Montana Comprehensive Assessment System (MontCAS, Phase 2)

Criterion-Referenced Test (CRT)

Common Constructed-Response Item Release
Mathematics, Grade 8

OPI

OFFICE OF PUBLIC INSTRUCTION

Mathematics
Session 1 (Calculator)

You may use a calculator during this session.

25. A regular sandwich at Smarty's Deli consists of bread, one kind of meat, and one kind of cheese. The choices are listed in the table below.

Bread	Meat	Cheese
white (w) oatmeal (o) pita (p)	turkey (t) ham (h) roast beef (r) corned beef (c) bologna (b)	American (A) Swiss (S)

a. Sandra always orders white bread, but she will order any of the meats or cheeses. Make an organized list or diagram to show all of the possible meat-and-cheese regular sandwich combinations that Sandra could order.

b. Lew likes all of these breads, meats, and cheeses. How many different regular sandwiches can Lew order? Show or explain how you found your answer.

c. Smarty's offers a "Three-Meat Special," which is a sandwich with three different kinds of meat. How many different ways can a person choose three different meats from the five kinds listed? Show or explain how you found your answer.

Scoring Guide

Score	Description
4	6 points
3	5 points **OR** Correct totals to all three parts.
2	3 or 4 points
1	1 or 2 points **OR** Minimal understanding of systematic counting principles.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes

Part a:

- 2 points for correct and complete list or diagram (see Solution Notes)
  OR
- 1 point for evidence of correct strategy through partially complete list that demonstrates systematic approach **or** correct total (10)

Part b:

- 2 points for correct number of combinations (30) with explanation or work shown indicating correct strategy (3×5×2)
  OR
- 1 point for correct answer **or** correct strategy (including list or diagram that, if complete, would result in correct answer)

Part c:

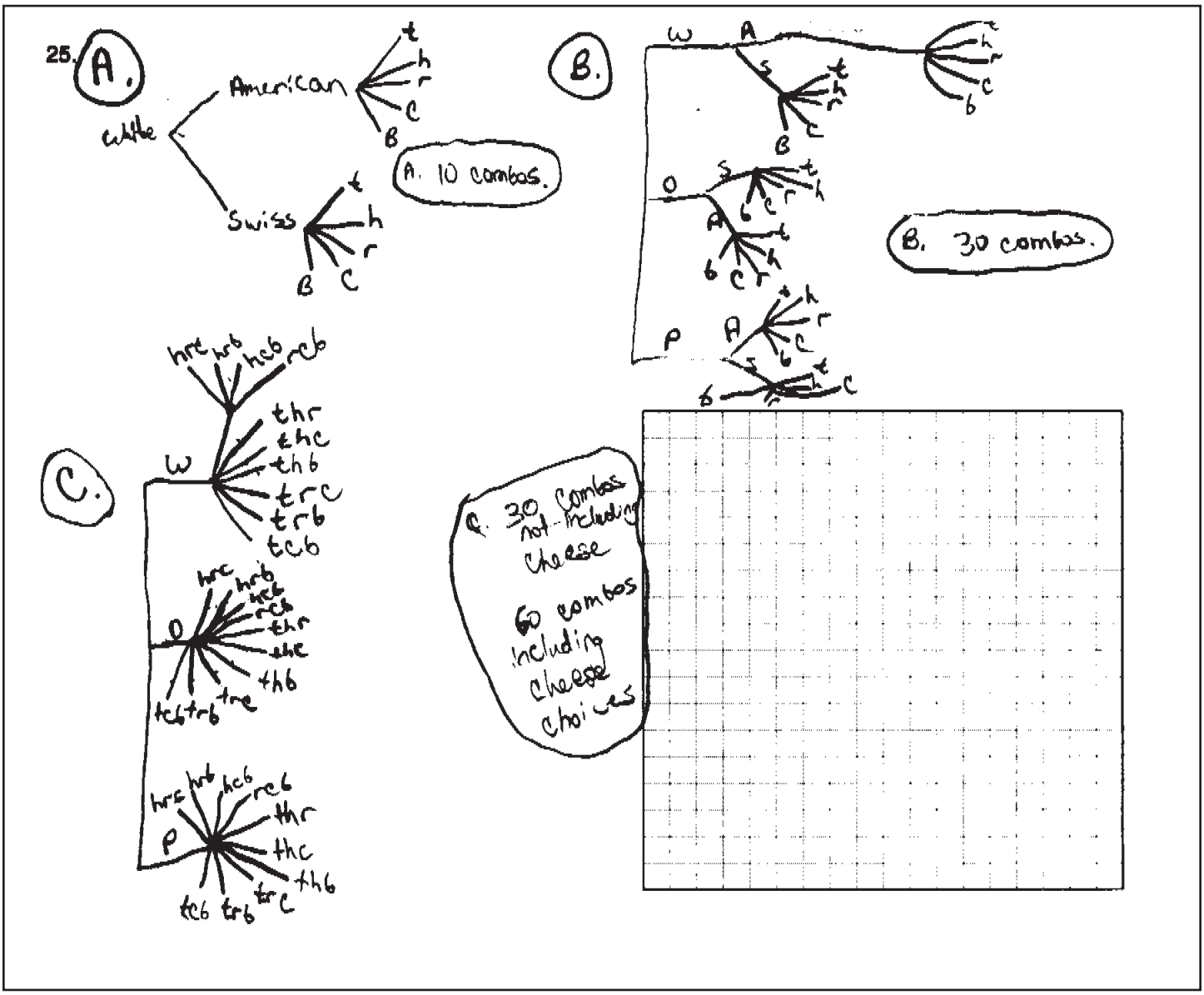
- 2 points for correct answer (10, or 30 with indication that it is based on different breads, or 60 with indication that answer is based on different breads and cheeses) with explanation or work shown indicating correct strategy ($3c5 = \frac{5!}{3! \times 2!}$ or systematic list)
  OR
- 1 point for correct answer **or** correct strategy (including list or diagram that, if completed, would result in correct answer)

Solution Notes

- **Part a:** tA, tS, hA, hS, rA, rS, cA, cS, bA, bS
- **Part c:** thr, thc, thb, trc, trb, tcb, hrc, hrb, hbc, rcb

Score Point 4

Sample 1



Score Point 4

Sample 2

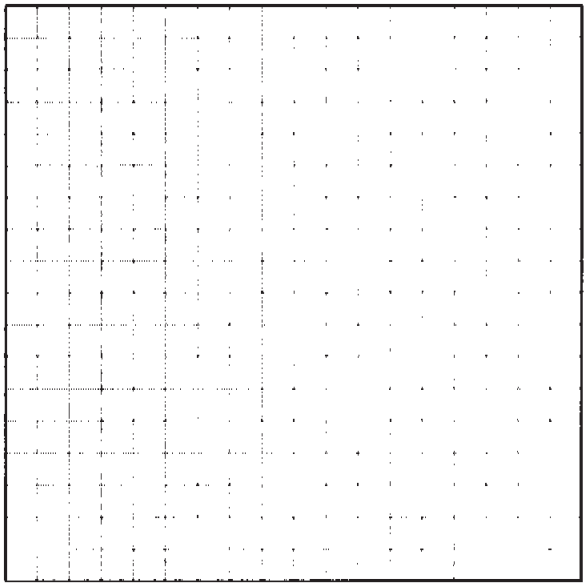
25. A.
W-t-A
W-t-S
W-h-A
W-h-S
W-r-A
W-r-S
W-c-a
W-c-S
W-b-a
W-b-S

10 different combinations

B.
W=10
O=10 = 30 different Combinations
P=10

C.
t-h-r
t-h-c
t-h-b
t-r-c
t-r-b
r-c-b
h-r-a
h-c-b
h-r-b
r-c-b

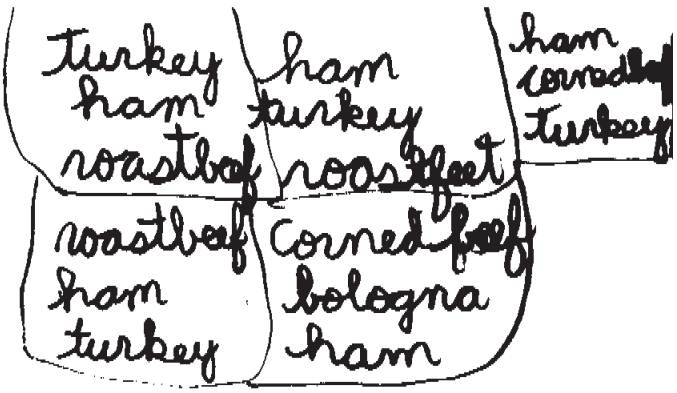
10 different meats

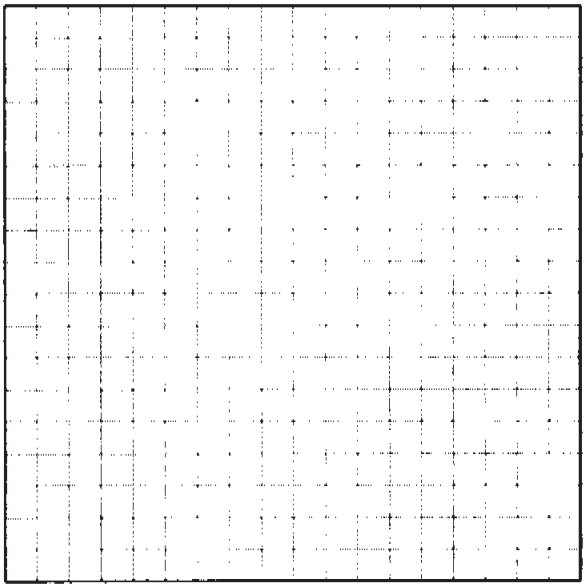


Score Point 3

Sample 1

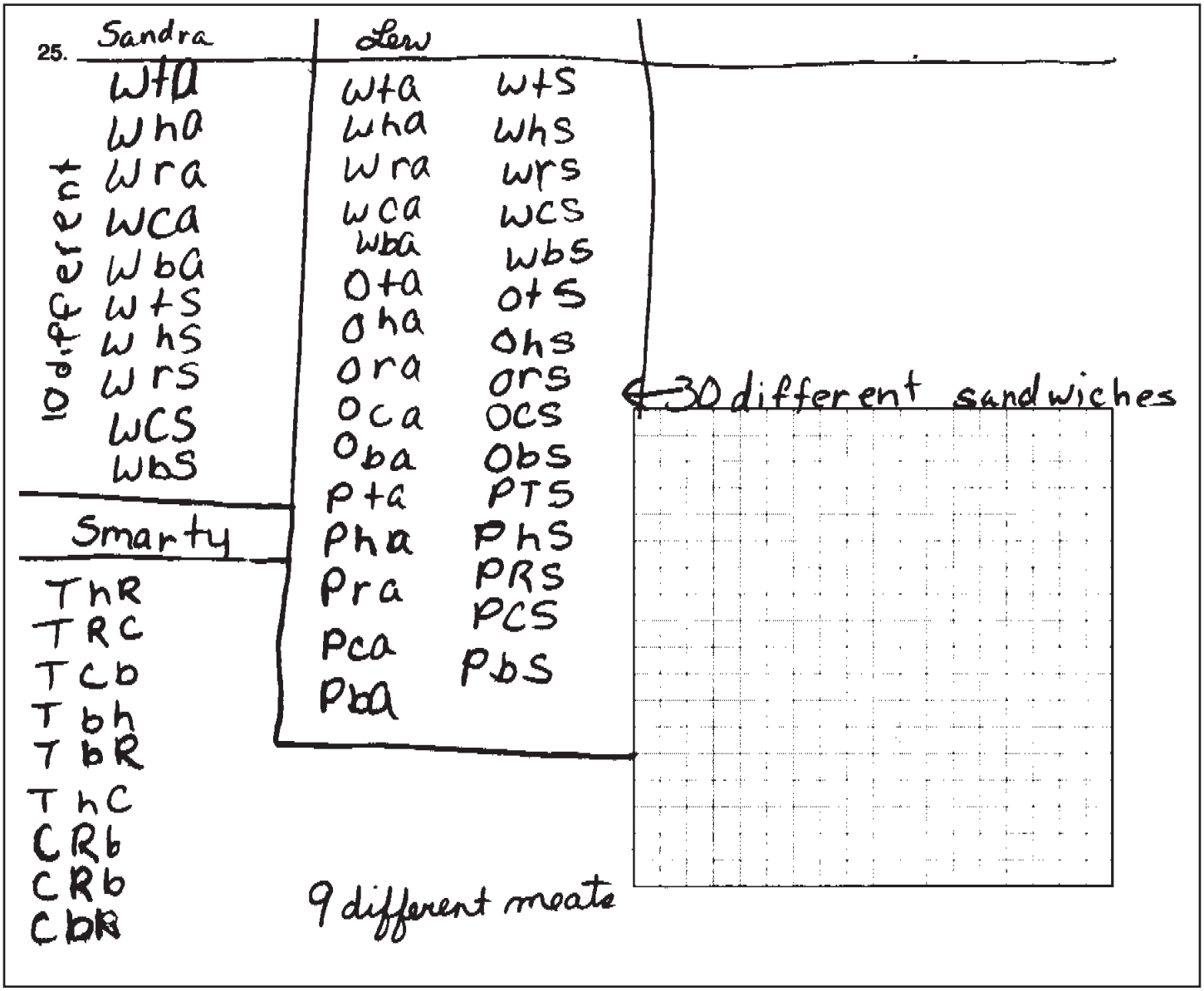
25. white, turkey, American
white, turkey, Swiss
white, ham, American
white, ham, Swiss
white roastbeef, American
white roastbeef Swiss
white corned beef American
white corned beef Swiss
white bologna American
white bologna Swiss
3 kinds of bread
5 kinds of meat
2 kinds of cheese
equals 30





Score Point 3

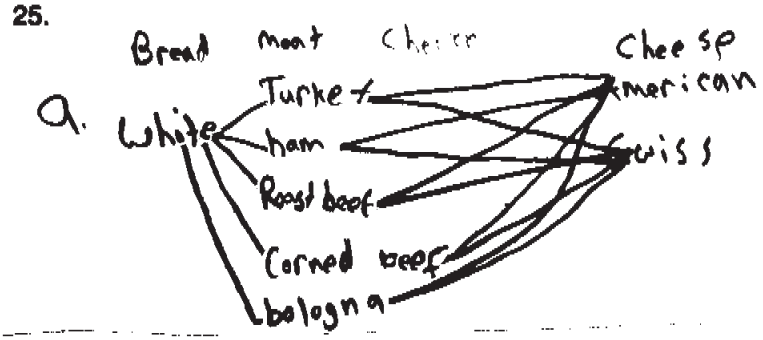
Sample 2



Score Point 2

Sample 1

25.



There are 10 different Possibilities.

B. He can have 30 different sandwiches. Take breads (3) x meats (5) x Cheese (2) 3 x 5 x 2 = 30

C. A person could have 15 different combinations.

3 x 5
meats ∴ combo | # of meats available.

Score Point 2

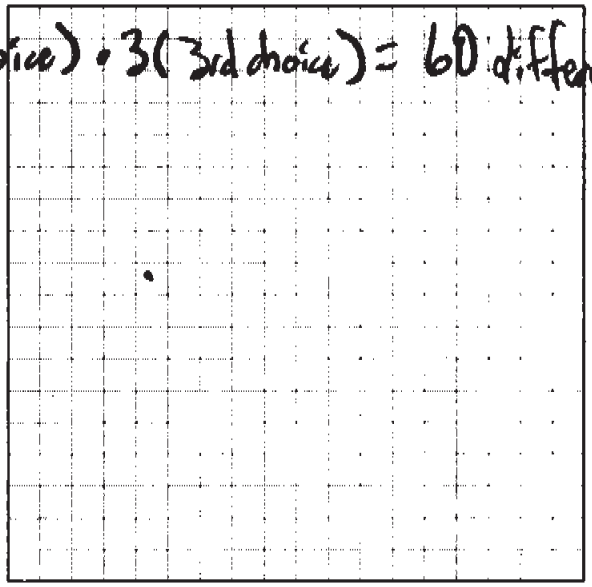
Sample 2

25.

A wtA whA wrA wcA wbA
wtS whS wrS wcS wbS

B. He can have thirty different sandwiches.
I took 3(bread) • 5(meat) • 2(cheese) = 30 sandwiches

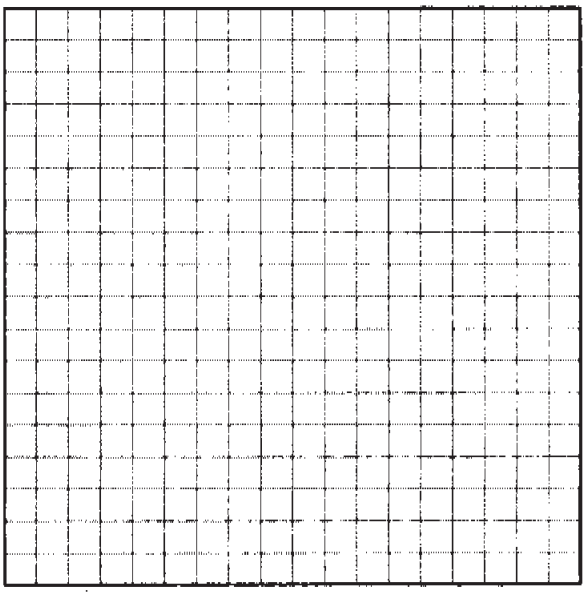
C. You can choose 3 meats 60 ways.
I took 5(1st choice) • 4(2nd choice) • 3(3rd choice) = 60 different ways



Score Point 1

Sample 1

25. A. 10
B. 40
C. 6

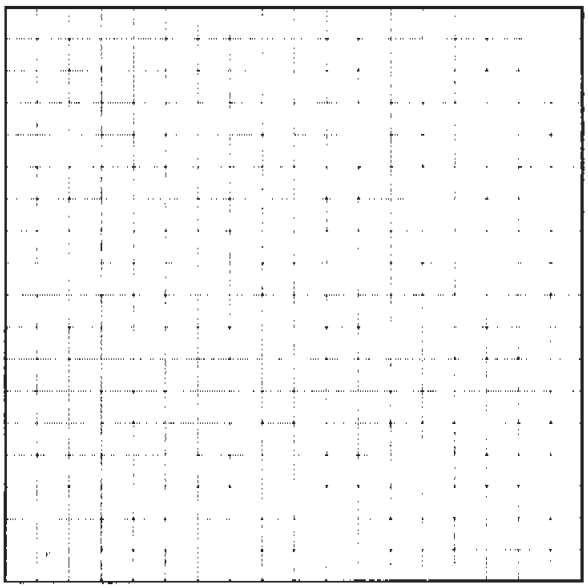


Score Point 1

Sample 2

25.

Bread	meat	Cheese
W	T	A
W	t	S
W	h	A
W	h	S
W	r	A
W	r	S
W	C	A
W	C	S
W	b	A
W	b	S



Mathematics
Session 3 (No Calculator)

You may NOT use a calculator during this session.

68. Scientists have discovered that the length of a person's tibia (t) provides a good estimate of his or her height (h). For an adult woman, with measurements given in centimeters, the relationship between h and t is given by the model $h = 3t + 62$.

    a. The length of a woman's tibia is 32 cm. Use the model to estimate her height.

    b. A woman is 176 cm tall. Based on the model, how long is her tibia? Show or explain how you found your answer.

    c. One woman's tibia is 2 cm longer than another woman's tibia. Based on the model, how much taller would the woman with the longer tibia be? Show or explain how you found your answer.

Scoring Guide

Score	Description
4	5 points
3	4 points **OR** Correct answers to all three parts.
2	2 or 3 points
1	1 point **OR** Minimal understanding of evaluating expressions and/or solving linear equations.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes

Part a:

- 1 point for correct height [158 (cm)] or correct estimate [within range of 150 – 160 (cm)]

Part b:

- 2 points for correct tibia length [38 (cm)] with explanation or work shown indicating correct strategy
  OR
- 1 point for correct answer **or** correct strategy

Part c:

- 2 points for correct answer [6 (cm)] with explanation or work shown indicating correct strategy
  OR
- 1 point for correct answer **or** correct strategy

Note: If work is shown, answer is correct only if correct strategy was used.

Score Point 4

Sample 1

68.

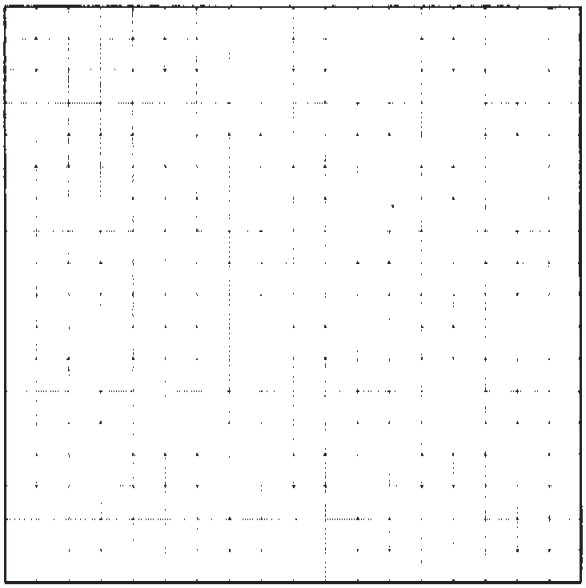
b) 38 cm 76 −62 14

38
3)114

37
× 3
96
+62
158

a) 158 cm

c) She would be 6cm tall because you would take 2×3



Score Point 4

Sample 2

68.

A. $h = 3t + 62$

$3 \cdot 32 = 96$

$h = 96 + 62$

$h = 158$

I estimate the women's height at 158 cms.

B. $176 = 3t + 62$ $-62 \quad -62$

$176 = 3t + 62 - 62$

$114 = 3t$

$\frac{114}{3} = \frac{3t}{3}$

$3\overline{)114}$ 38

9

24

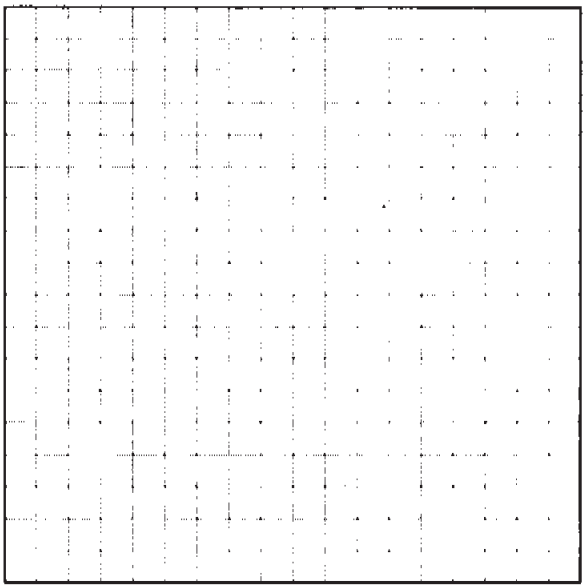
21

30

$30 = t$

The women's tibia is 38cm long.

C. She would be 6 cm taller because you multiply the tibia by three. Therefore with 2 more inches on your tibia, you would be 6 more inches tall.



Score Point 3

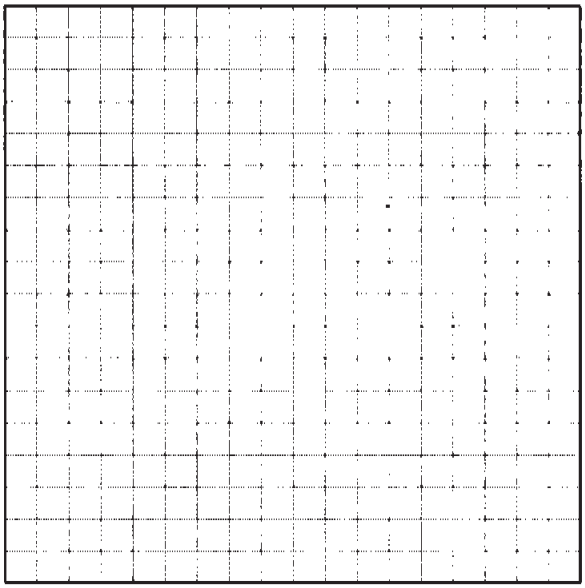
Sample 1

68.

a) 158 cm

b) 38 cm

c) 6 cm, added 2 cm to the first number



Score Point 3

Sample 2

68. (A) model: $h = 3t + 62$

$h = 3(32) + 62$

$h = 96 + 62$

$h = 158$ cm

$h = 158$ cm

(B) $176 = 3t + 62$

$-62 \quad -62$

$\frac{114}{3} = \frac{3t}{3}$

$t = 37.\overline{66}$ cm

$3\overline{)113.0}$ 37.6

9

23

21

20

(C) ex: $h = 3t + 62$

$h = 3(32) + 62$

$h = 96 + 62$

$h = 158$ cm

$h = 3t + 62$

$h = 3(34) + 62$

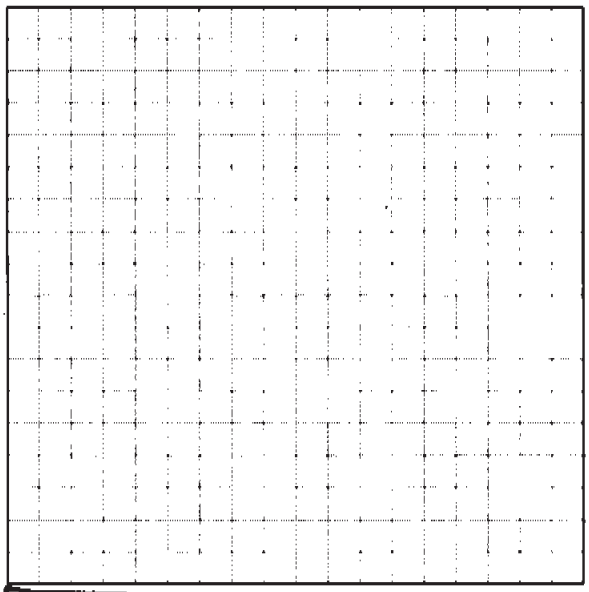
$h = 102 + 62$

$h = 164$ cm

164

-158

6



about 6 cm

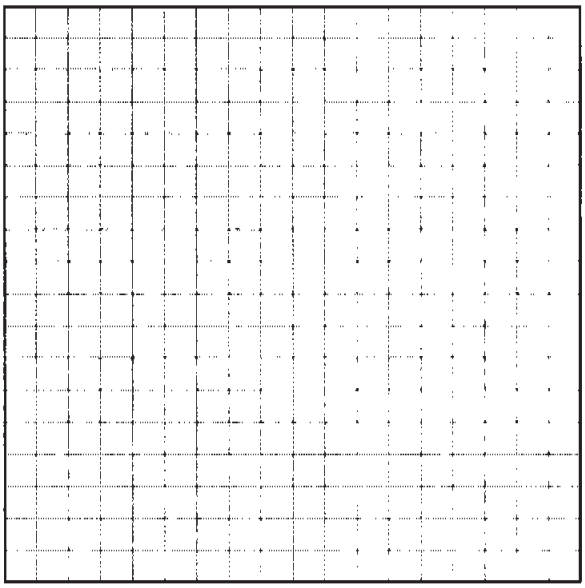
Score Point 2

Sample 1

68. (a) $h = 3(32) + 62$
160 cm.

(b) 170cm.

(c) 6 cm.



Score Point 2

Sample 2

68. A. $h = 3 \cdot 32 + 62$

$h = 96 + 62$

$h = 158\text{cm}$

B. $h = 3 \cdot 176 + 62$

$h = 528 + 62$

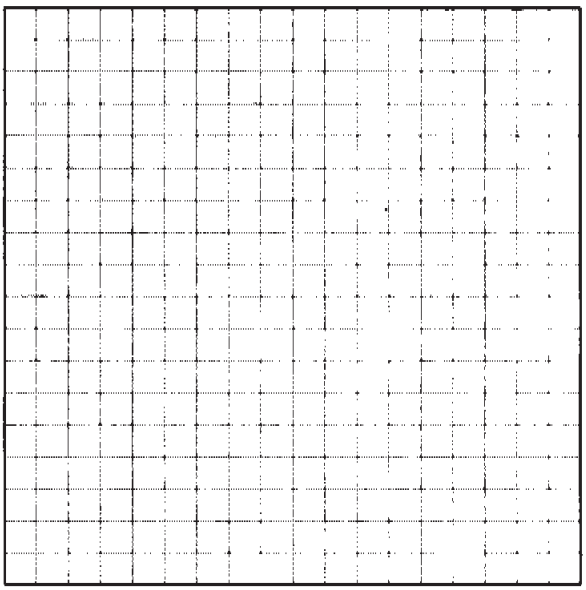
$h = 590\text{cm}$

C. The womans tibia would be 6 cm taller (compare to A)

$h = 3 \cdot 34 + 62$

$h = 102 + 62$

$h = 164$



Score Point 1

Sample 1

68. + h

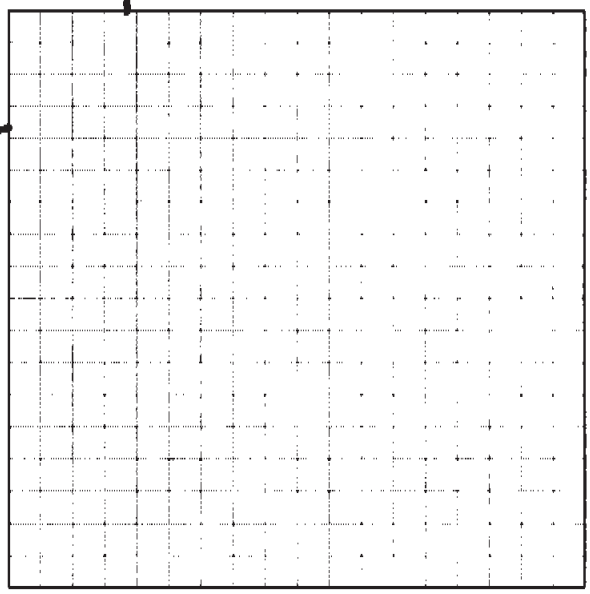
A $h = 3 + 62$

$h = 3 \times 32 + 62$

$h = 96 + 62$

B $h = 96 + 62$

$176 = 96 + 62$



Score Point 1

Sample 2

68.

a) $h = 3t + 62$

$h = 3 \cdot 32 + 62$

$h = 282$ cm

b) $h = 3t + 62$

$176 = 3t + 62$

$-62 \quad -62$

$114 = 3t$

$\frac{114}{3} = \frac{3t}{3}$

$t = 98$

c) She would be 2 cm taller because you would just add two more centameters to her hieght