

Student Name: \_\_\_\_\_



# Mathematics Test Booklet Grade 9

## Paper-Based Item Sampler

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Alaska Department of Education & Early Development



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## Part 1

# Mathematics

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Answer  $-3$  is shown here.

Answer  $\frac{1}{2}$  is shown here.

Answer  $.75$  is shown here.

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## **Mathematics – Grade 9 Part 1**

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Make sure you have marked all your answers in your answer document clearly and that you have completely erased any marks you do not want. When you are finished, close your test booklet and answer document. Then raise your hand.

1. The first four terms of a sequence are shown below.

18, 25, 32, 39, ...

Which expression can be used to find the  $n$ th term of the sequence?

- A.  $7 + 18(n - 1)$
- B.  $7 + 18n$
- C.  $18 + 7(n - 1)$
- D.  $18 + 7n$

2. A system of equations is shown below.

$$y = x^2 + 1$$

$$y = 3x + 11$$

Which coordinate pair is a solution to the system of equations?

- A.  $(-5, 26)$
- B.  $(-5, 5)$
- C.  $(-2, 5)$
- D.  $(2, 5)$

3. An expression is shown below.

$$\frac{4^5 \cdot 4^{-3}}{4^{-7}}$$

Which expression is equivalent to the given expression?

- A.  $4^4$
- B.  $4^5$
- C.  $4^9$
- D.  $4^{15}$

4. The momentum of an object,  $p$ , is determined by its mass,  $m$ , and its velocity,  $v$ . The formula  $p = mv$  shows this relationship.

Which equation shows the formula  $p = mv$  correctly solved for  $v$ ?

- A.  $v = p - m$
- B.  $v = pm$
- C.  $v = \frac{m}{p}$
- D.  $v = \frac{p}{m}$
5. A website surveys 250 of its members. Each member is asked whether he or she is younger than 35 years old and whether he or she is married. The two-way frequency table summarizes the results of the survey.

**Website Survey Results**

	<b>Younger than 35</b>	<b>35 or Older</b>	<b>Total</b>
<b>Married</b>	88	52	140
<b>Not Married</b>	91	19	110
<b>Total</b>	179	71	250

Which statement about the members the website surveyed is true?

- A. Of the surveyed members that are younger than 35, under half are married.
- B. Of the surveyed members that are married, under half are younger than 35.
- C. Of the surveyed members that are 35 or older, under one-third are married.
- D. Of the surveyed members that are not married, over 90% are younger than 35.

6. Maria sells collectible stamps. Ted sells collectible coins. The amounts of each of their last 8 sales are shown below.

<b>Maria</b>	\$2	\$18	\$22	\$22	\$24	\$2	\$30	\$31
<b>Ted</b>	\$31	\$35	\$36	\$38	\$41	\$41	\$44	\$170

Which measure is most appropriate to compare the centers of Maria's and Ted's last 8 sales?

- A. mean
  - B. median
  - C. range
  - D. standard deviation
7. Kelly owns a gym. She has different rates for youth and adults. Both rates depend on  $x$ , the number of visits one youth or one adult makes in a month.
- She uses the function  $f(x)$  to determine the monthly charge for a youth.
  - She uses the function  $g(x)$  to determine the monthly charge for an adult.

What does the function  $f(x) + g(x)$  represent?

- A. The total monthly charge for one youth and one adult who each make  $x$  visits per month.
- B. The total monthly charge for a total of  $x$  youths and adults who each make  $x$  visits per month.
- C. The total monthly charge for  $x$  youths and  $x$  adults who each make  $x$  visits per month.
- D. The total monthly charge for  $x$  youths and  $x$  adults who each make  $x$  visits per month for  $x$  months.

8. Lloyd solves the equation  $24x + 18(x - 2) = 216$  for  $x$ . Some of his steps are shown below.

Step 1:  $24x + 18(x - 2) = 216$

Step 2:  $24x + 18x - 36 = 216$

Step 3:  $42x - 36 = 216$

Step 4:  $42x = 252$

Which statement best describes what Lloyd did to get from Step 2 to Step 3?

- A. combined like terms
- B. used the distributive property
- C. used the commutative property
- D. added the same quantity to both sides of the equation

## Part 2

### Mathematics

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## **Mathematics – Grade 9 Part 2**

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9. An expression is shown.

$$81x^4 - 1$$

Jake rewrites the expression as a difference of squares so he can factor it. Which option shows how Jake could rewrite the expression?

- A.  $(9x^2) - 1^2$
  - B.  $(9x^2)^2 - 1^2$
  - C.  $(9x)^4 - 1^2$
  - D.  $(9x)^4 - 1^4$
10. Wallace is a book editor. He uses the function  $c(x)$  to determine the amount he will charge, in dollars, to edit a book with  $x$  pages.

Which statement best explains what the range of Wallace's function is?

- A. The range is all whole numbers because a page must have a whole number of edits.
- B. The range is all whole numbers because a book must have a whole number of pages.
- C. The range is all positive decimals rounded to the nearest hundredth because the amounts charged are represented as dollars and cents.
- D. The range is all positive and negative decimals rounded to the nearest hundredth because the amounts charged or gained are represented as dollars and cents.

11. Some input and output values for a function,  $f$ , are shown in the table.

Input	Output
2	5
5	4
10	5

Which equation or equations describes all the values of  $f(5)$ ?

- A.  $f(5) = 4$
  - B.  $f(5) = 2$
  - C.  $f(5) = 2$  and  $f(5) = 10$
  - D.  $f(5) = 2$ ,  $f(5) = 4$ , and  $f(5) = 10$
12. Toby is an electrician. He charges an \$80 flat fee to go to a person's house for a repair. He also charges \$45 per hour for the repair.
- Which equation can be used to determine Toby's total charge in dollars,  $y$ , to make a repair that takes  $x$  hours?
- A.  $x = 45y + 80$
  - B.  $x = 80y + 45$
  - C.  $y = 45x + 80$
  - D.  $y = 80x + 45$
13. Mila estimates that the value of her house increases by 2.5% each year. In 2015, the value of her house was \$195,000.

Which statement explains how Mila can estimate what the value of her house will be in 2020?

- A. Multiply 195,000 by the product of 0.025 and 5.
- B. Multiply 195,000 by the product of 1.025 and 5.
- C. Multiply 195,000 by  $0.025^5$ .
- D. Multiply 195,000 by  $1.025^5$ .

14. Julia orders boxes of books for her bookstore. Each box contains  $m$  books. Each book costs the same amount. To determine the cost,  $C$ , of a box of books, in dollars, she uses the equation shown.

$$C = xm$$

Select ALL the options that represent the units for  $x$  and the units for  $m$ .

- A. books per box
- B. books per dollar
- C. boxes per book
- D. boxes per dollar
- E. dollars per box
- F. dollars per book

15. An inequality is shown.

$$\frac{4 + x}{12 + x} \geq \frac{2}{3}$$

Select ALL the values of  $x$  for which the inequality is true.

- A. 4
- B. 7
- C. 8
- D. 12
- E. 16

## Mathematics – Grade 9 Part 2

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16. Carter is reading a book with 680 pages. He has already read 240 pages. He plans to read 40 pages per day for  $x$  days until he finishes the book. He writes the equation shown to determine how many days it will take to finish the book.

$$0 = 680 - 240 - 40x$$

How many days must Carter read 40 pages per day to finish the book?

Enter your answer in the gridded response area on the answer document.

17. Michael starts a website for people in his town to share news and photos. Before officially launching the website, he has his friends and family sign up. Then, he uses the equation shown below to estimate the number of users,  $y$ , who will have signed up  $x$  weeks after he officially launches the website.

$$y = 82(1.045)^x$$

What is the rate of growth, in decimal form, Michael expects each week after launching the website?

Enter your answer in the gridded response area on the answer document.

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