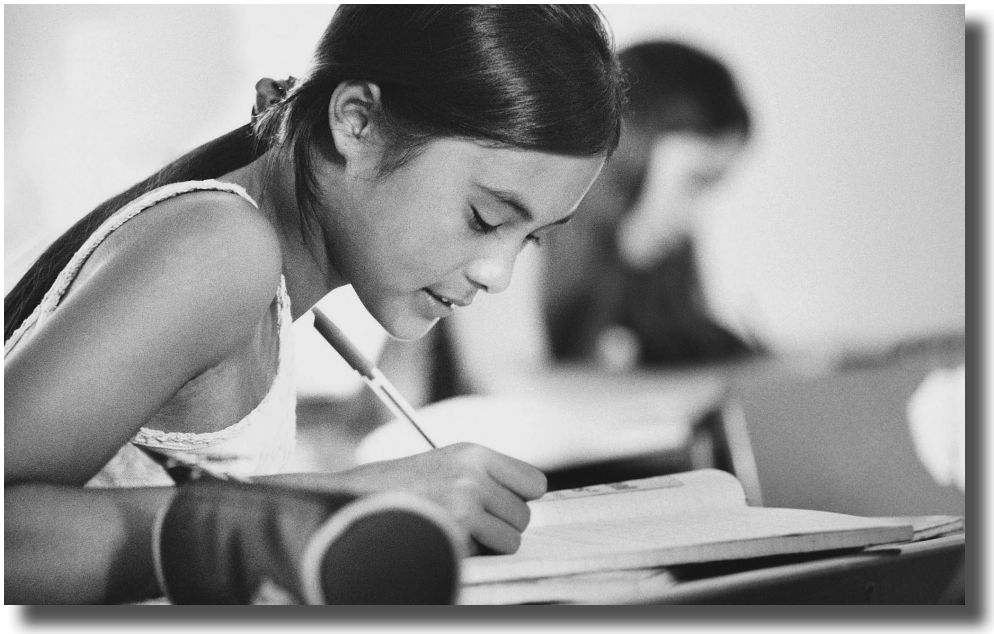
The Pennsylvania System of School Assessment

Modified Mathematics Item and Scoring Sampler



2009–2010
Grade 6

Pennsylvania Department of Education Bureau of Assessment and Accountability 2009–2010

MULTIPLE-CHOICE ITEMS

A.1.2.1

1 Four numbers are listed below.

3.51 2.96 3.09 3.18

Which number has the **greatest** value?

- ○ 3.51 *
- ○ 2.96 *greatest decimal part*
- ○ 3.09 *greatest digit in hundredths place*
- ○ 3.18 *farthest to the right in given list so assumes number is the greatest*

Modified from Item 9, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The context has been simplified for easier processing. The stimulus numbers have been rounded to 2 decimal places and changed from a table format to a horizontal list. The answer options have been changed from table row labels to the actual stimulus numbers.

A.1.3.1

2 What is the greatest common factor (GCF) of 42 and 46?

- ○ 2 *
- ○ 4 *common 1st digit*
- ○ 6 *factor of 42; digit in 46*
- ○ 7 *factor of 42*

Modified from Item 10, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The two numbers in the stem have been reordered to reduce cognitive processing.

A.1.3.3

3 All the students in a band will stand in groups.

Each group will have the same number of students.

Each group will have 3 students **or** 10 students.

Which of these could be the **total** number of students in the band?

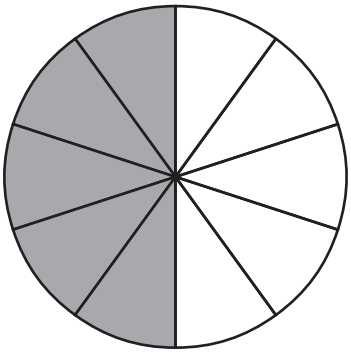
- ○ 36 students *multiple of 3*
- ○ 60 students *
- ○ 73 students *ends in 3*
- ○ 80 students *multiple of 10*

Modified from Item 12, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed to ease processing. The blocks of text have been separated by line breaks to emphasize key pieces of information. The wording of the question in the stem has been revised for better understanding, and boldfaced text has been added for emphasis. Units have been added to the answer options to provide additional direction. Two of the answer options have been reduced in value.

A.1.4.1

4 The circle below is divided into equal-sized sections.

Some of the sections are shaded.



What percent of the circle is shaded?

- ○ 5% *5 shaded sections*
- ○ 10% *10 sections in total*
- ○ 50% *
- ○ 100% *entire circle*

Modified from Item 13, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: A simple sentence has been added after the lead-in statement to provide more description. The sections of the circle have been reduced in number, and the shaded sections have been consolidated to facilitate visual processing. The answer options have been modified to align with the graphic change.

A.2.1.1

5 Which expression has the same value as $(19 \times 3) + (19 \times 1)$?

- ○ $19 + (3 \times 1)$ — *incorrect operations*
- ○ $19 \times (3 + 1)$ — *
- ○ $(19 + 19) \times (3 + 1)$ — *used both 19s*
- ○ $(19 + 3) \times (19 + 1)$ — *incorrect operations*

Modified from Item 14, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The stem has been reworded slightly and simplified to reduce processing. The answer box has been removed from the stem to avoid confusion.

B.1.1.1

6 Larry starts exercising at 9:15 A.M.

Larry stops exercising at 10:10 A.M.

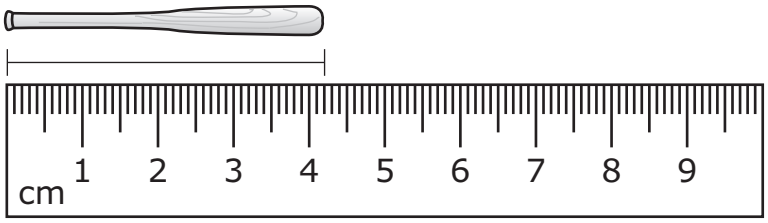
How many minutes does Larry spend exercising?

- ○ 55 minutes *
- ○ 65 minutes *15 – 10 = 5; 60 + 5 = 65*
- ○ 85 minutes *15 + 10 = 25; 60 + 25 = 85*
- ○ 95 minutes *10.10 – 9.15 = 0.95 as 95 minutes*

Modified from Item 16, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed, and the language has been simplified to reduce linguistic processing. The blocks of text have been separated by line breaks to emphasize key pieces of information. One of the times in the stem has been changed to reduce the item difficulty. The answer options have also been changed to reflect this revision.

B.2.1.1

7 A toy bat and a ruler are pictured below.



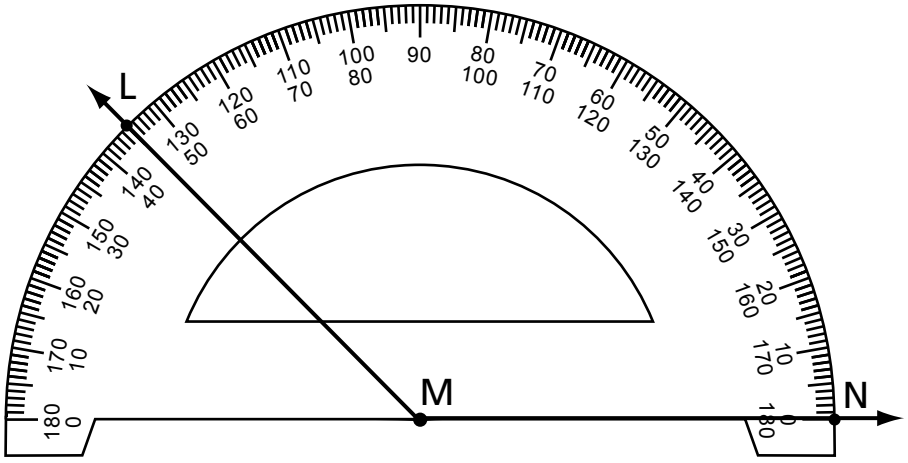
What is the length of the toy bat in **millimeters**?

- ○ 38 millimeters — *counts wrong direction from 40*
- ○ 40 millimeters — *reads closest labeled tick mark*
- ○ 42 millimeters — *
- ○ 48 millimeters — *counts wrong direction from 50*

Modified from Item 17, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been changed from a directive to a descriptive statement. The graphic has been rotated to a horizontal position, and a ruler has been added to facilitate processing. The question in the stem has been reworded to be more precise. The word "millimeters" has been added to the stem in boldfaced type to direct students to the correct unit to use when measuring.

B.2.1.3

8 A protractor and an angle are pictured below.



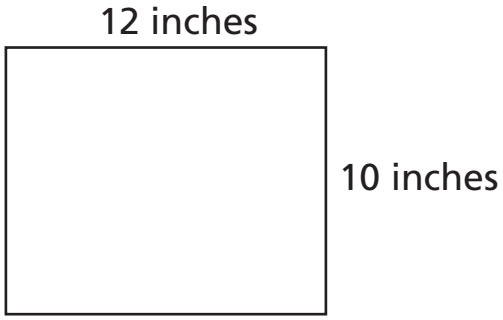
What is the measure of ∠LMN?

- ○ 45° *wrong scale*
- ○ 55° *wrong scale read in wrong direction*
- ○ 135° *
- ○ 145° *scale read in wrong direction*

Modified from Item 20, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been changed from a directive to a descriptive statement. The graphic has been enlarged for easier viewing.

B.2.2.1

9 A rectangle is shown below.



What is the perimeter of the rectangle?

Hint: Perimeter of a rectangle = $(2 \times l) + (2 \times w)$

- ○ 22 inches — *12 + 10*
- ○ 44 inches — *
- ○ 88 inches — *(12 + 10) × 4 sides*
- ○ 120 inches — *12 × 10*

Modified from Item 21, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context in the stem has been removed. A graphic has been added to enhance understanding. The blocks of text have been separated by line breaks to emphasize key pieces of information. A relevant formula has been added in a hint box below the stem to provide direction.

C.1.1.1

10 Which shape has the **greatest** number of sides?

- ○ hexagon *6 sides*
- ○ octagon *
- ○ pentagon *5 sides*
- ○ quadrilateral *4 sides*

Modified from Item 23, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Two of the answer options have been changed to more common shapes to lower the item difficulty.

C.1.1.2

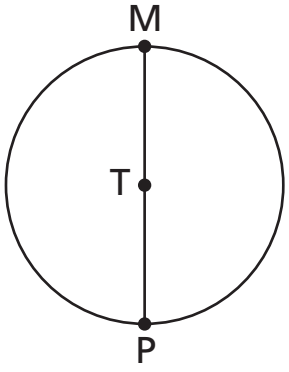
11 What type of triangle has 2 sides of the same length and 1 side of a different length?

- ○ acute
- ○ obtuse
- ○ scalene
- ○ isosceles *

Modified from Item 25, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed, and the descriptive language has been simplified. The required task has been made easier as a result of these changes.

C.1.1.3

12 Circle T is shown below.



The length of $\overline{MP}$ is 20 centimeters (cm).

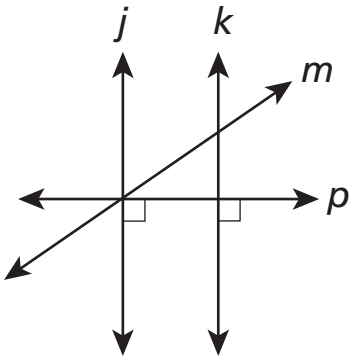
What is the length of $\overline{MT}$?

- ○ 5 cm — *half of $\overline{MT}$*
- ○ 10 cm — *
- ○ 15 cm — *$\overline{MT}$ plus half of $\overline{MT}$*
- ○ 20 cm — *length of $\overline{MP}$*

Modified from Item 26, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed to focus on the math task. The complexity of the graphic has been reduced to lower the item difficulty. The language has been simplified, and the standard mathematical symbol for "line segment" has been inserted. The blocks of text have been separated by line breaks to emphasize key pieces of information.

C.1.2.1

13 Four lines are shown in the figure below.



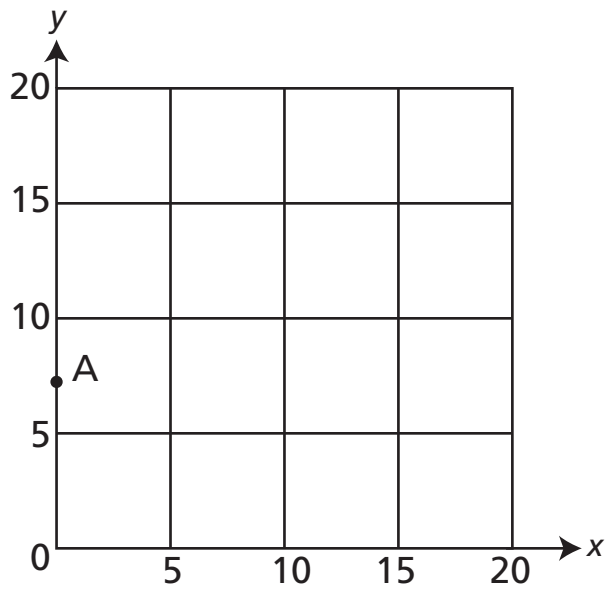
Which of the following pair of lines is perpendicular?

- ○ line *j* and line *m* — *intersecting*
- ○ line *j* and line *k* — *parallel*
- ○ line *k* and line *m* — *intersecting*
- ○ line *k* and line *p* — *

Modified from Item 28, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been simplified, an additional right angle symbol has been inserted to provide additional guidance, and the question in the stem has been reworded for better understanding. The letters in the graphic are now arranged in alphabetical order. The task is now focused on one specific piece of information. The answer options have been simplified as a result of this change.

C.3.1.1

14 Point A is shown on the coordinate grid below.



Which ordered pair **best** describes the location of point A?

- ○ (0, 3)
- ○ (0, 7) *
- ○ (3, 0)
- ○ (7, 0)

Modified from Item 30, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been changed from a directive to a descriptive statement. The question in the stem has been reworded to be more precise. Decimals have been changed to whole numbers in the answer options to reduce difficulty.

D.1.2.1

15 An input-output table is shown below.

Input	Output
0	3
1	5
2	7
3	9

Which rule is used on each input number to get the output number?

- ○ multiply by 1 then add 2 *differences in first column and in second column are 1 and 2*
- ○ multiply by 1 then add 3 *generates first row output*
- ○ multiply by 2 then add 2 *wrong value added after multiplying*
- ○ multiply by 2 then add 3 *

Modified from Item 33, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been changed from a directive to a descriptive statement. The question in the stem has been reworded to be more precise. The answer options have been reworded slightly for easier comprehension.

D.2.1.1

16 An equation is shown below.

$$3x = 36$$

Which operation can be used on **both** sides of the equation to solve for x?

- ○ add 3
- ○ subtract 3
- ○ divide by 3 *
- ○ multiply by 3

Modified from Item 35, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: A short, simple lead-in statement has been added to focus on the task. The blocks of text have been separated by line breaks to emphasize key pieces of information. The word "both" has been set in boldfaced type for emphasis. The question in the stem has been reworded to be more precise, and the wording in the answer options has been simplified.

D.2.1.2

17 An equation is shown below.

$$t \div 4 = 24$$

What value of t makes the equation true?

- ○ 6 $24 \div 4$
- ○ 20 $24 - 4$
- ○ 28 $24 + 4$
- ○ 96 *

Modified from Item 37, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: A short, simple lead-in statement has been added, and some context has been removed. The blocks of text have been separated by line breaks to emphasize key pieces of information. The question in the stem has been reworded to allow students to focus on the math task.

D.2.2.1

18 Dave has 14 shirts.

This is 6 fewer shirts than Cal has.

Cal has *c* shirts.

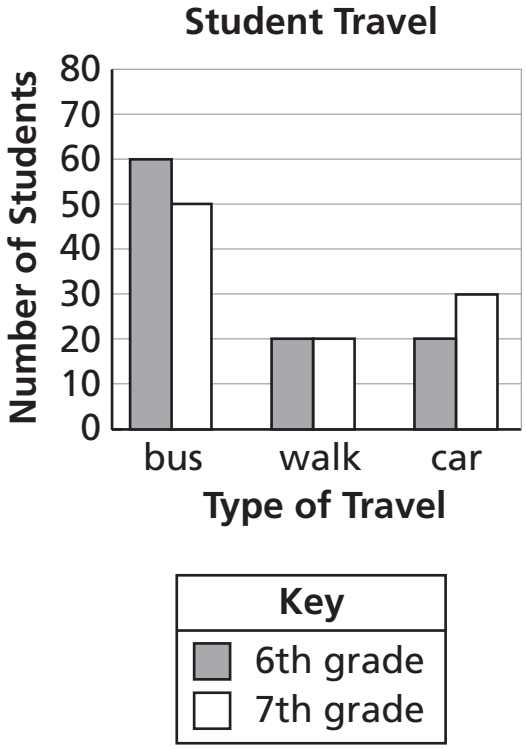
Which equation could be used to find the number of shirts Cal has (*c*)?

- ○ $14 = c + 6$
- ○ $14 = c - 6$ *
- ○ $14 = c \times 6$
- ○ $14 = c \div 6$

Modified from Item 39, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The blocks of text have been separated by line breaks to emphasize key pieces of information. A simple, descriptive sentence with a mathematical variable has been added to the stem. The question in the stem has been reworded for better understanding. The left and right sides of the equations in the answer options have been transposed to provide additional guidance. Option D has been changed to lower the difficulty of the item.

E.1.1.1

19 The bar graph below shows how some students in 6th grade and 7th grade travel to school.



How many students in 7th grade ride a bus to school?

- ○ 20 — *most common number on graph*
- ○ 30 — *number of 7th grade students who travel by car*
- ○ 50 — *
- ○ 60 — *number of 6th grade students who travel by bus*

Modified from Item 41, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed to simplify processing. The key has been repositioned below the bar graph, and the question in the stem has been reworded for better understanding.

E.1.1.2

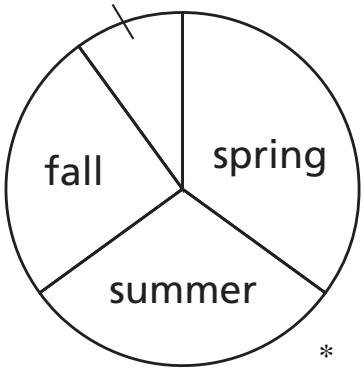
20 The table below shows the favorite season of 100 people.

Favorite Season

Season	Number of People
spring	35
summer	30
fall	25
winter	10

Which circle graph **best** displays the data in the table?

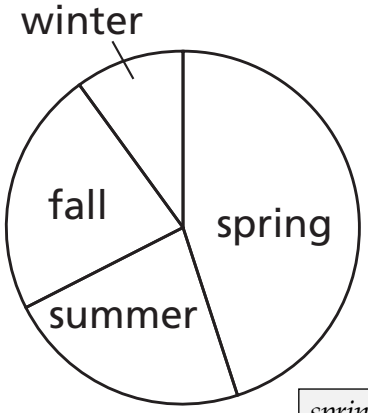
Favorite Season



*

○

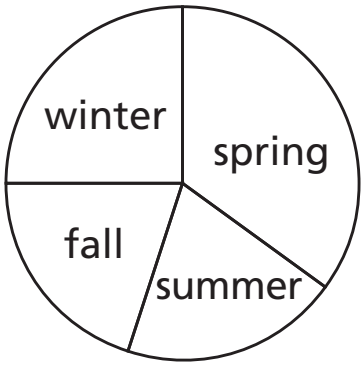
Favorite Season



spring too large

○

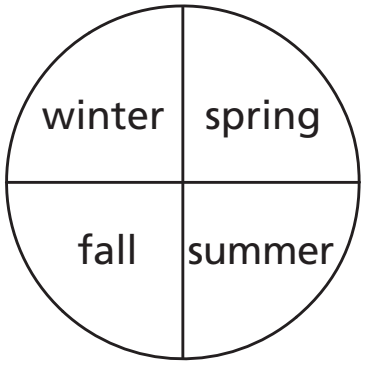
Favorite Season



○

winter too large

Favorite Season



○

all months equal

Modified from Item 43, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: Some context has been removed or simplified. The base stimulus number has been changed to 100 to reduce task complexity. The numbers in the table data and the stem graphics have been modified to align with the change in the base stimulus number.

E.3.1.1

21 Hank has 8 CDs.

- 3 of the CDs are new
- 5 of the CDs are old

Hank randomly chooses 1 CD.

What is the probability that the CD Hank chooses is **new**?

- ○ $\frac{1}{8}$ *1 of 8 CDs*
- ○ $\frac{1}{3}$ *1 of 3 new CDs*
- ○ $\frac{3}{8}$ *
- ○ $\frac{3}{5}$ *3 new over 5 old*

Modified from Item 47, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The context scenario has been simplified. Bullets have been added to important information in the stem. The blocks of text have been separated with line spacing to emphasize key pieces of information.

E.3.1.2

22 Amy designs rings with the band colors and stone colors shown in the table below.

Ring Designs

Band Color	Stone Color
red	clear
yellow	white
blue	black

How many different combinations of 1 band color and 1 stone color are possible for Amy to select as a ring design?

- ○ 2 — *1 band; 1 stone*
- ○ 3 — *the 3 combinations listed*
- ○ 6 — *6 choices*
- ○ 9 — *

Modified from Item 49, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: The lead-in statement has been enhanced to introduce and describe the details of the table in a clear way. A subject has been added to the scenario, and the question in the stem has been reworded for better understanding.

FIRST OPEN-ENDED ITEM

D.2

23 Sally has 3 baskets of apples.

Each basket contains the same number of apples.

Sally has a total of 27 apples in the 3 baskets.

A. Sally wrote the equation below to represent this situation.

$$3 \times y = 27$$

What does the variable *y* represent in the equation?

The variable *y* represents _____.

B. Solve the equation $3 \times y = 27$ for *y*. Show all your work.

Work:

***y* =** _____

Sally bought some more apples at the store.

Now Sally has a total of 42 apples.

C. Write an **equation** that can be used to find the number of apples (*n*) that Sally bought at the store.

Equation: _____

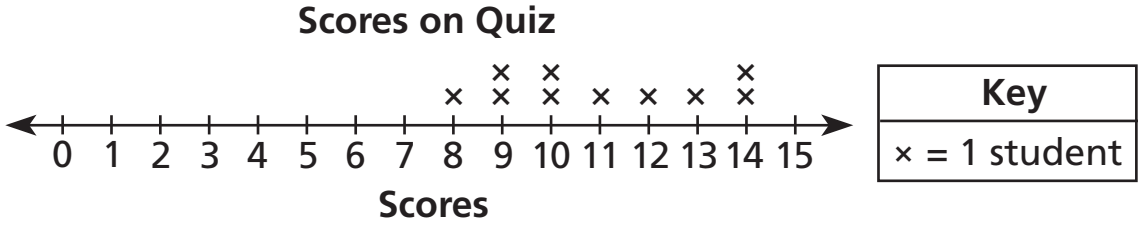
Modified from Item 52, Grade 6 PSSA Mathematics Sampler 2008 – 2009
Modifications: A different scenario for the context has been introduced, using smaller numbers to reduce the task complexity. The blocks of text have been separated with line spacing to emphasize key pieces of information. The order of tasks for Parts A and B has been switched to help guide the students through the tasks. For Part A, the stem has been reworded for better understanding, and a fill-in-the-blank sentence has been added to the response box to provide direction. For Part B, the stem has been reworded for better understanding, and labels have been added to the response box to provide direction. For Part C, a smaller number is used in the stem. A label has also been added to the response box to provide direction. The explanation task for Part C has been eliminated from the item.

SECOND OPEN-ENDED ITEM

E.2

24 A group of students took a 15-point quiz.

The line plot below shows the scores that the students earned on the quiz.



A. What is the **mean** of the scores? Show or explain all your work.

Work:

Mean:_____

B. What is the **range** of the scores? Show or explain all your work.

Work:

Range:_____

Modified from Item 53, Grade 6 PSSA Mathematics Sampler 2008 – 2009

Modifications: The context has been changed and simplified. The blocks of text have been separated to emphasize key pieces of information. The line plot and its title have been simplified, arrows have been placed on both sides of the number line, and a key has been added to clarify the graphic. For Parts A and B, the context has been removed, and the stems have been simplified. Labels and fill-in-the blanks have been added to the response boxes to direct the students in the tasks.

ITEM-SPECIFIC SCORING GUIDELINE

Item #24

This item will be reported under Category E, Data Analysis and Probability.

Assessment Anchor:

E.2– Select and use appropriate statistical methods to analyze data.

Specific Eligible Content addressed by this item:

E.2.1.1– Determine/calculate the mean, median, mode and/or range of displayed data (data can be displayed in a table or line plot—use whole numbers only up to 2 digits).

Scoring Guide:

Score	In response to this item, the student—
4	demonstrates a *thorough* understanding of how to determine the mean and range of displayed data by correctly solving problems and clearly explaining procedures.
3	demonstrates a *general* understanding of how to determine the mean and range of displayed data by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	demonstrates a *partial* understanding of how to determine the mean and range of displayed data by correctly performing a significant portion of the required task.
1	demonstrates a *minimal* understanding of how to determine the mean and range of displayed data.
0	The response has no correct answer and *insufficient* evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.
Non-scorable	BLK .....Blank, entirely erased, or written refusal to respond OT .....Off task IL.....Illegible LOE.....Response in a language other than English