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ABSTRACT

As part of the test development process, this document provides the released mathematics items and student responses to some questions from the Michigan High School Proficiency Test (HSPT) in mathematics. This packet is designed for teachers and students who are interested in understanding how the open-ended items from the HSPT in Mathematics are scored. The packet contains the Mathematics Scoring Guides for item #26 from the Spring 1996 administration and item #23 from the Winter 1997 administration. The guides include the test question, the scoring guide (or rubric), exemplary answers and annotated student papers which demonstrate how the items are scored. Also included are four multiple-choice items which were released from the Spring 1996 test. (ASK)

Michigan High School Proficiency Test (HSPT) Released Items for Mathematics

Michigan State Department of Education

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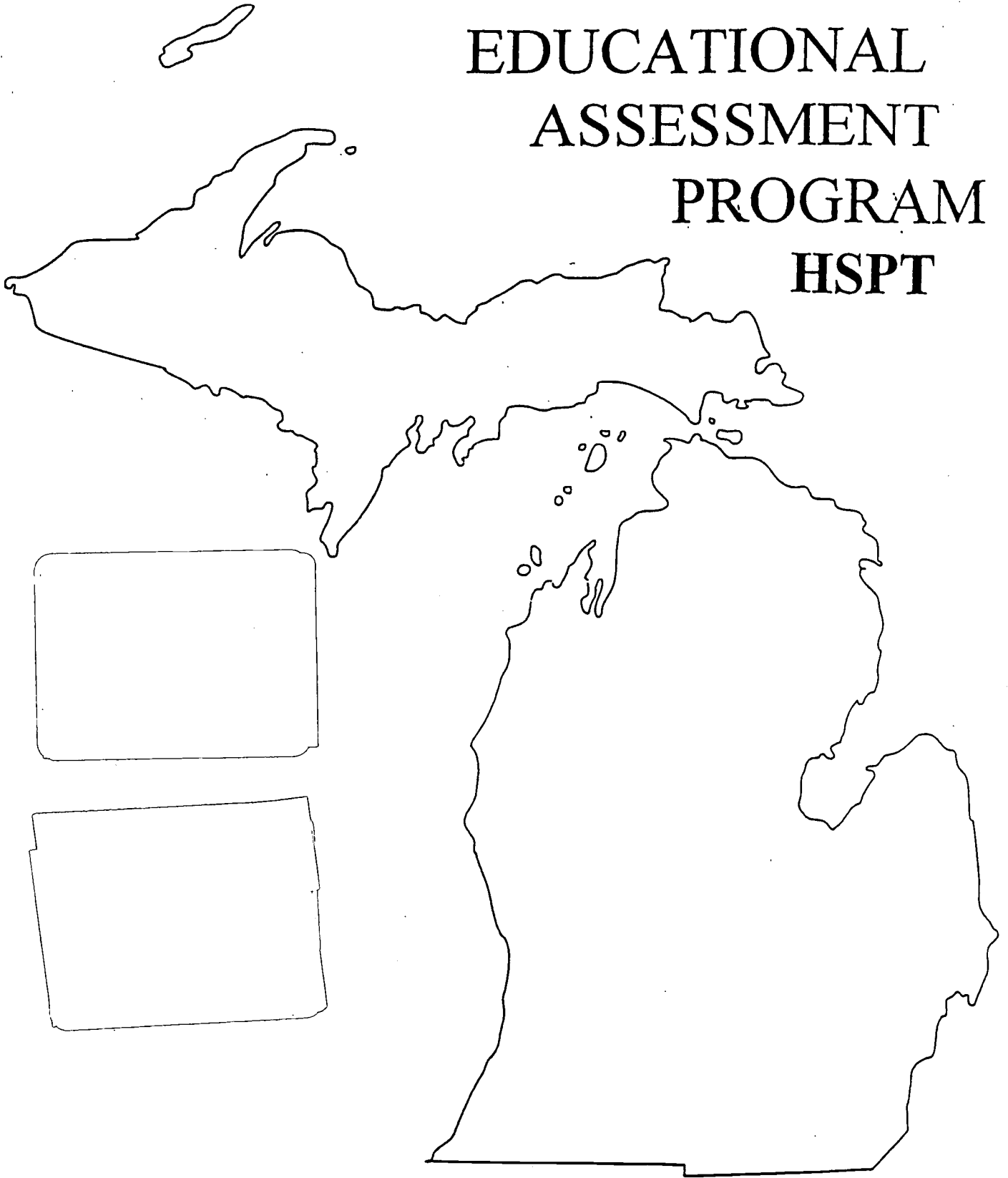
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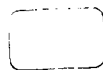
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MICHIGAN
EDUCATIONAL
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PROGRAM
HSPT



MATHEMATICS



**MICHIGAN
EDUCATIONAL
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PROGRAM
HSPT**

SPRING 1996

**SCORING GUIDE
ITEM 26**

MATHEMATICS

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

- 26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.
- A Construct a table showing all the possible choices of selecting three sticks.

STICK1	STICK2	STICK3	Δ's
2	3	4	*
2	3	5	
2	3	6	
2	4	5	*
2	4	6	
2	5	6	*
3	4	5	*
3	4	6	*
3	5	6	*
4	5	6	*

- B Indicate in the table in Part A which of the choices of three sticks can form a triangle.
- C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

$$\frac{7}{10}$$

7 out of 10

70%

MATHEMATICS
ITEM 26

TOTAL POINT VALUE: 4

PART A (2 points)

- 2 Table showing all 10 choices
- 1 Table showing at least 7 of the 10 choices
- 0 Other

PART B (1 point)

- 1 Indicates all possible choices from table in Part A
- 0 Other

PART C (1 point)

- 1 Correct probability
- 0 Other

NOTE: Score Part C as correct if answer is clearly based on incomplete answers from Parts A and B.

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

	2/3	2/4	2/5	2/6	3/4	3/5	3/6	4/5	4/6	5/6
2	///	///	///	///	▲	-	-	▲	-	▲
3	///	▲	-	-	///	///	///	▲	▲	▲
4	▲	///	▲	-	///	▲	▲	///	///	▲
5	-	▲	///	▲	▲	///	▲	///	▲	///
6	-	-	▲	///	▲	▲	///	▲	///	///

- Cannot form a triangle
 ▲ Can form a triangle
 ■ impossible situation

	2	3	4	5	6
2	///	▲	5	6	5
3	4	///	5	6	5
4	2	3	///	5	6
5	2	3	4	///	6
6	2	3	4	5	///

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

70% probability that drawing three sticks from the bag that they will form a triangle

10 possibilities
7 get triangles

SCORE POINT: 4

The table in Part A does show all 10 choices. The 7 possible choices are indicated in the table for Part B, and the probability given in Part C is correct based on the student's answers from Parts A and B.

015004-01395

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

(237)	(327)	(423)	(523)	(623)
235	325	(425)	(524)	624
276	726	426	(526)	(625)
(243)	(345)	(432)	532	632
(245)	(346)	(435)	(534)	(634)
296	(347)	(436)	(536)	(635)
257	(356)	(452)	(542)	642
(254)	(354)	(463)	(543)	(643)
(256)	762	(456)	(546)	(643)
263	(365)	462	(562)	(652)
264	(364)	(463)	(563)	(652)
(265)	362	(465)	(564)	(654)
6	8	10	10	8

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

No stick ones will form triangles

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

$\frac{42}{60}$ or 70% probability

that 3 stick drawn at random will form a triangle

SCORE POINT: 4

The table shows all 10 choices for Part A. The choices have been repeated to make a total of 60. The student did indicate the correct 7 possible choices for Part B. Again, the possible choices have been repeated. The probability is correct for Part C. 9

01
S004-00306

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

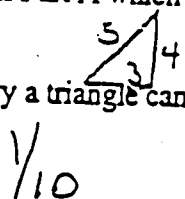
A Construct a table showing all the possible choices of selecting three sticks.

	2	3	4	5	6		2	3	4	5	6
2		X	X			2 3 4 5 6		X		X	
3											
4											
5											
6											
6											

- 2 3 4 3 4 5 4 5 6
 - 2 3 5 3 4 6
 - 2 3 6 3 5 6
 2 4 5
 2 4 6
 2 5 6

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?



SCORE POINT: 3

For Part A, the table does show all 10 choices. The response to Part B does not indicate all possible choices from the table in Part A. "1/10" is the correct probability based on answers from Parts A and B.

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks:

- | | |
|------------|-------------|
| 1. 2, 3, 4 | 7. 4, 5, 2 |
| 2. 2, 3, 5 | 8. 4, 5, 3 |
| 3. 2, 3, 6 | 9. 5, 6, 2 |
| 4. 3, 4, 5 | 10. 5, 6, 3 |
| 5. 3, 4, 6 | 11. 6, 2, 4 |
| 6. 4, 5, 6 | |

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

4, 5, 6 - 2, 3, 4 - 2, 4, 6.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

$\frac{3}{11}$

SCORE POINT: 3

For Part A, the table does show all 10 choices (3,4,5 and 4,5,3 are the same). The response to Part B does not indicate all possible choices from the table in Part A. The probability "3/11" for Part C is clearly based on the answers from Parts A and B.

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

sticks picked up

236
 246
 234-Δ
 245-Δ
 256-Δ
 324-Δ
 345-Δ
 325.
 326
 346-Δ
 456-Δ
 452-Δ
 453-Δ
 426
 463-Δ

Δ: ABLE TO MAKE A Triangle

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

234, 245, 256, 324, 345, 346, 456, 452, 453, 463

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

$$\frac{10}{15} = \frac{2}{3} \text{ of the time}$$

SCORE POINT: 3

The response to Part A shows 9 of the 10 choices. The choice "3 5 6" is missing. In Part B, the student does indicate all possible choices from the table in Part A. The probability is correct based on answers from Parts A and B.

015004-00705

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

(2, 3, 4)	(5, 6, 3)
(2, 3, 5)	(5, 6, 2)
(2, 3, 6)	(5, 4, 2)
(2, 4, 5)	(5, 3, 2)
(2, 4, 6)	(6, 5, 3)
(2, 4, 3)	(6, 5, 2)
(3, 2, 4)	(6, 5, 4)
(3, 2, 5)	
(3, 2, 6)	
(4, 5, 6)	
(4, 5, 3)	
(4, 2, 5)	
(4, 3, 6)	

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

There isn't a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

There isn't a triangle.

SCORE POINT: 2

The table does show all 10 choices.

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

Tri	X	234	235	236
Tri	X	345	346	342
Tri	X	456	452	
		562	563	

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

3/10

SCORE POINT: 2

The response to Part A shows only 9 choices (234 and 342 are the same). For Part B, the student does not indicate all of the possible choices from the table in Part A. In Part C, the probability "3/10" is clearly based on the answers from Parts A and B.

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

Handwritten table showing possible combinations of three sticks:

2, 3, + 4	or	3, 4, + 5	or	4, 5, + 6	or	5, 6, 2	or	6, 2, + 3
3, 6, + 5								

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

Handwritten answer: all of them except (6, 2 + 3)

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

Handwritten answer: 83% chance of making a triangle

SCORE POINT: 2

Only 6 choices are shown in Part A, so no credit is given. The student indicates all possible choice from the table so one point is received for Part B. The probability for Part C is correct (5 possible out of 6 choices is 83%) and is clearly based on answers for Parts A and B.

01 5004 - 01337

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

1

1 stick can form triangle

2

234
245
256
324
345
356
423
435
456
523
534

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

80%

SCORE POINT: 1

The table shows 7 possible choices in Part A. The choices that can form a triangle are not indicated so the probability "80%" for Part C is not clearly based on answers to Parts A and B.

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

Pick	inches chosen
1	2, 3, 4
2	2, 5, 6
3	3, 4, 5
4	3, 6, 2
5	4, 5, 6
6	4, 3, 2
7	5, 6, 2
8	5, 3, 4
9	6, 2, 3
10	6, 4, 5

10 possibilities

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

4, 5, 6

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag? $\frac{1}{10}$ in 10 possibilities. That a triangle can be formed when 3 sticks are drawn

SCORE POINT: 1

The table in Part A shows only 5 choices. "Pick" 6-10 are actually the same choices made in "Pick" 1-5. The response to Part B does not indicate all possible choices shown in Part A. The probability given in Part C is the correct probability clearly based on answers from Parts A and B.

01 Sep 04 - 00735

(4 Points)

26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.

A Construct a table showing all the possible choices of selecting three sticks.

Possible choices	
2	3, 4, 5, 6
3	2, 4, 5, 6
4	2, 3, 5, 6
5	2, 3, 4, 6
6	2, 3, 4, 5

As you can see in the chart, if you choose three sticks your odds of choosing the one you want is very slim. For example: If you pick a 3 the first time, you will either pick a 2, 4, 5 or 6 the second time and so on with all sticks

Sticks that can form a triangle are 2, 3 and 4. They are the only three choices that it will form.

B Indicate in the table in Part A which of the choices of three sticks can form a triangle.

C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?

The probability that a triangle can be formed when three sticks are drawn at random from the bag is 9:25.

or out of every 25 times you try to form a triangle, the probability of actually forming one is only 9.

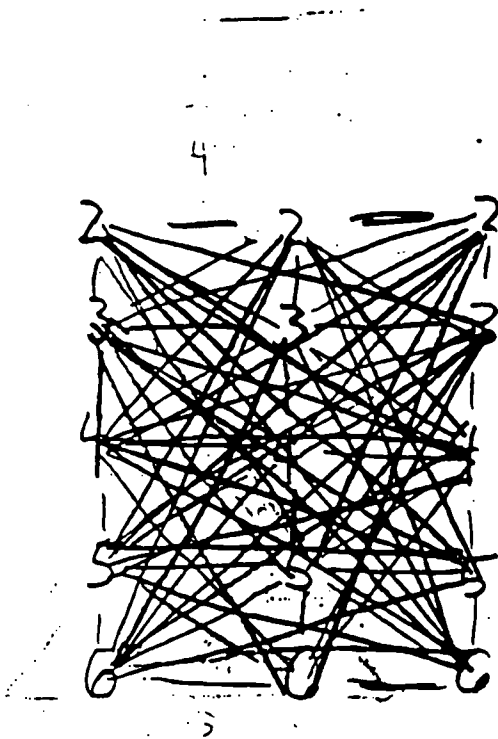
SCORE POINT: 0

The response to Part A shows less than 7 choices and the response to Part C is not clearly based on the answer to Part A.

69210-4005 10

(4 Points)

- 26 A bag contains five sticks with lengths of 2, 3, 4, 5, and 6 inches. Suppose you pick three of the sticks randomly to try and form a triangle.
- A Construct a table showing all the possible choices of selecting three sticks.



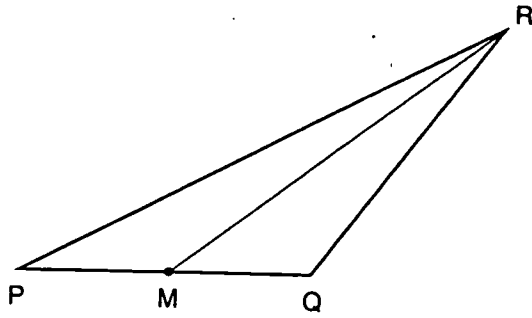
- B Indicate in the table in Part A which of the choices of three sticks can form a triangle.
all equilateral
- C What is the probability a triangle can be formed when three sticks are drawn at random from the bag?
2/3

SCORE POINT: 0

No clear choices are indicated in Part A.

015004-01065

1 GEOMETRY-MC 703



If M is the midpoint of \overline{PQ} , which statement is true about the relationship between triangle PMR and triangle QMR?

- 25.9 A Their areas are equal.
- 30.7 B They are similar.
- 35.4 C They are congruent.
- 7.5 D Their perimeters are equal.

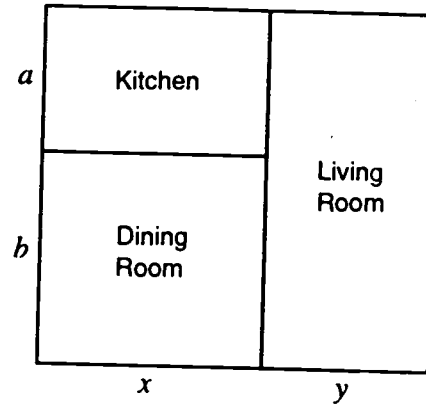
2 NUMBERS-MC 031

Victor receives \$5 every 2 weeks as his allowance. He pays \$2.50 every 3 weeks for a membership in a CD club. If he saves the rest of his money, how much money will he have at the end of 6 weeks?

- 4.5 A \$5 B \$10 75.9
- 10.5 C \$15 D \$25 8.7

3 ALGEBRA-MC 431

Which expression represents the area of the living room below?



- 8.5 A $(y-x)(a+b)$ B $y(a+b)$ 59.3
- 26.8 C $(x+y)(a+b)$ D $y(b-a)$ 4.5

4 DATA ANALYSIS-MC 277

The students in an economics class made the following table to show the number of radios their families own.

Number of Radios	Number of Students Responding
3 or more	4
2	15
1	12
0	1

What is the probability a student selected at random will be in a family owning 2 or more radios?

- 9.4 A $\frac{4}{32}$ B $\frac{13}{32}$ 4.5
- 22.9 C $\frac{15}{32}$ D $\frac{19}{32}$ 62.3

MICHIGAN
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WINTER 1997

ITEM
23

SCORING GUIDE

MATH PART 1

How to Use the Released Mathematics Item Winter 1997

The attached item can be used with teachers, students, parents, and anyone else who is interested in the mathematics items on the High School Proficiency Test.

The open-ended items are designed to assess student's problem solving and reasoning skills, in this particular case, in geometry and measurement. The objective tested is "Use both traditional and metric measures of length, angle, perimeter, area (including surface area), volume, capacity, weight, time and temperature to solve problems."

This released item, along with the one released in 1996, illustrate for teachers and students how the items are scored. This set of actual student answers is used in the training of the scorers to illustrate the different score points possible. This item is scored similarly to all open-ended items on the HSPT. Students can get partial credit for incomplete answers, provided they have a good start. Each part of the problem is scored separately, so a student who does not receive any credit in part a could get credit in part b if they apply a correct conversion.

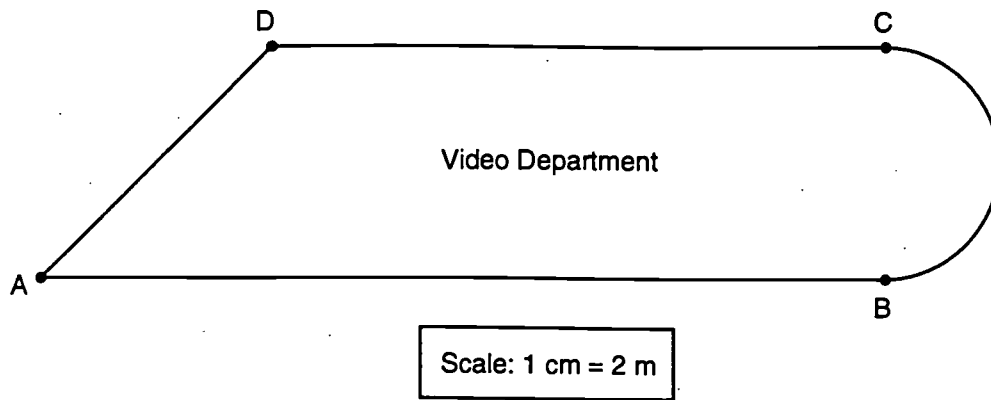
In using the released item, students and teachers should determine what is being asked of students: the depth of thinking needed, the connections that need to be made, the contexts in which the items are placed, and the data they are asked to analyze. Then examine where this type of thinking is developed in your school's curriculum. Are students reading carefully, following directions, completing all steps in this type of problem in their regular school work? Do they have misconceptions about geometry and measurement terms? Examine the amount of written work required on this item for a correct answer. How much detail is needed, how extensive do the explanations have to be? Students need to write out the formulas they are using, attempt the question, and write down what they do know, even if it is not the whole answer. They need to re-read the question and make sure they have answered every part.

Focusing exclusively on the skills shown here will not help students. These exact skills may or may not be tested on the HSPT again. Focusing on the strand, the types of general misconceptions seen, general problem solving skills, and types of acceptable responses on the written portion of the test will help students.

Using open-ended items and rubrics in your classroom will prepare students for what they need to do. Providing multiple opportunities for students to do these types of questions will help with the HSPT.

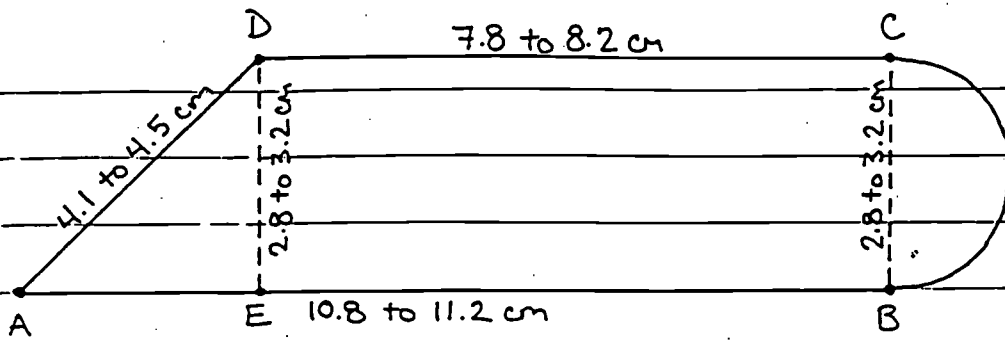
(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)
- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

multiplier /
Ranges



A Triangle-Rectangle-Semicircle

Triangle: $\frac{1}{2}bh = 3.92 \text{ to } 5.12 \text{ cm}^2$

Rectangle: $lw = 21.84 \text{ to } 26.24 \text{ cm}^2$

Semicircle: $\frac{1}{2}\pi r^2 = 3.08 \text{ to } 4.02 \text{ cm}^2$ (or $.98\pi \text{ to } 1.28\pi$)

$28.84 \text{ to } 35.38 \text{ cm}^2$ (or $25.76 + .98\pi \text{ to } 31.36 + 1.28\pi$)

Trapezoid-Semicircle

Trapezoid: $\frac{1}{2}(b_1+b_2)h = 26.04 \text{ to } 31.04 \text{ cm}^2$

Semicircle: $\frac{1}{2}\pi r^2 = 3.08 \text{ to } 4.02 \text{ cm}^2$ (or $.98\pi \text{ to } 1.28\pi$)

$31.40 \text{ to } 35.04 \text{ cm}^2$ (or $26.04 + .98\pi \text{ to } 31.04 + 1.28\pi$)

B Total area ranges: $115.36 \text{ to } 141.52 \text{ m}^2$

(or $103.04 + 3.92\pi \text{ to } 125.44 + 5.12\pi$)

Results in Part B can be obtained from the same methods as in Part A or by multiplying the result from Part A by $\frac{4 \text{ m}^2}{\text{cm}^2}$

Item 23

Total point value: 5

Part A (3 points)

- 3 Correct total area with work showing a correct method
- 2 Correct method with incorrect total area due to a computational or measurement error
or
a partially correct method with incorrect total area showing:
- 2 of 3 correct areas when using the triangle-rectangle-semicircle method
 - correct trapezoid area when using the trapezoid-semicircle method
- 1 Correct total area with no work shown
or
a partially correct method with incorrect total area showing:
- 1 of 3 correct areas when using the triangle-rectangle-semicircle method
 - correct semicircle area when using the trapezoid-semicircle method
- or
a partial setup of a correct method without arriving at a correct total area (or without arriving at any total area)
- 0 Other

Item 23

Part B (2 points)

2 Correct total area with work showing a correct method

1 Correct total area with no work shown

or

a partially correct method with incorrect total area showing

- 1 of 3 correct areas when using the triangle-rectangle-semicircle method
- 1 of 2 correct areas when using the trapezoid-semicircle method

0 Other

Note:

Score Part B correct if the student correctly uses an incorrect area from Part A.

Score Part B as 0 if the student attempts conversion to m^2 by multiplying the result in Part A by 2.

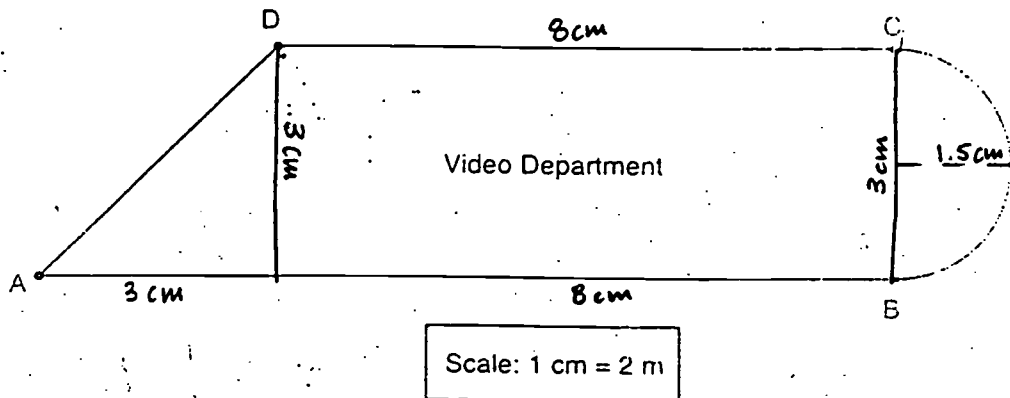
If the student finds the perimeter in Part A and Part B and correctly doubles the measurements of the segments, score Part B as 1.

If the student finds the correct area in m^2 in Part A, give credit in Part A but not in Part B (unless the student converts to cm^2 in Part B).

Students may use the grid on the provided acetate overlay to estimate a correct total area.

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is made of 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$A_{\text{TRIANGLE}} = \frac{1}{2}bh = \frac{1}{2}(3)(3) = 4.5 \text{ cm}^2$$

$$A_{\text{RECTANGLE}} = lW = (8)(3) = 24 \text{ cm}^2$$

$$A_{\text{SEMICIRCLE}} = \frac{1}{2}(\pi r^2) = \frac{1}{2}(\pi)(1.5)^2 = 1.125\pi \text{ cm}^2$$

$$\text{TOTAL} = 28.5 + 1.125\pi \text{ cm}^2$$

$$\approx 32.03429 \text{ cm}^2$$

- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$1 \text{ cm} = 2 \text{ m}$$

$$A_T = \frac{1}{2}(2 \cdot 3)(2 \cdot 3) = 18 \text{ m}^2$$

$$A_R = (2 \cdot 8)(2 \cdot 3) = 96 \text{ m}^2$$

$$A_S = \frac{1}{2}(\pi)(2 \cdot 1.5)^2 = 4.5\pi \text{ m}^2$$

$$\text{TOTAL} = 114 + 4.5\pi \text{ m}^2$$

$$\approx 128.13717 \text{ m}^2$$

3 points

Part A: Correct total area showing work

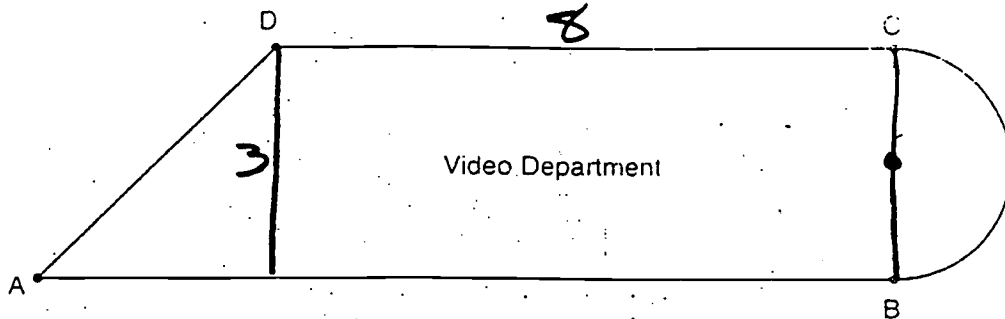
2 points

Part B: Correct total area showing work

Total score : 5

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



Scale: 1 cm = 2 m

A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$A_{\text{RECT}} = l \cdot w \quad A_{\text{RECT}} = 8 \times 3 \quad A_{\text{TRI}} = \frac{1}{2}bh$$

$$A_{\text{RECT}} = 24\text{cm}^2 \quad A_{\text{TRI}} = \frac{1}{2}(3)(3)$$

$$A_{\text{TRI}} = 4.5\text{cm}^2$$

$$A_{\text{CIRCLE}} = \frac{1}{2}\pi r^2 \quad 24\text{cm}^2 + 4.5\text{cm}^2 + 3.5\text{cm}^2 = A$$

$$A_{\text{CIRCLE}} = \frac{1}{2}\pi r^2 \quad \text{Diameter} = 3 \quad A = 32\text{cm}^2$$

$$A_{\text{CIRCLE}} = \frac{1}{2}\pi(2.25\text{cm}^2) \quad r = 1.5 \quad A_{\text{CIRCLE}} = 3.5\text{cm}^2$$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$k = 2\text{m} \quad \frac{1\text{cm}^2}{4\text{m}^2} = \frac{32\text{cm}^2}{x} \times (1\text{cm}^2) = (32\text{cm}^2)(4\text{m}^2)$$

$$128\text{m}^2 = x$$

3 points

Part A: Correct total area showing work

2 points

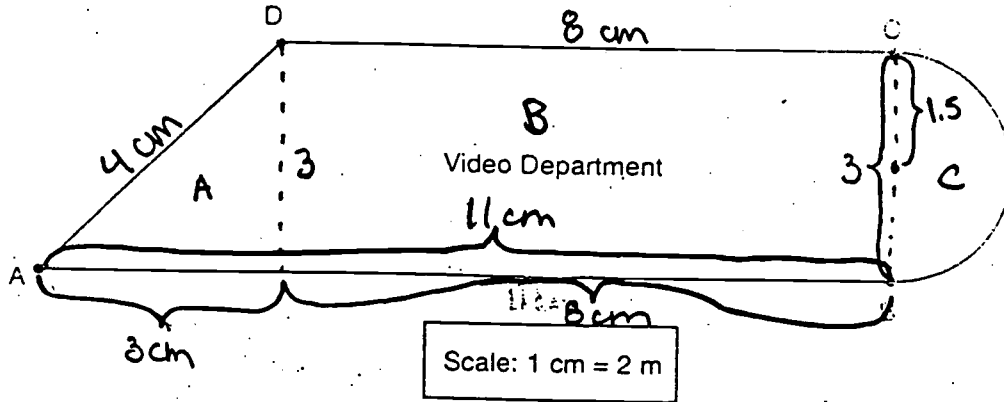
Part B: Correct total area showing work

This student chose to convert directly from cm^2 to m^2 by multiplying cm^2 by 4. This avoids repeating the more complicated calculations in part A.

Total score : 5

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is bounded by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$T_m = A_m + B_m + C_m$$

$$\frac{1}{2} b_m h_m = A_m$$

$$L_m W_m = B_m$$

$$\frac{1}{2} \pi r_m^2 = C_m$$

$$b_m = 8$$

$$h_m = 3$$

$$L_m = 8$$

$$W_m = 3 \quad r_m = 1.5$$

$$A_m = \frac{1}{2}(8)(3)$$

$$A_m = 12$$

$$B_m = 8(8)$$

$$B_m = 64$$

$$C_m = \frac{1}{2} \pi (1.5)^2$$

$$C_m = 1.125\pi$$

$$T_m = 12 + 64 + 1.125\pi$$

$$T_m = 76.5 \text{ cm}^2 + 1.125\pi \text{ cm}^2$$

- B Using the scale in the diagram above, what is the area of the actual video department, to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$T_A = A_A + B_A + C_A$$

$$\frac{1}{2} b_A h_A = A_A$$

$$L_A W_A = B_A$$

$$\frac{1}{2} \pi r_A^2 = C_A$$

$$b_A = 16$$

$$h_A = 6$$

$$L_A = 16$$

$$W_A = 6 \quad r_A = 3$$

$$A_A = \frac{1}{2}(16)(6)$$

$$A_A = 48$$

$$B_A = (16)(16)$$

$$B_A = 256$$

$$C_A = \frac{1}{2} \pi (3)^2$$

$$C_A = 4.5\pi$$

$$T_A = 48 + 256 + 4.5\pi$$

$$T_A = 304 \text{ m}^2 + 4.5\pi \text{ m}^2$$

3 points

Part A: Correct total area showing work

2 points

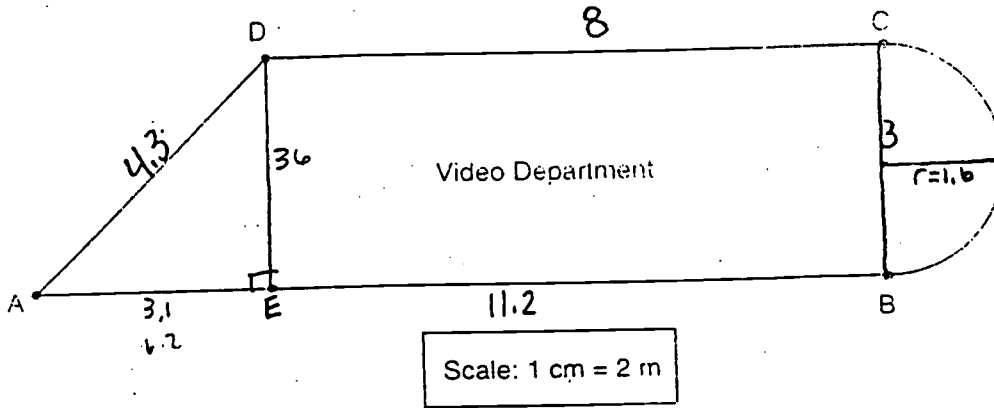
Part B: Correct total area showing work

Student chooses to leave both answers in terms of π .

Total score : 5

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bounded by 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$\begin{aligned} \frac{1}{2}(3.1)(3.6) &= 4.65\text{cm}^2 = \triangle ADE \\ 8 \cdot 3.6 &= 24\text{cm}^2 = \square DCBE \\ \frac{1}{2}\pi(1.6)^2 &= 2.5133 \\ 4.65 + 24 + \frac{1}{2}\pi(1.6)^2 &= \\ 28.65 + \frac{1}{2}\pi(1.6)^2 &= \\ &\approx 31.16\text{cm}^2 \end{aligned}$$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$\begin{aligned} \frac{1}{2}(3.1 \times 2)(3.6 \times 2) &= \frac{1}{2}(6.2)(7.2) = 18.6\text{m}^2 \\ (8 \cdot 2)(3.6 \times 2) &= 16(7.2) = 96\text{m}^2 \\ \frac{1}{2}\pi(1.6 \times 2)^2 &= \frac{1}{2}\pi(3.2)^2 = 5.027 \\ &120\text{m}^2 \end{aligned}$$

323960

2 points

Part A: Student divides the figure into a triangle, a rectangle, and a semicircle. The area of the semicircle is incorrect. 2 of 3 correct areas with this method merits 2 points in part A.

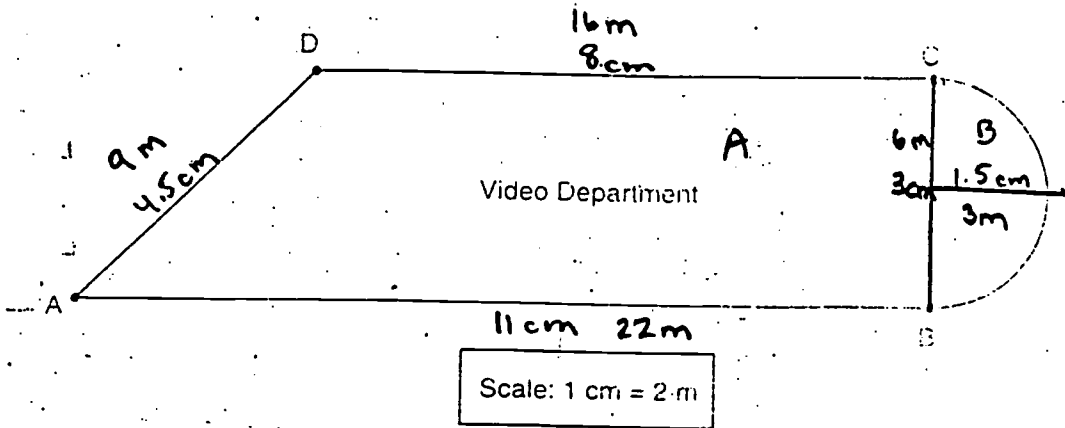
2 points

Part B: Student makes the same mistake here as in part A. Don't punish the student twice for the same mistake! Method for finding area in m^2 using the scale is acceptable.

Total score : 4

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

A = Trapezoid
 $A = \frac{1}{2}(8+11) \times 3$

$A = 28.5 \text{ cm}^2$

A + B = Total Area

$28.5 \text{ cm}^2 + 3.54 \text{ cm}^2$
 $= 32.04 \text{ cm}^2$

Semicircle

B = $A = \pi r^2$

$A = \frac{\pi(1.5)^2}{2}$

$A = \frac{7.07 \text{ cm}^2}{2}$

$A = 3.54 \text{ cm}^2$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$\frac{1}{4.5} = \frac{2}{x}$

A Trapezoid
 $A = \frac{1}{2}(16+11) \times 6$

$A = 40.5 \text{ cm}^2$

A + B = Total Area

$40.5 \text{ cm}^2 + 14.14 \text{ m}^2 =$
 $= 54.64 \text{ m}^2$

Semicircle

B = $A = \pi r^2$

$A = \pi(3)^2$

$A = 9\pi$

$A = \frac{28.27 \text{ m}^2}{2}$

14.14 m^2

3 points

Part A: Correct total area showing work. Student divides figure into a trapezoid and a semicircle. Student correctly applies the formula for the area of a trapezoid.

1 point

Part B: Student uses the same method as in part A but makes a mistake by not doubling 11 in the formula.

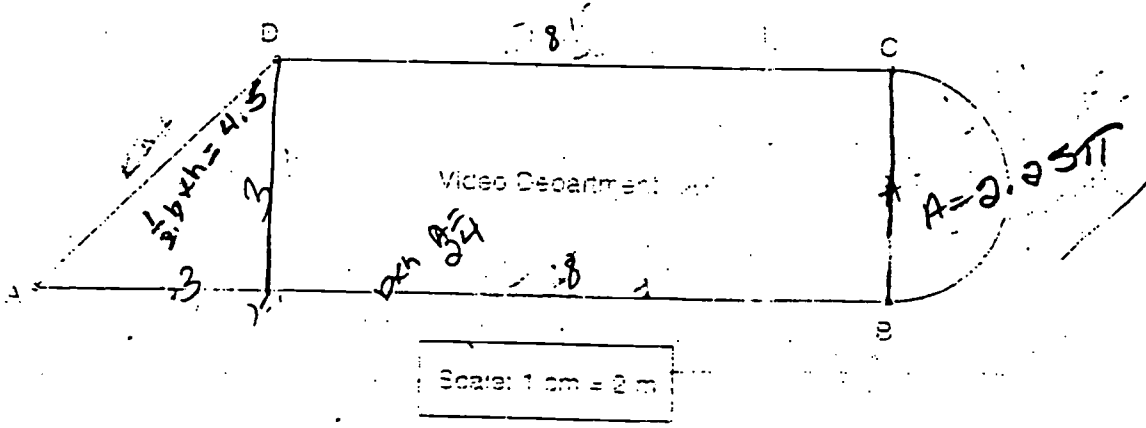
Total score : 4

Mathematics - Part I

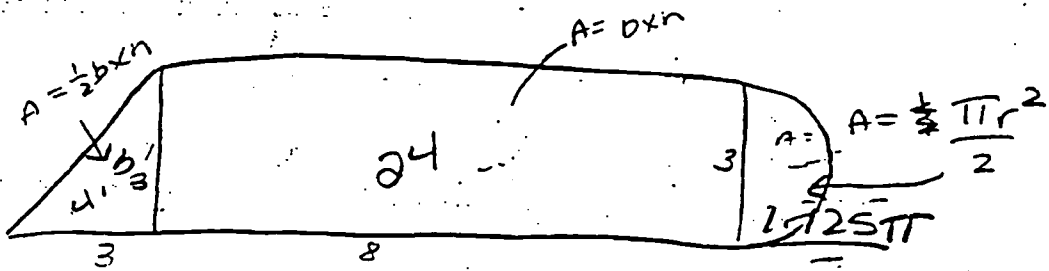
(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.

046454

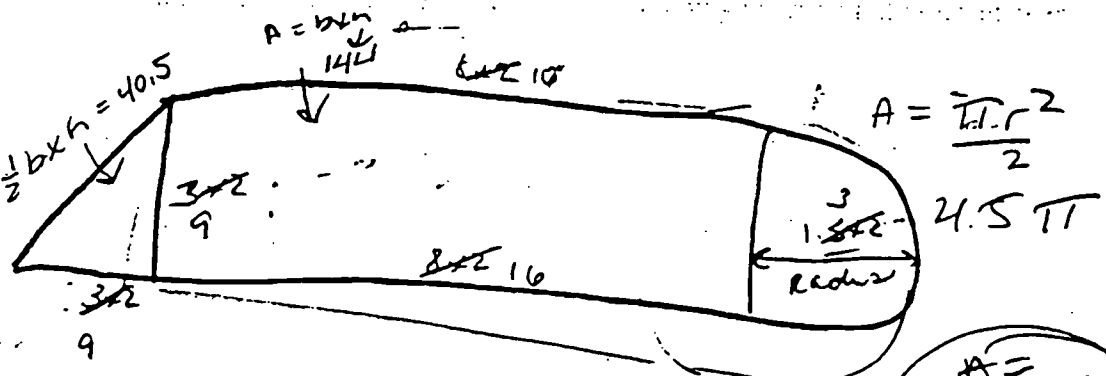


A Find the area of the video department in square meters, rounding to the nearest unit. Provide the work for this problem.



$4.5 + 24 + 1.125\pi =$

$29.625\pi \text{ cm}^2$



$40.5 + 144 + 4.5\pi =$

189.11 m^2

2 points

Part A: Incorrect total area. All three smaller areas are correct, but student attempts to combine unlike terms to find total area.

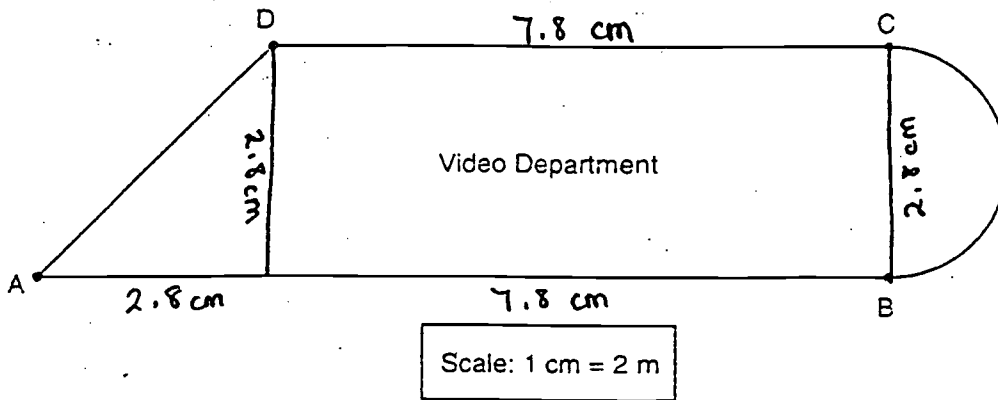
1 point

Part B: Area of semicircle is correct. Rectangle and triangle areas are incorrect. Student again attempts to combine unlike terms.

Total score : 3

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$A \text{ of } \Delta = \frac{1}{2}bh$	$A \text{ of } \square = bh$	$A \text{ of } O = \pi r^2$
$A \text{ of } \Delta = \frac{1}{2}(2.8)(2.8)$	$A \text{ of } \square = (7.8)(2.8)$	$A \text{ of } O = \pi(1.4)^2$
$A \text{ of } \Delta = 3.92 \text{ cm}^2$	$A \text{ of } \square = 21.84 \text{ cm}^2$	$A \text{ of } O = 6.1544 (1.96\pi)$
		$A \text{ of } D = \frac{6.1544}{2} \frac{(1.96\pi)}{2}$
Entire Area = $A \text{ of } \Delta + A \text{ of } \square + A \text{ of } D$		$A \text{ of } D = 3.0772 (0.98\pi)$
Entire Area = $3.92 + 21.84 + 3.0772$		
Entire Area = 28.8372 cm^2	or: $25.76 \text{ cm}^2 + 0.98\pi \text{ cm}^2$	

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$\frac{1 \text{ cm}}{2 \text{ m}} = \frac{28.8372 \text{ cm}^2}{? \text{ m}^2} \quad \frac{(28.8372)(2)}{1}$$

Entire Area = 57.6744 m^2

t.h.t.t.t

3 points

Part A: Correct total area showing work.

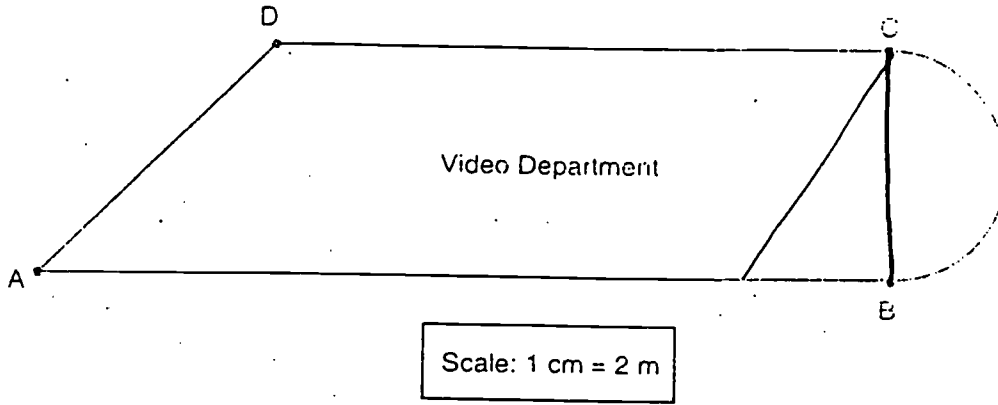
0 points

Part B: Student attempts conversion to m^2 by multiplying the result in part A by 2.

Total score : 3

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bounded by 3 line segments and 1 semicircle.



323173

A Compute the area of the entire scale model drawing to the nearest cm². Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter ruler. Your answer may be left in terms of π .)

$$\overline{DC} = 8\text{cm} = 16\text{m}$$

$$\overline{AD} = 4.5\text{cm} = 9\text{m}$$

$$\overline{AB} = 11\text{cm} = 22\text{m}$$

$$\overline{CB} = 3\text{cm} = 6\text{m}$$

$$A = \frac{\pi r^2}{2}$$

$$A_{\Delta} = \frac{\pi (3)^2}{2} \quad A_{\Delta} = \frac{9\pi}{2}$$

$$A_{\Delta} = \frac{1}{2} \cdot 3 \cdot 3 = 4.5$$

$$A(\text{par.}) = 8 \cdot 4.5 = 36$$

$$\frac{9\pi}{2} + \frac{40.5(\frac{2}{2})}{1} = 45$$

$$\frac{9\pi}{2} + \frac{81}{2} = \frac{90\pi}{2} = 45\pi$$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m²? Provide the work that shows how you arrived at your answer.

$$A = \frac{\pi r^2}{2} \quad A = \frac{36\pi}{2}$$

$$\frac{36\pi}{2} + \frac{162(\frac{2}{2})}{1} =$$

$$A_{\Delta} = \frac{1}{2} \cdot 6 \cdot 6 = 18$$

$$A(\text{par.}) = 16 \cdot 9 = 144$$

$$\frac{36\pi}{2} + \frac{324}{2} = \frac{360\pi}{2} =$$

$$180\pi\text{m}^2$$

1 point

Part A: Student divides the figure into a semicircle, a triangle, and a parallelogram. Only the area of the triangle is correct (1 of 3 correct areas).

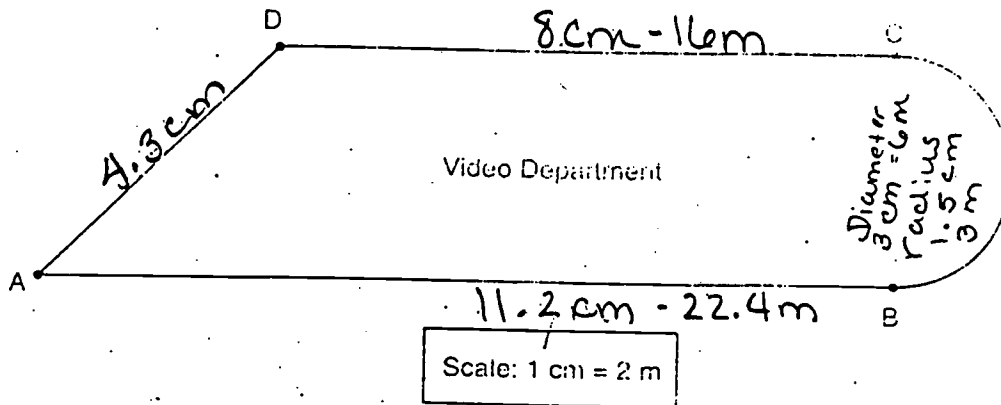
2 points

Part B: Student multiplies all dimensions by two, correctly resulting in an area 4 times that in part A, so conversion is correct. Student repeats the errors from part A, but is not punished twice for the same error.

Total score : 3

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is bounded by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

(A,D) 8.6
(C,C) 6
(A,B) 22.4

$$A = \frac{1}{2} (\text{sum of bases}) \times \text{height} + \pi r^2 \cdot 2$$

$$A = \frac{1}{2} (19.2) \times 3 + \pi r^2 \cdot 2$$

$$A = 28.8 \text{ cm}^2 + 1.5 \pi \text{ cm}^2 \cdot 2$$

- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$A = \frac{1}{2} (\text{sum of bases}) \times \text{height} + \pi r^2 \cdot 2$$

$$A = \frac{1}{2} (38.4) \times 3 + \pi r^2 \cdot 2$$

$$A = 57.6 \text{ m}^2 + 1.5 \pi \text{ cm}^2 \cdot 2$$

2 points

Part A: Student divides the figure into a trapezoid and a semicircle. The area of the trapezoid is correct.

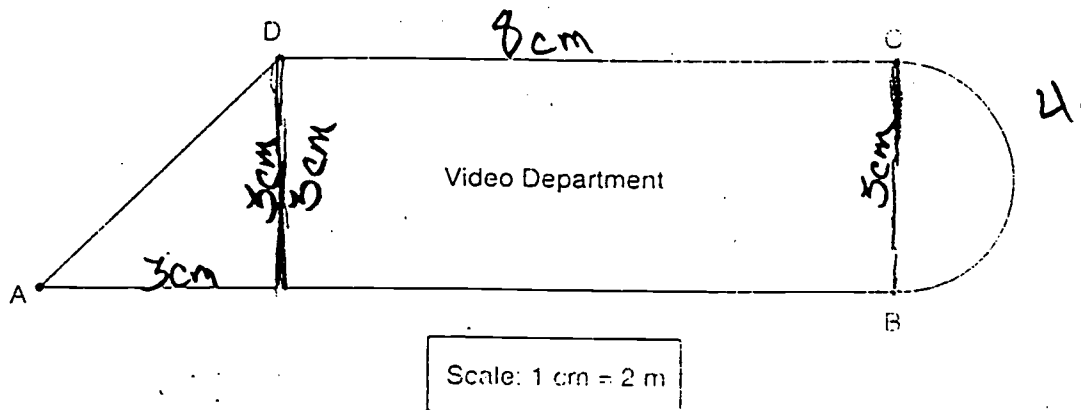
0 points

Part B: Student multiplies the bases of the trapezoids by 2, but not the height. Student fails to multiply the radius of the semicircle by 2.

Total score : 2

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is formed by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

Circle

$$3.14 \cdot 3 \div 2 = 4.71$$

Rectangle

$$8 \cdot 5 = 24$$

Triangle

$$.5 \cdot 3 \cdot 3 = 4.5$$

$$4.71 + 24 + 4.5 =$$

$$33.21 \text{ cm.}$$

- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$33.21 \text{ cm} \cdot 2 \text{ m} = 66.42 \text{ m}$$

2 points

Part A: Student divides the figure into a semicircle, a rectangle, and a triangle. The area of the semicircle is incorrect (2 of 3 correct areas).

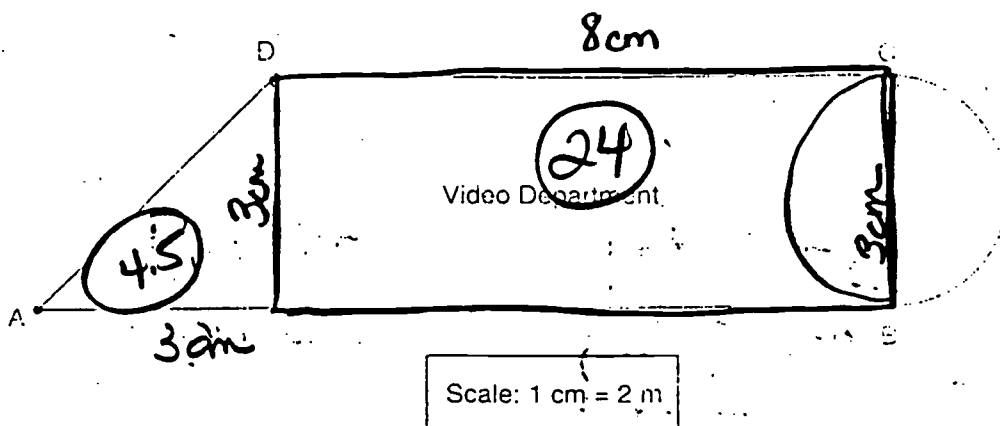
0 points

Part B: Student attempts conversion to m^2 by multiplying the result in part A by 2.

Total score : 2

(5 Points)

23 A scale model of the video department in a store is shown below. This department is made of 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm². Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter ruler. Your answer may be left in terms of π .)

$$A \text{ of } \Delta = \frac{1}{2}(b) \cdot h$$

$$.5(3) \cdot 3$$

$$4.5$$

$$A \text{ of Rectangle } L \cdot W$$

$$8 \cdot 3 = 24$$

$$\text{Area of Circle } \pi r^2$$

$$\pi(1.5)^2$$

$$2.25\pi$$

$$61.5\pi \text{ m}^2$$

$$4.5 + 24 + 2.25\pi = 30.75\pi \text{ cm}^2$$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m²? Provide the work that shows how you arrived at your answer.

$$2(30.75\pi \text{ cm}^2) \cdot 4 = 243\pi \text{ m}^2$$

$$61.5\pi \text{ m}^2$$

$$\approx 193 \text{ m}^2$$

2 points

Part A: Student divides the figure into a semicircle, a rectangle, and a triangle. Student uses the area of the circle instead of the semicircle (2 of 3 correct areas). Student attempts to combine unlike terms.

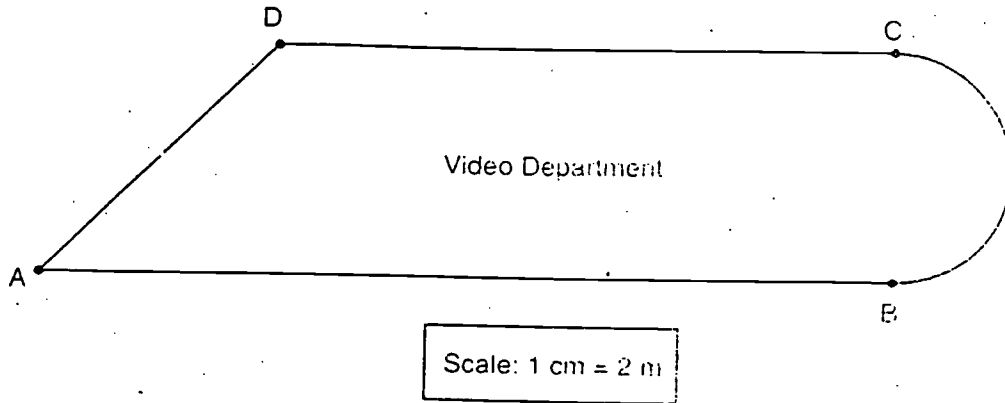
0 points

Part B: Student attempts conversion to m^2 by multiplying the result in part A by 2.

Total score : 2

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$\overline{AB} = 11\text{cm} = 22\text{m}$$

$$\overline{AD} = 4\text{cm} = 8\text{m}$$

$$\overline{DC} = 8\text{cm} = 16\text{m}$$

$$\overline{CB} = 5\text{cm} = 10\text{m}$$

$$\text{28 cm}^2$$

- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$22\text{m}$$

$$8\text{m}$$

$$16\text{m}$$

$$+ 10\text{m}$$

$$56\text{m}^2$$

0 points

Part A: Student attempts to find the perimeter of the figure.

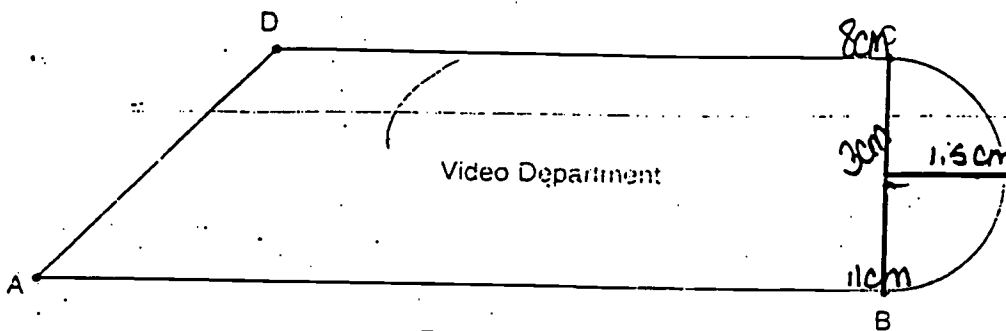
1 point

Part B: Student again attempts to find the perimeter. The measurements of each segment are correctly doubled (partial understanding).

Total score : 1

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



Scale: 1 cm = 2 m

A. Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

8 trapezoid $8\text{cm} + 11\text{cm} = 19\text{cm}$
 $19\text{cm} \times 3\text{cm} = 57\text{cm} = \text{area}$

circle $3.14 \cdot (1.5^2) = 7.065$ area of circle = 7.065 cm

$\pi = 3.14 \cdot 2.25 = 7.065$
 $r = 1.5$

area of trapezoid = 57 cm

$$\begin{array}{r} 7.065 \\ + 57 \\ \hline 64.065 \end{array}$$

Video department area = 64.065 cm

B. Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

1 point

Part A: Student attempts to divide the figure into smaller figures and sum the areas of the smaller figures. This is part of the correct process (partial setup). Areas are incorrect.

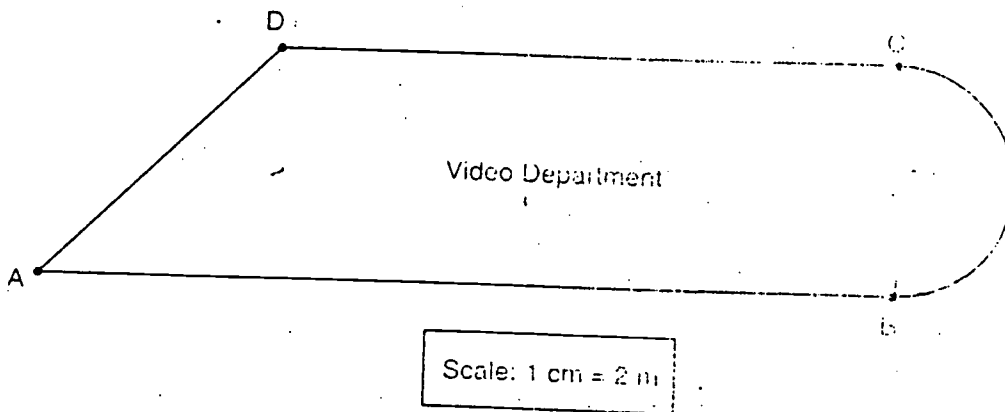
0 points

Part B: No attempt.

Total score : 1

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

$$\begin{array}{l}
 \text{rectangle} = 3 \text{ cm} \times 8 \text{ cm} = 24 \text{ cm}^2 \\
 \text{triangle} = 1.5 \text{ cm} \times 3 \text{ cm} = 4.5 \text{ cm}^2 \\
 \text{semicircle} = 1.5 \text{ cm} \times \pi = 4.71 \text{ cm}^2
 \end{array}$$

$$\begin{array}{r}
 12 \text{ cm} \\
 20.25 \text{ cm} \\
 \hline
 141.25 \text{ cm} \\
 20.09 \text{ cm} \\
 \hline
 163.34 \text{ cm}
 \end{array}$$

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$$\begin{array}{l}
 163.34 \text{ cm} \times 2 = 326.68 \text{ m} \\
 326.68^2 = 106719.82 \text{ m}^2
 \end{array}$$

1 point

Part A: Student divides the figure into a rectangle, a triangle, and a semicircle. The area of the triangle is correct (1 of 3 correct areas). Student then adds the squares of these areas.

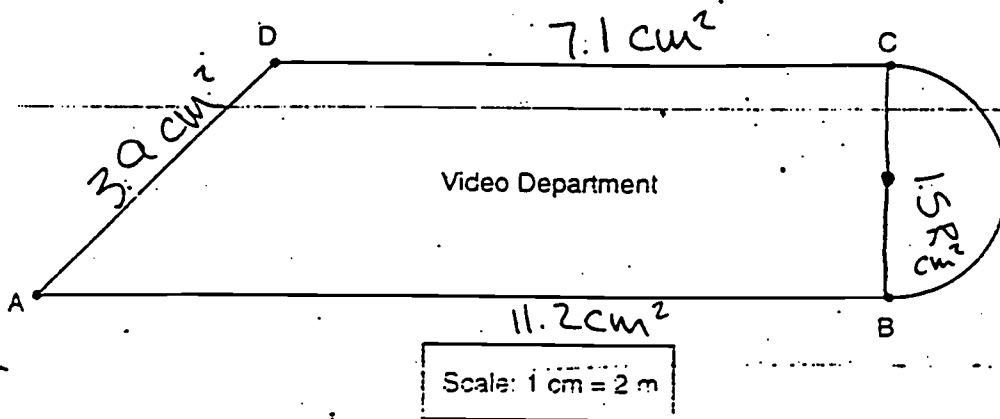
0 points

Part B: Student attempts conversion to m^2 by multiplying the result in part A by 2 and then squaring this result.

Total score : 1

(5 Points)

- 23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



- A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .

S.A sphere = 14.13

Area = 36.33 cm^2 $3.9 + 11.2 + 7.1 + 1.5 = 36.33$

- B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

$36.33 \div 2 = 18.165$

18.165

0 points

Part A: Student attempts to find the perimeter.

0 points

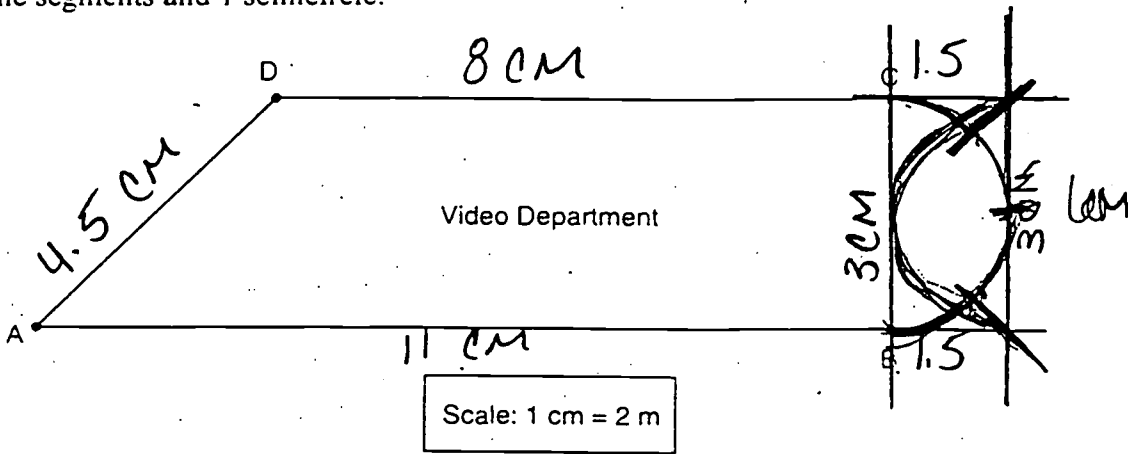
Part B: Student attempts conversion to m^2 by dividing the result in part A by 2.

Total score : 0

29.5 cm

(5 Points)

23 A scale model of the video department in a store is shown below. This department is bordered by 3 line segments and 1 semicircle.



A Compute the area of the entire scale model drawing to the nearest cm^2 . Provide the work that shows how you arrived at your answer. (Be sure to use the centimeter side of your ruler. Your answer may be left in terms of π .)

It is impossible for me to reach an answer. The distance from point C to point B is a semi-circle. The ruler does not follow a circular pattern. It only measures straight lines. For me to get the actual measurements, I would have to somehow break apart the lines, which is impossible to do.

B Using the scale in the diagram above, what is the area of the actual video department to the nearest m^2 ? Provide the work that shows how you arrived at your answer.

Since I could not reach an answer for part A, it is again impossible to reach an answer for part B. The only way I could get either answer is to have a straight line. Besides, the department can not have walls that curve.

AP.1251

0 points

Part A and Part B: Student explains why the problem is impossible from his/her viewpoint.

Total score : 0



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