## Problem

Biff tells the class he has won a million dollars, all in $\$ 10$ bills, and has them all stuffed in his backpack. Some of his classmates are a bit skeptical, and decide to investigate his claim through the following questions:
a) If he had a million dollars, how many $\$ 10$ bills would Biff have?

b) If he spent $\$ 500$ per week, for how many years would a million dollars last? (Assume a year is 52 weeks.)
c) Assuming a sheet of photocopy paper is about the same thickness as a $\$ 10$ bill, estimate how high a stack of $\$ 10$ bills equivalent to a million dollars would be.

## Extension :

1. Would that quantity of $\$ 10$ bills fit in a backpack? (Each bill is 7 cm wide by 15 cm long, and about the same thickness as a sheet of photocopy paper.)


## Hints

Hint 1 - a) If Biff had $\$ 2000$, how many $\$ 10$ bills would he have? How did you get your answer?
Hint 2 - b) How much would Biff spend in a year?
Hint 3 - c) How many sheets of photocopy paper are there in a stack of height 1 cm ? How many in a stack of height 2 cm ?

## Extension:

Hint 1 - What are the dimensions of a backpack?
Hint 2 - About how many bills, laid edge to edge, would fit in the bottom of a backpack?
Suggestion: Have students measure the dimensions of several backpacks and come to a consensus on a reasonable size of 'rectangular' box which approximates a backpack.

## Solution

a) Since one million dollars equals $\$ 1000000$, Biff will have $\$ 1000000 \div \$ 10=100000$ ten dollar bills.
b) First we note that $\$ 500$ per week equals $\$ 500 \times 52=\$ 26000$ per year. Thus the million dollars would last $\$ 10^{6} \div \$ 26000=38.46$ years, or roughly 38.5 years.
c) Since the diagram tells us that 500 sheets of photocopy paper make a stack 5 cm high, and we know a $\$ 10$ bill is about the same thickness, every 500 bills would make a stack 5 cm high. Thus 100 bills would make a stack 1 cm high. Since one million dollars equals $100000 \$ 10$ bills, the stack would be $100000 \div 100=1000 \mathrm{~cm}$ high, or 10 metres high.

## Extension:

1. Assuming, as a rough approximation, that an average backpack is a rectangular box about 30 cm wide, 40 cm high, and 21 cm deep, the base will be 21 cm by 30 cm . This would permit about 6 stacks of bills, since the bills are 7 cm wide by 15 cm long, and $21=3 \times 7$, while $30=2 \times 15$. Each stack 40 cm high would contain $40 \times 100=4000$ bills, and so the six stacks would contain $6 \times 4000=24000$ ten dollar bills, or $\$ 240000$. Thus an average backpack would only be able to contain about one quarter of the money!
Note: Answers will vary, depending on the size of backpack; it would have to be a VERY large backpack to hold all the money!

