# Mathematics <br> 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 Which of the following is a multiple of 12 ?
A. 1
B. 3
C. 18
D. 24

2 A city planner created the table below to show the total number of seats for different numbers of subway cars.

Seats on Subway Cars

| Number of <br> Subway Cars | 6 | 8 | 10 | 12 |
| :--- | :---: | :---: | :---: | :---: |
| Total Number <br> of Seats | 180 | 240 | 300 | 360 |

Which of the following represents the relationship between $x$, the number of subway cars, and $y$, the total number of seats, for the data in the table?
A. $y=30 x$
B. $x=30 y$
C. $y=30+x$
D. $x=30+y$

3 What is the value of the expression below when $x=10$ ?

$$
\frac{4 x+5}{8 x+5}
$$

A. $\frac{1}{2}$
B. $\frac{9}{17}$
C. $\frac{9}{13}$
D. $\frac{3}{2}$

4 The Enescu family rented 4 movies at a video store. The length, in hours, of each of the movies is shown below.

$$
2 \frac{1}{4} \quad 1 \frac{3}{4} \quad 1 \frac{1}{2} \quad 1 \frac{3}{4}
$$

What is the total length of the 4 movies?
A. $5 \frac{8}{14}$ hours
B. $6 \frac{1}{4}$ hours
C. $6 \frac{4}{6}$ hours
D. $7 \frac{1}{4}$ hours

5 The length of Ann's bedroom is $5 \frac{3}{4}$ yards. What is the length, in feet, of her bedroom?
A. $11 \frac{1}{2}$ feet
B. $15 \frac{3}{4}$ feet
C. $17 \frac{1}{4}$ feet
D. $23 \frac{1}{4}$ feet

6 The table below shows four pairs of $x$ and $y$ values.

| $\boldsymbol{x}$ | $\boldsymbol{y}$ |
| :---: | :---: |
| 1 | 0 |
| 2 | 3 |
| 3 | 8 |
| 4 | 15 |

Which of the following equations is true for all pairs of $x$ and $y$ values in the table?
A. $y=x+1$
B. $y=x-1$
C. $y=x^{2}+1$
D. $y=x^{2}-1$

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 Triangle $D E F$ is similar to triangle $A B C$.


What is the measure, in degrees, of $\angle F$ ?

8 Sarah and Jacob compared their total bowling scores. Sarah's total score was 109 points greater than Jacob's total score. Write an expression that represents Jacob's total score based on $S$, Sarah's total score.

## 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 Jerry wants to copy five files onto a compact disc (CD). The CD can hold a total of 700 megabytes of data. The size, in megabytes, of each of Jerry's files is shown in the chart below.

Sizes of Jerry's Files

| File Number | Size of File <br> (megabytes) |
| :---: | :---: |
| 1 | 47.76 |
| 2 | 58.32 |
| 3 | 178.99 |
| 4 | 110.55 |
| 5 | 96.75 |

a. What is the difference, in megabytes, between the largest and smallest of the five files? Show or explain how you got your answer.
b. Jerry estimated that the total number of megabytes in the five files was about 500 megabytes. Do you agree or disagree with Jerry's estimate? Show or explain how you got your answer.
c. Based on Jerry's estimate, what percent of the 700 total megabytes that the CD can hold will be left after Jerry copies these five files to the CD? Show or explain how you got your answer.

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 The table below shows Patrick's results on a 25 -question history test.

|  | Multiple-Choice <br> Questions | True-False <br> Questions |
| :--- | :---: | :---: |
| Number of Questions <br> Answered Correctly | 14 | 6 |
| Number of Questions <br> Answered Incorrectly | 1 | 4 |

Of the questions Patrick answered correctly, what percent were true-false questions?
A. $30 \%$
B. $40 \%$
C. $42 \%$
D. $67 \%$

11 When Lisa first started exercising, she could exercise for only 8 minutes. Yesterday, she exercised for 15 minutes. Which of the following proportions could be used to determine the percent increase in Lisa's exercise time?
A. $\frac{x}{100}=\frac{8}{7}$
B. $\frac{8}{x}=\frac{7}{100}$
C. $\frac{100}{x}=\frac{7}{8}$
D. $\frac{x}{100}=\frac{7}{8}$

12 The formula below can be used to determine $f$, the total braking distance, in feet, that a car moving at $n$ miles per hour will travel after the driver applies the brakes.

$$
f=\frac{n^{2}}{20}
$$

Using this formula, what is the total braking distance that a car moving at 60 miles per hour will travel after the driver applies the brakes?
A. 6 feet
B. 60 feet
C. 180 feet
D. 1800 feet

13 Which of the following expressions is not equivalent to -7 ?
A. $(-4-3)$
B. $-(4+3)$
C. $|-4-3|$
D. $-|4+3|$

14 Which of the following is the prime factorization of 72 ?
A. $2^{3} \cdot 3^{2}$
B. $2^{4} \cdot 3^{3}$
C. $8 \cdot 3^{2}$
D. $2^{3} \cdot 9$
(15) Sandra bought $2 \frac{5}{8}$ pounds of apples. Which of the following shows $2 \frac{5}{8}$ written in decimal notation?
A. 2.375
B. 2.580
C. 2.625
D. 2.875

16 Martin correctly answered $90 \%$ of the questions on a math test that contained exactly 40 questions. How many of the questions did he answer incorrectly?
A. 4
B. 10
C. 44
D. 90

17 Which of the following equations best represents the line in the graph shown below?

A. $y=-2 x+3$
B. $y=-3 x+2$
C. $y=-2 x-3$
D. $y=-3 x-2$

18 In Mr. Montgomery's class, there are 8 boys and 12 girls. If Mr. Montgomery selects 1 student from his class at random, what is the probability that the student will be a girl?
A. $\frac{2}{3}$
B. $\frac{3}{5}$
C. $\frac{1}{12}$
D. $\frac{1}{20}$

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 Lorna swam 30 laps per day for the first 6 days of swim practice. She swam 40 laps per day for the next 4 days of practice. What was the mean number of laps that Lorna swam per day for these 10 days?

20 On the real number line, between what two consecutive integers is $\sqrt{7}$ ?

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 The stem-and-leaf plot below shows the number of laps walked by 15 students in a walk-a-thon.


What is the total number of students who walked more than 29 laps?

## 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 Chelsea drew triangle $A B C$ so that the vertices are at points $A(4,-2), B(2,-5)$, and $C(5,-6)$, as shown on the coordinate grid below.

a. Copy the coordinate grid and triangle $A B C$ onto the grid in your Student Answer Booklet. Draw the reflection of triangle $A B C$ across the $x$-axis to form triangle $A^{\prime} B^{\prime} C^{\prime}$. List the coordinates for point $A^{\prime}$, point $B^{\prime}$, and point $C^{\prime}$.
b. On the same coordinate grid, draw the reflection of triangle $A^{\prime} B^{\prime} C^{\prime}$ across the $y$-axis to form triangle $A^{\prime \prime} B^{\prime \prime} C^{\prime \prime}$. List the coordinates for point $A^{\prime \prime}$, point $B^{\prime \prime}$, and point $C^{\prime \prime}$.

# Mathematics <br> 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 Jay went on a whale-watching trip in Massachusetts Bay and saw several whales. Which of the following units could be used to measure the length of a whale?
A. grams
B. kilograms
C. meters
D. milliliters

24 At 6:00 p.m., the temperature was $-14.8^{\circ} \mathrm{F}$. During the night, the temperature decreased by $8.7^{\circ} \mathrm{F}$. What was the temperature after the decrease?
A. $-23.5^{\circ} \mathrm{F}$
B. $-22.5^{\circ} \mathrm{F}$
C. $-6.1^{\circ} \mathrm{F}$
D. $-5.9^{\circ} \mathrm{F}$

25 The diagram below shows the dimensions of a rectangular field.


What is the length of a diagonal of the field?
A. 120 ft .
B. 200 ft .
C. 394 ft .
D. 520 ft .

26 Denzel read about a glacier that is moving in the same direction at a rate of 80 meters every 3 years. At that rate, which of the following equations can be used to find $d$, the distance, in meters, that the glacier will move in $t$ years?
A. $d=\frac{3}{80} t$
B. $d=\frac{80}{3} t$
C. $d=\frac{t}{3}+80$
D. $d=\frac{t}{3}-80$

27 Mona counted a total of 56 ducks on the pond in Town Park. The ratio of female ducks to male ducks that Mona counted was $5: 3$. What was the total number of female ducks Mona counted on the pond?
A. 15
B. 19
C. 21
D. 35

## 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 Currently, Irina exercises a total of 135 minutes during each week. She is planning to begin the following new exercise program.

- The exercise program will last 6 weeks.
- During each week of the program, she will exercise 15 minutes more than she exercised the previous week.
a. Copy the table below into your Student Answer Booklet. In the table, week 0 shows the number of minutes per week Irina exercised before she started the new program. Complete your table to show the number of minutes that Irina will exercise during each of the 6 weeks if she follows her new exercise program.


## Minutes of Exercise <br> During Each Week

| Week (w) | Number of <br> Minutes (n) |
| :---: | :---: |
| 0 | 135 |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |

b. For the data shown in the table, write an equation that shows the relationship between $w$ and $n$.
c. Based on the equation you wrote in part (b), what is the total number of minutes Irina will exercise in week 20 if she continues her exercise program beyond 6 weeks? 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 diagram below shows the circular surface of a pond being designed for a park and a walkway around the pond. The diameter of the surface of the pond will be approximately 200 feet.

a. Based on the diameter, what will be the circumference, in feet, of the surface of the pond? Show or explain how you got your answer. (Use 3.14 for $\pi$.)
b. What will be the area, in square feet, of the surface of the pond? Show or explain how you got your answer.
c. As the diagram shows, a walkway 10 feet wide is being designed to go around the pond. What will be the area, in square feet, of the walkway? 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 The prices of some of the comic books sold in a collectors' catalogue are listed below.

| $\$ 5.00$ | $\$ 20.00$ | $\$ 4.50$ | $\$ 3.00$ | $\$ 3.50$ |
| :--- | ---: | ---: | ---: | ---: |
| $\$ 3.00$ | $\$ 5.50$ | $\$ 3.00$ | $\$ 6.00$ | $\$ 4.00$ |

What is the mean price of these books?
A. $\$ 3.00$
B. $\$ 4.25$
C. $\$ 5.00$
D. $\$ 5.75$
(31) The area of a square is 49 square inches. What is the length of one side of the square?
A. 49 inches
B. 25 inches
C. 12 inches
D. 7 inches

32 Which of the following is represented by the expression below?

$$
5 x+2
$$

A. two more than $\frac{1}{5}$ of a number
B. two more than five times a number
C. five more than $\frac{1}{2}$ of a number
D. five more than twice a number

33 Right triangle $A B C$ and its dimensions are shown below.


Which of the following figures is similar to but not congruent to triangle $A B C$ ?
A.

B.

C.

D.


34 Four friends earned money by painting a house. After they divided the money equally, they each received $\$ 315$.
Which of the following equations could be used to determine $x$, the total amount, in dollars, that the four friends earned by painting the house?
A. $\frac{x}{4}=315$
B. $4 x=315$
C. $x-4=315$
D. $x+4=315$

35 At her job, Alexa is paid $\$ 12.00$ per hour. When she drives her car for work, she is paid an additional $32.5 \phi$ per mile. The expression below can be used to find the amount she is paid, in dollars, when she works for $h$ hours and drives $m$ miles in her car.

$$
12 h+0.325 m
$$

How much is Alexa paid on a day when she works $3 \frac{1}{2}$ hours and drives 218 miles in her car?
A. $\$ 74.50$
B. $\$ 112.85$
C. $\$ 230.00$
D. $\$ 233.33$

36 Which of the following is equivalent to the expression below?

$$
(-a)(b-c)
$$

A. $-a b-c$
B. $-a b+c$
C. $-a b-a c$
D. $-a b+a c$

37 There are a total of 500 students at Lincoln Middle School. The table below shows the number of students who are members of $0,1,2,3$, or 4 clubs.

Members of Student Clubs

| Number <br> of Clubs <br> $(\boldsymbol{n})$ | Number of Students <br> Who Are Members <br> of $\boldsymbol{n}$ Clubs |
| :---: | :---: |
| 0 | 300 |
| 1 | 110 |
| 2 | 60 |
| 3 | 20 |
| 4 | 10 |

Based on the table, what percent of the 500 students are members of 2 or more clubs?
A. $12 \%$
B. $18 \%$
C. $90 \%$
D. $94 \%$

38 Which bar graph below shows a mode of 7 hours of television viewed per week?
A.

B.

C.

D.


## 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 The individual weights, in pounds, of the members of a school's wrestling team are shown in the box below.

| 180 | 163 | 165 | 165 |
| :--- | :--- | :--- | :--- |
| 171 | 177 | 191 | 168 |
| 180 | 203 | 196 | 175 |
| 162 | 155 | 178 | 195 |

a. What is the range of the weights? Show or explain how you got your answer.
b. Copy the diagram below into your Student Answer Booklet. Use the diagram to make a stem-and-leaf plot of the data above. Be sure to title your plot and provide a key.

c. What is the median weight for the data in your stem-and-leaf plot from part (b)? Show or explain how you got your answer.

Grade 8 Mathematics
Spring 2006 Released Items:
Reporting Categories, Standards, and Correct Answers

| Item No. | Page No. | Reporting Category | Standard | Correct Answer (MC/SA)* |
| :---: | :---: | :---: | :---: | :---: |
| 1 | 326 | Number Sense and Operations | 8.N. 5 | D |
| 2 | 326 | Patterns, Relations, and Algebra | 8.P. 7 | A |
| 3 | 326 | Patterns, Relations, and Algebra | 8.P. 2 | B |
| 4 | 327 | Number Sense and Operations | 8.N. 10 | D |
| 5 | 327 | Measurement | 8.M. 1 | C |
| 6 | 327 | Patterns, Relations, and Algebra | 8.P. 1 | D |
| 7 | 328 | Geometry | 8.G. 2 | $50^{\circ}$ |
| 8 | 328 | Patterns, Relations, and Algebra | 8.P. 4 | S - 109 |
| 9 | 329 | Number Sense and Operations | 8.N. 12 |  |
| 10 | 330 | Data Analysis, Statistics, and Probability | 8.D. 2 | A |
| 11 | 330 | Number Sense and Operations | 8.N. 3 | D |
| 12 | 330 | Patterns, Relations, and Algebra | 8.P. 2 | C |
| 13 | 331 | Number Sense and Operations | 8.N. 6 | C |
| 14 | 331 | Number Sense and Operations | 8.N. 5 | A |
| 15 | 331 | Number Sense and Operations | 8.N. 1 | C |
| 16 | 331 | Number Sense and Operations | 8.N. 10 | A |
| 17 | 332 | Patterns, Relations, and Algebra | 8.P. 7 | D |
| 18 | 332 | Data Analysis, Statistics, and Probability | 8.D. 4 | B |
| 19 | 333 | Data Analysis, Statistics, and Probability | 8.D. 3 | 34 |
| 20 | 333 | Number Sense and Operations | 8.N. 2 | 2 and 3 |
| 21 | 334 | Data Analysis, Statistics, and Probability | 8.D. 2 | 4 |
| 22 | 335 | Geometry | 8.G.6 |  |
| 23 | 336 | Measurement | 8.M. 1 | C |
| 24 | 336 | Number Sense and Operations | 8.N. 12 | A |
| 25 | 336 | Geometry | 8.G. 4 | B |
| 26 | 337 | Patterns, Relations, and Algebra | 8.P. 9 | B |
| 27 | 337 | Number Sense and Operations | 8.N. 3 | D |
| 28 | 338 | Patterns, Relations, and Algebra | 8.P. 10 |  |
| 29 | 339 | Measurement | 8.M. 3 |  |
| 30 | 340 | Data Analysis, Statistics, and Probability | 8.D. 3 | D |
| 31 | 340 | Measurement | 8.M. 3 | D |
| 32 | 340 | Patterns, Relations, and Algebra | 8.P. 4 | B |
| 33 | 341 | Geometry | 8.G. 2 | C |
| 34 | 341 | Patterns, Relations, and Algebra | 8.P. 7 | A |
| 35 | 341 | Patterns, Relations, and Algebra | 8.P. 2 | B |
| 36 | 342 | Patterns, Relations, and Algebra | 8.P. 3 | D |
| 37 | 342 | Data Analysis, Statistics, and Probability | 8.D. 2 | B |
| 38 | 342 | Data Analysis, Statistics, and Probability | 8.D. 2 | D |
| 39 | 343 | Data Analysis, Statistics, and Probability | 8.D. 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.

