Texas Alliance for Minorities in Engineering

2018 State STEM Competition

Middle School Math Test

Student Instructions

- This test is for students in 6th, 7th and 8th grades. If you are not in one of those grades, work with a test proctor to find the appropriate test.

- Leave the test booklet closed and wait until the proctor tells you to start.

- The test period will be 60 minutes and this test contains 60 multiple choice questions.

- This test includes topics covered in all middle school math classes.   The questions range in difficulty from easy to very challenging. Most students will NOT be familiar with all of the material on their test.

- There is no penalty for skipping a problem or answering incorrectly.

- You may write on this test. If you need scratch paper, please raise your hand and ask for some.

- Your score will be determined by the number of correct answers. All ties will be broken by awarding the place to the student having the most consecutive correct answers from the start of the test.

- You will not be permitted to leave the room while the test is in progress. If you finish early, you must remain in the room quietly until the test is completed. Any student causing a disturbance will be disqualified.

- **LEGIBLY** write your name, grade, and school on the right side of the answer/Scantron sheet, as shown below -

NAME	Your First and Last Name		
SUBJECT	**Your Grade**	TEST NO.	**Test Name**
DATE	**School Name**	PERIOD	

- Answers must be marked on the answer/Scantron sheet with a number two pencil.

- All tests must be turned in at the end of the testing period. Tests may not be taken from the testing room.

GOOD LUCK!

Answer the following questions by marking the **BEST** answer on the answer sheet.

(1) $(2 + 4 + 6 + \ldots + 14) - (1 + 3 + 5 + \ldots + 13) =$
       A) 7   B) 6   C) 5   D) 4

(2)   The product of 402 and $N6$ is 34,572. What is N?
       A) 0   B) 1   C) 7   D) 8

(3)   Wes has $\dfrac{3}{4}$ cup of flour in a mixing bowl. After adding more flour Wes says he now has $\dfrac{5}{8}$ cup of
       flour. Which of the following explains why Wes' statement is incorrect?
       A) 5 is not a multiple of 3   C) 3 is less than 5

       B) $\dfrac{5}{8}$ is less than $\dfrac{3}{4}$ D) $\dfrac{5}{8}$ is not a multiple of $\dfrac{3}{4}$

(4)   Which expression could be used to find the quotient of $1,575 \div 21$?

       A) $(1,000 \div 21) + (500 \div 21) + (70 \div 21) + (5 \div 21)$
       B) $(1,575 \div 21) + (575 \div 21) + (75 \div 21) + (5 \div 21)$
       C) $(1,575 \div 20) + (1,575 \div 1)$
       D) $(1,500 \div 20) + (75 \div 1)$

(5)   What is the missing value, N, in the equation $2\dfrac{1}{4} + \dfrac{3}{N} = 2\dfrac{5}{8}$?
       A) 6   B) 7   C) 8   D) 10

(6)   Jane is measuring fabric for costumes a school play. She has $12\dfrac{1}{3}$ yards of fabric and needs 47 feet
       of fabric. How many more yards of fabric does she need?
       A) $35\dfrac{2}{3}$ yards   B) $3\dfrac{1}{3}$ yards   C) 10 yards   D) $10\dfrac{1}{3}$ yards

(7)   A math team club member kept track of the numbers and types of cookies that were sold during one
       week as a fundraiser. Based on the data, in the table below and the fact that each cookie sold for
       75 cents, how much money did the team raise in one week?

Day of Week	Chocolate Chip	Sugar	Peanut Butter	Oatmeal
Monday	27	10	8	5
Tuesday	25	12	12	7
Wednesday	28	15	7	4
Thursday	26	13	10	8
Friday	30	14	11	6

       A) $278   B) $268.50   C) $208.50   D) $1

(8)   Noah is making a scale drawing of an airplane for class. The airplane has a 100-foot wingspan and is 50 feet long. If Noah's drawing has a 10-inch wingspan, what is the length of the plane?

A) 5 inches   B) $9\frac{1}{2}$ inches   C) $10\frac{1}{2}$ inches   D) 20 inches

(9)   Which operation should be performed first in the expression $18 - 2 + 5 \times (16 + 66 \div 2)$?
A) $2 + 5$ B) 5×16 C) $16 + 66$ D) $66 \div 2$

(10)   When three different numbers from the set $\{-3, -2, -1, 4, 5\}$ are multiplied, the largest possible product is
A) 10   B) 20   C) 30   D) 40

(11)   A bag contains only blue balls and green balls. There are 6 blue balls. If the probability of drawing a blue ball at random from this bag is $\frac{1}{4}$ then what is the number of green balls in the bag?

A) 12   B) 18   C) 24   D) 30

(12)   A team won 40 of its first 50 games.   How many of the remaining 40 games must this team win so it will have won exactly 70% of its games for the season?
A) 20   B) 23   C) 28   D) 30

(13)   Matt has a hundred-dollar bill. He plans to buy a shirt that costs $32.68, a snack that costs $8.73 and a drink that costs $2.38.   If there is no tax on any item, how much change will he have after purchasing the items?
A) $67.31   B) $58.51   C) $64.91   D) $56.21

(14)   Jose wants to find the sum of 54,600 and 8,986. What will Jose's answer be if he were to round to the nearest hundred after totaling the given numbers?
A) 65,300   B) 63,600   C) 63,500   D) 63,590

(15)   What is the least common multiple of the numbers 22 and 36?
A) 252   B) 262   C) 396   D) 412

(16)   If $3n - 17 = 4n - 8$, find the value of $\frac{2n}{3} + 5$.

A) 11   B) 8   C) –8   D) –1

(17)   Mike and Dan have the chore to clean their kitchen. If Mike does it alone, it would take him 30 minutes. If Dan does it alone, it would take him 45 minutes. If they work together, how long would it take them to clean the kitchen?
A) 18 minutes   B) 20 minutes   C) 23 minutes   D) 24 minutes

(18)   How much time has passed from 2:13 AM to 3:14 PM the same day?
A) 780 minutes   B) 781 minutes   C) 782 minutes   D) 787 minutes

(19)   What is six percent of $833\frac{1}{3}$?

A) 1,500   B) 416   C) 50   D) 116

(20)   If $x = 15$ and $y = 15$ then what is $x^2 + 2xy + y^2$ equal to?
     A) 30   B) 225   C) 900   D) 1,225

(21)   Three gallons minus two quarts minus one pint is equal to how many pints?
     A) 17 pints   B) 18 pints   C) 19 pints   D) 20 pints

(22)   The point $(-3, -4)$ is reflected across the line $y = -1$ to the point (a, z). Find $a + z$.
     A) -7 B) -1 C) 1   D) 12

(23)   A class recorded the growth of a plant for a month and displayed the data on the line graph shown to the right. Assuming the rate of growth is the same, what will be the height of the plant in week five?

     A) 7 inches

     B) 8 inches

     C) 9 inches

     D) 10 inches
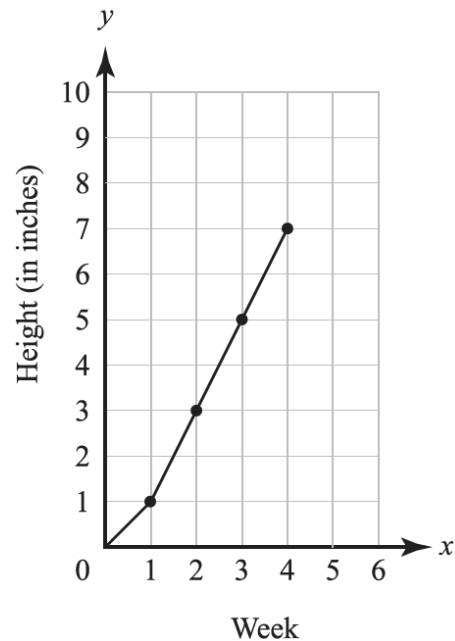
(24)   The 6th grade class is making phone calls to ask community members for donations. There are 1,305 people to call and nine volunteers to make the calls. How can you tell if 1,305 phone calls can be divided up evenly among the nine volunteer-students?
     A) Determine if 2 and 3 both divide evenly into 1,305. If they do, then so will 9.
     B) Add up all the digits in the number 1,305. If the sum is divisible by 9, then 9 is a factor of the entire number.
     C) Determine if 9 divides evenly into the last two digits, and if it does then it will be a factor of the entire number.
     D) Add up all the digits in the number 1,305. If the sum is divisible by 3, then 9 is a factor of the entire number.

(25)   Look at the table to the right.   What is the equation of of the line that contains all the points in the table?

     A) $f(x) = 4x$

     B) $f(x) = x + 3$

     C) $f(x) = x + 4$

     D) $f(x) = \dfrac{x}{4}$

x	$f(x)$
0	0
1	4
2	8
3	12
4	16

(26)   What is the sum of the greatest number and the least number in this list below?

$$\left\{ \frac{8}{5}, -\frac{11}{20}, \frac{9}{4}, -\frac{1}{2}, \frac{3}{10} \right\}$$

A) $\dfrac{17}{10}$ B) $-\dfrac{17}{10}$ C) $\dfrac{7}{4}$ D) $\dfrac{21}{20}$

(27)   A parallelogram is drawn on a coordinate plane.
        Three of its vertices are at (0, 1), (1, 0), and (2, 2).
        What are the two possible locations for the fourth
        vertex?
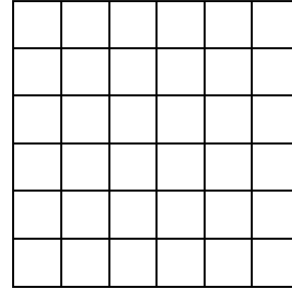
        A) (1, 3) and (3, 1)

        B) (2, 3) and (3, 2)

        C) (0, 3) and (3, 0)

        D) (4, 2) and (2, 4)

(28)   A ride-sharing-service driver charges her passengers $2.00 for a trip that is one mile or less. For trips
        over 1 mile, she adds a charge of 15¢ for every tenth of a mile past the first mile. One passenger was
        charged $3.95. How far did that passenger travel?
        A) 14 miles   B) 13 miles   C) 2.6 miles   D) 2.3 miles

(29)   Kenzie was to be paid $24 for raking the leaves in a neighbor's yard. Kenzie raked the leaves in
        three-fourths of the yard. Then Wes came over and agreed to help Kenzie rake the rest of the yard.
        Kenzie and Wes each did the same amount of work on that part of the yard. For Kenzie and Wes to
        receive the same rate of pay, how much of the $24 should Wes be paid?
        A) $2   B) $3   C) $4   D) $6

(30)   Which of the following is the prime factorization of 120?
        A) 2×2×3×10   B) 2×2×2×15   C) 2×2×2×3×5   D) 2×2×2×2×3×5

(31)   Mike is holding a yardstick perpendicular to the ground. The shadow of the yardstick is 27 inches long.
        If at the same time, Mike's shadow is 4 feet 6 inches long, how tall is Mike?
        A) 5 feet   B) 5 feet 6 inches   C) 60 inches   D) 6 feet

(32)   A square is folded in half to form two congruent rectangles. If the perimeter of one of the rectangles is
        18 centimeters, what is the perimeter of the original square?
        A) 72 centimeters   B) 48 centimeters   C) 36 centimeters   D) 24 centimeters

(33)   Seven red balls numbered 1 through 7 and five blue balls numbered 1 through 5 are placed in a bowl.
        If one ball is drawn at random, what is the probability that it is numbered 4 or is blue?

        A) $\dfrac{5}{12}$ B) $\dfrac{1}{2}$ C) $\dfrac{7}{12}$ D) $\dfrac{3}{4}$

(34)   In a 30-60-90 triangle, if the hypotenuse is 10, what the length of the side opposite the 60-degree angle?
        A) 5   B) $3\sqrt{5}$ C) $5\sqrt{3}$ D) $5\sqrt{2}$

(35)   On a TV game show, a contestant is paid $7 for each correct answer, but must pay back $5 for each wrong answer. After answering 24 questions on the show, Genny broke even ($0). How many questions did she answer correctly?
A) 12   B) 14   C) 8   D) 10

(36)   Debra uses 100 grams of lemon juice, 100 grams of sugar, and 400 grams of water to make lemonade. There are 25 calories in 100 grams of lemon juice and 386 calories in 100 grams of sugar. If water contains no calories, how many calories are in 200 grams of her lemonade?
A) 129   B) 137   C) 174   D) 411

(37)   If $x^2 \leq 16$, what is the sum of all the positive integers that satisfy the inequality?
A) 6   B) 8   C) 10   D) 12

(38)   If my mom is 38 and my dad is 44, after how many years will the sum of their ages equal 100?
A) 9 years   B) 8 years   C) 7 years   D) 5 years

(39)   What are the factors of $6a^2 + 7ab - 10b^2$?
A) $(6a + 5b)$ and $(a + 2b)$ C) $(2a + 5b)$ and $(3a + 2b)$
B) $(6a - 5b)$ and $(a + 2b)$ D) $(6a + 5b)$ and $(a - 2b)$

(40)   The rate at which a river flows is one-third the speed of a boat in still water. If that boat travels down that river for two hours and then back upriver for two hours, it will be 16 miles short of its starting point. What is the speed of the boat in still river?
A) 4 mph   B) 8 mph   C) 12 mph   D) 24 mph

(41)   Mike, Dan, Paige, and Amanda have started collecting baseball cards. Together they have 84 cards. Amanda has three quarters as many as Dan has. Mike has the average of the other three, and Dan has twice as many as Paige. How many cards does Amanda have?
A) 28   B) 14   C) 16   D) 21

(42)   *ABCD* is a rectangle with area equal to 24 square centimeters as shown to the right. Points *E*, *F*, and *G* are midpoints of the sides on which they are located. What is the area of Δ*EFG*?
A) 6 cm^2
B) 8 cm^2
C) 12 cm^2
D) 24 cm^2
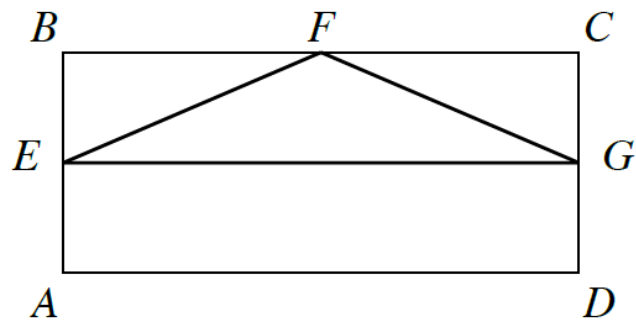
(43)   A piece of paper containing six joined squares labeled as shown to the right is folded along the edges of the squares to form a cube. What is the label of the face opposite the face labeled D?

A) F
B) E
C) D
D) B
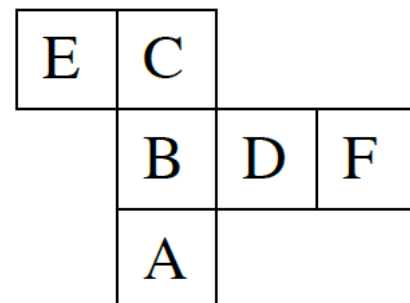
(44) A pirate sails in a circular route around point A, as shown to the right, with a circumference of 32 km, and a merchant ship sails in a circular route around point B with a circumference of 48 km. If they both start where the routes meet, and the pirate sails 12 km per day and the merchant sails at 8 km per day, what is the least number of days later they will next meet?
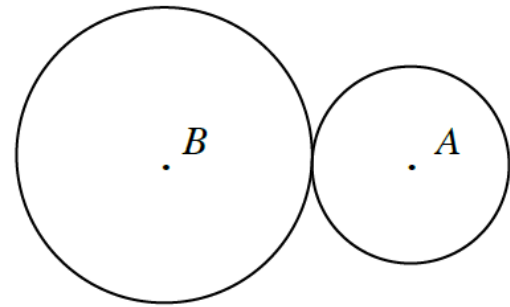
A) 8 days   B) 16 days   C) 24 days   D) 32 days

(45) What is the volume of this triangular right prism shown to the right?
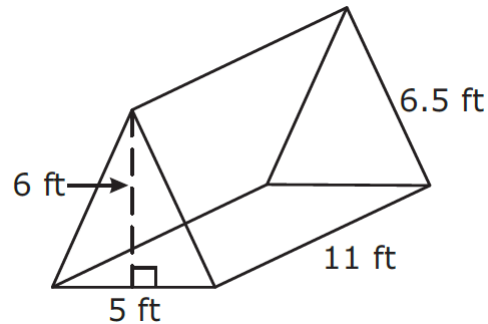
A) 165 ft^3

B) 330 ft^3

C) 1,073 ft^3

D) 2,145 ft^3

(46) Matt is 12 years younger than twice Elizabeth's age. If Matt is 28 years old, how old is Elizabeth?
A) 8 years   B) 14 years   C) 16 years   D) 20 years

(47) Karen spends $450 on monthly bills. Of this total amount, 12% is for phone service, $\frac{1}{10}$ is for Internet service and $\frac{2}{9}$ is for utilities. If the rest of the total amount is for food, how much does she have for food?
A) $144.00   B) $199.00   C) $251.00   D) $277.00

(48) The stem-and-leaf plot to the right shows the number of laps walked by 15 students in a walk-a-thon. What is the total number of students who walked more than 29 laps?
A) 4
B) 6
C) 11
D) 15

Number of Laps Walked

1	2 4 4 6 7
2	0 0 0 3 5 8
3	0 2 6
4	2

Key
1	8 represents 18

(49) Mona counted a total of 56 ducks on the pond in Millersview Park. If the ratio of female ducks to male ducks that Mona counted was 5:3, what was the total number of female ducks Mona counted on the pond?
A) 40   B) 35   C) 24   D) 15

(50) $24\frac{1}{2}$% of 39 is the same as 78% of what amount?

A) 124   B) 62   C) 49   D) $12\frac{1}{4}$

(51)   There is a total of 500 students at Aspermont Middle School. The table to the right shows the number of students who are members of 0, 1, 2, 3, or 4 clubs. Based on the table, what percent of the 500 students are members of 2 or more clubs?

Members of Student Clubs

Number of Clubs (n)	Number of Students Who Are Members of n Clubs
0	300
1	110
2	60
3	20
4	10

   A) 12%

   B) 18%

   C) 90%

   D) 94%

(52)   What is the domain of $F = \{(2, 1), (4, 3), (7, 8), (9, 8)\}$?
   A) {1, 2, 3, 4, 5, 6, 7, 8, 9}   C) {1, 2, 3, 4, 7, 8, 9}
   B) {1, 3, 8}   D) {2, 4, 7, 9}

(53) $(-3)^2 \times (-2)^3 \times (-1)^5 =$
   A) −6   B) −72   C) 6   D) 72

(54)   Andy has $100 in his bank account. If he spends $5 per week on comic books, after how many weeks will he first have less than $20 in his bank account?
   A) 5 weeks   B) 6 weeks   C) 17 weeks   D) 25 weeks

(55)   Consuelo's dog had 6 puppies that weighed 20 ounces, 16 ounces, 22 ounces, 16 ounces, 19 ounces, and 15 ounces at birth. What is the mode weight of the puppies?

   A) 6 ounces   B) 16 ounces   C) $17\dfrac{1}{2}$ ounces   D) 18 ounces

(56)   Larry has 2 trees in his yard. The height of the taller tree is 4 feet more than 3 times the height of the shorter tree (s). Which expression represents the height of the taller tree in terms of the shorter tree?
   A) $3s + 4$ B) $3s - 4$ C) $3(s + 4)$ D) $3(s - 4)$

(57)   Albert has a water pump that fills a 750-gallon tank in 36 minutes. How long will it take Albert to fill a 1,000-gallon tank with the same pump?
   A) 27 minutes   B) 48 minutes   C) 215 minutes   D) 250 minutes

(58)   If the midpoint of $(-1, 5)$ and $(3, 11)$ is (a, b), then $a + b =$
   A) 7   B) 8   C) 9   D) 10

(59) $18 \div 3^2 - 1 =$

   A) 5   B) $2\dfrac{1}{4}$ C) 2   D) 1

(60) $20 + 19 + 18 + \ldots + 1 =$
   A) 210   B) 105   C) 100   D) 25