



## Problem of the Week

### Problem B

### Block Out!

#### Problem

Aputi ('Snow on the Ground'), Siku ('Ice'), and Qinu ('Slushy Ice by the Sea') are using rectangular blocks of snow to build a snow fort.

- a) They want to build one wall of their fort, but they can't decide on the dimensions. If they have 24 blocks of snow, what are the possible different sizes of walls they could build, using whole blocks? Which of these would be sensible for a snow fort wall?
- b) The snow fort is to be rectangular, with four walls. Each wall is to be at least two, but no more than four blocks high.
  - (i) If the front wall uses 24 blocks, and they can make up to 60 snow blocks in total, what possible dimensions could the other walls be? (Assume all four walls are the same height.)
  - (ii) What is the total number of blocks they would need in each case?
  - (iii) Which dimensions give the fort with greatest interior floor area? Which give the best protection?

Organize your answers in the chart below. Note that  $b$  and  $h$  stand for *base* and *height*, respectively; all measurements are in blocks.

Dimensions of the fort front $\times$ side $\times$ height	Dimensions of front and back walls	No. of Blocks	Blocks for Side Walls (no corners)	No. of Blocks	Total Blocks
$6 \times 3 \times 4$	$b = 6, h = 4$	48	$b = 1, h = 4$	8	56
$8 \times 3 \times 3$	$b = 8, h = 3$	48	$b = 1, h = 3$	6	54
$8 \times 4 \times 3$	$b = 8, h = 3$	48	$b = 2, h = 3$	12	60
$12 \times 3 \times 2$	$b = 12, h = 2$	48	$b = 1, h = 2$	4	52
$12 \times 4 \times 2$	$b = 12, h = 2$	48	$b = 2, h = 2$	8	56
$12 \times 5 \times 2$	$b = 12, h = 2$	48	$b = 3, h = 2$	12	60

#### Solution

- a) Possible dimensions for the wall (length  $\times$  height, in blocks) include  
 $1 \times 24, 2 \times 12, 3 \times 8, 4 \times 6, 6 \times 4, 8 \times 3, 12 \times 2, 24 \times 1$ .  
 Of these, only  $6 \times 4, 8 \times 3,$  and  $12 \times 2$  seem reasonable.
- b) The answers to parts (i) and (ii) are shown in the completed table above.  
 (iii) The greatest interior floor area is in the  $12 \times 5 \times 2$  fort (with a  $10 \times 3$  block floor area), while the best protection is the  $6 \times 3 \times 4$  fort (with the highest walls).

