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# **Senior 4 Applied Mathematics (40S) Standards Test**

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**Inquiry Task**

**June 2006**



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## SENIOR 4 APPLIED MATHEMATICS (40S) STANDARDS TEST

### DESCRIPTION

**Total Possible Marks: 20**

**Time: 2 hours**

**This test consists of two tasks:**

	Description	Suggested Time to Complete	Marks
<b>Task 1</b>	A question on the Design and Measurement unit worth 10 marks	60 minutes	10
<b>Task 2</b>	A question on the Sequences unit worth 10 marks	60 minutes	10

### TEST RESOURCES AND DIRECTIONS

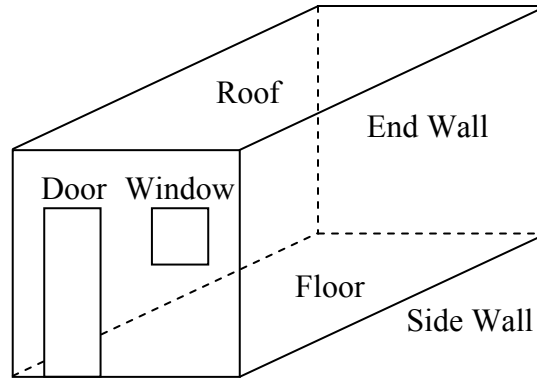
- ◆ This test should be written with the assistance of computer software and/or a graphing calculator.
- ◆ You may consult your 8½" × 11" individually prepared study sheet during the test.
- ◆ If you use a graphing calculator, make sure you indicate all the values you entered in the space provided in this booklet.
- ◆ If you use a spreadsheet, print a copy of the answers. Indicate your booklet ID number on the printout. Remain seated and your teacher will distribute this printout to you.
- ◆ If you use a website, make sure you indicate all the values you entered, and print or copy the screen, showing answers.
- ◆ Please staple printed copies of all your work on the page of the question. Indicate in the response space of the question that the answer is on a printed sheet.
- ◆ Clearly identify the question number on your answer sheet(s) (e.g., Question 2b).
- ◆ Always state your assumptions.

**DESIGN AND MEASUREMENT**

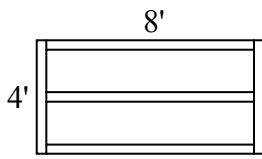
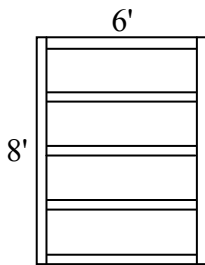
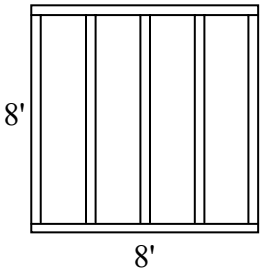
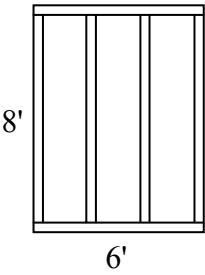
1. You want to build an ice-fishing shack that is 8 feet wide, 12 feet long and 8 feet high.

Total:  
10 marks

**Ice-Fishing Shack**



Since you want to assemble it for winter fishing and disassemble it in the spring for summer storage, the following construction procedures must be followed:

<ul style="list-style-type: none"> <li>The framing for the flat <b>roof</b> will be built with three <math>4' \times 8'</math> sections. The three sections will be covered with <math>\frac{1}{2}</math>" plywood and be fastened together when assembled.</li> </ul> 	<ul style="list-style-type: none"> <li>The framing for the <b>floor</b> will be built with two <math>6' \times 8'</math> sections. The two sections will be covered with <math>\frac{3}{4}</math>" plywood and be fastened together when assembled.</li> </ul> 
<ul style="list-style-type: none"> <li>The framing for each <b>end wall</b> will be built with an <math>8' \times 8'</math> section. The two sections will be covered with <math>\frac{3}{8}</math>" plywood.</li> </ul> 	<ul style="list-style-type: none"> <li>The framing for each <b>side wall</b> will be built with two <math>6' \times 8'</math> sections. The two sections will be covered with <math>\frac{3}{8}</math>" plywood and be fastened together, for each side wall, when assembled.</li> </ul> 

- A  $2' \times 2'$  window and a  $2' \times 6'$  door will be installed at one end of the shack.

Cost of materials:

- one  $4' \times 8'$  sheet of  $\frac{3}{4}$ " plywood \$45.69
- one  $4' \times 8'$  sheet of  $\frac{1}{2}$ " plywood \$35.89
- one  $4' \times 8'$  sheet of  $\frac{3}{8}$ " plywood \$26.59
- one  $2" \times 4"$  eight feet long (for framing) \$3.99
- one 4 L container of stain (covers  $300 \text{ ft.}^2$ ) \$25.60
- one 1 L container of stain (covers  $75 \text{ ft.}^2$ ) \$8.30
- one heater (heats  $700 \text{ ft.}^3$  of space) \$120.00
- one heater (heats  $1000 \text{ ft.}^3$  of space) \$175.00
- hardware/window \$75.00

- a) Calculate the number of sheets of each type of plywood needed and the total cost of the plywood used to cover only one side of each section.

*(2 marks)*

- b) The framing for each section is built with  $2" \times 4"$ s as shown in the diagrams. Calculate the number of eight-foot long  $2" \times 4"$ s that you will need for the framing. Shorter pieces of wood cannot be fastened together to make a longer piece. Determine the cost of the framing.

*(2 marks)*

c) Stain is to be used to protect the following surfaces of the fishing shack:

- exterior walls (1 coat, including the door)
- roof (2 coats)
- interior floor (3 coats)

Determine the total area needed to be stained, the most economical way of buying the stain, and the cost of the stain.

*(3 marks)*

d) State which heater you would buy for the ice-fishing shack and give a reason why.

*(1 mark)*

e) Find the total cost for the ice-fishing shack including hardware/window and taxes.

*(2 marks)*

**SEQUENCES**

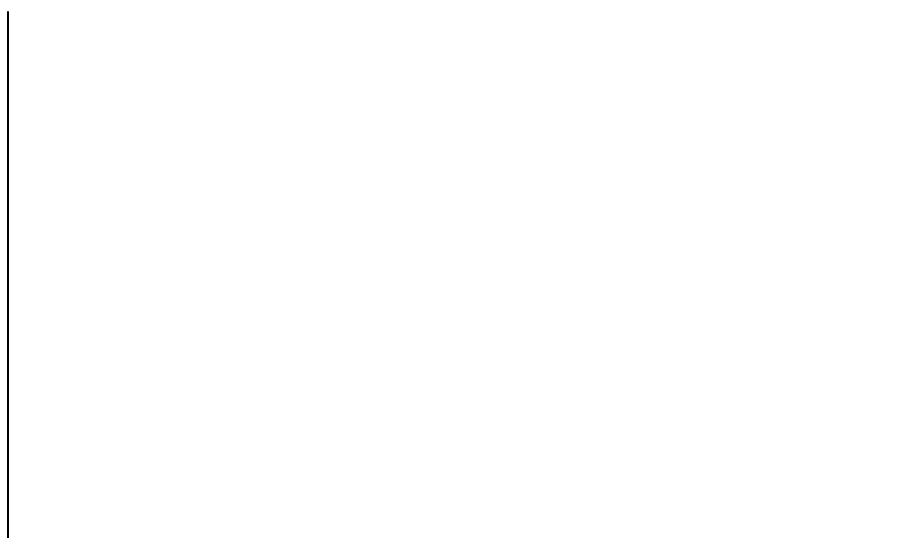
2. Conservation officers are concerned about the decreasing numbers of fish in Manitoba Lake. At the end of 2001, they determined that there were 25 000 fish in the lake. Over the past five years they have monitored the fish population and determined that the birth rate has averaged 10% per year and that the death rate has averaged 35%. At the end of each year, 5000 fish are added to the lake.

Total:  
10 marks

- a) How many fish will be in the lake at the end of 2006? Show your work.  
(2 marks)
- b) What will the fish population be when it stabilizes, if the current conditions do not change? Show your work.  
(2 marks)

- c) For the years 2001 to 2006, compare the number of fish in the lake when 5 000 fish were added each year, with the number of fish in the lake if no fish were added each year. Sketch a graph to show this comparison. Label your axes and state the population for 2006 on both curves.

*(3 marks)*



d) Devise a plan to stabilize the fish population within 30 years by using the following parameters:

- The initial fish population, birth rate and death rate remain the same as in part a).
- It has been determined that the ideal number of fish in the lake is  $8000 \pm 50$ .
- Recreational fishermen want the lake opened up for their use. The fishermen have been guaranteed at least 10% of the lake's fish population each year.
- You can vary the amount of fish you add to the lake and/or the amount of fish fishermen take out.

Calculate the stabilized fish population. Show your work to explain how you arrived at your answer.

*(3 marks)*

**END OF TEST**

**NO MARKS WILL BE AWARDED FOR WORK DONE  
ON THIS PAGE.**