

## SPORTS BAG

### Performance Standard (7C/9B).G

Determine an efficient layout of the pieces to make a sports bag with given dimensions and specifications accordingly:

- *Mathematical knowledge*: know how to solve problems using formulas to determine the circumference and area of a circle and the area of pyramids, cylinders and cones,
- *Strategic knowledge*: use appropriate strategies to layout the pieces of the sports bag using a minimal amount of material, and
- *Explanation*: explain completely and clearly what was done and why it was done.

### Procedures

1. Provide students with sufficient learning opportunities to develop the following skills in order to (7C) select and use appropriate technology, instruments, and formulas to solve problems, interpret results, and communicate findings and (9B) identify, describe, classify and compare relationships using points, lines, planes, and solids:
  - Select an appropriate formula to determine the circumference and the area of circles,
  - Select and explain an appropriate formula or strategy to find the surface area and volume of rectangular and triangular pyramids, cylinders and cones, and
  - Solve problems using properties of polygons and circles.
2. Provide each student a copy of the "Sports Bag" task sheet and the rubric. Have students review and discuss the task to be completed and how the rubric will be used to evaluate it.
3. Have the students work individually to solve the problem. Do not help the students or guide their thinking as they solve the problem.
4. Evaluate each student's work using the rubric and its guide to determine the performance level. Give each student a score in each of the three categories, scoring each part of the problem separately. Minor errors in computation include making errors in the actual addition or multiplication, rounding incorrectly, or forgetting to add in the 2cm for the seams. Major errors include using the wrong operation or formulas, or using an incorrect value for pi, or not using the correct dimensions for a given measurement for the finished bag (e.g., using the length of the body as both the length and width of the rectangular body piece, instead of just as one of them). All written descriptions should include proper uses of the terminology for the various shapes and their parts, e.g. cylinder, circles, diameters, radius, circumference, rectangle, and side. Evaluate each part as follows:
  - Part A: the students should have identified that they will need two circular pieces that are 29 cm in diameter, and a rectangular piece of cloth that is 64 cm by about 82.5 cm (using 3.14 for pi). Their measurements should be supported by work showing the length of the rectangular piece of cloth being the same as the circumference of a 29 cm diameter circle. This includes adding in the 2 cm on all edges for seams.
  - Part B: the students should show a feasible layout of the pieces, making sure that all the pieces will fit in the area shown, and does not waste too much material. A score of 4 should show the layout accomplished with using only the 82.5 cm of material that is needed for the length of the rectangle. The circular ends would then fit along the side of the rectangular piece since there is 40 cm left there. (If they try to place the 82.5 cm length of the rectangle along the width of the material, it would take another 29 cm to get the circular ends included. If laid out that way, it would take a total of 111.5 cm, which wastes material. This response should score no more than a 3.)

### Examples of Student Work not available

### Time Requirements

- 30 minutes

### Resources

- Copies of the "Sports Bag" task sheet
- Meter sticks
- Calculators as desired
- Mathematics Rubric

### ASSESSMENT (7C/9B).G

NAME \_\_\_\_\_ DATE \_\_\_\_\_

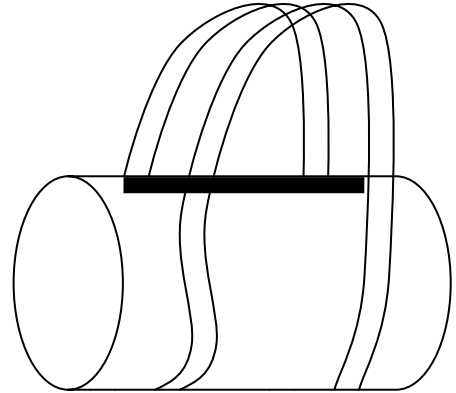
### SPORTS BAG

Your company makes sports bags. Your job is to make a pattern for the pieces, and design the layout of the pieces on the material so you don't waste material. Another workgroup will do the sewing and adding the strapping for handles. Each bag has the shape of a cylinder as shown, and meets the following criteria:

- The body of the finished bag is 60 cm long.
- The circular ends of the finished bag have a diameter of 25 cm.
- The body is made of a single piece of heavy material.
- The ends are made of the same fabric.
- Each piece must be cut to allow for an extra 2 cm on all sides for the seam (where the pieces are sewn together).

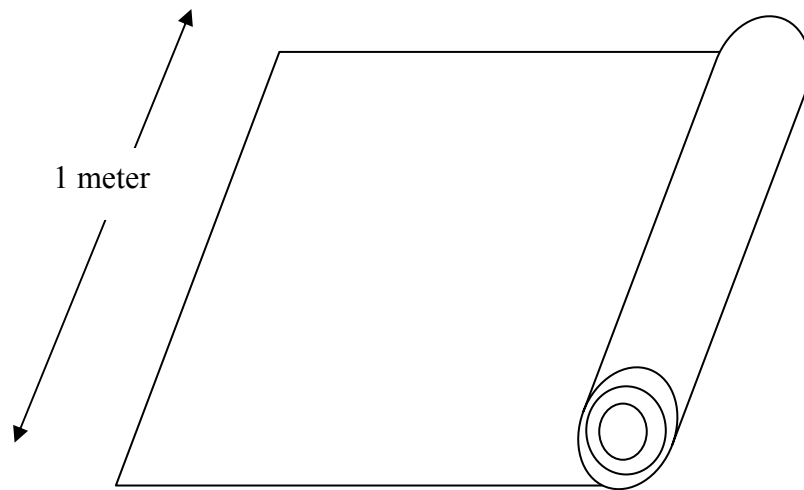
#### Part A.

What are the exact shape and sizes of the pieces you will need to cut from the material to make one bag? Explain what you did to figure out these shapes and sizes and how you know what you did is right. You may use drawings and calculations to help with your explanation, but you must also include a written summary others can follow.



#### Part B.

You will need to cut the pattern pieces from fabric that comes on a long roll and is 1 meter wide. What is the shortest length of fabric you will need to cut out all the pieces needed to create one bag? Draw a diagram showing how the pieces should be cut out from the fabric. Provide a written explanation of your solution and a description of your diagram.



Adapted from the *New Standards* tasks and reference exams available from Harcourt Brace Educational Measurement, as included in NCSM's *Great Tasks and More* (1996).