Mathematics

SESSION 1

You may use your reference sheet and MCAS ruler during this session.
*You may **not** use a calculator during this session.*

DIRECTIONS

This session contains fifteen multiple-choice questions, five short-answer questions, and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

1 Vineet answered 20 out of 25 questions correctly on his last mathematics test. What percent is equivalent to $\frac{20}{25}$?

A. 20%

B. 50%

C. 75%

D. 80%

2 At 7:00 a.m., the temperature was $-6°F$. The temperature was $8°F$ higher at noon. Which of the following expressions can be used to calculate the temperature at noon?

A. $-6 + 8$

B. $-6 - 8$

C. $8 + 6$

D. $8 - (-6)$

3 The table below shows the maximum weights of some of the smallest living animals in the world.

**Maximum Weights
of Some Small Animals**

| Animal	Maximum Weight (in ounces)
Bee Hummingbird	0.056
Kitti's Hog-nosed Bat	0.07
Pygmy Mouse	0.28
Pygmy Shrew	0.09

Which of the following shows the numbers in the table in order from least to greatest?

A. 0.28, 0.07, 0.09, 0.056

B. 0.07, 0.09, 0.28, 0.056

C. 0.28, 0.056, 0.07, 0.09

D. 0.056, 0.07, 0.09, 0.28

4   As *x* increases, which of the following graphs best represents a positive rate of change for *y*?

A.

C.

B.

D.
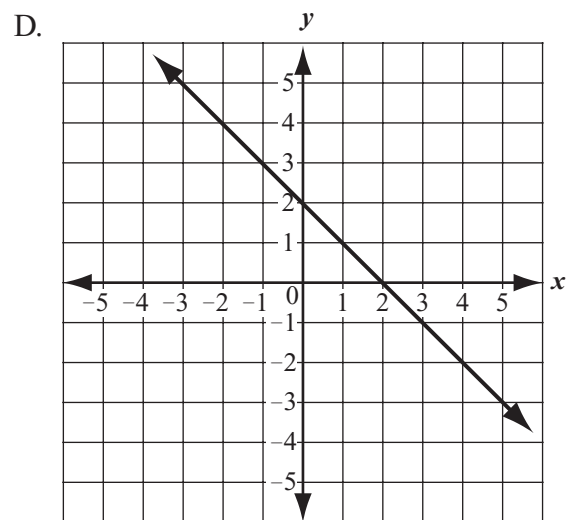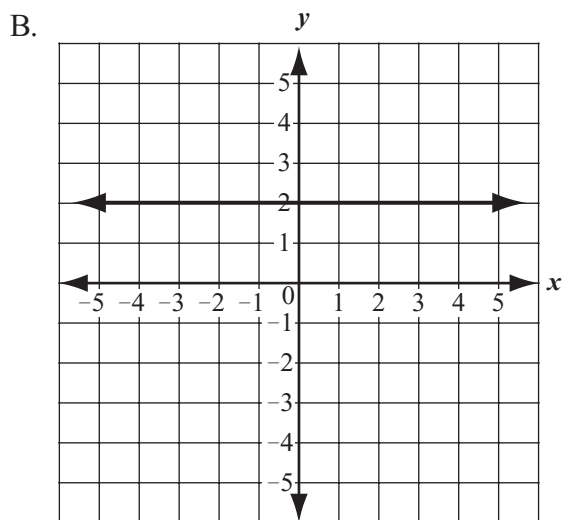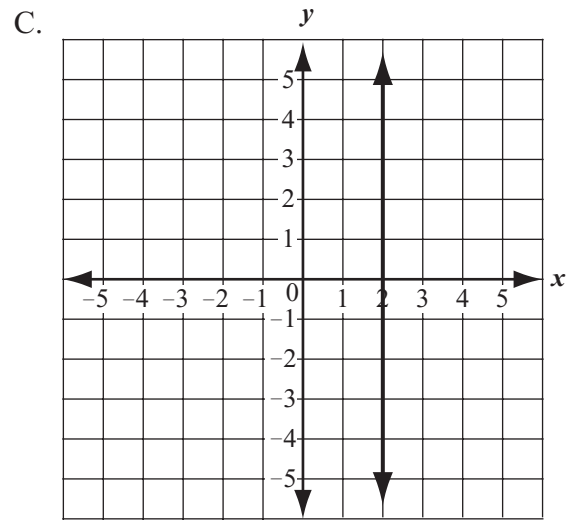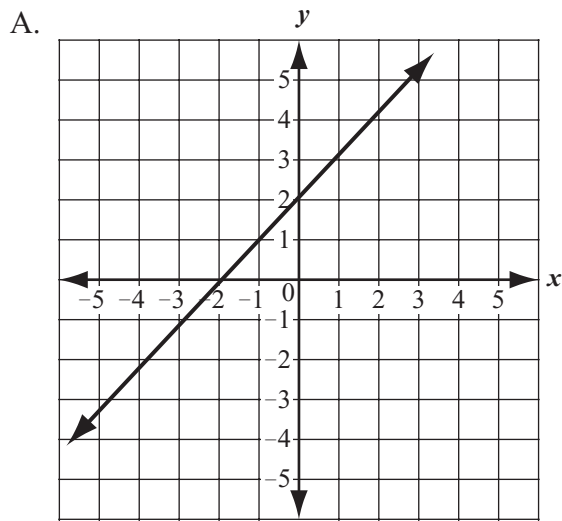
5 The figure below shows a hexagon on a coordinate plane.
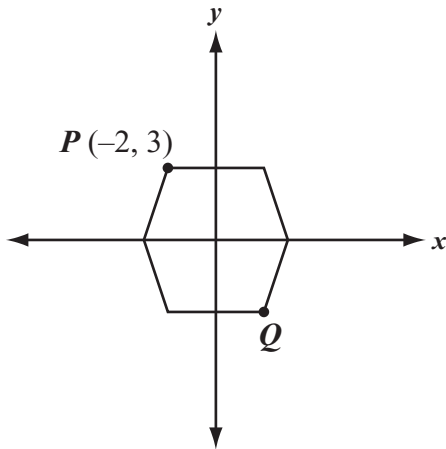
Both the x-axis and the y-axis are lines of symmetry of the hexagon. Point P is located at $(-2, 3)$. What is the location of point Q?

A. $(-3, 2)$

B. $(-2, -3)$

C. $(2, -3)$

D. $(3, 2)$

6 What is the value of the expression below when $n = -5$?

$$-(n + 3)$$

A. -8

B. -2

C. 2

D. 8

Questions 7 and 8 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

7   Each step in the pattern below is made up of congruent small squares.

Step 1

Step 2

Step 3

Step 4
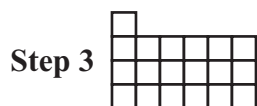
If the pattern continues by adding a row of 6 congruent small squares for each additional step, what is the total number of congruent small squares in Step 6 of this pattern?

8   What is the value of the expression below?

$$(7 - 4)^2$$

Question 9 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 9 in the space provided in your Student Answer Booklet.

9 Copy the *x*-axis and the *y*-axis, as shown below, onto the grid in your Student Answer Booklet.
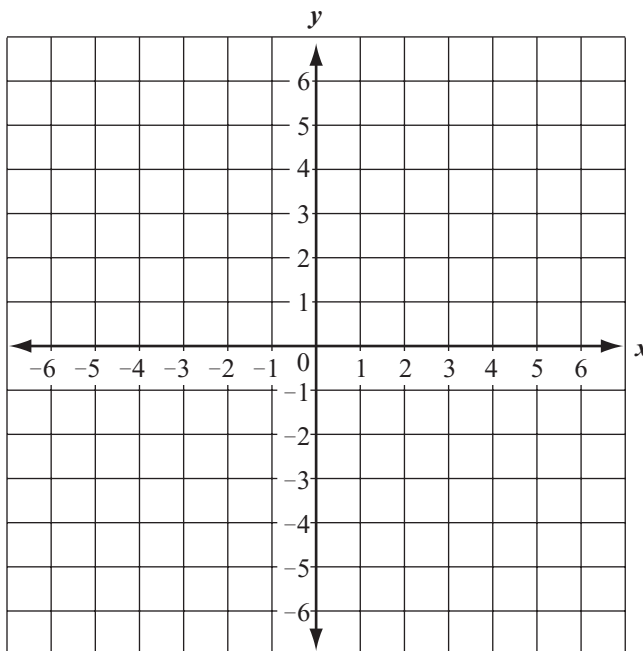
The coordinates of three of the four vertices of rectangle *PQRS* are given below.

- Point *P*: (2, 5)
- Point *Q*: (6, 5)
- Point *R*: (6, 2)

a. On your grid, plot and label points *P*, *Q*, and *R*.

b. On your grid, locate and plot the fourth vertex of the rectangle and label it *S*. Draw rectangle *PQRS*.

c. On your grid, draw the reflection of rectangle *PQRS* over the *x*-axis.

d. Based on the reflection you performed in part (c), write the coordinates of the point that is the image of point *P*.

307

Mark your answers to multiple-choice questions 10 through 18 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

10 Chale bought some packages of pens. He bought one package containing 5 pens and n packages containing 2 pens each. Which of the following expressions could be used to find the total number of pens that Chale bought?

A. $7n$

B. $10n$

C. $5n + 2$

D. $2n + 5$

11 Ali lives in a state where the sales tax rate is 6.5%. Which of the following decimal numbers is equivalent to 6.5%?

A. 0.0065

B. 0.065

C. 0.65

D. 6.5

12 What is the value of the expression below?

$$|4| + |-9|$$

A. -13

B. -5

C. 5

D. 13

13 Wrangell–St. Elias National Park and Preserve in Alaska covers 13,200,000 acres. What is 13,200,000 written in scientific notation?

A. 1.32×10^5

B. 1.32×10^6

C. 1.32×10^7

D. 1.32×10^8

14 Sarah has the following items in her book bag:

- one red 12-inch ruler
- one green 12-inch ruler
- one black pen
- one blue pen
- one purple pen

Sarah will randomly select one 12-inch ruler and one pen. The tree diagram below shows all of the possible combinations of one 12-inch ruler and one pen that Sarah could select.

```
              black
red           blue
              purple

              black
green         blue
              purple
```
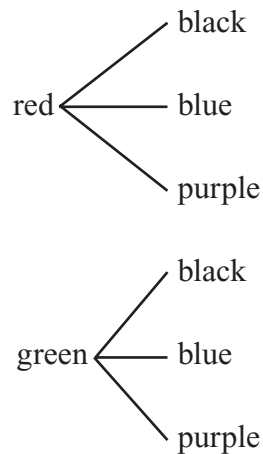
What is the probability that Sarah will select a green 12-inch ruler and either a black or a purple pen?

A. $\frac{1}{4}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{2}{3}$

15 What is the value of the expression below when $x = 3$ and $y = 0$?

$$5x^2 - 2xy$$

A. 24

B. 30

C. 39

D. 45

16 Janice rented a moving van for one day at a rate of $30 per day plus $0.25 per mile. Which of the following equations can she use to calculate c, the cost, in dollars, of renting the van for one day and driving it m miles?

A. $c = 55m$

B. $c = 30.25m$

C. $c = 30 + 0.25m$

D. $c = 0.25 + 30m$

17　A fair cube has three red faces and three blue faces. When the cube is rolled, the outcome is that it will land with either a red face or a blue face on top. The organized list below shows all of the possible combinations of outcomes for rolling this cube 3 times.

R R R　　　B R R

R B R　　　B B R

R R B　　　B R B

R B B　　　B B B

Key
R represents red
B represents blue

If a cube is rolled 3 times, what is the probability that it will land with a red face on top 2 times and a blue face on top 1 time, in any order?

A. $\frac{3}{8}$

B. $\frac{1}{2}$

C. $\frac{2}{3}$

D. $\frac{3}{5}$

18　An automobile repair shop takes approximately 0.4 hour to change the oil in a car. What is the total number of minutes in 0.4 hour?

A. 40 minutes

B. 35 minutes
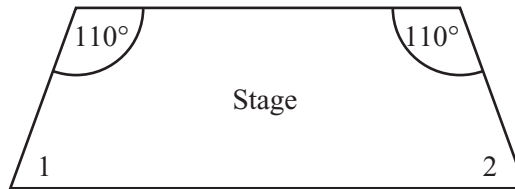
C. 24 minutes

D. 15 minutes

Questions 19 and 20 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

19 The list below shows the ages of the students in Mario's computer class.

$$15, \ 13, \ 12, \ 14, \ 12, \ 14, \ 15, \ 13, \ 14, \ 16, \ 14$$

What is the range of the ages of the students in the class?

20 The stage in the auditorium at Washington Middle School is shaped like a quadrilateral with each of two angles measuring 110°, as shown in the diagram below.

In the drawing, $\angle 1$ is congruent to $\angle 2$. What is the degree measure of $\angle 1$?

Question 21 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

21   What value of y makes the equation below true?

$$\frac{y}{4} = 24$$

Question 22 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 22 in the space provided in your Student Answer Booklet.

**22** Jeremy had some bricks that he was going to use to build a short wall on his patio, next to his garden.

a. Each brick is 8 inches long, as shown below. What is the total length of a row of 4 bricks? Show your work or explain how you got your answer.

$\longmapsto$ 8 in. $\longmapsto$
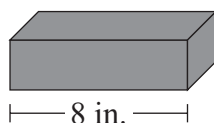
b. Each brick is $2\frac{1}{4}$ inches high, as shown below. What is the total height of a stack of 4 bricks? Show your work or explain how you got your answer.

$2\frac{1}{4}$ in.
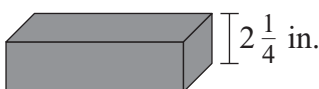
To build the wall, Jeremy first spread a $\frac{3}{8}$-inch layer of mortar, then placed a layer of bricks, then spread another $\frac{3}{8}$-inch layer of mortar, and so on. Five layers of bricks, with mortar, are pictured below. (A finished brick wall has bricks, not mortar, on top.)

Mortar

$\left(\text{Each layer is } \frac{3}{8} \text{ in. high.}\right)$

$2\frac{1}{4}$ in.
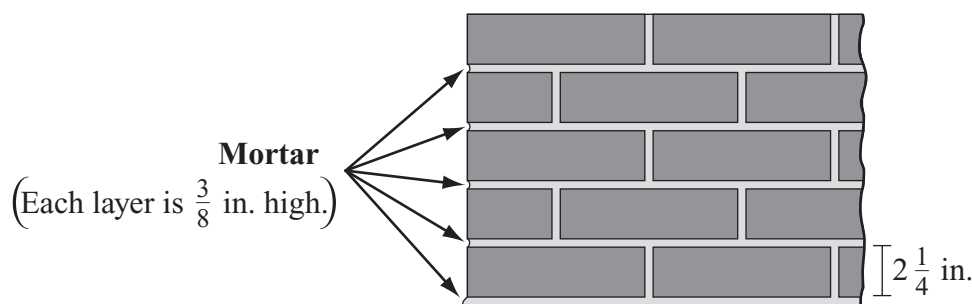
c. How many layers of bricks, with mortar, did Jeremy need in order to make the wall a total of 21 inches high? Show or explain how you got your answer.

Mathematics

SESSION 2

You may use your reference sheet and MCAS ruler during this session.
You may use a calculator during this session.

DIRECTIONS
This session contains fourteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

23 The table below shows the low temperatures of four cities on one winter night.

Low Temperatures of Four Cities One Night

City	Temperature
Boston	3°F
Lowell	0°F
Springfield	−8°F
Worcester	−5°F

Which city had the lowest temperature that night?

A. Boston

B. Lowell

C. Springfield

D. Worcester

24 Jiro bowled 7 games in a tournament. The list below shows his scores for those 7 games.

149, 160, 180, 155, 160, 137, 158

What is the mode of Jiro's scores?

A. 155

B. 157

C. 158

D. 160

25 The student council held a dance to raise money. The expression below represents the amount of profit the council made based on n, the number of students who bought tickets to the dance.

$$3n - 150$$

What is the amount of profit the student council made if 60 students bought tickets to the dance?

A. $30

B. $60

C. $180

D. $210

26 The table below shows the numbers of vertices and edges for four types of prisms.

Features of Prisms

Type of Prism	Number of Vertices (v)	Number of Edges (e)
Triangular	6	9
Rectangular	8	12
Pentagonal	10	15
Hexagonal	12	18

Which of the following equations could be used to predict e, the number of edges of a prism with v vertices?

A. $e = \dfrac{2v}{3}$

B. $e = \dfrac{3v}{2}$

C. $e = v + 3$

D. $e = 2v - 6$

27 Sina's goal is to exercise a mean of 45 minutes per day for one week. For the first 6 days of the week, she exercised 35, 40, 37, 42, 45, and 50 minutes.

What is the number of minutes Sina must exercise on the 7th day of the week to reach her goal exactly?

A. 21 minutes

B. 42 minutes

C. 49 minutes

D. 66 minutes

315

Questions 28 and 29 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 28 in the space provided in your Student Answer Booklet.

28   A park has a rose garden with the dimensions shown below. A 36-inch-wide sidewalk surrounds the rose garden.

Map of Park
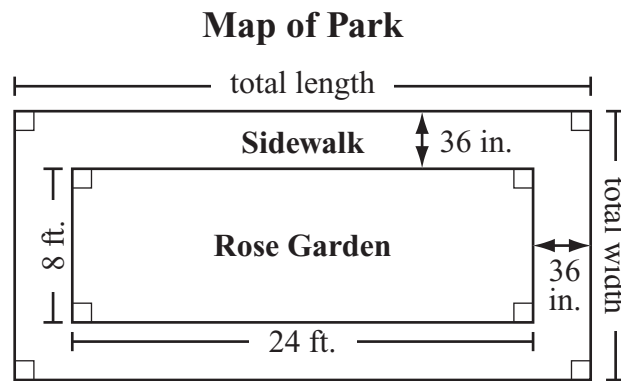
a. What are the total length and the total width, in **feet**, of the park? Show or explain how you got your answers.

b. What is the perimeter, in **feet**, of the park? Show or explain how you got your answer.

c. What is the area, in **square feet**, of the entire sidewalk? Show or explain how you got your answer.

Write your answer to question 29 in the space provided in your Student Answer Booklet.

29   The circle graph below shows the student attendance at the Central Middle School Fall Festival.

Central Middle School
Fall Festival Attendance
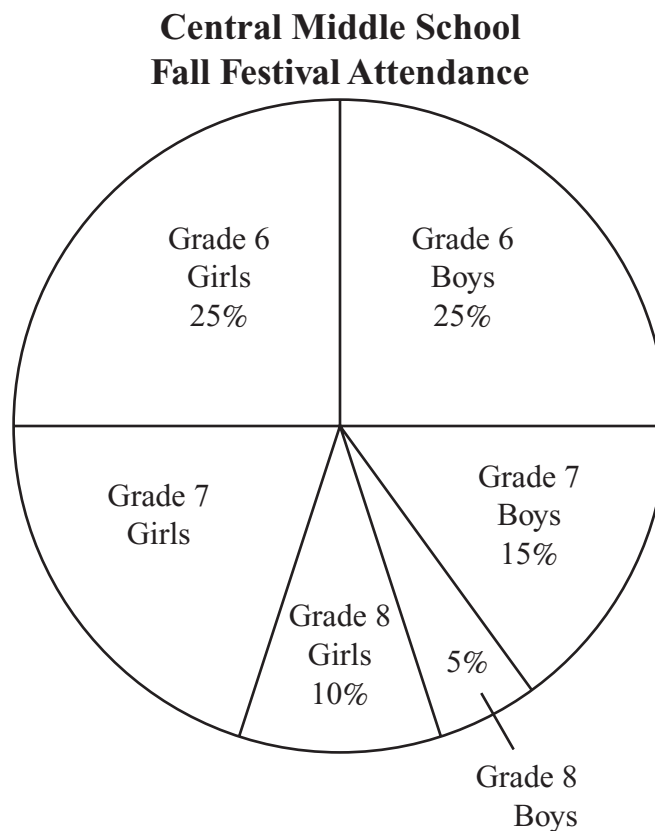
a. What percent of the students who attended the Fall Festival were grade 7 girls? Show or explain how you got your answer.

b. What part of the students attending the Fall Festival were girls? Write your answer as a **fraction**. Show or explain how you got your answer.

c. There were 32 grade 7 girls who attended the Fall Festival. What was the total number of students who attended the Fall Festival? Show or explain how you got your answer.

Mark your answers to multiple-choice questions 30 through 38 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

30   It took a ball 1 minute to roll 90 feet. What was this ball's average rate of speed, in **feet per second**?

A. $\frac{2}{3}$ feet per second

B. $1\frac{1}{2}$ feet per second

C. 2 feet per second

D. 3 feet per second

31   Which of the following number patterns follows the rule shown below?

> Multiply the previous number by 2; then add 1 to the result.

A. 1, 2, 3, 4
B. 1, 2, 4, 8
C. 1, 3, 5, 7
D. 1, 3, 7, 15

32   Mr. Lui wants to build a bridge across the creek that runs through his property. He made measurements and drew the map shown below.
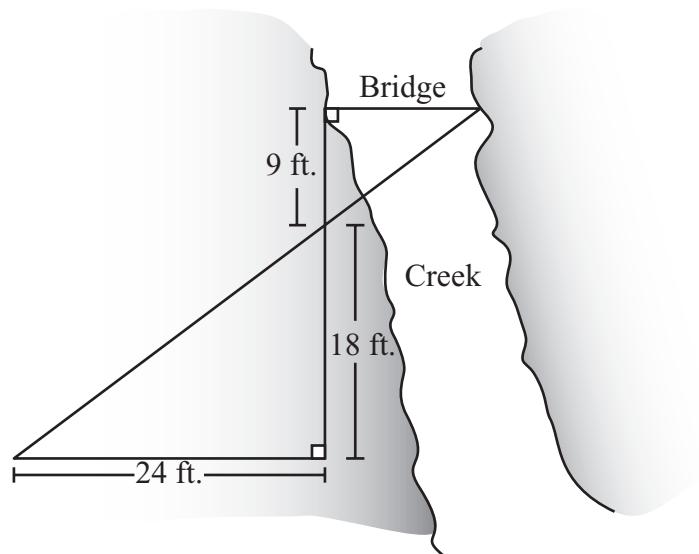
Based on this map, what is the distance across the creek at the place where Mr. Lui wants to put the bridge?

A.   9 feet
B. 12 feet
C. 18 feet
D. 24 feet

33 The table below shows the relationship between n, the term number in a pattern, and the value of that term.

Term Number (n)	Value of the Term
1	1
2	4
3	9
4	16

Based on the pattern shown in the table, which of the following could be the rule used to find the value of any term?

A. n

B. $2 \cdot n$

C. $n \cdot n$

D. $4 \cdot n$

34 The floor of a daycare center is a rectangle that is 36 feet by 27 feet. The floor needs to be covered by foam mats. Each foam mat measures 3 feet by 3 feet.

How many foam mats are needed to completely cover the floor with no overlaps?

A. 108

B. 126

C. 162

D. 324

35 The table below shows the average depth of each of the five deepest oceans and seas in the world.

Depths of World's Deepest Oceans and Seas

Name	Depth (in feet)
Atlantic Ocean	12,880
Caribbean Sea	8,685
Indian Ocean	13,002
Pacific Ocean	13,215
Sea of Japan	5,468

What is the median depth of these five oceans and seas?

A. 13,215 feet

B. 13,002 feet

C. 12,880 feet

D. 10,650 feet

36 Basim used a trailer to haul dirt. The trailer is in the shape of a rectangular prism. The interior of the trailer has a length of 8 feet, a width of 4 feet, and a height of 2 feet.

What is the total number of cubic feet of dirt that the trailer can hold when it is filled so that the dirt is level with the top?

A. 14 cubic feet

B. 56 cubic feet

C. 64 cubic feet

D. 112 cubic feet

37 The volleyball coach recorded the ratios of successful serves for four players, as shown in the table below.

Ratios of Successful Serves for Four Volleyball Players

Player Name	Ratio of Successful Serves
Andrea	7 out of 10
Bren	9 out of 12
Cari	12 out of 18
Diana	13 out of 20

Which player had the greatest ratio of successful serves?

A. Andrea

B. Bren

C. Cari

D. Diana

38 The stem-and-leaf plot below shows the total number of hits by each of the 24 players on the high school baseball team last season.

Number of Hits by High School Baseball Team's Players

3	7 8
4	0 2 5 5 8
5	1 2 2 3 5 7 8 8
6	2 4 4 7
7	0 2 5
8	3 8
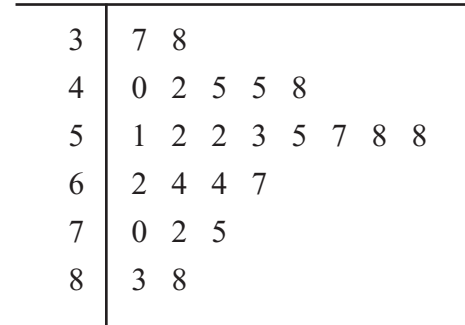
Key
4 | 1 represents 41

What fraction of the players had more than 65 hits?

A. $\frac{5}{24}$

B. $\frac{1}{4}$

C. $\frac{7}{24}$

D. $\frac{3}{4}$

320

Question 39 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 39 in the space provided in your Student Answer Booklet.

39 Danny saved money to buy a bike that cost a total of $150. He saved the same amount of money each week until he had enough money to pay for the bike. The table below shows how much money Danny still needed at the end of each of the first five weeks of saving.

**Money Still Needed for Bike
at End of Week**

Week Number	Money Needed
1	$135
2	$120
3	$105
4	$ 90
5	$ 75

a. How much money did Danny save each week? Show or explain how you got your answer.

b. On the grid in your Student Answer Booklet, graph the data from the table. Be sure to title your graph and label the axes.

c. How much money did Danny still need to save after he had saved for 7 weeks? Show or explain how you got your answer.

d. Write an equation that could be used to find a, the amount of money Danny still needed to save after he saved for w weeks.

Grade 7 Mathematics
Spring 2006 Released Items:
Reporting Categories, Standards, and Correct Answers

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	303	*Number Sense and Operations*	7.N.1	D
2	303	*Number Sense and Operations*	7.N.9	A
3	303	*Number Sense and Operations*	7.N.1	D
4	304	*Patterns, Relations, and Algebra*	7.P.5	A
5	305	*Geometry*	7.G.4	C
6	305	*Patterns, Relations, and Algebra*	7.P.2	C
7	306	*Patterns, Relations, and Algebra*	7.P.1	37
8	306	*Number Sense and Operations*	7.N.5	9
9	307	*Geometry*	7.G.6	
10	308	*Patterns, Relations, and Algebra*	7.P.3	D
11	308	*Number Sense and Operations*	7.N.1	B
12	308	*Number Sense and Operations*	7.N.4	D
13	308	*Number Sense and Operations*	7.N.3	C
14	309	*Data Analysis, Statistics, and Probability*	7.D.3	B
15	309	*Patterns, Relations, and Algebra*	7.P.2	D
16	309	*Patterns, Relations, and Algebra*	7.P.3	C
17	310	*Data Analysis, Statistics, and Probability*	7.D.3	A
18	310	*Measurement*	7.M.1	C
19	311	*Data Analysis, Statistics, and Probability*	7.D.2	4
20	311	*Geometry*	7.G.1	70°
21	312	*Patterns, Relations, and Algebra*	7.P.4	96
22	313	*Number Sense and Operations*	7.N.9	
23	314	*Number Sense and Operations*	7.N.1	C
24	314	*Data Analysis, Statistics, and Probability*	7.D.2	D
25	314	*Patterns, Relations, and Algebra*	7.P.2	A
26	315	*Patterns, Relations, and Algebra*	7.P.6	B
27	315	*Data Analysis, Statistics, and Probability*	7.D.2	D
28	316	*Measurement*	7.M.3	
29	317	*Data Analysis, Statistics, and Probability*	7.D.1	
30	318	*Number Sense and Operations*	7.N.2	B
31	318	*Patterns, Relations, and Algebra*	7.P.1	D
32	318	*Geometry*	7.G.2	B
33	319	*Patterns, Relations, and Algebra*	7.P.1	C
34	319	*Measurement*	7.M.3	A
35	319	*Data Analysis, Statistics, and Probability*	7.D.2	C
36	320	*Measurement*	7.M.3	C
37	320	*Number Sense and Operations*	7.N.1	B
38	320	*Data Analysis, Statistics, and Probability*	7.D.1	B
39	321	*Patterns, Relations, and Algebra*	7.P.3	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's Web site later this year.