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.)
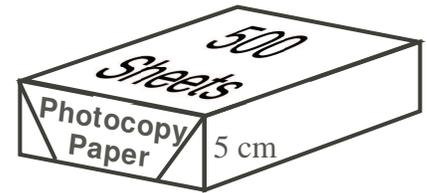
Hints

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 $1 000 000, Biff will have $1 000 000 ÷ $10 = 100 000 ten dollar bills.

b) First we note that $500 per week equals $500 × 52 = $26 000 per year. Thus the million dollars would last $10^6 ÷ $26 000 = 38.46$ 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 100 000 $10 bills, the stack would be 100 000 ÷ 100 = 1 000 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 $40 \times 100 = 4 000$ bills, and so the six stacks would contain $6 \times 4 000 = 24 000$ ten dollar bills, or $240 000. 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!

40 cm

30 cm

21 cm