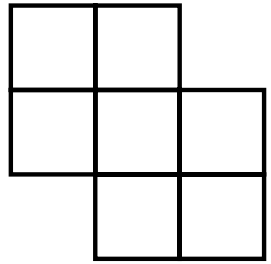
Workout 2 Solutions

Peter S. Simon

Homework: October 19, 2004

Problem 1

How many rectangles are in this figure? Each angle is a right angle.



Make a table counting the number of rectangles of specified dimensions:

Width	Height	Count
1	1	7
2	1	4
1	2	4
2	2	2
3	1	1
1	3	1
Total		**19**

Problem 2

Cal Ripkin Jr. played in 2632 consecutive baseball games. During this time, he was at bat 10,221 times, and his batting average was .277, meaning that he got a hit 27.7% of the times he was at bat. How many hits did Cal Ripkin Jr. get during this time period? Express your answer to the nearest ten.

$$\#\text{ Hits} = 0.277 \times 10{,}221 \approx 2831.2 \approx \boxed{2830}$$

Problem 3

A store puts everything on sale for 20% off. If the sales tax is 8%, what percent of the original marked price is the final cost including tax? Express your answer to the nearest tenth.

Let the original price be P. Then the sale price, before tax, is $(100\% - 20\%) \times P = 80\% \times P = 0.8P$. The sale price with tax included is $1.08 \times 0.8P = 0.864P = 86.4\% \times P$. So the answer is $\boxed{86.4\%}$.

Problem 4

The house numbers in a housing development are the multiples of four starting at 4 and ending at 120. If metal digits cost 50 cents each, what is the total cost of all of the metal digits that are needed to number the houses in this development?

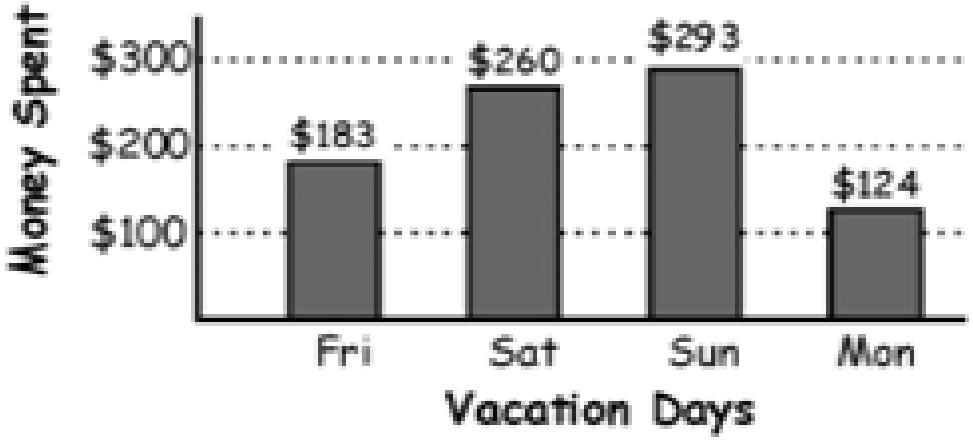
Some of the house numbers will require one digit, some two digits, and some will require three digits.

	Start #	End #	# Houses	# digits
1 Digit	4	8	2	$2 \times 1 = 2$
2 Digits	12	96	$1 + (96 - 12)/4 = 22$	$22 \times 2 = 44$
3 Digits	100	120	$1 + (120 - 100)/4 = 6$	$6 \times 3 = 18$

The total number of digits needed is $2 + 44 + 18 = 64$. Since each digit costs one-half dollar, the total cost is $\boxed{\$32}$.

Problem 5

The amount of money spent on each of the four days of Kia's vacation is shown in the bar graph below. What was the average amount of money spent per day of the vacation?



$$\text{Avg} = \frac{183 + 260 + 293 + 124}{4} = \boxed{\$215}$$

Problem 6

Susan has exactly \$1.50 in change. She has 30 total coins selected from pennies, nickels, dimes and/or quarters. Half of the coins are nickels. There are two-thirds as many pennies as there are nickels. How many dimes does Susan have?

Half are nickels $\implies$ 15 nickels

2/3 as many pennies as nickels $\implies \frac{2}{3} \times 15 = 10$ pennies

So the number of dimes and quarters is $30 - 15 - 10 = 5$.
The value of the dimes and quarters must equal
$150 - 15 \times 5 - 10 \times 1 = 65$ cents.
We can generate 65 cents with 1 quarter and $\boxed{4}$ dimes.

Problem 7

A bike's front wheel has a 1-foot radius. How many revolutions does the wheel make in a one-mile trip? There are 5280 feet in one mile. Use the π key on your calculator or the approximation 3.142, and express your answer to the nearest whole number.

The wheel will make one revolution for each circumference traveled. The circumference C is

$$C = 2\pi r = 2\pi \approx 6.28318$$

The number of revolutions is then

$$\#\text{ Revolutions} = \frac{5280}{2\pi} \approx 840.34 \approx \boxed{840}$$

Problem 8

After 12 minutes on a stair-stepper, Rick has burned 210 calories. At the same rate, what is the total number of calories Rick will burn in a 20-minute workout?

We assume that the number of calories burned is proportional to the workout time, obtaining

$$\text{Calories burned} = \frac{210\,\text{cal}}{12\,\text{min}} \times 20\,\text{min} = \boxed{350\,\text{cal}}$$

Problem 9

Today there were 4622 fans at the soccer game. Last week, there were only 3095 fans at the soccer game. What is the percent increase in the number of fans from last week's game to today's game? Express your answer to the nearest whole number.

$$\%\ \text{Change} = \frac{\text{New} - \text{Old}}{\text{Old}} \times 100\%$$

$$= \frac{4622 - 3095}{3095} \times 100\% \approx 49.34\% \approx \boxed{49\%}$$

Problem 10

At the beginning of a program, the 105 members of a marching band stand in a rectangular formation named Formation A. All of the band members then move into Formation B, which is a different rectangular formation with six more rows, but with two fewer band members per row. How many rows are in Formation A?

Let m_A and m_B be the number of rows for formations A and B, and let n_A and n_B be the number of columns for the two formations. Then, from the given information:

$$m_A n_A = m_B n_B = 105$$

$$m_B = m_A + 6, \quad n_B = n_A - 2$$

Consider writing $105 = 3 \times 5 \times 7$ as the product of two factors:

$$105 = 3 \times 35 = 5 \times 21 = 7 \times 15$$

We can see that $m_A = \boxed{15}$, $n_A = 7$ works, since $m_B = 15 + 6 = 21$ and $n_B = 7 - 2 = 5$.