

# **Maine Through Year Assessment**

## **Item Type Sampler**

### **Math**

### **High School**

Student's Name:

**Directions:**

On the following pages of your booklet are questions for the High School *Maine Through Year Assessment Mathematics* Item Type Sampler.

Read these directions carefully before beginning this item type sampler.

This item type sampler will include several different types of questions. Multiple choice questions will ask you to select an answer from among four choices. Multiple select questions will ask you to select multiple correct answers from among five or more choices. For some questions, there may be two parts, Part A and Part B, where each part has a multiple choice or multiple select question. These questions will be found in your item type sampler.

For all questions:

- Read each question carefully and choose the best answer.
- You may use scratch paper to solve the problems.
- The Mathematics Reference Sheet is provided in the back of the Mathematics section. You may refer to this page at any time during the sampler.
- You may use a calculator ONLY for questions 1–4. You may NOT use a calculator for any other questions on this sampler.
- Be sure to answer ALL the questions.

When you come to the word STOP at the end of Part 1, you have finished Part 1 of the High School Mathematics Item Type Sampler. You may review ONLY Part 1 to check your answers. Your calculator must be collected before you can continue with Part 2. When your calculator has been collected, and your proctor has given you permission, you may move on to Part 2.

When you are finished with Part 2, you may review ONLY Part 2 to check your answers.

## Perimeter

The perimeter of a polygon is equal to the sum of the lengths of its sides.

## Circumference of a Circle

$$C = \pi d \quad \text{or} \quad C = 2\pi r$$

$$\pi \approx 3.14$$

## Area

Triangle  $A = \frac{1}{2}bh$

Rectangle  $A = bh \quad \text{or} \quad A = lw$

Circle  $A = \pi r^2$

## Surface Area

The total area of the 2-dimensional surfaces that make up a 3-dimensional object.

## Volume

Right Rectangular Prism  $V = lwh \quad \text{or} \quad V = Bh$

Right Prism  $V = Bh$

Cylinder  $V = \pi r^2 h$

Cone  $V = \frac{1}{3}\pi r^2 h$

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

Pyramid  $V = \frac{1}{3}Bh$

## Slope Formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

## Linear Equation

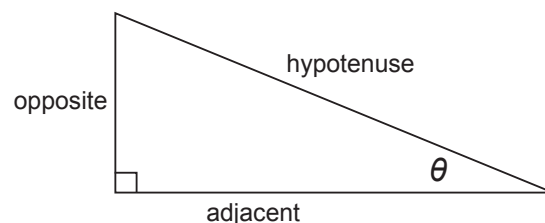
$$y = mx + b$$

## Pythagorean Theorem

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

## Definition of Trigonometric Functions

For  $0^\circ < \theta < 90^\circ$ ,



$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

## Mean

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

## Interquartile Range

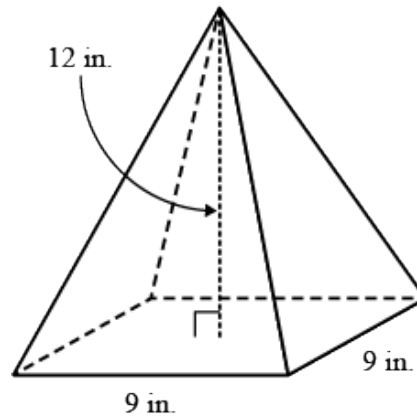
$$IQR = Q_3 - Q_1$$

The difference between the third quartile and first quartile of a set of data.

## Standard Deviation

$$\sigma = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n}}$$

1. A square pyramid is shown.



What is the volume of the pyramid?

- A.  $144 \text{ in.}^3$
  - B.  $324 \text{ in.}^3$
  - C.  $486 \text{ in.}^3$
  - D.  $972 \text{ in.}^3$
2. A system of equations is shown.

$$3x + 2y = 19.5$$

$$2x + 5y = 29.5$$

What is the value of  $x$  and  $y$  in the solution to the system of equations? Select **all** that apply.

- A.  $x = 3.5$
- B.  $x = 4.5$
- C.  $x = 5.5$
- D.  $y = 1.5$
- E.  $y = 3.5$
- F.  $y = 4.5$

3. The table shows the number of burgers and the number of pizza slices sold by a food truck in the last 5 days.

**Food Sold in the Last 5 Days**

	Monday	Tuesday	Wednesday	Thursday	Friday
Burgers	18	31	40	39	32
Pizza Slices	13	16	25	16	20

**Part A**

What is the difference between the mean number of burgers and the mean number of pizza slices sold in the last 5 days?

- A. 10                      B. 14  
C. 15                      D. 16

**Part B**

Which statement is true of the standard deviations of the data?

- A. The standard deviation for the burgers is approximately 0.6 greater than the standard deviation for the pizza slices.  
B. The standard deviation for the pizza slices is approximately 0.6 greater than the standard deviation for the burgers.  
C. The standard deviation for the burgers is approximately 3.7 greater than the standard deviation for the pizza slices.  
D. The standard deviation for the pizza slices is approximately 3.7 greater than the standard deviation for the burgers.

4. The equations of functions  $f(x)$  and  $g(x)$  are shown.

$$f(x) = -x^2 + 3x + 4$$

$$g(x) = -x^2 - 8x - 12$$

**Part A**

Which statements are true of the  $y$ -intercepts of the functions? Select **all** that apply.

- A. The  $y$ -intercept of  $f(x)$  is below the  $x$ -axis.
- B. The  $y$ -intercept of  $g(x)$  is below the  $x$ -axis.
- C. The  $y$ -intercept of  $f(x)$  is the same as the  $y$ -intercept of  $g(x)$ .
- D. The  $y$ -intercept of  $f(x)$  is 11 units above the  $y$ -intercept of  $g(x)$ .
- E. The  $y$ -intercept of  $f(x)$  is 16 units above the  $y$ -intercept of  $g(x)$ .

**Part B**

Which statement correctly compares the  $x$ -intercepts of the functions?

- A. One  $x$ -intercept of  $f(x)$  is 1 unit to the left of an  $x$ -intercept of  $g(x)$ .
- B. One  $x$ -intercept of  $f(x)$  is 1 unit to the right of an  $x$ -intercept of  $g(x)$ .
- C. One  $x$ -intercept of  $f(x)$  is 2 units to the left of an  $x$ -intercept of  $g(x)$ .
- D. One  $x$ -intercept of  $f(x)$  is 2 units to the right of an  $x$ -intercept of  $g(x)$ .

5. What is the product of  $(x + 5)(x^2 + x - 6)$ ?

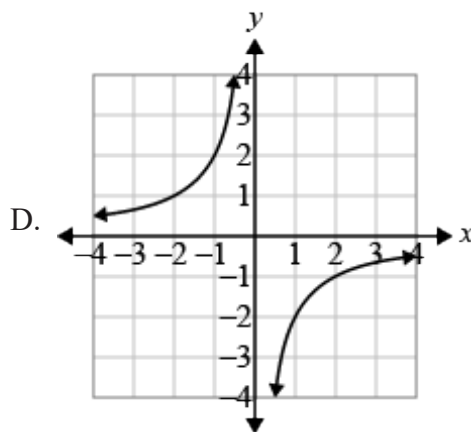
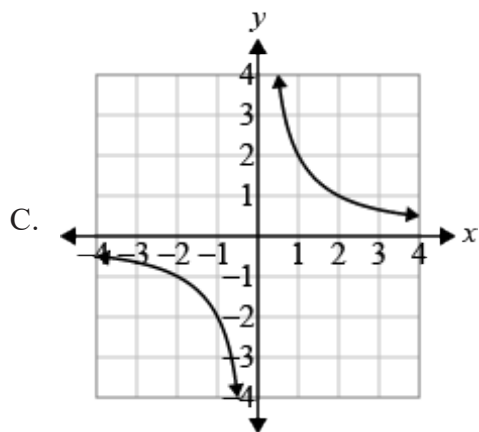
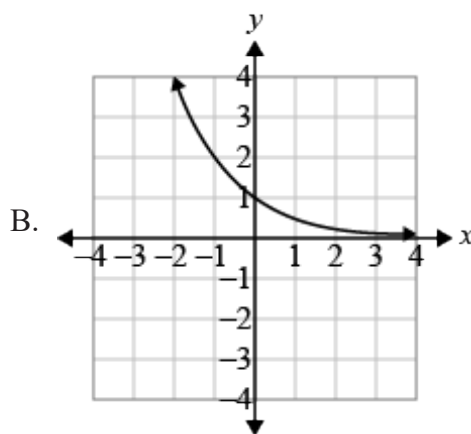
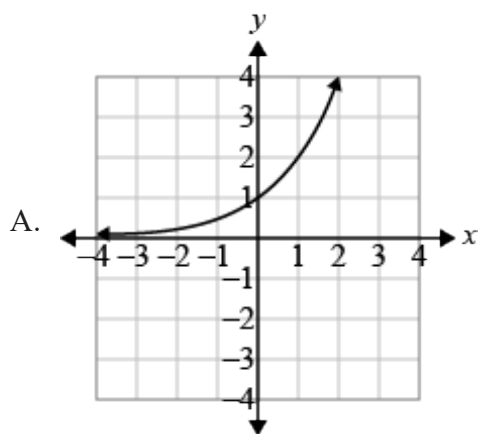
A.  $x^3 + x^2 + 5x - 30$

B.  $x^3 + x^2 - 6x - 30$

C.  $x^3 + 6x^2 + x - 30$

D.  $x^3 + 6x^2 - x - 30$

6. Which graph models the equation  $y = \frac{2}{x}$ ?



7. Which expressions have a product that is an irrational number? Select **all** that apply.

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

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

C.  $\sqrt{2} \cdot \sqrt{8}$

D.  $\frac{4}{9} \cdot \sqrt{\frac{4}{9}}$

E.  $\sqrt{25} \cdot \sqrt{5}$

F.  $\frac{5}{7} \cdot 3.3333\ldots$

8. A student factored the expression  $2x^2 + x - 3$  to determine the zeros of the function it defines. The student's work is shown.

Step 1:  $(2x + 3)(x - 1)$

Step 2:  $2x + 3 = 0$  and  $x - 1 = 0$

Step 3: The zeros are at  $x = \frac{3}{2}$  and  $x = -1$ .

The student made an error. Which statements are true? Select **all** that apply.

A. An error was made factoring the expression in step 1.

B. An error was made solving the equations from step 2.

C. The zeros of the function are at  $x = -\frac{3}{2}$  and  $x = 1$ .

D. The zeros of the function are at  $x = -\frac{2}{3}$  and  $x = 1$ .

E. The zeros of the function are at  $x = -\frac{1}{2}$  and  $x = 3$ .

F. The zeros of the function are at  $x = \frac{1}{2}$  and  $x = -3$ .



9. A worker adds water to an empty 6-foot tall storage tank at a rate of 2 cubic feet per minute. The tank is in the shape of a right circular cylinder.

Which piece of information is needed to know how long it will take to fill the tank?

- A. the weight of one gallon of water
- B. the radius of the base of the tank
- C. the time the worker starts to add water
- D. the material that was used to make the tank

10. The first term,  $a_1$ , of a sequence is 4.

4, 8, 16, 32, 64, ...

Which formula models the sequence when  $n = 1, 2, 3, 4, \dots$ ?

- A.  $a_n = 2(4^{n-1})$
- B.  $a_n = 2(4^n)$
- C.  $a_n = 4(2^{n-1})$
- D.  $a_n = 4(2^n)$

11. Use the table to answer the question.

$x$	$f(x)$
-4	13
-2	7
2	-5
4	-11

Which function models the values in the table?

- A.  $f(x) = -6x - 5$
- B.  $f(x) = -3x + 1$
- C.  $f(x) = -2x - 6$
- D.  $f(x) = -x - 3$
12. A teacher drew a figure. A student correctly said, "The figure is part of a line."

Which name BEST describes the figure?

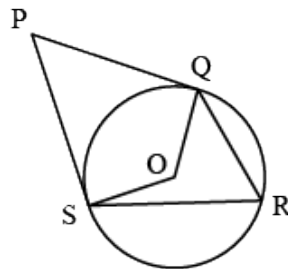
- A. a line segment
- B. a parallel line
- C. an angle
- D. a circle

13. A teacher shows a right triangle XYZ to a student. The teacher knows that  $XZ = 5 \sin 23^\circ$ . A student claims that  $XZ = 5 \cos 67^\circ$ .

Which statement explains the student's claim?

- A. The student is wrong and should have used  $23^\circ$  instead of  $67^\circ$ .
- B. The student is wrong and should have used tangent instead of cosine.
- C. The student is correct because the cosine of an angle is the same as the sine of the complement.
- D. The student is correct because the cosine of an angle is the same as the sine of the supplement.

14. In the diagram, O is the center of the circle.



Which statements are true? Select **all** that apply.

- A.  $\angle SPQ$  is a central angle.
- B.  $\angle SOQ$  is a central angle.
- C.  $\angle PSR$  is an inscribed angle.
- D.  $\angle SRQ$  is an inscribed angle.
- E.  $\angle QPS$  is a circumscribed angle.
- F.  $\angle QRS$  is a circumscribed angle.

15. Which equations represent lines that are parallel to the line represented by  $4x - y = 2$ ?  
Select **all** that apply.

A.  $-4x = y + 1$

B.  $-\frac{1}{4}x = y + 2$

C.  $4x = y + 4$

D.  $y = -\frac{1}{4}x + 2$

E.  $y = \frac{1}{4}x + 4$

F.  $y = 4x + 1$

**Maine Through Year Assessment High School  
Paper Item Type Sampler Answer Key  
Mathematics**

Sequence	Key	Points
1.	B	1
2.	A, F	1
3.	Part A: B Part B: C	2
	Part A or Part B	1
4.	Part A: B, E Part B: B	2
	Part A or Part B	1
5.	D	1
6.	C	1
7.	A, E	1
8.	B, C	1
9.	B	1
10.	C	1
11.	B	1
12.	A	1
13.	C	1
14.	B, D, E	1
15.	C, F	1