hours of packing and unpacking services	5 hours of packing and unpacking services
\$730 total cost	\$710 total cost

Luke's Moving Company charges a set hourly moving team rate for loading and unloading, and a different set hourly moving team rate for packing and unpacking. Determine the hourly rates. **\$90 for loading and unloading and \$70 for packing and unpacking**

19. Fill in the missing entries in this loan amortization table for a \$220,000, 20-year mortgage with an APR of 2.95%. **See margin.**

Payment Number	Beginning Balance	Monthly Payment	Towards Interest	Towards Principal	Ending Balance
1	\$220,000.00	a.	\$540.83	\$673.79	b.
2	b.	a.	\$539.19	\$675.44	\$218,650.78
3	\$218,650.78	a.	c.	\$677.10	\$217,973.68
4	\$217,973.68	a.	\$535.85	d.	\$217,294.92
5	\$217,294.92	a.	\$534.18	\$680.44	e.

- 19a. \$1,214.62;
 b. \$219,326.21;
 c. \$537.52;
 d. \$678.76;
 e. \$216,614.48 Answers may differ slightly due to rounding

20. Joanne and Matt have been approved for a \$350,000, 15-year mortgage with an APR of 4.25%. Using the mortgage and interest formulas, set up a 2-month amortization table with the following headings and complete the table for the first 2 months. **See additional answers.**

Payment Number	Beginning Balance	Monthly Payments	Towards Interest	Towards Principal	Ending Balance
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21. Answers may vary slightly due to rounding.
 Total paid: \$148,107.84
 Total rent: \$173,859.72
 Total to principal: \$92,868.42

21. Use the spreadsheets from Sections 7-4 and 7-6 to compare the following two situations after an 8-year period.

Total amount paid and total amount paid to principal for a \$250,000, 18-year mortgage with an APR of 3.35%	Total amount paid for a \$1,700 monthly rent that has an annual increase of 1.8%
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22. Answers may vary slightly due to rounding.
 Situation 1: Total paid = \$190,804.32
 Total paid to principal = \$96,491.51
 Situation 2: \$231,949.56

22. Use the spreadsheets from Sections 7-4 and 7-6 to compare the following two situations after a 7-year period. **See margin.**

Total amount paid and total amount paid to principal for a \$370,000, 20-year mortgage with an APR of 4.15%	Total amount paid for a \$2,600 monthly rent that has an annual increase of 2%
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23. Michelle took out a \$370,000, 30-year, adjustable-rate mortgage with a 2.8% initial 6-month rate. The amortization table for the initial rate period is shown. After the first 6 months, the rate went up to 3.4%. Calculate the next line of the amortization table.

Payment Number	Beginning Balance	Monthly Payment	Toward Interest	Toward Principal	Ending Balance	Interest Rate
1	\$370,000.00	\$1,520.31	\$863.33	\$656.98	\$369,343.02	2.80%
2	\$369,343.02	\$1,520.31	\$861.80	\$658.51	\$368,684.51	2.80%
3	\$368,684.51	\$1,520.31	\$860.26	\$660.05	\$368,024.46	2.80%
4	\$368,024.46	\$1,520.31	\$858.72	\$661.59	\$367,362.87	2.80%
5	\$367,362.87	\$1,520.31	\$857.18	\$663.13	\$366,699.74	2.80%
6	\$366,699.74	\$1,520.31	\$855.63	\$664.68	\$366,035.06	2.80%
7	\$366,035.06	\$1,639.16	\$1,037.10	\$602.06	\$365,433.00	3.4%

24. Calculate the missing amounts in the amortization table, which shows extra payments toward the principal made each month.

Payment Number	Beginning Balance	Monthly Payment	Extra Payment	Toward Interest	Toward Principal	Ending Balance
1	\$190,000.00	\$1,048.99	\$100.00	\$467.08	\$681.91	a. \$189,318.09
2	a. \$189,318.09	\$1,048.99	\$100.00	\$465.42	b. \$683.57	\$188,634.52
3	\$188,634.52	\$1,048.99	\$100.00	c. \$463.73	\$685.26	\$187,949.26
4	\$187,949.26	\$1,048.99	d. \$100.00	\$462.04	\$686.95	\$187,262.31
5	\$187,262.31	\$1,048.99	\$100.00	\$460.35	\$688.63	\$186,573.68
6	\$186,573.68	\$1,048.99	\$100.00	\$458.66	\$690.33	e. \$185,883.35

25. Ryan wants to take out a \$520,000 loan with an APR of 4.15% for 20 years. He can purchase a discount point for 1% of his principal that will decrease his APR by 0.125%. If Ryan purchases 3 points, after how many months will he breakeven? **After approximately 152 months**
26. Millie is considering a zero closing cost loan. She wants to borrow \$600,000. Her lending institution is offering her a 3.49% loan for 25 years. She has the option of purchasing negative points, which will increase her APR by 0.125% for each 1% of her principal credited to her. To cover the bank's closing costs, she will need to get 2 negative points. Determine Millie's breakeven time. She plans on staying in this house for the full term of the loan. Is this purchase of negative points a wise decision? Explain. **Breakeven after 148 months (approx. 12.3 years). This is not a wise decision. She will be losing money by paying her loan off at the higher rate after 12.3 years.**
27. The Lennon family is renting an outdoor movie screen for their backyard party. The screen is 12 feet high, and it needs to be tethered to the ground with four guy wires 15 feet long.
- How far from the screen must they attach the guy wires? **9 ft**
 - What is the angle of elevation of each guy wire? **53.1 degrees**
 - They need to use four guy wires, one on each side of the screen in front of the screen, and one on each side on the back of the screen. Each guy wire should be 2 feet longer than necessary so it can be clamped at each end. How much guy wire do they need? **68 ft**