

Arkansas Comprehensive Testing, Assessment & Accountability Program

Algebra I Midyear End of Course Examination Released Item Booklet

January 2005 Administration

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- **1.** Which is an equation?
 - * A. $3x^2 + 7x = -4$
 - B. 6x + 8y
 - C. 7x + 5x 5 18 < 5
 - D. 7(x + 3) 2(x 5)
- 2. The ticket sales for a community play totaled \$2,250. The cost was \$8 for adults and \$5 for youths. There were 4 times as many youth tickets sold as adult tickets sold. Which algebraic sentence could be used to determine how many tickets of each type were sold?
 - * A. 2,250 = 8x + 5(4x)
 - B. 2,250 = 8(4x) + 5x
 - C. 2,250 = (8)(5)(4x)
 - D. 2,250 = 4x(8x + 5x)

Use the chart below to answer question 3.

Sport	1990–1991 Season	2000–2001 Season	
Hockey	\$271,000	\$1.4 million	
Basketball	\$823,000	\$3.5 million	
Baseball	\$597,537	\$2.26 million	
Football	\$430,000	\$1.2 million	

- **3.** The average salaries of 4 major sports are shown above for the years 1990–1991 and 2000–2001. Which statement is correct when describing the data?
 - A. For both seasons, the average hockey salary was the lowest.
 - B. Baseball had the largest increase from the 1990–1991 season to the 2000–2001 season.
 - * C. For both seasons, the average basketball salary was the highest.
 - D. For both seasons, the average football salary was the lowest.

Use the graph below to answer question 4.



- **4.** The graph above shows the total profit of swing sets sold. What are the zeros of the graph?
 - A. (0, 0) and (70, 700)
 - * B. (10, 0) and (70, 0)
 - C. (20, 400) and (60, 400)
 - D. (40, 625) and (50, 600)
- 5. Sound travels through air at about 8.7×10^{-5} times the speed of light. Which is another way to represent 8.7×10^{-5} ?
 - A. 0.0000087
 - * B. 0.000087
 - C. 870,000
 - D. 8,700,000

6. Bill had a piece of lumber *x* feet long. He cut a new length of lumber 2 feet longer than one-third of the original length of lumber. Which expression represents the length of the new piece of lumber?

A.
$$\frac{1}{3}x + 2$$

B. $\frac{1}{3}(x + 2)$
C. $3x + 2$
D. $3(x + 2)$

*

- 7. Ellen bought beef and pork. She bought $7\frac{1}{2}$ pounds of beef and $5\frac{1}{4}$ pounds of pork. The beef cost \$3 per pound. The total bill was \$33.00. What was the cost of the pork per pound?
 - A. \$0.27B. \$1.00
 - * C. \$2.00
 - D. \$5.57

Use the table below to answer question 8.

				1	1				
Fertilizer	0	1	2	3	4	5	6	7	8
Corn yield	58	60	59	61	63	66	65	67	70

Scott's Crop Report

- **8.** Scott is a farmer and grows corn. He records the number of pounds of fertilizer he uses and the corn yield (in bushels). Which is a correct statement representing Scott's data?
 - A. Each pound of fertilizer yields 60 bushels of corn.
 - B. The corn yield generally decreases as the fertilizer increases.
 - C. If Scott uses 2.5 pounds of fertilizer, he will grow 60 bushels of corn.
 - * D. The corn yield generally increases as the fertilizer increases.
- **9.** Mark earns \$40,000 per year and receives a raise of \$1,000 per year. Which equation represents his income level after *t* years?
 - A. I = (1,000 + t) + 40,000
 - B. I = 1,000 (40,000 + t)
 - * C. I = 1,000t + 40,000
 - D. I = 40,000t + 1,000
- **10.** Completely factor:

$$x^2 + 3x - 10$$

- * A. (x 2)(x + 5)B. (x - 1)(x + 10)C. (x + 1)(x - 10)
 - D. (x + 2)(x 5)

- **11.** A parking lot has 31 spaces for cars. Which type of numbers best represent the possible number of cars in the parking lot?
 - A. integers
 - B. rationals
 - C. reals
 - * D. counting
- 12. William found an equation to calculate the number of diagonals (D) in a polygon with *n* sides:

$$D = \frac{n(n-3)}{2}$$

A polygon with 54 diagonals has how many sides?

A. 9
* B. 12
C. 27
D. 30

Use the matrix below to answer question 13.

	А	В	С
X	-3	2	0
Y	_ 2	1	-5

13. The matrix above represents three points that form a triangle when graphed. When the matrix above is multiplied by the scalar 3, what is the result?



- **14.** Which set represents a function?
 - A. $\{(1, 1), (1, 2), (1, 3)\}$
 - B. $\{(0, 2), (2, 4), (2, 6)\}$
 - C. $\{(0, 0), (1, 0), (0, 1)\}$
 - * D. {(1, 0), (2, 1), (3, 1)}

- 15. The mass of 1 hydrogen atom is 1.67×10^{-24} grams. What is the approximate mass of 60,000 hydrogen atoms?
 - A. 2.783×10^{-29} grams
 - B. 2.783×10^{-27} grams
 - C. 1.002×10^{-21} grams
 - * D. 1.002×10^{-19} grams

Use the figure below to answer question 16.



- **16.** Jeff has an entertainment center with a triangular base, as shown above. What is the perimeter of the entertainment center's base?
 - * A. 4x + 11
 - B. 4x + 17
 - C. $2x^3 + 11$
 - D. $2x^3 + 17$
- 17. When x = -3, what is the value of $5x^2$?
 - A. -45
 - B. -30
 - * C. 45
 - D. 225
- **18.** Carolyn printed her history paper. The printer operated at a speed of 3 pages per minute. How many minutes did it take to print half of a 12-page paper?
 - * A. 2
 - B. 4
 - C. 6
 - D. 9

Use the information below to answer question 19.

\$129,900	\$219,500
\$129,900	\$264,900
\$157,900	\$264,900
\$159,500	\$264,900
\$165,900	\$285,000

- **19.** Bryan kept track of the sales of 10 townhouses as shown above. What is the mode of the sales for the townhouses Bryan tracked?
 - A. \$129,900
 - B. \$192,700
 - C. \$204,230
 - * D. \$264,900
- **20.** Which equation is written using function notation?
 - A. y = mx + b
 - * B. f(x) = 5x + 7
 - C. f = 3
 - D. 2(3x) = 7

- 21. Bill's Bait Shop has a monthly operating $\cot (C)$ of $C = 2(x - 15)^2 - (2x - 7)$, where x is the number of days the shop is open each month. Bill's shop was open for 25 days last month. What was Bill's operating cost that month?
 - A. \$143
 - * B. \$157
 - C. \$357
 - D. \$364
- 22. Jeremy has $2\frac{3}{4}$ cups of plaster. He needs $5\frac{1}{2}$ cups of plaster to fill the mold he is using. Jeremy can solve the equation $2\frac{3}{4} + x = 5\frac{1}{2}$ to determine how much more plaster is needed. How many more cups of plaster does Jeremy need?
 - A. $2\frac{1}{2}$
 - * B. $2\frac{3}{4}$
 - C. $3\frac{1}{4}$
 - D. $8\frac{1}{4}$

Use the data below to answer question 23.

Student heights (inches): 62, 66, 67, 69, 73, 73, 80

- 23. Which is true of the data set above?
 - * A. The mode is larger than the median.
 - B. The mode and median have the same value.
 - C. There is no mode.
 - D. The median is larger than the mode.

Use the table below to answer question 24.

Kyle's Electric Bills

Total Cost	Energy Used (kWh)
\$107	1,352
\$125	1,563
\$93	1,163
\$102	1,275

- **24.** Kyle's 4 most recent electric bills are shown in the table above. What is the independent variable in this situation?
 - A. number of bills
 - B. total cost
 - C. cost per unit of energy used
 - * D. energy used

- **25.** Human blood cells measure 0.00076 mm in diameter. What is this value written in scientific notation?
 - A. $7.6 \times 10^{-5} \text{ mm}$
 - * B. $7.6 \times 10^{-4} \text{ mm}$
 - C. 7.6×10^3 mm
 - D. 7.6×10^4 mm
- **26.** A photographer charges \$2.50 for developing one roll of film plus \$0.75 for each panoramic picture. Which expression represents the total cost of developing one roll of film with *p* panoramic pictures?
 - A. \$2.50p + \$0.75
 - B. \$2.50*p* \$0.75
 - * C. \$2.50 + \$0.75p
 - D. p(\$2.50 + \$0.75)
- 27. A furniture store has tables (t) and chairs (c) stored in boxes. One box can hold either 2 chairs or 1 table. This situation is represented by the equation below:

Number of boxes = $\frac{c}{2} + t$

The store has 480 chairs and 128 tables. How many boxes does the furniture store have?

A.	304
[∗] В.	368
C.	544

D. 1,088

Use the matrix below to answer question 28.

Ha	Software	
Computer	18	9
Printer	11	4

28. Carl's Computer Company uses a matrix to keep record of computer parts inventory. The inventory on October 1st is listed in the matrix above. By November 30th, the company wanted to triple the inventory. Which matrix represents the tripled inventory?

A.	Ha Computer Printer	rdware 15 8	Software $\begin{bmatrix} 6 \\ 1 \end{bmatrix}$
В.	Ha Computer Printer	rdware 21 14	Software $12 \\ 7 \end{bmatrix}$
C.	Ha Computer Printer	rdware 36 22	Software
* D.	Ha Computer Printer	rdware 54 33	Software 27 12

Use the table below to answer question 29.

Cedar (Age, Height)	Aspen (Age, Height)	Pine (Age, Height)	Oak (Age, Height)
(1, 1)	(1, 1.5)	(2, 1)	(3, 3)
(1, 1.5)	(2, 3)	(2, 2)	(3, 2)
(2, 2.5)	(3, 4)	(4, 3.5)	(5, 5)

- **29.** James is studying 4 types of trees. He recorded the age (in years) and height (in feet) of 3 trees from each tree type, shown above. Which tree type represents a function?
 - A. Cedar
 - * B. Aspen
 - C. Pine
 - D. Oak
- **30.** The mass of one electron is 9.28×10^{-28} grams. One atom of radium has 88 electrons. What is the approximate mass of electrons in one atom of radium expressed in scientific notation?
 - A. 8.17×10^{-30}
 - B. 8.17×10^{-28}
 - * C. 8.17×10^{-26}
 - D. 8.17×10^2

Use the equations below to answer question 31.

$$y = mx + b$$
$$3x = 9$$
$$n = 1 + t^{2}$$

- **31.** Which describes the **letters** in the equations above?
 - A. domains
 - B. exponents
 - C. products
 - * D. variables

Use the graph below to answer question 32.



- **32.** Markus owes his parents \$70. He saved \$30 every 2 weeks. How much money will he have after 10 weeks and after paying his parents \$70?
 - * A. \$80
 - B. \$150
 - C. \$220
 - D. \$230

33. A student put together a data set of approximate related temperatures in the Fahrenheit and Celsius scales:

 $\{(0, -18), (32, 0), (70, 21), (100, 38), (212, 100)\}$

What is the domain of this relation?

- A. 118
- B. 212
- C. {-18, 0, 21, 38, 100}
- * D. {0, 32, 70, 100, 212}
- **34.** Solve:

4x - 15 < 9

- A. $x \le -\frac{3}{2}$ B. $x \ge \frac{3}{2}$
- * C. x < 6
 - D. *x* < 96
- **35.** The length of a flu virus cell is 1.0×10^{-7} meters. What is the length of the flu virus cell in standard notation?
 - * A. 0.0000001 meters
 - B. 0.000001 meters
 - C. 1,000,000 meters
 - D. 10,000,000 meters

Use the function below to answer question 36.

S(h) = 1,116 - 4.04h

- **36.** The function above approximates the speed of sound (in feet per second) at an altitude of h (in thousands of feet). To the nearest whole number, what is the value of S at an altitude of 10,000 feet (h = 10)?
 - A. 111 feet per second
 - B. 274 feet per second
 - * C. 1,076 feet per second
 - D. 2,199 feet per second
- **37.** What is the greatest common factor of $3ax^3$ and $9a^2x^2$?
 - A. 3*ax*
 - * B. $3ax^2$
 - C. 6*ax*
 - D. $9a^2x^3$

Use the table below to answer question 38.

# of Tickets Sold	Total Cost for the Group
1	\$7.50
2	\$15.00
3	\$22.50
4	\$30.00
5	\$37.50

- **38.** Joleen worked at a movie theater. She kept a list by the cash register to determine how much to charge groups of *n* people for tickets. Which expression represents the total cost for a group of *n* people?
 - A. 5*n* + 37.50
 - B. 7.50 + n
 - C. 7.50 + 5n
 - * D. 7.50*n*

- **39.** Shawn has a collection of 50 stamps worth \$18.30. Some stamps are worth 37 cents each and the rest of the stamps are worth 25 cents each. Which algebraic sentence could Shawn use to determine how many stamps he has of each type?
 - * A. 0.37x + 0.25(50 x) = 18.30
 - B. 0.37x + 0.25(x 50) = 18.30
 - C. (0.37 + 0.25) + (50 x) = 18.30
 - D. (0.37 + 0.25) + (x 50) = 18.30

Use the matrix below to answer question 40.

	Price A	Price B	Price C
Kites	22	10	12
Windsocks	21	3	10

40. The Wind Shop carries kites and windsocks that sell in 3 price ranges. Their present inventory is represented in the matrix above.

In April, the store adds 6 kites that sell for price A, 4 kites for price B, and 2 kites for price C to the shelves. Also, the windsock inventory is doubled. Which matrix represents the new inventory at the Wind Shop?

		Price A	Price B	Price C			Price A	Price B	Price C
A.	Kites	44	20	24	B.	Kites	44	20	24
	Windsocks	42	6	20		Windsocks	27	7	12

		Price A	Price B	Price C			Price A	Price B	Price C
C.	Kites	28	14	14	* D.	Kites	28	14	14
	Windsocks	27	7	12		Windsocks	42	6	20

- **41.** Which algebraic statement can be solved?
 - A. -3(x-5) 2(x+1)
 - B. 3x + 2x 6x
 - * C. 4(x 2) 3(x + 1) = 11
 - D. 6*x* − 1
- **42.** A train travels 125 miles per hour. How many hours will it take the train to travel 3,000 miles?
 - A. 0.04
 - B. 2.4
 - C. 4
 - * D. 24

43. The function f(x) = 70 + 5x represents the amount of money Jenny has in her bank account after *x* weeks. How much money does she have in the bank account after 8 weeks?

44. Factor:

*

$$x^{2} + 3x + 2$$
A. $6x^{3}$
* B. $(x + 2)(x + 1)$
C. $(x - 2)(x - 1)$
D. $(x - 2)(x + 1)$

Use the matrices below to answer question 45.

Sw	eatpants	Sw	Sweatshirts		
Small	9	Small	12		
Medium	15	Medium	19		
Large	22	Large	28		
X-Large	13	X-Large	20		

45. A store carries sweatpants and sweatshirts. The store keeps track of inventory using two separate matrices as shown above. The store has combined the sweatshirts and sweatpants to make outfits. Which matrix shows how many sweatshirts were left over after all the outfits were made?

		٦					٦			
* A.	3]	B.	21				
	4					34				
	6					50				
	7					33				
	L -	-				_	_			
	9	12								
C.	15	19		J	D.	9	15	22	13	
	22	28				12	19	28	20	
	13	20								

- 46. A computer program can sort a list of n items in order after going through the list n(n 1) times. This is equivalent to $n \cdot n n$. Which algebraic property is demonstrated?
 - A. associative
 - B. commutative
 - * C. distributive
 - D. reflexive

- **47.** Nita is shopping for school clothes. She has a total of \$45.00 to spend. She has already purchased a shirt for \$12.50 and pair of pants for \$15.00. What is the most she can pay for other items and stay within her total?
 - * A. \$17.50
 - B. \$27.50
 - C. \$30.00
 - D. \$32.50

48. Jamie's dad records his mileage each time he fills his car with gas. The number of miles he traveled on 7 full tanks of gas is listed below.

220, 196, 205, 165, 220, 180, 190

What is the mean to the nearest whole mile?

- A. 165
- B. 196
- * C. 197
 - D. 220

Use the equation below to answer question 49.

$$f(x) = x^2 + x + 1$$

- **49.** What is *f*(3)?
 - A. 7
 - B. 9
 - C. 10
 - * D. 13

Use the graph below to answer question 50.



- 50. Brent kicked a football. The graph above shows the height of the football, *h*, at time *t*. When was the football at a height of zero?
 - A. $\frac{1}{2}$ second
 - B. 1 second
 - C. $1\frac{1}{2}$ seconds
 - * D. 2 seconds

Use the table below to answer question 51.

City	Temperature		
Chicago	-2°F		
Des Moines	-12°F		
Denver	20°F		
Houston	34°F		
New Orleans	34°F		

- **51.** The table above lists the low temperatures for one day in January for some U.S. cities. What type of number are the temperatures listed?
 - * A. integers
 - B. irrational
 - C. whole
 - D. counting

Use the figure below to answer question 52.



- **52.** The state of Wyoming is in the shape of a rectangle. The perimeter of Wyoming is 1,280 miles. The width of the state is 90 miles less than the length. What is the length of Wyoming?
 - A. 275 miles
 - B. 297.5 miles
 - C. 342.5 miles
 - * D. 365 miles

- 53. Margie is choosing a caterer for her graduation party. Jeff's Catering charges \$11 per guest. Sarah's Dinner Service charges a set-up fee of \$80 plus \$7 per guest. How many guests would Margie have to invite for the catering costs to be the same for each company?
 - A. 4
 - B. 10
 - C. 13
 - * D. 20
- 54. The cheerleaders held a car wash to raise money. They started with \$80 in their account and earned \$3 per car washed (c). Which equation reflects the new balance (b) in their account?

A.
$$b + 3c = 80$$

B. $b = 3c + 80$
C. $3b = c + 80$
D. $c = 80 - 3b$

55. Completely factor:

$$a^3b^2 - a^2b^3$$

* A.
$$a^{2}b^{2}(a - b)$$

B. $a^{2}b^{2}(a^{2} - b)$
C. $a^{2}b^{3}(a - 1)$
D. $a^{3}b^{3}(a - 1)$



56. Which graph is a function?



- **57.** At Cedarville Accounting Firm, a junior accountant earns x dollars each year. A senior accountant earns \$5,000 less than twice the salary of a junior accountant. Which expression represents the senior accountant's annual earnings?
 - * A. 2x 5,000

B.
$$2(x - 5,000)$$

- C. 2(5,000 x)
- D. 5,000 2x

Use the information below to answer question 58.

$$I \begin{pmatrix} 4(x-1) = 3(x+2) - 7 \\ 4x - 4 = 3x + 6 - 7 \\ II \begin{pmatrix} 4x - 4 = 3x - 1 \\ 4x = 3x - 1 \\ III \begin{pmatrix} 4x = 3x - 5 \\ 1V \begin{pmatrix} x = -5 \end{pmatrix} \end{pmatrix}$$

- **58.** Which step in the work shown above is incorrect?
 - A. I
 - B. II
 - * C. III
 - D. IV

59. Mrs. Marks made a stem-and-leaf plot of her students' homework scores.



What is the mode of the data?

- A. 12
 * B. 21
 C. 27
 D. 36
- **60.** A compact disc is 0.0017 meters thick. Which expresses 0.0017 in scientific notation?
 - A. 1.7×10^{-4} * B. 1.7×10^{-3} C. 1.7×10^{3}
 - D. 1.7×10^4

CALCULATOR PERMITTED ON ALL ITEMS

ALGEBRA I OPEN-RESPONSE ITEM A

A. Johnson's Bus Company uses the equation below to determine the rate per person, in dollars, for groups to use the bus:

R(n) = 8 - 0.05(n - 80), where *n* is the number of people in the group

- 1. What is the rate per person for a group of 100 people? What is the bus company's income from this group? Show or explain all of your work even if you use mental math or a calculator.
- 2. By how much does the group size need to increase in order for each person's rate to decrease by \$0.50? Show or explain all of your work even if you use mental math or a calculator.

BE SURE TO LABEL YOUR RESPONSES (1) AND (2).

ALGEBRA I OPEN-RESPONSE ITEM B

- **B.** The Amazing Museum has a butterfly house of 1,200 butterflies. There are 3 types of butterflies, Swallowtail, Monarch, and Lacey, in a ratio of 5:3:2.
 - 1. The museum staff members randomly catch a butterfly, measure its wing span, and then let it go. Determine the probability that the first butterfly they catch is a Swallowtail butterfly. Show or explain all of your work even if you use mental math or a calculator.
 - 2. Using the ratio above, determine the number of each type of butterfly in the butterfly house. Show or explain all of your work even if you use mental math or a calculator.
 - 3. Each week for 5 weeks the museum adds 20 Swallowtails, 96 Monarchs, and 64 Laceys to the butterfly house. Determine the new ratio in lowest terms of butterflies in the house after 5 weeks. Show or explain all of your work even if you use mental math or a calculator.

BE SURE TO LABEL YOUR RESPONSES (1), (2), AND (3).

ALGEBRA I OPEN-RESPONSE ITEM C

- **C.** Linda and Cal are each saving money to buy a bicycle. The bicycles are \$500 each. Linda has \$100 and will save \$10 of her allowance each week. Cal has \$250 and will save \$5 of his allowance each week.
 - 1. Determine the number of weeks it will take each of them to save \$500. Show or explain all of your work even if you use mental math or a calculator.
 - 2. After how many weeks will Linda and Cal have the same amount of money? Show or explain all of your work even if you use mental math or a calculator.

BE SURE TO LABEL YOUR RESPONSES (1) AND (2).

ALGEBRA I OPEN-RESPONSE ITEM E

E. A bicycle race is divided into 4 segments. The length of each segment of the race is shown below.

Segment 1: 8 - (-3 + 7) miles Segment 2: $\frac{2\pi(2 \cdot 2 + 3)}{4}$ miles Segment 3: $\sqrt{6^2 + 3^2}$ miles Segment 4: $(3 - 4)^2$ miles

- 1. Determine the length of each segment of the race. Show or explain all of your work even if you use mental math or a calculator. Round each answer to the nearest tenth.
- 2. Determine the length of the entire race. Show or explain all of your work even if you use mental math or a calculator. Round your answer to the nearest tenth.

BE SURE TO LABEL YOUR RESPONSES (1) AND (2).

ALGEBRA I OPEN-RESPONSE ITEM F

- F. According to the U.S. Census, the population of the state of Arkansas during the year 2000 was 2.673×10^6 . The total population of the United States during the year 2000 was 2.814×10^8 .
 - 1. Determine the percent of the U.S. population that lived in Arkansas in 2000. Show or explain all of your work even if you use mental math or a calculator. Round your answer to the nearest hundredth of a percent.
 - 2. The land area of Arkansas is 52,068 square miles. Determine the number of people per square mile in Arkansas for the year 2000. Write your answer in scientific notation. Show or explain all of your work even if you use mental math or a calculator.

BE SURE TO LABEL YOUR RESPONSES (1) AND (2).

Released Items for Algebra I *

ltem	Content Standard/Goals	Expectation		
1	1	6		
2	2	3		
3	3	1		
4	4	4		
5	5	4		
6	1	5		
7	2	1		
8	3	1		
9	4	6		
10	5	2		
11	1	1		
12	2	4		
13	3	2		
14	4	3		
15	5	4		
16	5	1		
17	1	3		
18	2	1		
19	3	4		
20	4	1		
21	1	3		
22	2	1		
23	3	4		
24	4	5		
25	5	4		
26	1	4		
27	2	1		
28	3	2		
29	4	3		
30	5	4		
31	1	2		
32	3	3		
33	4	2		

ltem	Content Standard/Goals	Expectation		
34	2	2		
35	5	4		
36	4	1		
37	5	2		
38	1	4		
39	2	3		
40	3	2		
41	1	6		
42	2	1		
43	4	1		
44	5	2		
45	3	2		
46	1	7		
47	2	2		
48	3	4		
49	4	1		
50	5	3		
51	1	1		
52	2	4		
53	3	3		
54	4	6		
55	5	2		
56	4	3		
57	1	5		
58	2	1		
59	3	4		
60	5	4		
А	4	1		
В	2	1		
С	3	3		
E	1	3		
F	5	4		

*Only the predominant Content Standard/Goals and learning expectation is listed for the Algebra I items.