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Grade 12  
Applied Mathematics  
Standards Test

# Inquiry Task

January 2012

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# GRADE 12 APPLIED MATHEMATICS STANDARDS TEST

## DESCRIPTION

Total Possible Marks: 19

Time: 2 hours

	Description	Suggested Time	Marks
<b>Task 1</b>	One question on the Design and Measurement Unit	60 minutes	10
<b>Task 2</b>	One question on the Vectors Unit	60 minutes	9

## TEST RESOURCES AND DIRECTIONS

- You may consult your  $8\frac{1}{2}'' \times 11''$  individually prepared study sheet during the test.
- You may use a geometry set, a graphing calculator, and computer software, and have access to the Internet for tools such as applets or a mortgage payment calculator. **Use of the Internet to access course notes, find definitions, or search for conceptual information about the course is prohibited during the test.**
- Provide **complete answers** in the spaces provided in the test booklet. You may print out diagrams from the computer or your calculator where applicable. Indicate your booklet number and question number on the printouts. Remain seated and your teacher will distribute these printouts to you. Indicate in the response space of the question that the answer is on a printed sheet and staple it to the page.
- Provide clear explanations or justifications where applicable. This can be done through labelled diagrams, in words, by showing mathematical operations to verify your answer, or by referring to a calculator or software program.
  - If you refer to a calculator program, indicate your input values.
  - If you refer to a software program or a website, indicate your input values and print or copy the screen showing the answers.
  - If you refer to a spreadsheet, print a copy of the answers.
- Let the mark values for each question guide your time and the amount of detail you use in your answer.
- Round your final answers to the nearest two decimal places.
- Unless otherwise indicated, it is not necessary to draw diagrams to scale. If you draw a diagram to scale, make sure to indicate the scale you used.
- An answer without any work shown will be considered incomplete.
- Always state your assumptions.

**DESIGN AND MEASUREMENT**

1. You have been asked to design the layout for a new community fitness centre. The centre measures 36 feet by 40 feet and must meet the following specifications:

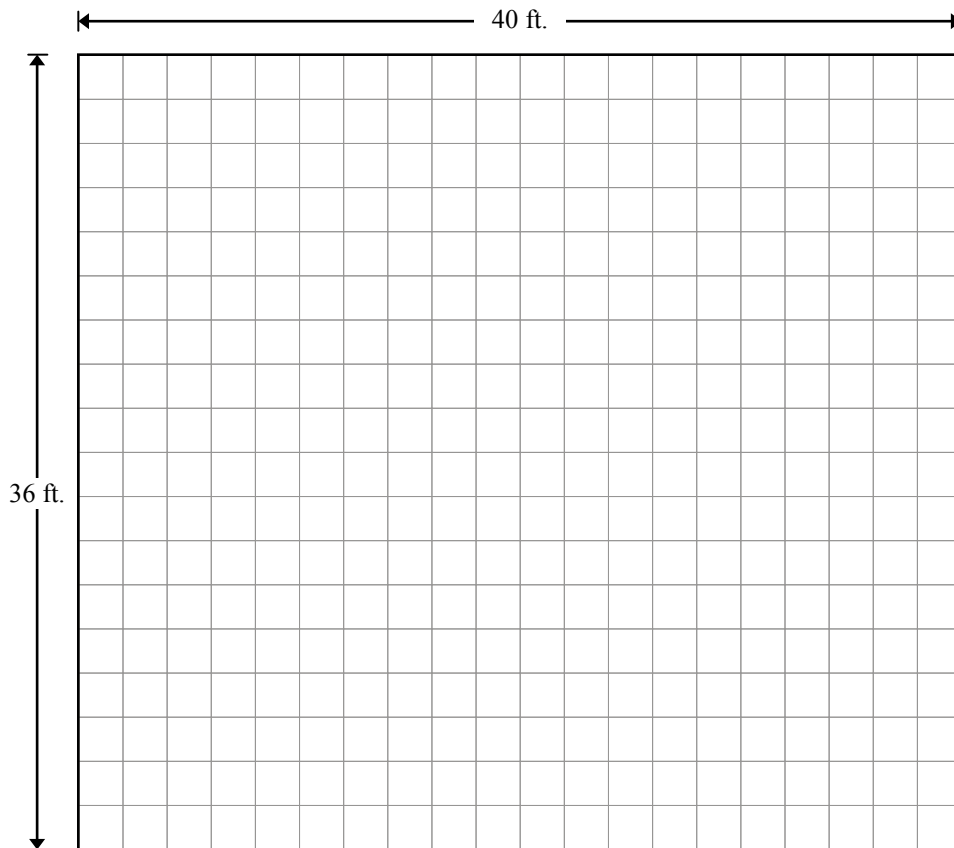
Total:  
10 marks

- The women’s washroom, with change room, must have an area between 150 ft.<sup>2</sup> and 200 ft.<sup>2</sup>
- The men’s washroom, with change room, must have an area between 120 ft.<sup>2</sup> and 170 ft.<sup>2</sup>
- The hot tub room must measure 8 ft. by 12 ft.
- The mechanical room must have an area between 50 ft.<sup>2</sup> and 100 ft.<sup>2</sup>
- The rest of the centre must be an open space reserved for equipment and for clients to move around.
- Each room must have a door that is 36 in. wide and 80 in. high.
- The entrance to the fitness centre must have a double door that is 60 in. wide and 80 in. high.

a) Complete a scale diagram of the centre. Draw all the walls with a solid line and indicate the location of all the doors. When considering distances and areas, ignore the thickness of the walls. Label each room and indicate the dimensions.

(3 marks)

Scale: 1 square = 2 feet



- b) You have also been asked to install equipment in the open space, allowing a certain amount of space for each piece of equipment to be used safely. You can spend between \$12 000.00 and \$16 000.00, not including taxes, and must have at least one of each of the pieces indicated in the chart below.

Complete the last column of the chart. Indicate where each piece of equipment will be located on your diagram in (a). Use the labels provided and draw lines around each piece to indicate the area of safe use. Determine the total cost of the equipment, not including taxes.

(2 marks)

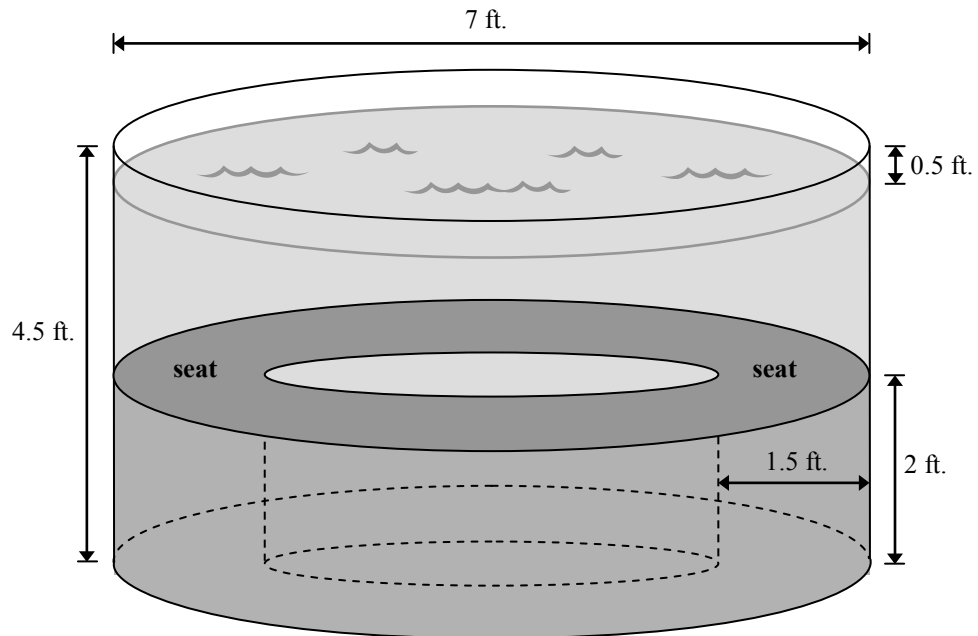
<b>Equipment</b>	<b>Label</b>	<b>Cost (not including taxes)</b>	<b>Area of Safe Use</b>	<b>Quantity</b>
Bench press	BP	\$850.00	8 ft. × 8 ft.	
Leg press	LP	\$650.00	8 ft. × 8 ft.	
Squat rack	SR	\$550.00	8 ft. × 8 ft.	
Treadmill	T	\$1550.00	8 ft. × 6 ft.	
Exercise bench	EB	\$550.00	6 ft. × 4 ft.	
Elliptical trainer	ET	\$1450.00	6 ft. × 4 ft.	
Stationary bicycle	SB	\$1575.00	6 ft. × 4 ft.	

- c) The walls surrounding the open space reserved for the equipment are 10 feet high and must be painted. The doors do not need to be painted. You will need one coat of primer and two coats of paint. How many cans of each will be needed if one can of primer covers  $300 \text{ ft.}^2$  and one can of paint covers  $400 \text{ ft.}^2$ ?

*(3 marks)*

- d) The dimensions for the hot tub are indicated on the diagram below. Determine the volume of water necessary to fill the hot tub to 0.5 feet from the top. Show your work. (Diagram is not drawn to scale.)

(2 marks)

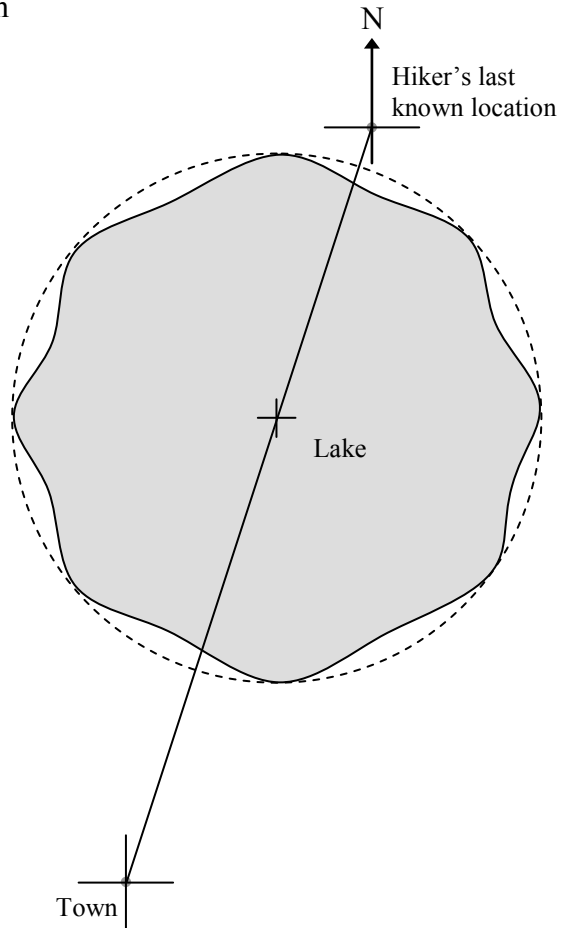


**VECTORS**

2. A hiker is lost in the woods. His last known location is 105 km from the nearest town, where a search and rescue operation has been organized. The following scale diagram describes the situation.

Total:  
9 marks

Scale: 1 cm = 10 km



- a) What is the direction from the town to the hiker's last known location?  
(1 mark)

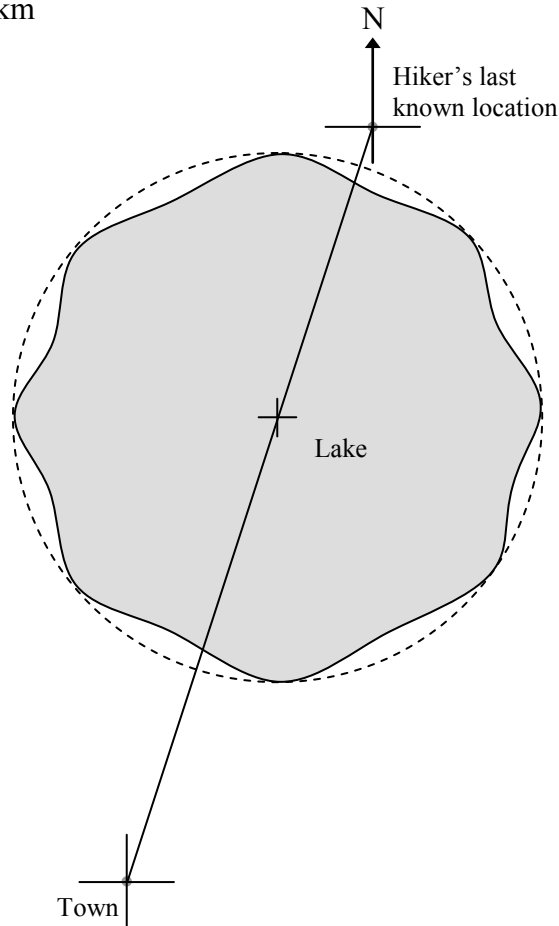
- b) Avoiding the lake, create a route for the rescue crew to travel from the town to the hiker's last known location. Complete the scale diagram on the previous page stating all distances and directions.

(2 marks)

- c) Once the rescue crew reaches the hiker's last known location, they find an arrow in the sand pointing due west and "8:30 a.m." is written below it. The rescue crew estimates that the hiker can walk 1.5 km/h in the woods. If a rescue plane leaves from the town, at what bearing should the pilot fly in order to intercept the hiker at 5:00 p.m.? How far away from the town will the hiker be when he is found? Show your work.

(4 marks)

Scale: 1 cm = 10 km



- d) The pilot is unable to find the hiker. The rescue crew finds him the next morning, trapped under a fallen tree. Two of the rescuers tie ropes on the end of the tree and form an angle of  $38^\circ$  to each other. One rescuer pulls on his rope with a force of 550 newtons. If 1150 newtons of force is needed to move the tree, what is the magnitude of the minimum force the other rescuer will need to exert on his rope? Show your work.

*(2 marks)*

**END OF TEST**