Arkansas Council of Teachers of Mathematics
Algebra I State Exam Spring 2008

Select the best answer for each of the following questions and mark it on the answer sheet provided. Be sure to read all the answer choices before making your selection. When you are finished with the multiple-choice questions, please attempt the tiebreaker questions.

1. The graph below shows the distribution of the cost of landscaping of a new home. If approximately $4,000 was spent on the total landscaping, approximately how much money was spent on the cost of the fence?

m∠ABC = 117.97°
m∠CBD = 42.95°
m∠DBE = 33.29°
m∠EBF = 45.85°
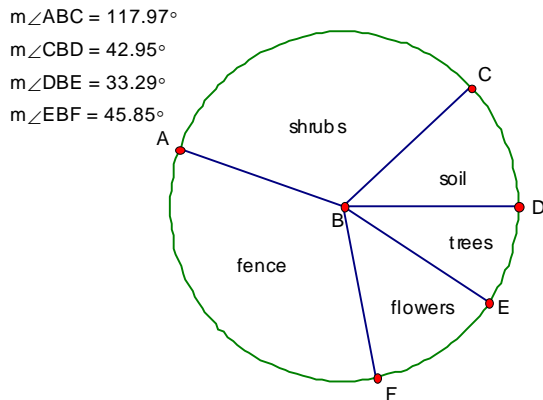
a) $1215
b) $240
c) $1540
d) $2000
e) $1333

2. The formula for finding the perimeter of a rectangle is $P = 2l + 2w$. Which equation solves for l in terms of w and P?

a) $l = \dfrac{P}{2w}$

b) $l = \dfrac{P + 2w}{2}$

c) $l = \dfrac{P - 2w}{2}$

d) $l = 2(P - 2w)$

e) $w = \dfrac{P - 2l}{2}$

3. Based on the graph below, what would the overdue charge be for 25 days?

Overdue Charges
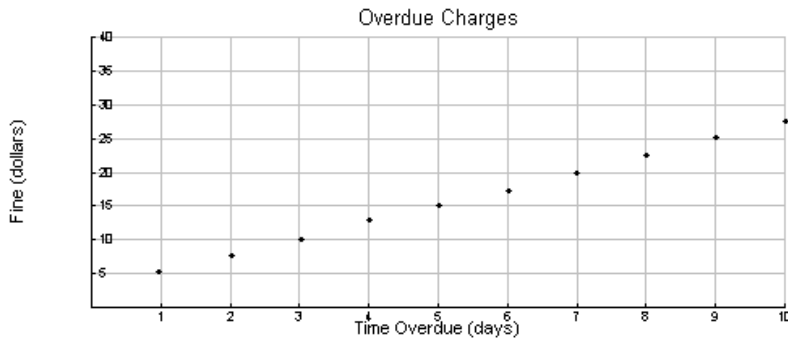
a) $15
b) $65
c) $115
d) $80
e) $40

4. One letter is randomly selected from the word "Mathematics." What is the probability that the selected letter appears twice in the word?

a) $\dfrac{3}{11}$

b) $\dfrac{6}{11}$

c) $\dfrac{6}{8}$

d) $\dfrac{3}{8}$

e) $\dfrac{3}{5}$

5. The graph below shows the distance of a car from home after t minutes. When is the *velocity* of the car zero?

a) $0 < t < 10$
b) $t = 25$
c) $t = 60$
d) $t = 10$
e) both $0 < t < 10$ and at $t = 25$
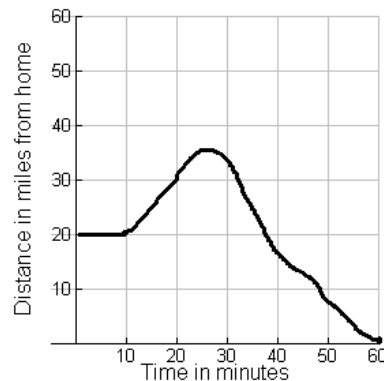
6. A season pass at Magic Springs and Crystal Falls is $79.99 per person. Regular daily admission is $45.99. Daily admission for children under 52″ tall and seniors 55 years old and older is $35.99 per day. Juan's family plans to go to Magic Springs three times this year. His family consists of himself (an 8th grader), his short 4 year-old sister, his two old grandparents and his not-so-old dad. Approximately how much money will Juan's family save if they purchase season passes rather than paying the daily admission?

   a) $600
   b) $400
   c) $300
   d) $200
   e) $100

7. What is the value of $f(x) = \dfrac{-4x}{x-3}$, for x = -3?

   a) 2
   b) undefined
   c) $\dfrac{-4}{3}$
   d) $\dfrac{-7}{6}$
   e) -2

8. You just received a brand new Visa credit card. You are allowed to charge up to $10,000, and you don't have to make any payments for an entire year. However, the annual interest rate on the unpaid amount is 24%, compounded monthly. You buy a new computer system for $2,600 and charge it to your new credit card. If you don't charge anything else and do not make any payments for a year, how much do you owe at the end of the year?

   a) $3,224
   b) $34,358.45
   c) $3,297.43
   d) $2,624
   e) None of the above

9. A survey is taken at an ice cream parlor. People are asked to list their two favorite flavors. Seventy-four list vanilla as one of their favorite flavors while forty-one list chocolate. If 16 people list both flavors and 10 list neither of these two flavors, how many people participated in the survey?

   a) 141
   b) 121
   c) 89
   d) 109
   e) 125

10. A function p matches each integer with its opposite. A function t matches each integer with the integer that is four greater than the integer. Compute the composition $(t \circ p)(8)$.

        a) 4
        b) 12
        c) -8
        d) -4
        e) -32

11. Simplify completely: $\dfrac{16x^5 y^8}{x^7 y^4} \bullet \left(\dfrac{x^3 y^2}{8xy}\right)^4$

    a) $\dfrac{x^6 y^8}{256}$

    b) $\dfrac{xy^6}{256}$

    c) $2y^5$

    d) $2x^4 y^9$

    e) $\dfrac{x^4 y^6}{32}$

12. Simplify completely: $\dfrac{4}{x+4} - \dfrac{7}{5x}$

    a) $\dfrac{-3}{4-4x}$

    b) $\dfrac{13x+4}{5x(x+4)}$

    c) $\dfrac{-28}{5x(x+4)}$

    d) $\dfrac{13x-28}{5x(x+4)}$

    e) $\dfrac{9x-7}{x+4}$

13. Your basketball team scores 79 points with no 3-point points. Each free throw x is worth 1 point. Each field goal y is worth 2 points. Which equation relates the number of free throws with the number of field goals?

    a) $y = 2x+1$

    b) $2x+y = 79$

    c) $x+y = 79$

    d) $x+2y = 79$

    e) $x+79 = 2y$

14. A roller skating rink charges $12 for admission and skate rental. If you bring your own skates, the admission is $8. You can buy a pair of roller skates for $80. How many times must you go skating to justify buying your own skates?
    a) at least 10 times
    b) at least 20 times
    c) at least 7 times
    d) at least 12 times
    e) at least 4 times

15. Solve the inequality: $7 \le 3x - 8 \le 22$
    a) $\dfrac{-1}{3} \le x \le \dfrac{14}{3}$
    b) $15 \le x \le 30$
    c) $5 \le x \le 10$
    d) $5 \ge x \ge 10$
    e) $-57 \le x \le -17$

16. Which ordered pair is not a solution of the inequality $y \ge 2x^2 - 7x - 10$?
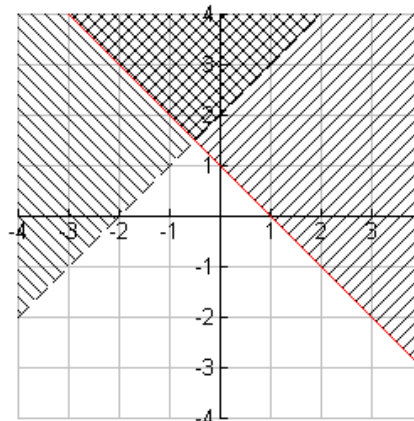   a) (0, 4)
    b) (-1, -1)
    c) (4, -13)
    d) (5, 15)
    e) (2, -12)

17. A student scored 91, 85, 79, 87 and 70 on five tests. What score would she need to make on the next test to have a mean score of at least 82?
    a) 65
    b) 70
    c) 75
    d) 80
    e) 85

18. Match the system of inequalities with the following graph:

a) $\begin{cases} y > 2 + x \\ y \ge 1 - x \end{cases}$

b) $\begin{cases} y \ge 2 + x \\ y \ge 1 - x \end{cases}$

c) $\begin{cases} y \le 2 + x \\ y < 1 - x \end{cases}$

d) $\begin{cases} y \ge 2 + x \\ y > 1 - x \end{cases}$

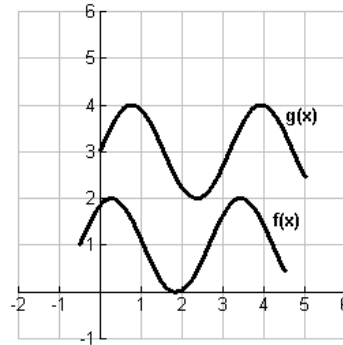e) $\begin{cases} y \ge 1 + x \\ y > 2 - x \end{cases}$

19. Solve the following equation: $2(x+3)^2 - 4 = 0$

    a) $x = -1$

    b) $x = 3 \pm \sqrt{2}$

    c) $x = 1$

    d) $x = -3 \pm \sqrt{2}$

    e) $x = -3 \pm \sqrt{6}$

20. Below, the graph of $g(x)$ is a transformation of the graph of $f(x)$. Choose the equation for $g(x)$ in terms of $f(x)$.

    a) $g(x) = f(x-1) + 2$

    b) $g(x) = f(x+1) + 2$

    c) $g(x) = f(x-1) - 2$

    d) $g(x) = f(x+1) + 2$

    e) $f(x) = g(x+2) - 1$

21. The population of Little Rock has been growing at an annual rate of 1.02% for the last 5 years. The population is now approximately 2,809,000. Find the approximate population of Little Rock 5 years ago.

    a) 2,663,000

    b) 3,098,000

    c) 2,670,000

    d) 2,755,000

    e) 2,810,000

22. Americans make almost 2 billion telephone calls each day. How many phone calls do Americans make in one year assuming that there are 365 days in a year?
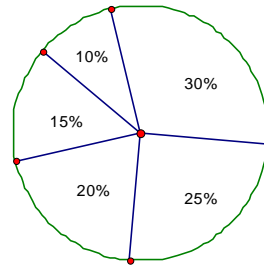
    a) 3.7×10^5

    b) 7.3×10^{12}

    c) 73×10^{12}

    d) 7.3×10^{11}

    e) 7.3×10^9

23. In a lake with 300 tagged fish, recapture results show that 12% of the fish are tagged. About how many fish are in the lake?

   a) 312

    b) 336

    c) 2500

    d) 250

    e) 3700

24. Which data set matches the relative frequency circle graph shown?

   a) $\{15, 18, 22, 25, 28\}$

   b) $\{20, 24, 30, 36, 45\}$

   c) $\{12, 18, 24, 30, 36\}$

   d) $\{9, 12, 18, 20, 24\}$

   e) $\{12, 18, 20, 24, 26\}$

25. The graph below shows Michael's distance over time as he jogs straight down the street in front of his home. Michael started from home (point A). During which time period was Michael jogging the fastest?

   a) A to B
   b) B to C
   c) C to D
   d) D to E
   e) E to F
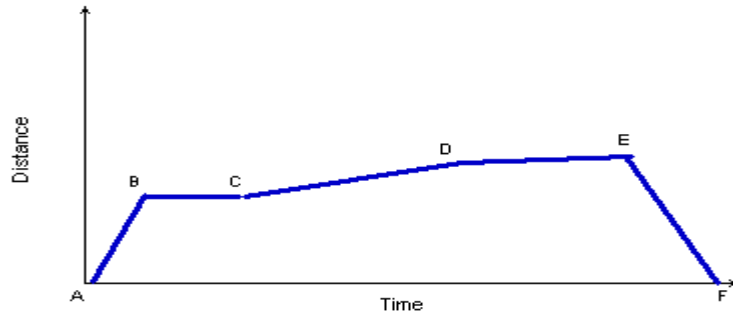
In the event of a tie, the following questions will be graded in order. *Please work them consecutively and show all your work.*

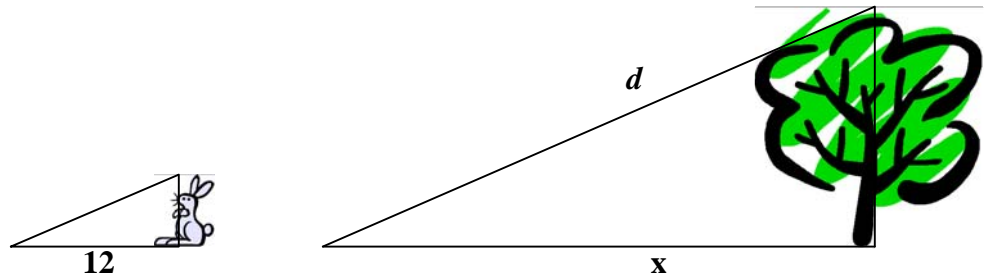**Tie-Breaker # 1**

Name _____

Your teacher is giving a test worth 150 points. There are 46 questions, some are worth three-points and some are five-point questions. How many of each are on the test?

Name _____

The tree below is 30 feet tall and casts a shadow x feet long. The bunny is one ft tall and casts a shadow 12 feet long. Solve for d, the distance from the top of the tree to the end of its shadow.

Tie-Breaker # 3

Name _____

Tara is standing at point *A* on the bank of a river that is 2.5 kilometers wide. She wants to reach point *B*, which is 15 kilometers upstream on the opposite bank of the river. She plans to row upstream to point *C* on the opposite shore and then run to *B*, as shown below. She can row upstream at a rate of 4 kilometers per hour and can run at 8 kilometers per hour. If her trip takes 3 hours, how far from *B* should she land?

A

15-x

D   C   x   B

15
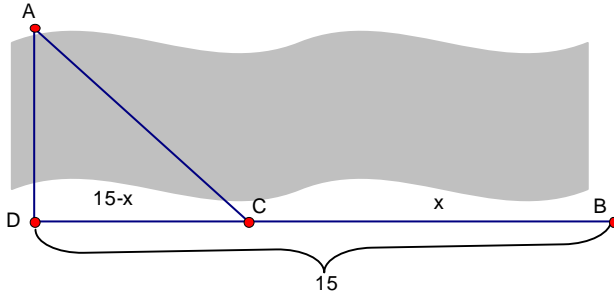
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Answer Key

1) e
2) c
3) b
4) b
5) e
6) d
7) e
8) c
9) d
10) d
11) a
12) d
13) d
14) b
15) c
16) c
17) d
18) a
19) d
20) a
21) c
22) d
23) c
24) c
25) a

Tie Breaker # 1:

Let x = # of 3 point questions
Let y = # of 5 point questions

$x + y = 46$
$3x + 5y = 150$

$-3x + -3y = -3(46)$
$3x + 5y = 150$

$2y = 12$
$y = 6$ five point questions
$x = 40$ three point questions

Tie-breaker # 2

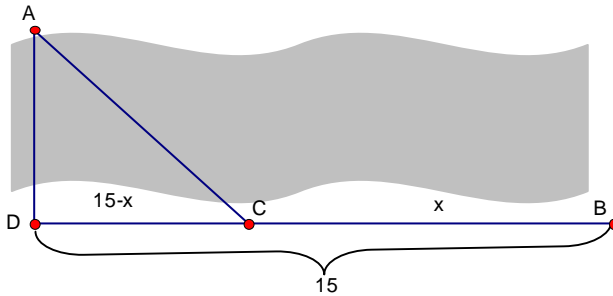$\dfrac{1}{12} = \dfrac{30}{x}$
$x = 360$
$30^2 + 360^2 = d^2$
$d^2 = 130,500$
$d \approx 361.248$ feet

Name _____

Tara is standing at point *A* on the bank of a river that is 2.5 kilometers wide. She wants to reach point *B*, which is 15 kilometers upstream on the opposite bank of the river. She plans to row upstream to point *C* on the opposite shore and then run to *B*, as shown below. She can row upstream at a rate of 4 kilometers per hour and can run at 8 kilometers per hour. If her trip takes 3 hours, how far from *B* should she land?

A diagram shows point A at top left, D at bottom left, C in the middle of the bottom, and B at bottom right. The vertical segment A–D is labeled; the bottom segment from D to C is labeled 15-x, from C to B is labeled x, and the total bottom D to B is labeled 15.

Tie-breaker # 3

$$D = rt$$

$$t = \frac{D}{r}$$

Let $d = \overline{AC}$

$$(2.5)^2 + (15 - x)^2 = d^2$$

$$d = \sqrt{(2.5)^2 + (15 - x)^2}$$

$$\frac{\sqrt{(2.5)^2 + (15 - x)^2}}{4} + \frac{x}{8} = 3$$

$$2\sqrt{(2.5)^2 + (15 - x)^2} + x = 24$$

$$\left(2\sqrt{(2.5)^2 + (15 - x)^2}\right)^2 = (24 - x)^2$$

$$4\left((2.5)^2 + (15 - x)^2\right) = 576 - 48x + x^2$$

$$4\left(6.25 + 225 - 30x + x^2\right) = 576 - 48x + x^2$$

$$25 + 900 - 120x + 4x^2 = 576 - 48x + x^2$$

$$3x^2 - 72x + 349 = 0$$

$$x = \frac{72 \pm \sqrt{\left((-72)^2 - 4(3)(349)\right)}}{2(3)}$$

$$x = \frac{72 \pm \sqrt{996}}{6}$$

$x = 17.260$ omit, must be less than 15 km

$x = 6.74$ km