

It's the Most *Optimal* Time of the Year!

Santa wants to take the summer off so he needs to do some serious prep work (**math**)...

1. Mrs. Clause is worried about the reindeer.

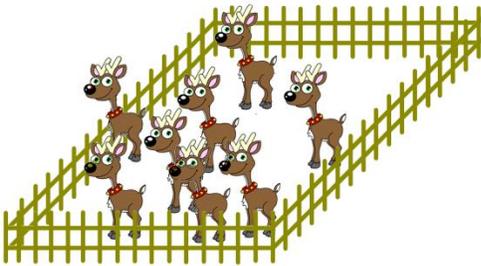
She wants to make sure they are happy while her and Mr. Clause are on vacation!

She has determined that in order to be happy, the reindeer require:

- a) A rectangular pen to play with all the other reindeer with a total area of 138 m^2 .

Determine the **dimensions** of this area if the minimum amount of fencing is used

(2 marks K)



NOTE: DIAGRAMS ARE NOT TO SCALE

- b) 8 m^2 of space each, separated from all the other reindeer (note: Santa has 8 reindeer).

Determine the **minimum amount of fencing** required to construct this area with its 8 separate compartments. Be sure to include the outer perimeter in your calculation.

(4 marks A)

Draw a fully **labelled**, AND **NEAT**, diagram to represent the situation.

(3 marks C)

Name: _____

- c) An area to hang out together after meals attached to their barn. This area only requires fencing on 3 sides!

Determine the **dimensions** of this pen if the elves plan to use 68 m of fencing.

(3 marks K)



NOTE: DIAGRAMS ARE NOT TO SCALE

2. Now that the reindeer are taken care of, it's time to wrap some presents!

Times are tough, what with the recession and all, so Santa and the elves are trying to cut costs.

At their annual gift-wrapping conference, the team decides that all presents this year must be packaged in optimally sized containers.

- a) By packing all of the presents in *optimally sized containers*, Santa and his elves will _____

the amount of wrapping paper required, while at the same time _____ the amount

of space available for gifts.

Fill in the blanks (2 marks K)

- b) One of the packages that needs to be wrapped has a volume of $37,595.375 \text{ cm}^3$.

If the package is in an *optimized* square-based prism, **how much wrapping paper** will be needed to wrap the gift?

(2 marks K, 3 marks A)

Name: _____

c) Another optimally sized package used 1176.40 cm^2 of wrapping paper.

What **volume** of super amazing presents can fit inside this box?

(2 marks K, 2 marks A)

3. Even though the big day is still more than 6 months away, Santa and the elves need to start collecting sleigh fuel right away!

Everyone knows that Santa's sleigh is powered by cylindrical containers filled with *Holiday Spirit*.

If Santa is going to fly all around the world, he will need to be able to carry as much *Holiday Spirit* as possible!

a) Describe what these cylindrical fuel containers will look like. (Describe their dimensions) **(2 marks C)**

b) Santa fills a cube-shaped box with cans of *Holiday Spirit* stacked $3 \times 3 \times 3$. If the volume of the box is $250,047 \text{ cm}^3$. What is the volume of each can of *Holiday Spirit*? Show your work!

(5 marks T)

Name: _____

- c) The elves have decided that in order to prevent a major global catastrophe, each can of *Holiday Spirit* needs to be properly labelled. They plan to label the tops with one type of label and the lateral surfaces with a different type of label. They will not label the bottoms.

USE A CYLINDER WITH A HEIGHT OF 20cm and a radius of 10cm!

What is the area of each label for the **top** of the cans? (2 marks K)

What is the area of each label for the **lateral surface** of the cans? (2 marks K)

How much total paper is needed to label all of the cans in the box from part b? (3 marks A)

Communication

If cubes are the “optimally shaped” square-base prisms, explain why every present isn’t just packed in a cube.

Level: 1 2 3 4

K	A	T	C	
/15	/12	/5	/5	Level: