

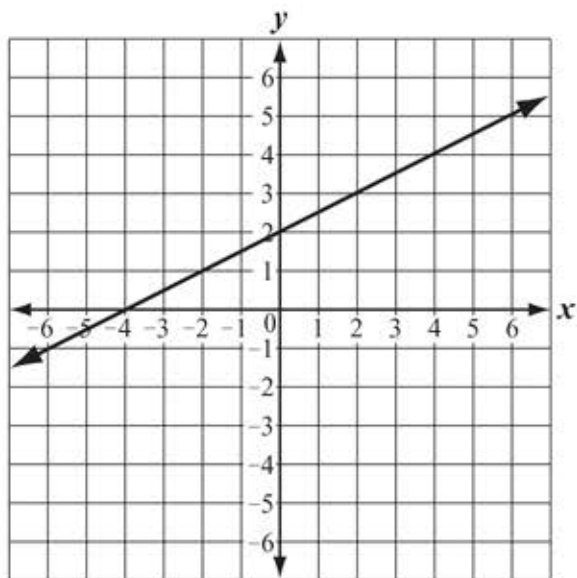
# Grade 8 Mathematics

## SESSION 1

### DIRECTIONS

This session contains eight multiple-choice questions, two short-answer questions, and one open-response question.

- 1 The graph below shows a relationship between  $x$  and  $y$ .



Which of the following equations best represents this relationship?

- A.  $y = 2x$
- B.  $y = x + 2$
- C.  $y = \frac{1}{2}x + 2$
- D.  $y = 2x + \frac{1}{2}$

- 2 What is the value of the expression below?

$$8 - 3\sqrt{16}$$

- A.  $-40$
- B.  $-4$
- C.  $2$
- D.  $20$

- 3 During the first year of operation, a company produced  $8.4 \times 10^9$  reams of paper. During the second year, the company produced 5.6 times the number of reams of paper that it produced during the first year.

Which expression represents the number of reams of paper the company produced during the second year?

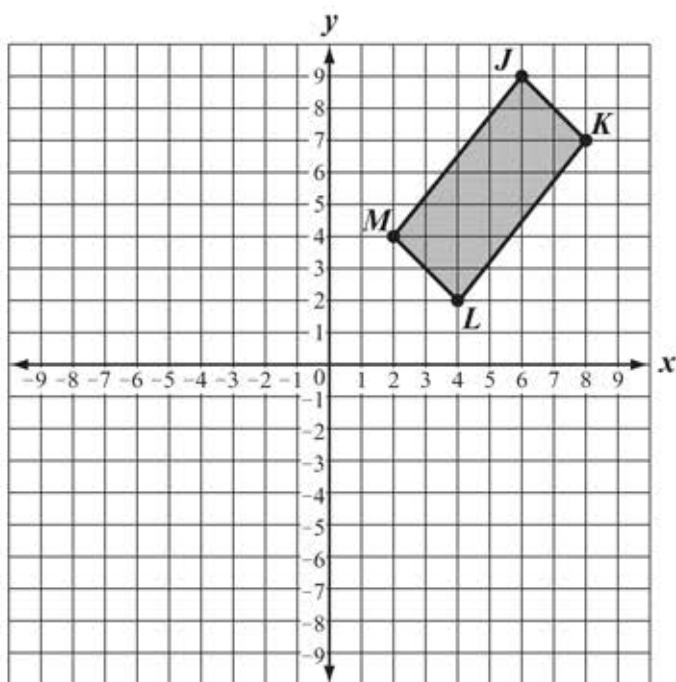
- A.  $1.5 \times 10^9$
- B.  $1.5 \times 10^{10}$
- C.  $4.704 \times 10^9$
- D.  $4.704 \times 10^{10}$

- 4 What are the solutions to the system of equations below?

$$\begin{aligned} 3y &= x - 2 \\ y &= -2x + 4 \end{aligned}$$

- A.  $x = 0$ ;  $y = 2$
- B.  $x = 1$ ;  $y = -2$
- C.  $x = 2$ ;  $y = 0$
- D.  $x = -2$ ;  $y = 4$

- 5 Quadrilateral  $JKLM$  is shown on the coordinate grid below.



Quadrilateral  $JKLM$  will be reflected over the  $x$ -axis to create its image, quadrilateral  $J'K'L'M'$ . What will be the  $x$ -coordinate of vertex  $K'$ ?

- A.  $-8$
- B.  $-7$
- C.  $7$
- D.  $8$

Questions 6 and 7 are short-answer questions.

6 What is the decimal equivalent of  $\frac{5}{6}$ ?

7 What value of  $x$  makes the equation below true?

$$9^5 \cdot 9^7 = 9^x$$

- 8 An equation is incorrectly solved below.

Equation:  $2x + 3 = -4$

Step 1:  $2x + 3 - 3 = -4 - 3$

Step 2:  $2x = -1$

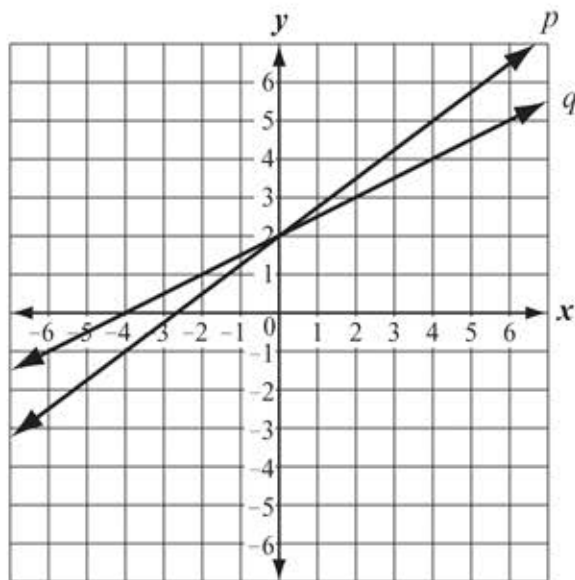
Step 3:  $\frac{2x}{2} = -\frac{1}{2}$

Step 4:  $x = -\frac{1}{2}$

What is the first step that shows an error in the solution to the equation?

- A. Step 1
- B. Step 2
- C. Step 3
- D. Step 4

- 9 Line  $p$  and line  $q$  are shown on the coordinate grid below.



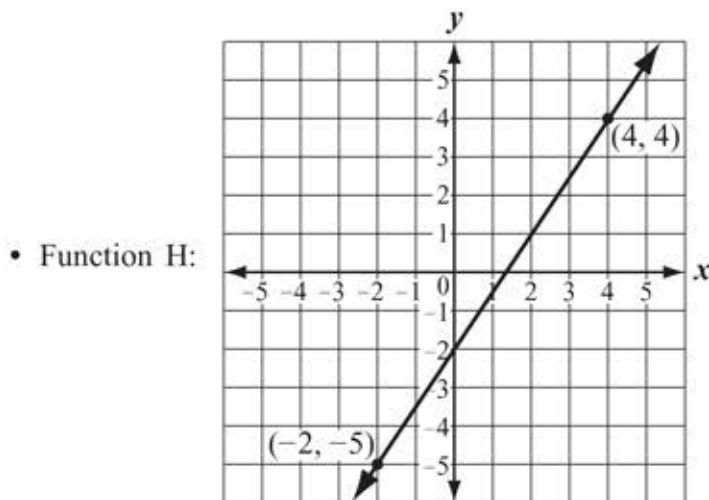
Which of the following statements best describes the lines?

- A. Line  $p$  has the same slope as line  $q$ .
  - B. Line  $p$  has a greater slope than line  $q$ .
  - C. The  $y$ -intercept of line  $p$  is greater than the  $y$ -intercept of line  $q$ .
  - D. The  $x$ -intercept of line  $q$  is greater than the  $x$ -intercept of line  $p$ .
- 10 Which of the following is closest to 0.0432?
- A.  $4 \times 10^{-2}$
  - B.  $4 \times 10^{-1}$
  - C.  $4 \times 10^1$
  - D.  $4 \times 10^2$

Question 11 is an open-response question.

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

11 Each of the four functions below shows a relationship between  $x$  and  $y$ .



- Function I:  $y = 2.5x + 8$
- Function J: Multiply the  $x$  value by 3 and subtract 6 to get the  $y$  value.

• Function K:

$x$	$y$
-2	4
0	6
2	8
4	10
6	12

- What is the slope of the line that represents Function H? Show or explain how you got your answer.
- Write an equation in terms of  $x$  and  $y$  to represent the graph of **Function J**.
- What is the  $y$ -intercept of **Function K**? Show or explain how you got your answer.
- List the four functions in order from the function with the least rate of change to the function with the greatest rate of change.

# Grade 8 Mathematics

## SESSION 2

### DIRECTIONS

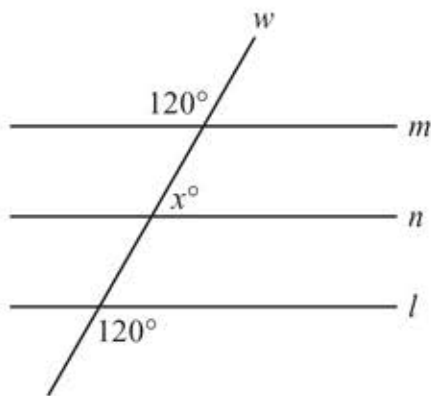
This session contains eight multiple-choice questions, one short-answer question, and one open-response question.

- 12 What is the slope of the line represented by the equation below?

$$y = \frac{1}{3}x + 4$$

- A.  $\frac{1}{4}$
- B.  $\frac{1}{3}$
- C. 3
- D. 4

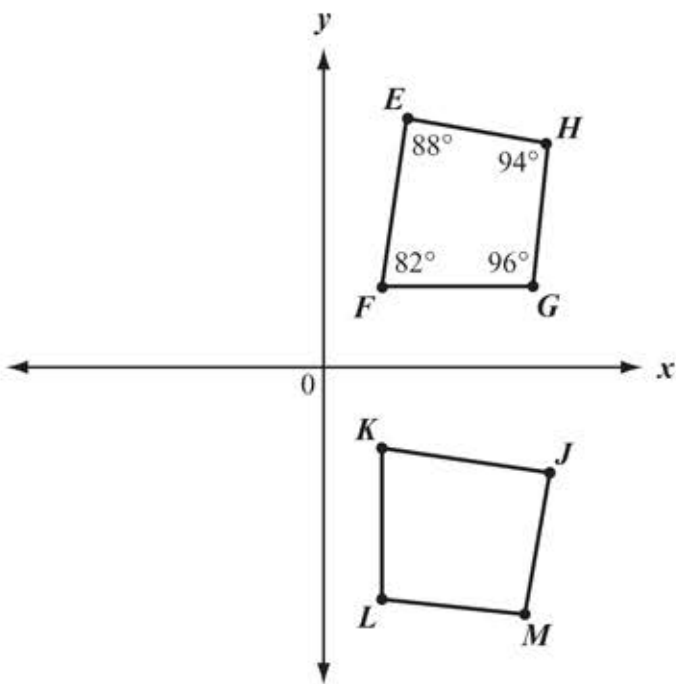
- 13 Lines  $m$ ,  $n$ , and  $l$  are parallel. Line  $w$  intersects each line, as shown in the diagram below.



Based on the angle measures in the diagram, what is the value of  $x$ ?

- A. 20
- B. 30
- C. 60
- D. 120

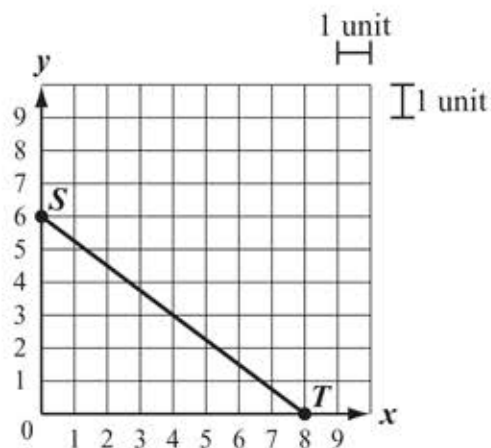
- 14 Quadrilateral  $EFGH$  is rotated  $90^\circ$  clockwise about the origin to create quadrilateral  $JKLM$ . Both quadrilaterals are shown on the coordinate plane below.



What is the measure of  $\angle J$ ?

- A.  $82^\circ$
- B.  $88^\circ$
- C.  $94^\circ$
- D.  $96^\circ$

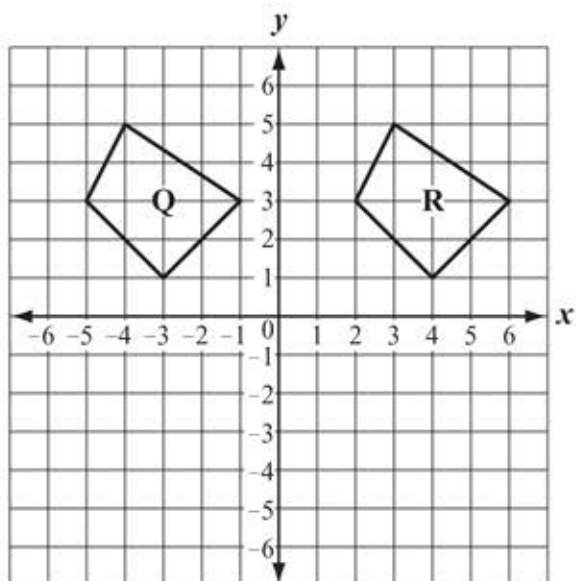
- 15 Line segment  $ST$  is shown on the coordinate grid below.



What is the length, in units, of  $\overline{ST}$ ?

- A. 7
- B. 8
- C. 10
- D. 14

- 16 Figures Q and R are shown on the coordinate grid below.



Which of the following transformations, when performed on Figure Q, will result in Figure R?

- A. a translation of 7 units to the right
- B. a rotation of  $90^\circ$  clockwise about the origin
- C. a rotation of  $270^\circ$  counterclockwise about the origin
- D. a reflection over the  $y$ -axis followed by a translation of 1 unit to the right

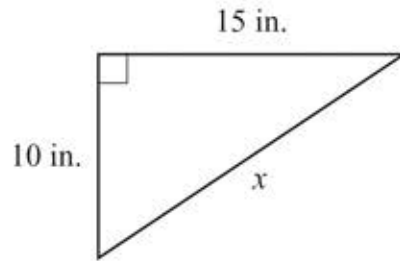
- 17 A jar of peanut butter is in the shape of a cylinder. The jar has an inside radius of 4 centimeters. It is filled with peanut butter to an inside height of 12 centimeters.

What is the total number of cubic centimeters of peanut butter in the jar? (Use 3.14 for  $\pi$ .)

- A. 241.15 cubic centimeters
- B. 301.44 cubic centimeters
- C. 401.92 cubic centimeters
- D. 602.88 cubic centimeters

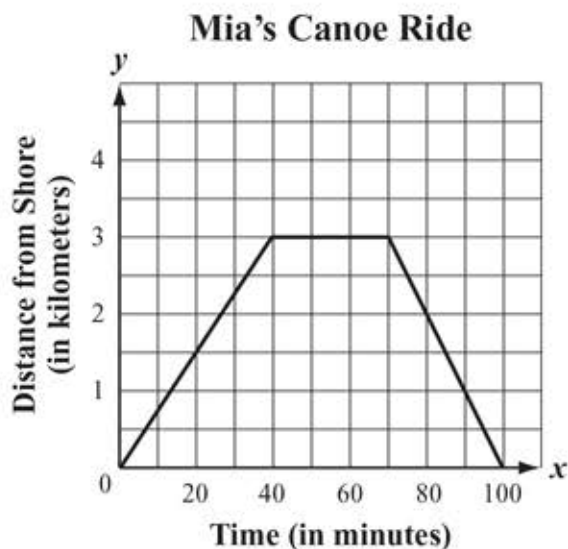


- 18 A right triangle and some of its measurements are shown below.



What is  $x$ , the length to the nearest inch of the third side of the triangle?

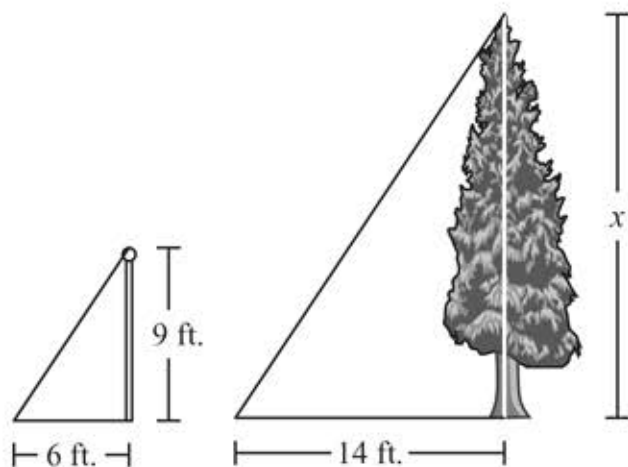
- 19 Mia paddled her canoe from the shore of a lake to an island. She stopped on the island to eat lunch, and then paddled her canoe back to the shore. The graph below shows Mia's distance, in kilometers, from the shore over time.



Based on the graph, which of the following statements is true?

- A. Mia paddled a total distance of 3 kilometers.
- B. Mia paddled for a total of 100 minutes.
- C. Mia paddled faster on the way to the island than on the way back to the shore.
- D. Mia paddled faster on the way back to the shore than on the way to the island.

- 20 A 9-foot flagpole cast a shadow 6 feet long, and at the same time, a nearby tree cast a shadow 14 feet long, as shown below.



What is  $x$ , the height of the tree?

- A. 7 feet
- B. 14 feet
- C. 17 feet
- D. 21 feet

Question 21 is an open-response question.

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

**21** An athletic director wants to add either tennis or gymnastics to the physical education program at her school. She surveyed the seventh-grade students and eighth-grade students to determine whether they preferred tennis or gymnastics. Some of the data from the survey is listed below.

- A total of 255 students were surveyed.
- 120 of the students surveyed are seventh-graders.
- 72 of the seventh-graders surveyed chose tennis.
- 62 of the eighth-graders surveyed chose gymnastics.

In your Student Answer Booklet, copy the table exactly as shown below.

**Student Preference by Grade**

	Tennis	Gymnastics
Seventh Grade		
Eighth Grade		

- Use the data from the survey to complete your table. Show or explain how you got your answers.
- Based on your table, what percentage of the eighth-graders chose tennis? Show or explain how you got your answer.
- Among those students who chose gymnastics, what is the relative frequency of seventh-graders? Show or explain how you got your answer.
- In which grade did a higher percentage of students choose tennis? Show or explain how you got your answer.

## Grade 8 Mathematics Reference Sheet

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### PERIMETER FORMULAS

square . . . . .  $P = 4s$

rectangle . . . . .  $P = 2b + 2h$   
OR  
 $P = 2l + 2w$

triangle . . . . .  $P = a + b + c$

### AREA FORMULAS

square . . . . .  $A = s^2$

rectangle . . . . .  $A = bh$   
OR  
 $A = lw$

parallelogram . . . . .  $A = bh$

triangle . . . . .  $A = \frac{1}{2}bh$

trapezoid . . . . .  $A = \frac{1}{2}h(b_1 + b_2)$

circle . . . . .  $A = \pi r^2$

### TOTAL SURFACE AREA FORMULAS

rectangular prism . . . . .  $SA = 2(lw) + 2(hw) + 2(lh)$

cylinder . . . . .  $SA = 2\pi r^2 + 2\pi rh$

sphere . . . . .  $SA = 4\pi r^2$

### VOLUME FORMULAS

rectangular prism . . . . .  $V = lwh$   
OR  
 $V = Bh$   
( $B$  = area of a base)

cube . . . . .  $V = s^3$   
( $s$  = length of an edge)

cylinder . . . . .  $V = \pi r^2 h$

sphere . . . . .  $V = \frac{4}{3}\pi r^3$

### CIRCLE FORMULAS

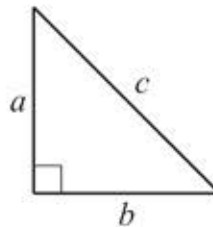
$$C = 2\pi r$$

OR

$$C = \pi d$$

$$A = \pi r^2$$

### PYTHAGOREAN THEOREM



$$a^2 + b^2 = c^2$$

## Grade 8 Mathematics

### Reporting Categories, Standards, and Correct Answers\*

Item No.		Reporting Category	Standard	Correct Answer (MC/SA)*
1		<i>Expressions and Equations</i>	EE.6	C
2		<i>Expressions and Equations</i>	EE.2	B
3		<i>Expressions and Equations</i>	EE.4	D
4		<i>Expressions and Equations</i>	EE.8	C
5		<i>Geometry</i>	G.3	D
6		<i>The Number System</i>	NS.1	0.8333... or equivalent
7		<i>Expressions and Equations</i>	EE.1	12
8		<i>Expressions and Equations</i>	EE.7	B
9		<i>Expressions and Equations</i>	EE.5	B
10		<i>Expressions and Equations</i>	EE.3	A
11		<i>Functions</i>	F.2	
12		<i>Functions</i>	F.4	B
13		<i>Geometry</i>	G.5	C
14		<i>Geometry</i>	G.1	B
15		<i>Geometry</i>	G.8	C
16		<i>Geometry</i>	G.2	A
17		<i>Geometry</i>	G.9	D
18		<i>Geometry</i>	G.7	18 in.
19		<i>Functions</i>	F.5	D
20		<i>Geometry</i>	G.4	D
21		<i>Statistics and Probability</i>	SP.4	

\* Answers are provided here for multiple-choice and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells,