

MONKEY BUSINESS

Teaching Guidelines

Subject: Mathematics

Topics: Problem Solving, Algebra (optional)

Grades: 5-8

Concepts:

- Expression

Knowledge and Skills:

- Can use the problem-solving strategy “Break the problem down into smaller parts”
- Can use the problem-solving strategy, “Choose the correct operations”
- Can use the problem-solving strategy “Organize the data in a chart or table”
- Can create/evaluate an expression using correct order of operations conventions

Procedure:

Distribute the handout to students working in teams of two or three, and ask the teams to study it and talk it over for a few minutes. Then, as a class discussion, ask students to summarize the problem, so that it’s clear to everyone what they are being asked to do.

Next, ask students to think about the strategies they could use to solve this problem. As a class activity, list problem-solving strategies that students are familiar with (or introduce them). Ensure that the list includes the strategies of “break the problem down into smaller parts,” “organize information into a table or chart,” and “choose the correct operations.”

Ask the teams to begin to work, developing their business plans. As they do so, circulate and offer guidance (only as needed) to help students break the problem up into parts and choose the correct operations to answer each part.

To speed up the activity, you may wish to assign different aspects of the business expenses (excluding property costs and veterinarian cost) to different teams. In this case the teams that are assigned the same problem part should compare their answers and resolve any differences. Then, as a class, put together all of the answers to come up with the total monthly expenses and compute the taxes to be paid. Teams would then work separately to determine how much to charge.

Optionally, you can use this activity as a context for teaching students about expressions and order of operations. To do so, ask the teams, or work as a class, to create an expression that represents the business’s total month expenses (or, as a simpler problem, a portion of them). As you develop and write the expression, review or introduce the rules regarding order of operations in an expression.

Expenses Calculations

Item	Calculation	Amount
Property		\$7,500
Food	Cost per week = 10 monkeys × 35 pounds of weight per monkey × 3 ounces of food per pound of weight × \$2.00 per ounce of food (cost per ounce is 1/16 the cost per pound) = \$2,100 Cost per month = cost per week × 52 weeks per year ÷ 12 months per year = \$9,100	\$9,100
Trainer	2 trainers × 72,000 per year ÷ 12 (to get cost per month)	\$12,000
Administrator	\$45,000 per year ÷ 12 (to get cost per month)	\$3,750
Assistants	3 assistants × \$22.50 per hour × 40 hours per week × 52 weeks per year (to get annual cost) ÷ 12 (to get monthly cost)	\$11,700
Veterinarian		\$750
Partners	2 partners × \$7,500 per month	\$15,000
Total expenses	Sum of above	\$59,800
Taxes	0.3 × Total expenses	\$17,940
Total		\$77,740

Expression

$$\begin{aligned} \text{Monthly expenses} = & \$7,500 + 10 \times 35 \times 3 \times \$2 \times 52 \div 12 + 2 \times \$72,000 \div 12 + \$45,000 \div 12 + \\ & 3 \times \$22.50 \times 40 \times 52 \div 12 + \$750 + 2 \times \$7,500 + \\ & 0.3 \times (\$7,500 + 10 \times 35 \times 3 \times \$2 + 2 \times \$72,000 \div 12 + \$45,000 \div 12 + \\ & 3 \times \$22.50 \times 40 \times 52 \div 12 + \$750 + 2 \times \$7,500) \end{aligned}$$

Determining how much to charge

$$\begin{aligned} \text{Monthly income} &= 10 \text{ monkeys} \times 8 \text{ days per month} \times \text{daily rate per monkey} \\ &= 80 \text{ days} \times \text{daily rate per monkey} \end{aligned}$$

If you want to earn, for example, \$96,000 per month, then you have

$$96,000 = 80 \text{ days} \times \text{daily rate}$$

$$\text{daily rate} = \$1,200$$

That would leave you \$96,000 – \$77,740, or \$18,260, with which to pay back your loan and pay other, miscellaneous expenses.

Assuming your miscellaneous expenses aren't too high, you might repay the loan of \$353,340 (six times monthly expenses) at a rate of \$12,000 per month. (Of course, in order to determine the length of time for repayment at this rate, you would need to take the interest rate into account.)

Monkey Business

You and a partner have decided to start a business that provides trained chimpanzees to movie producers.

In order to get started, you need to borrow money from a bank. The bank wants to see a business plan, which is a plan that shows how your business will work and how you will make enough money to pay back the loan.

To start creating your business plan, you collect as much information as you can, by talking to other people who have had similar businesses. That information is shown on the next page.

Next, you meet with your partner to write your business plan. You will do this in three steps:

- 1) Calculate how much money you will spend each month.
- 2) Decide how much you will charge movie producers to rent your chimpanzees.
- 3) Write the business plan, with these parts:
 - a. What your business will do,
 - b. How much money you need to borrow, and what you will use it for, and
 - c. How much money your business will make, and how much you will be able to pay back each month.

Monkey Business Data

- An adult chimpanzee weighs around 35 pounds.
- Chimpanzees require 3 ounces of food per week for every pound of their own weight.
- Chimpanzee food costs \$32 per pound.
- You plan to own 10 chimpanzees.
- The property and buildings that you will need to house your chimpanzees will cost you \$7,500 per month in rent.
- Based on your research with movie producers, you expect that you will be able to rent out each of your ten chimpanzees for 8 days out of every month.
- You will need to two chimpanzee trainers, at a salary of \$72,000 per year each.
- You will need one administrator to answer the phone, order supplies, and keep track of expenses and income, at a salary of \$45,000 per year.
- You will also want three more general assistants, each working 40 hours per week, to maintain the property and feed the chimpanzees during the days, evenings and weekends. They will be paid \$22.50 per hour.
- You will want to have a veterinarian visit your facility one day a month, at a rate of \$750 per visit.
- You will want to pay yourself and partner each \$7,500 per month.
- You will need to pay taxes, a total of 30% of your expenses.
- You want to borrow enough money from the bank to pay for the first 6 months of operations to get your business started.

How much money will you charge per day per monkey? How much will be left over each month to pay back your loan?