Montana Comprehensive Assessment System (MontCAS, Phase 2)

Criterion-Referenced Test (CRT)

COMMON CONSTRUCTED-RESPONSE ITEM RELEASE
MATHEMATICS, GRADE 10

2005

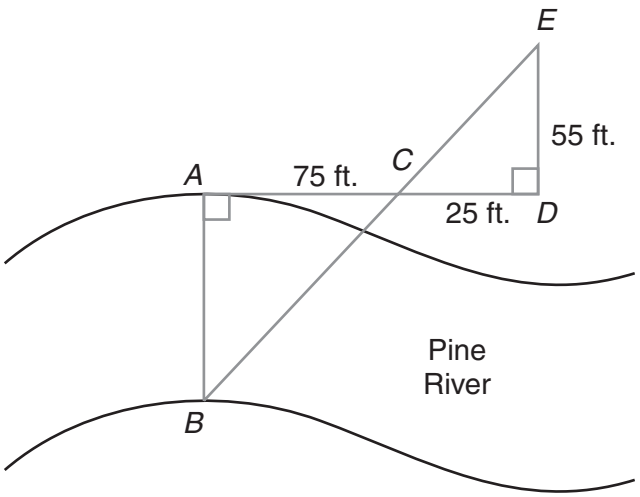
OPI

OFFICE OF PUBLIC INSTRUCTION

Mathematics
Session 1 (Calculator)

You may use a calculator during this session.

25. Rochelle is finding the distance between points *A* and *B* on opposite shores of Pine River. She used a transit to create the right triangles and then measured the distances that are shown on the diagram below.



a. Prove that triangles *ABC* and *DEC* are similar.

b. Find the distance across the river between points *A* and *B*. Justify your answer mathematically, showing all of your work.

Scoring Guide

Score	Description
4	4 points
3	3 points
2	2 points
1	1 point OR Student demonstrates minimal understanding of the problem.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring information:

Part a: 2 points complete proof that triangles are similar
OR
1 point apparently correct reasoning, expressed vaguely and/or with significant error(s) in terminology (e.g., using the term or symbol for similarity when congruence is intended, or calling vertical angles "opposite angles")

Part b: 2 points correct answer, 165 feet, and a complete justification OR $3 \times 55 = 165$
OR
1 point correctly dealing with the proportion (or equal ratios) but with minor computational error OR for correct answer only (165) without work

Notes:

Part a: Complete proof includes the reason that angles ACB and ECD are congruent (vertical angles) and that angles A and D have the same measure. (The congruence of the right angles does not have to be explicitly stated, but must be implied.)

Sample computation for part b:

$\frac{x}{75} = \frac{25}{55}$. So $55x = 75 \times 25$. $x = 165$.

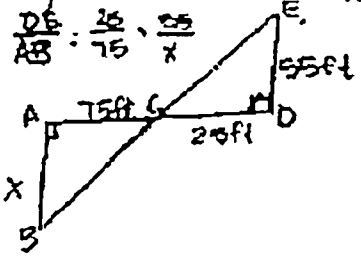
It is sufficient for the student to notice that 75 is 3 times 25 and so AB must be 3 times 55, or by writing $3 \times 55 = 165$.

Score Point 4

Sample 1

a. $\angle BAC \cong \angle EDC$ because all right angles are $\cong$ ✓
$\angle ACB \cong \angle DCE$ because vertical $\angle$'s are $\cong$ therefore $\angle ABC \cong \angle DEC$ because if 2 $\angle$'s of a $\triangle$ are $\cong$, then the 3rd $\angle$'s are $\cong$
so $\triangle ABC \sim \triangle DEC$ because if all 3 $\angle$'s in a $\triangle$ are $\cong$ to all 3 $\angle$'s of another $\triangle$, then the $\triangle$s are similar.

b. The corresponding sides of similar $\triangle$'s are proportional
therefore $\frac{DC}{AC} = \frac{DE}{AB} : \frac{25}{75} = \frac{55}{x}$



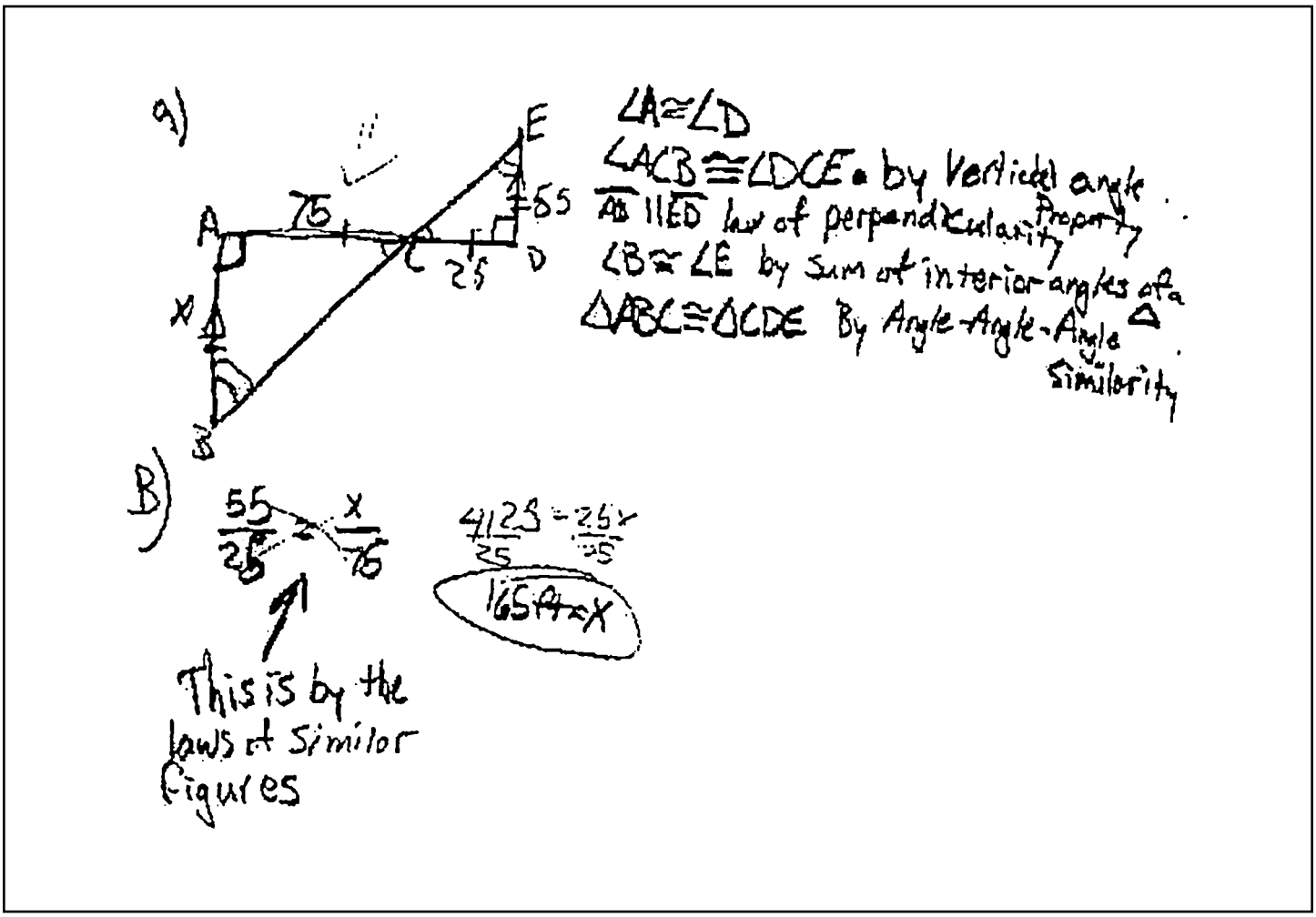
$25x = 75 \cdot 55$
$25x = 4125$
$x = \frac{4125}{25}$

$x = 165ft$

The distance across the river (point A to B) is equal to 165ft.

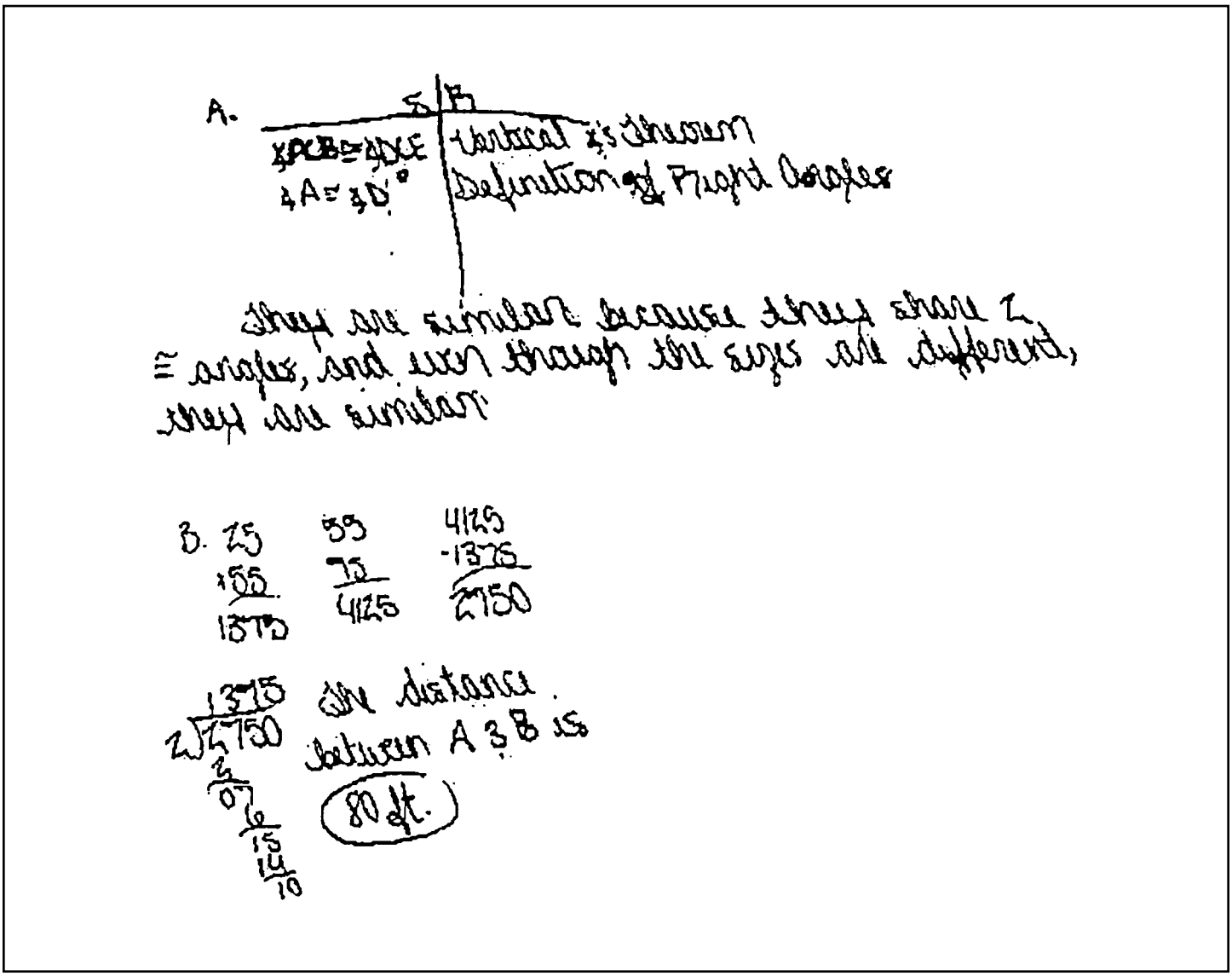
Score Point 3

Sample 1



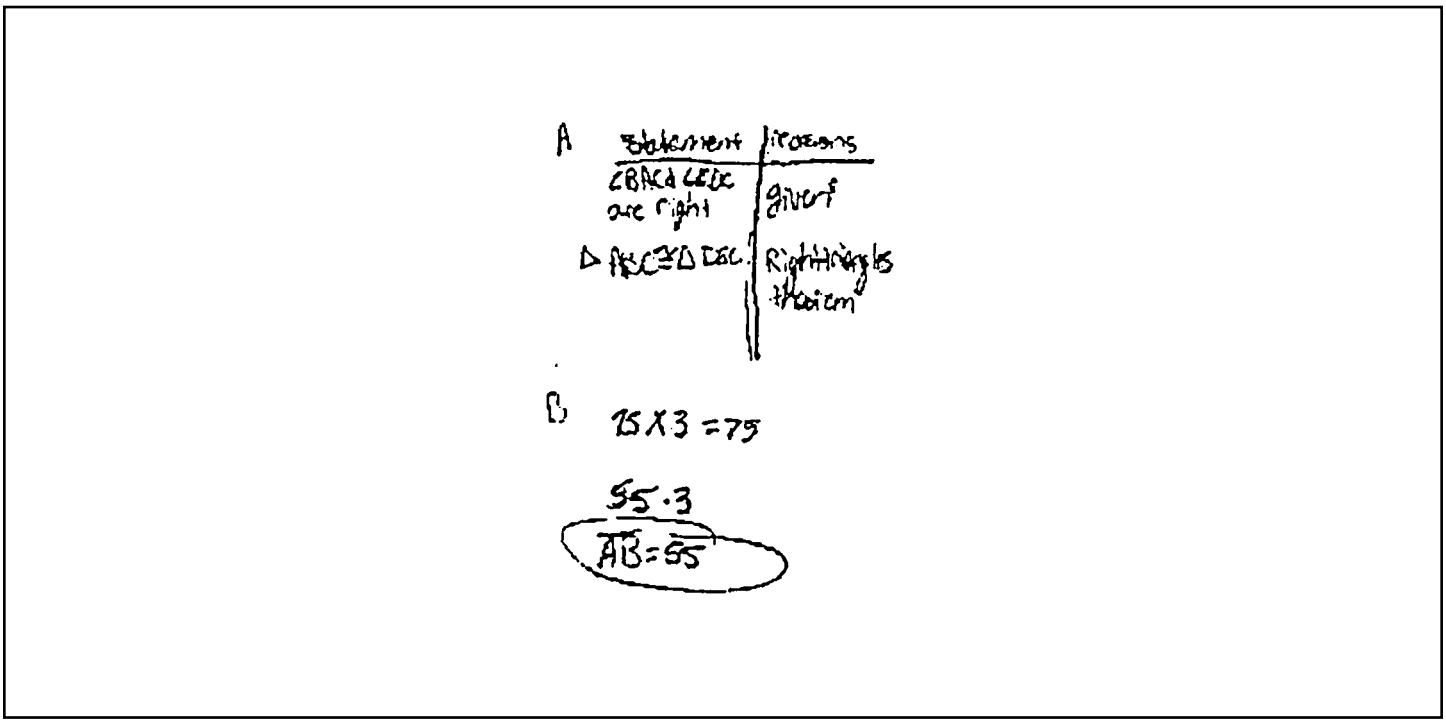
Score Point 2

Sample 1



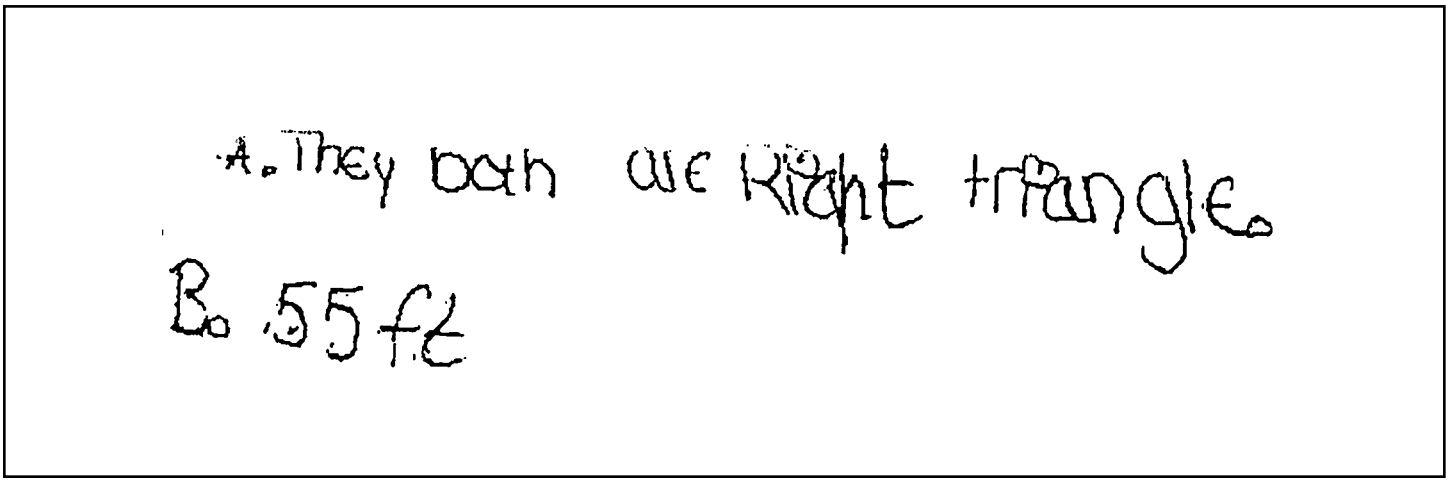
Score Point 1

Sample 1



Score Point 0

Sample 1



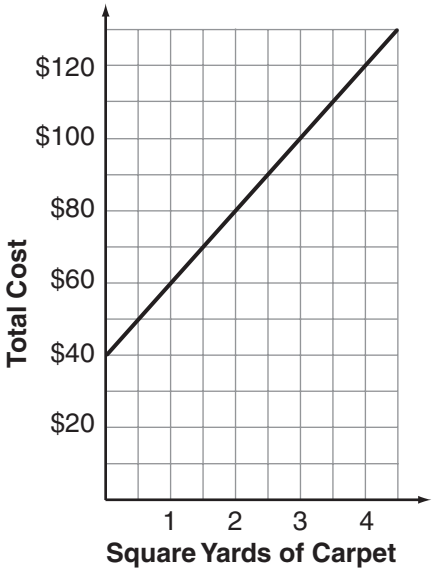
Mathematics
Session 3 (No Calculator)

You may NOT use a calculator during this session.

73. To install special carpet, the Home Store charges two fees:

- an initial preparation fee to prepare the floor for the carpet and
- a fee for each square yard of carpet that is installed.

The store's salespersons use the graph below to quickly determine the total cost of installing different numbers of square yards of this carpet.



a. Write the equation for the line in the graph. Let y represent the total cost and x represent the number of square yards installed.

b. Write the number that represents the y-intercept of the line on the graph.

c. Write the number that represents the slope of the line.

d. Suppose that the store decides to increase the cost per yard of the carpet but not to change the preparation fee. Explain how this change will affect **both** the y-intercept and the slope of the line.

e. Suppose that the cost per yard is not changed but the preparation fee is increased. Explain how this change will affect **both** the y-intercept and the slope of the line.

BE SURE TO LABEL YOUR RESPONSES (a), (b), (c), (d), AND (e).

Scoring Guide

Score	Description
4	5 points
3	4 or 4½ points
2	1½ – 3½ points
1	½ or 1 point OR Student shows minimal understanding of writing equations, intercepts, and/or slopes.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring information:

Part a: 1 point for the correct equation, $y = 20x + 40$ or equivalent

Part b: 1 point for correct y-intercept, 40, or for the y-intercept based on the student's equation

Part c: 1 point for correct slope, 20, or for the slope based on student's equation
OR
½ point for giving slope as 2/2 or 1

Part d: 1 point for explaining that the slope will increase and the y-intercept will not change
OR
½ point for explaining that the slope will increase
or
that the y-intercept will not change

Part e: 1 point for explaining that the y-intercept will increase and the slope will not change
OR
½ point for explaining that the y-intercept will increase
or
that the slope will not change

Notes: If student's equation in part a uses different variables than y and x, do not award a 4-score, but do not otherwise penalize the student.

Score Point 4

Sample 1

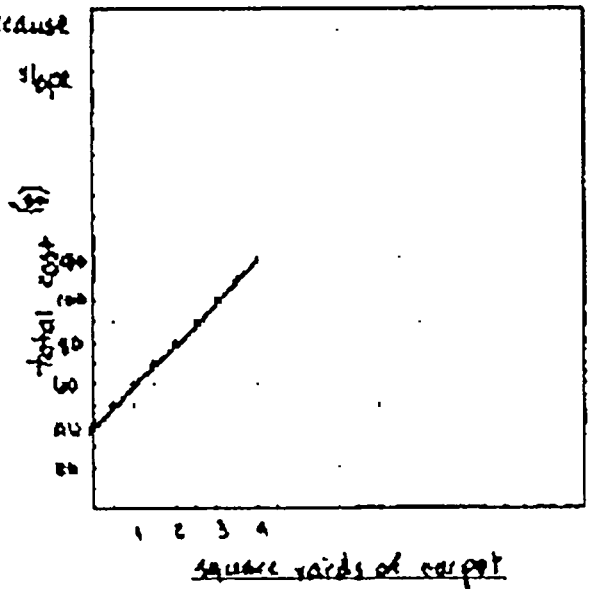
a) $y = 40 + 20x$

b) $40 is the y-intercept

c) the slope of the line is for every square yard, it is $20 more. so the slope = 20.

d) The y-intercept will not change because the preperation fee is the same, but the slope will increase because the cost per yard is increasing

e) The y-intercept will change because the fee is increasing, but the slope will remain the same.



Score Point 3

Sample 1

a. $\boxed{y = 40 + 20x}$

b. $\boxed{40}$

c. (0, 40) (1, 60)

$m = \frac{60 - 40}{1 - 0}$

$= \frac{20}{1}$

$= \boxed{20}$

d. the y-intercept will start a little higher on the y-axis and the slope will increase way more

e. the y-intercept will start higher on the y-axis and the slope will gradually rise

Score Point 2

Sample 1

A.) $y=mx+b$
$y=1x+b$
$60=1(1)+b$
$60=b$
$\boxed{y=1x+60}$

B.) -40

C.) 1

D.) You could say all the #'s on the y-int. (+20, -40, +60 etc.) will move down. Making larger prices fit on the graph.

E.) You would have to add the difference to everything; total cost.

Score Point 1

Sample 1

a) $y = 85x$

b) $2\frac{1}{2}$

c) $\frac{2}{2}$

d) It will affect it b/c all of the costs will go up and b/c the square yards will be messed up also.

e) It will just affect the ~~total~~ cost but not the square yards.

Score Point 0

Sample 1