

CONTESTANT NUMBER:

**FOR GRADER USE ONLY**

Score Test Below:

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**Papers contending to place:**

\_\_\_\_\_ out of 250. Initials \_\_\_\_\_



**University Interscholastic League  
A+ Mathematics Contest • Answer Sheet**

*Write your contestant number in the upper right corner, and circle your grade below.*

**Circle Grade Level:                      6                      7                      8**

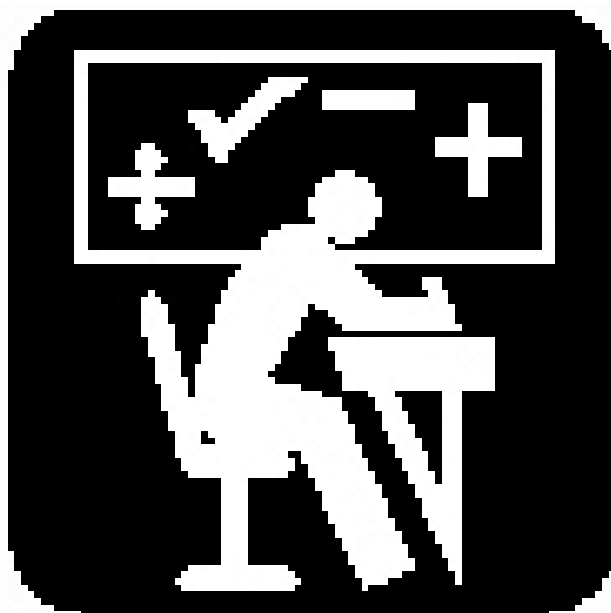
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| 1.  | A | B | C | D | E | 26. | A | B | C | D | E |
| 2.  | A | B | C | D | E | 27. | A | B | C | D | E |
| 3.  | A | B | C | D | E | 28. | A | B | C | D | E |
| 4.  | A | B | C | D | E | 29. | A | B | C | D | E |
| 5.  | A | B | C | D | E | 30. | A | B | C | D | E |
| 6.  | A | B | C | D | E | 31. | A | B | C | D | E |
| 7.  | A | B | C | D | E | 32. | A | B | C | D | E |
| 8.  | A | B | C | D | E | 33. | A | B | C | D | E |
| 9.  | A | B | C | D | E | 34. | A | B | C | D | E |
| 10. | A | B | C | D | E | 35. | A | B | C | D | E |
| 11. | A | B | C | D | E | 36. | A | B | C | D | E |
| 12. | A | B | C | D | E | 37. | A | B | C | D | E |
| 13. | A | B | C | D | E | 38. | A | B | C | D | E |
| 14. | A | B | C | D | E | 39. | A | B | C | D | E |
| 15. | A | B | C | D | E | 40. | A | B | C | D | E |
| 16. | A | B | C | D | E | 41. | A | B | C | D | E |
| 17. | A | B | C | D | E | 42. | A | B | C | D | E |
| 18. | A | B | C | D | E | 43. | A | B | C | D | E |
| 19. | A | B | C | D | E | 44. | A | B | C | D | E |
| 20. | A | B | C | D | E | 45. | A | B | C | D | E |
| 21. | A | B | C | D | E | 46. | A | B | C | D | E |
| 22. | A | B | C | D | E | 47. | A | B | C | D | E |
| 23. | A | B | C | D | E | 48. | A | B | C | D | E |
| 24. | A | B | C | D | E | 49. | A | B | C | D | E |
| 25. | A | B | C | D | E | 50. | A | B | C | D | E |

**INVITATIONAL 2019-2020**

**A+ ACADEMICS**



University Interscholastic League

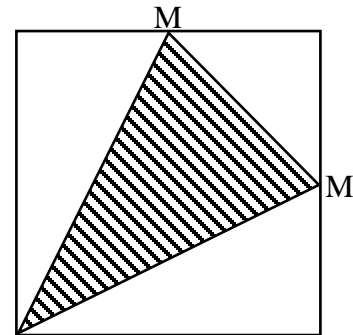


# Mathematics

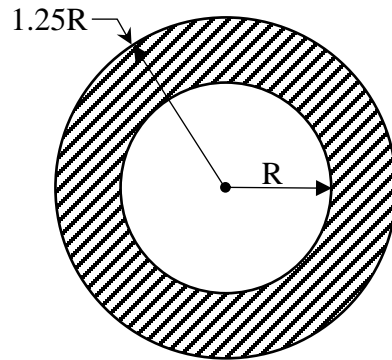
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# 2019 – 2020 University Interscholastic League JH/MS Mathematics Contest A

- (1) Evaluate:  $2^4 \div 4^{1/2} \times 2^{-2}$   
 A) 8                      B) -2                      C) 4                      D)  $\frac{1}{2}$                       E) 2
- (2)  $3\frac{1}{3} \times 6\frac{1}{3} =$   
 A)  $18\frac{1}{9}$                       B)  $18\frac{1}{3}$                       C)  $19\frac{1}{3}$                       D)  $21\frac{1}{9}$                       E)  $20\frac{1}{9}$
- (3) What is the number of hours in four days?  
 A) 96                      B) 84                      C) 72                      D) 60                      E) 48
- (4) The sides of a rectangle are changed so that the new rectangle has a width that is increased by 20% and the length is increased by 25%. By what percent is the original rectangle's area increased?  
 A) 5%                      B) 45%                      C) 50%                      D) 145%                      E) 150%
- (5) Matt tied a 25-foot long rope to the top of a pole and stretched the rope taut to the level ground. If the rope on the ground is 20 feet away from the base of the pole, how tall is the pole?  
 A)  $\sqrt{41}$  feet                      B)  $5\sqrt{41}$  feet                      C)  $22\frac{1}{2}$  feet                      D) 15 feet                      E) None of these
- (6) One hot summer day Mackenzie finished her lunch at 12:15 PM, took a  $1\frac{3}{4}$  hour nap and then went swimming 30 minutes later. At what time did she start swimming?  
 A) 1:15 PM                      B) 2:30 PM                      C) 2:45 PM                      D) 3:15 PM                      E) 3:30 PM
- (7) Andy took 16 identical wooden cubes that measured 2 inches on a side. He placed the cubes on a sheet of paper so that their faces were touching and formed a square that measured 4 cubes by 4 cubes. If Andy then spray-painted the square of cubes, what area of the cubes was not painted?  
 A)  $512 \text{ in}^2$                       B)  $384 \text{ in}^2$                       C)  $256 \text{ in}^2$                       D)  $128 \text{ in}^2$                       E)  $64 \text{ in}^2$
- (8) If the point M is at the midpoint of the sides for the square to the right, what percentage of the square area is the shaded region?

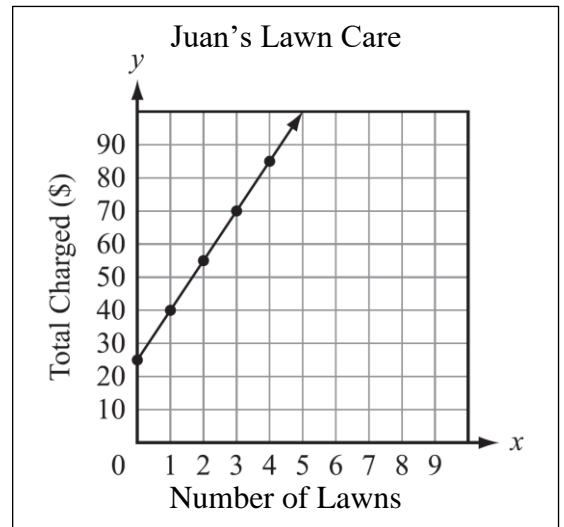


- (9) In the drawing to the right, if  $R$  is the radius of the smaller circle, what percentage of the larger circle is the shaded portion?



- A) 25 %
- B) 36 %
- C) 40 %
- D) 44 %
- E) 64 %

- (10) Juan mows lawns. The line graph to the right shows how much money Juan makes mowing lawns. Based on the graph, which statement is true?



- A) Juan charges exactly \$25 for each lawn worked.
- B) Juan charges exactly \$40 for each lawn worked.
- C) Juan charges a \$25 initial fee and \$15 for each mowed lawn.
- D) Juan charges a \$25 initial fee and \$25 for each mowed lawn.
- E) Juan charges a \$25 initial fee and \$40 for each mowed lawn.

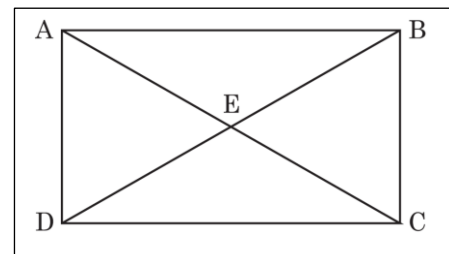
- (11) Which number is equivalent to:  $1,824 \div 4 \div 3 \div 2$ ?

- A) 76
- B) 152
- C) 228
- D) 304
- E) 456

- (12) Liz is surveying her class about sports. Which survey question will generate data that can be **best** recorded in a frequency table?

- A) What is your favorite sports memory?
- B) Why do you like soccer more than basketball?
- C) What racing team is the most liked by NASCAR fans?
- D) If you spent a day at a lake in the summer, what would you do?
- E) Which sport do you like the most: basketball, football, soccer, or tennis?

- (13) A rectangle is divided using its diagonals as shown to the right. Which of the following figures are congruent?



- A)  $\triangle ABE$  and  $\triangle ADE$
- B)  $\triangle AEB$  and  $\triangle DCE$
- C)  $\triangle ADE$  and  $\triangle ABD$
- D)  $\triangle ADC$  and  $\triangle ADE$
- E)  $\triangle DCE$  and  $\triangle DAB$



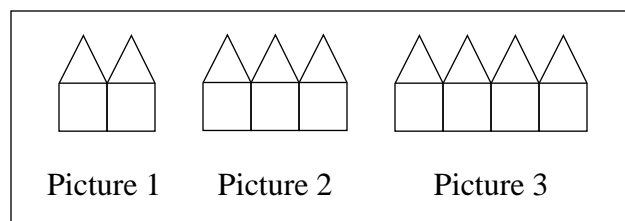
- (24) How many 3-digit positive integers have digits whose product equals 24?  
 A) 12                      B) 15                      C) 18                      D) 21                      E) 24
- (25) A sign at the store’s fish market states, “50% off, today only: half-pound packages for just \$3 per package”. What is the regular price for a full pound of fish, in dollars?  
 A) \$6                      B) \$9                      C) \$10                      D) \$12                      E) \$15
- (26) Eight friends ate at a restaurant and agreed to share the bill equally. Because Amanda forgot her money, each of her seven friends paid an extra \$2.50 to cover her portion of the total bill. What was the total bill?  
 A) \$120                      B) \$128                      C) \$140                      D) \$144                      E) \$160
- (27) A fair coin is tossed 3 times. What is the probability of at least two consecutive heads?  
 A)  $\frac{1}{4}$                       B)  $\frac{3}{8}$                       C)  $\frac{1}{2}$                       D)  $\frac{1}{8}$                       E)  $\frac{3}{4}$
- (28) What is the ratio of the greatest common factor of 24 and 54 to the least common multiple of 24 and 54?  
 A)  $\frac{1}{36}$                       B)  $\frac{1}{6}$                       C)  $\frac{1}{3}$                       D)  $\frac{4}{9}$                       E)  $\frac{2}{9}$
- (29) Paige is in the 5<sup>th</sup> grade and weighs 106 pounds. Her quadruplet brothers are tiny babies and weigh 5, 5, 6, and 8 pounds. Which is greater, the average (mean) weight of these five children or the median weight, and by how many pounds?  
 A) median by 60      B) average by 5      C) median by 20      D) average by 15      E) average by 20
- (30) In Harris county, statisticians estimate there is a baby born every 8 hours and a death every day. To the nearest hundred, how many people are added to the population of Harris county each year?  
 A) 600                      B) 700                      C) 800                      D) 900                      E) 1,000
- (31) In a middle school football district, each team plays every other team exactly once. If a total of 21 district games were played during the 2020 season, how many teams were members of this district?  
 A) 6                      B) 7                      C) 8                      D) 9                      E) 10
- (32) What is the unit’s digit for  $13^{2020}$ ?  
 A) 1                      B) 2                      C) 3                      D) 7                      E) 9
- (33)  $24 \times 0.1666 \dots =$   
 A) 4                      B) 6                      C) 3                      D)  $\frac{1}{4}$                       E) 8
- (34) A black bag contains a number of marbles, each of which is red, white or blue. If there are 12 red, 20 white and 18 blue what are the odds of Noah drawing a blue marble in the first random draw?  
 A)  $\frac{9}{25}$                       B)  $\frac{9}{10}$                       C)  $\frac{2}{3}$                       D)  $\frac{9}{16}$                       E)  $\frac{3}{5}$
- (35) What is the volume of a square pyramid with base side of 9 inches and height of 15 inches?  
 A)  $1,215 \text{ in}^3$                       B)  $2,025 \text{ in}^3$                       C)  $567 \text{ in}^3$                       D)  $550 \text{ in}^3$                       E)  $405 \text{ in}^3$

- (36) What is the 7<sup>th</sup> term in the pattern: 1, 3, 7, 15, 31, . . . ?  
 A) 46                      B) 47                      C) 63                      D) 127                      E) 128
- (37) Albert wants to shrink the size of an image on a poster. The image has a length of 35 centimeters (cm) and a width of 28 centimeters. The shrunken image will be similar to the original image and has a width of 9 centimeters. What will be the length of the shrunken image?  
 A) 2 cm                      B)  $7\frac{1}{5}$  cm                      C)  $11\frac{1}{4}$  cm                      D) 12 cm                      E) 16 cm
- (38) What will the interior angles of a 7-sided polygon add up to?  
 A) 540°                      B) 600°                      C) 720°                      D) 880°                      E) 900°
- (39) A movie club charges a \$7.99/month membership fee for unlimited old movies plus a \$3.99/movie fee for new-release videos. Which equation represents the total cost ( $C$ ) of one month of membership including renting a certain number of new-release movies ( $m$ )?  
 A)  $7.99C = 3.99m$   
 B)  $C = 3.99m + 7.99$   
 C)  $C = 7.99m + 3.99$   
 D)  $C = 3.99m - 7.99$   
 E)  $C = \frac{3.99}{m} + 7.99$

- (40) A student records data for the maximum number of diagonals that can be drawn inside some polygons in the table to the right. Which algebraic formula generalizes the relationship between the number of sides of a polygon,  $s$ , and the number of diagonals,  $d$ , in the polygon?  
 A)  $d = s - 2$   
 B)  $d = \frac{s}{3} - 1$   
 C)  $d = \frac{s(s-3)}{2}$   
 D)  $d = s^2 - 1$   
 E)  $d = 2s - 6$

Number of Sides ( $s$ )	Number of Diagonals ( $d$ )
3	0
4	2
5	5
6	9
7	14

- (41) To the right are 3 pictures in a sequence of pictures. Picture 1 uses 11 toothpicks. I wish to continue to build the pictures in the sequence using toothpicks. What is the first picture that will use at least 1000 toothpicks?  
 A) Picture 197  
 B) Picture 198  
 C) Picture 199  
 D) Picture 200  
 E) Picture 201







**2019 – 2020 University Interscholastic League JH/MS Mathematics Contest A – Key**

- (1) E
- (2) D
- (3) A
- (4) C
- (5) D
- (6) B
- (7) C
- (8) C
- (9) B
- (10) C
- (11) A
- (12) E
- (13) B
- (14) B
- (15) C
- (16) B
- (17) D
- (18) D
- (19) E
- (20) D
- (21) A
- (22) E
- (23) B
- (24) D
- (25) D

- (26) C
- (27) B
- (28) A
- (29) E
- (30) B
- (31) B
- (32) A
- (33) A
- (34) D
- (35) E
- (36) D
- (37) C
- (38) E
- (39) B
- (40) C
- (41) C
- (42) C
- (43) A
- (44) E
- (45) C
- (46) A
- (47) B
- (48) E (91)
- (49) A
- (50) C

**FALL/WINTER DISTRICT 2019-2020**

**A+ ACADEMICS**



University Interscholastic League

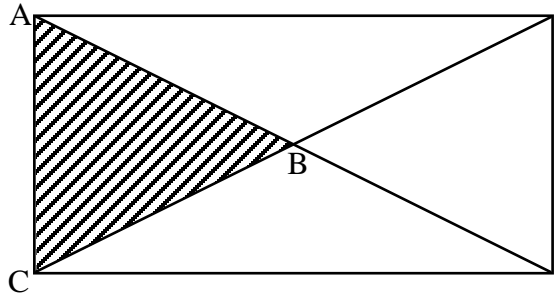


# Mathematics

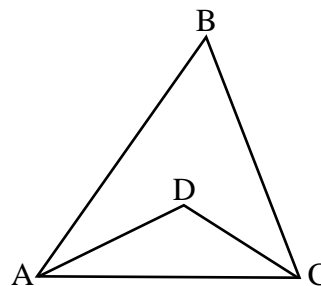
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## 2019 – 2020 University Interscholastic League JH/MS Mathematics Contest B

- (1) Evaluate:  $6\frac{2}{3} \times 10^{-1}$
- A)  $\frac{2}{3}$                       B)  $1\frac{1}{3}$                       C)  $2\frac{1}{3}$                       D)  $1\frac{1}{2}$                       E)  $66\frac{2}{3}$
- (2)  $9\frac{1}{3} \times 9\frac{2}{3} =$
- A)  $90\frac{1}{9}$                       B)  $81\frac{1}{3}$                       C)  $81\frac{2}{9}$                       D)  $90\frac{1}{3}$                       E)  $90\frac{2}{9}$
- (3) What is the number of hours in two and two-thirds days?
- A) 16                      B) 24                      C) 40                      D) 64                      E) 72
- (4) A rectangle with a side of length 12 centimeters (cm) has a diagonal length of 15 cm. What is the perimeter of this rectangle?
- A) 14 cm                      B) 21 cm                      C) 42 cm                      D) 72 cm                      E) 108 cm
- (5) If a rod is  $16\frac{1}{2}$  feet long, how many rods are in one mile?
- A) 640 rods                      B) 575 rods                      C) 500 rods                      D) 320 rods                      E) 160 rods
- (6) Wes took all the pennies he had in his piggy bank and started to make piles of pennies. In the first pile he placed one penny; in the second pile he placed two pennies, in the third pile he placed three pennies; and so on until he created 15 piles with the same pattern of penny placement. How much money did Wes have in all?
- A) \$120.00                      B) \$1.20                      C) \$10.50                      D) \$11.50                      E) \$112.50
- (7) There are 24 marbles in a bag. Albert reaches in the bag and pulls out one-third of the marbles. Elizabeth then reaches in the bag and pulls out one half of what was left. What percentage of the marbles were pulled out of the bag?
- A) 8%                      B) 16%                      C) 24%                      D) 48%                      E)  $66\frac{2}{3}\%$
- (8) The figure to the right is a rectangle. If the area of  $\triangle ABC$  is  $250\text{ cm}^2$  and  $\overline{AC} = 20\text{ cm}$ , what percent of the rectangle area is the shaded region?
- A) 25 %
- B)  $\frac{1}{5}\%$
- C) 20 %
- D) 40 %
- E)  $20\frac{1}{5}\%$



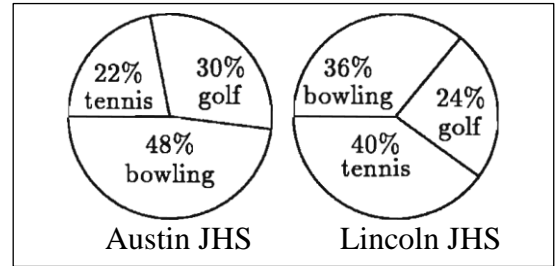
- (9) What is the probability of drawing a red Jack from a standard deck of 52 cards?  
 A)  $\frac{1}{26}$                       B)  $\frac{1}{13}$                       C)  $\frac{1}{3}$                       D)  $\frac{1}{52}$                       E)  $\frac{2}{13}$
- (10) Mario decided to read a book in a special way. He decided to read only half the number of pages that were left to read each day. If the book was 256 pages long, how many days did it take Mario to finish reading the book?  
 A) 128 days                      B) 16 days                      C) 14 days                      D) 12 days                      E) 8 days
- (11) What number multiplied by itself four times is equal to 81?  
 A) 9                      B) 3                      C) -3                      D) 3 or -3                      E) None of these
- (12) The time it took a solar car to travel around a circular track was 24 minutes. If the solar car was then to travel around a circular track with twice the radius at the same average speed, how long would it take the car to travel around the track?  
 A) 12 minutes                      B) 36 minutes                      C) 48 minutes                      D) 72 minutes                      E) None of these
- (13) The 64 whole numbers from 1 through 64 are written, one per square, on a checkerboard (an 8 by 8 array of 64 squares). The first 8 numbers are written in order across the first row, the next 8 across the second row, and so on. After all 64 numbers are written, what will the sum of the numbers in the four corners will be?  
 A) 130                      B) 131                      C) 132                      D) 133                      E) 134
- (14) How many positive factors of 36 are also multiples of 4?  
 A) 2                      B) 3                      C) 4                      D) 5                      E) 6
- (15) In the triangle to the right, the measure of  $\angle ABC$  is  $50^\circ$ .  $\overline{AD}$  bisects  $\angle BAC$  and  $\overline{DC}$  bisects  $\angle BCA$ . What is the measure  $\angle ADC$ ?  
 A)  $90^\circ$   
 B)  $100^\circ$   
 C)  $115^\circ$   
 D)  $122\frac{1}{2}^\circ$   
 E)  $125^\circ$



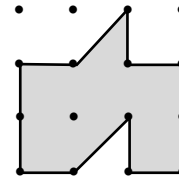
- (16) Genny's monthly salary was \$2000 in November. In December she received a 20% raise. In January she received a 20% pay cut. After the two changes in December and January, what was Genny's monthly salary?  
 A) \$1,920                      B) \$1,980                      C) \$2,000                      D) \$2,020                      E) \$2,040
- (17) Noah has goldfish that quadruple every month, and Kenzie has goldfish that double every month. If Noah has 4 goldfish at the same time that Kenzie has 128 goldfish, then in how many months from that time will they have the same number of goldfish?  
 A) 4                      B) 5                      C) 6                      D) 7                      E) 8

- (18) What is the remainder when  $2014 \times 2017 \times 2021 \times 2025$  is divided by 5?  
 A) 0                      B) 1                      C) 2                      D) 3                      E) 4
- (19) The volume of a square pyramid is  $324 \text{ cm}^3$ . If the area of the base is  $81 \text{ cm}^2$ , what is the height of this pyramid?  
 A) 3 cm                      B) 4 cm                      C) 8 cm                      D) 12 cm                      E) 16 cm

- (20) The pie charts to the right indicate the percent of students who prefer golf, bowling or tennis at Austin JHS. and Lincoln JHS. The total number of students at Austin is 2,000 and Lincoln is 2,500. What is the number of students who prefer tennis in the combined school populations?  
 A) 440  
 B) 1,000  
 C) 1,440  
 D) 1,550  
 E) 4,250

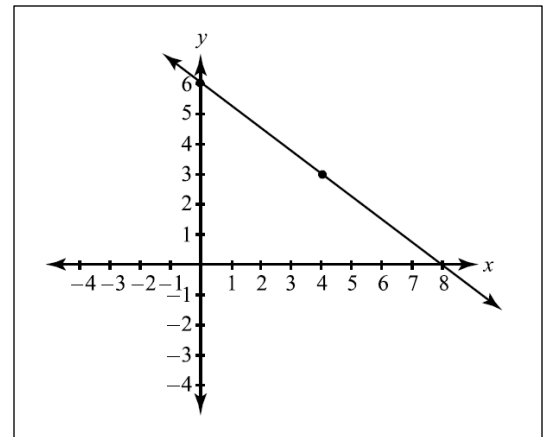


- (21) The diagram to the right shows dots that are spaced one unit apart, horizontally and vertically. How many square units are enclosed by the shaded polygon?  
 A)  $5 \text{ units}^2$   
 B)  $6 \text{ units}^2$   
 C)  $7 \text{ units}^2$   
 D)  $8 \text{ units}^2$   
 E)  $9 \text{ units}^2$

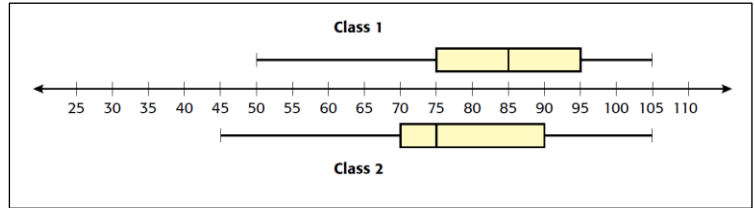


- (22) When four gallons are added to a tank that is one-third full, the tank is then one-half full. What is the capacity of the tank in gallons?  
 A) 8 gallons                      B) 12 gallons                      C) 20 gallons                      D) 24 gallons                      E) 48 gallons
- (23) If two dice are tossed, what is the probability that the product of the numbers showing on the tops of the dice is greater than 10?  
 A)  $\frac{15}{22}$                       B)  $\frac{11}{36}$                       C)  $\frac{17}{36}$                       D)  $\frac{17}{18}$                       E)  $\frac{11}{18}$

- (24) What is the equation of the line in the graph to the right?  
 A)  $y = \frac{3}{4}x + 6$   
 B)  $y = -3x + 6$   
 C)  $y = \frac{3}{4}x - 6$   
 D)  $y = -\frac{3}{4}x + 6$   
 E)  $y = -\frac{3}{4}x - 6$



- (25) Mr. Zapata gave the same quiz to two mathematics classes he taught. The box-and-whisker plots to the right were created using the quiz scores the students earned in each class. Looking at the plot which of the following statements is true?



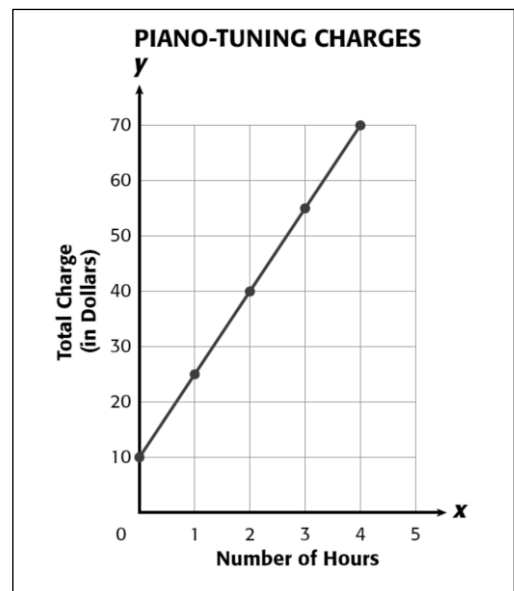
- A) The median scores for both classes are identical.
- B) The lowest scores for both classes are identical.
- C) The median for class 1 is 10 points more than class 2.
- D) The median for class 2 is 70.
- E) The median for class 1 is 95.

- (26) Mike has a box filled with different colored marbles that are the same size and shape. To the right is a list of each color of marble and the number of each in the box. Mike will randomly choose 1 marble, record the color, and not put the marble back. If Mike does this two times, what is the probability that both marbles will be black?

Color	Number
Red	3
Purple	2
Green	2
Black	2
Yellow	2
Orange	3

- A)  $\frac{1}{49}$
  - B)  $\frac{1}{72}$
  - C)  $\frac{1}{91}$
  - D)  $\frac{1}{95}$
  - E)  $\frac{1}{98}$
- (27) The scale on Matt’s map is 0.5 inch represents 8 miles. The route from Matt’s house to his friend’s house is 3.25 inches on his map. What is the actual distance of Matt’s route?
- A) 61.25 miles
  - B) 52.00 miles
  - C) 20.31 miles
  - D) 13.00 miles
  - E) 11.75 miles

- (28) Paige is a piano tuner. She charges her clients a fixed amount for a house call plus labor, which is based on an hourly rate. The graph to the right shows how much Paige charges as a function of time required to tune a piano. Which of the following best represents Paige’s hourly rate for labor?



- A) \$10
- B) \$15
- C) \$20
- D) \$25
- E) \$30

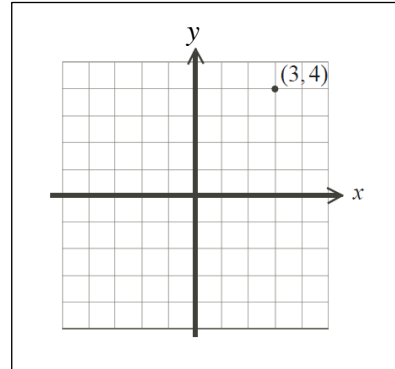
- (29)  $(2 + 4 + 6 + \dots + 24) - (1 + 3 + 5 + \dots + 23) =$   
 A) 24                      B) 20                      C) 18                      D) 16                      E) 12
- (30) I have sold  $\frac{2}{3}$  of my pencils for 15¢ each. If I have 8 pencils left, how much money did I collect for the pencils sold?  
 A) 60 ¢                      B) \$1.20                      C) \$1.80                      D) \$2.40                      E) \$3.00
- (31) If the operation  $*$  is defined as  $x*y = (x - y)(x + y)x + xy$ , then  $4*3 =$   
 A) -10                      B) 12                      C) 18                      D) 24                      E) 40
- (32) What is the greatest common divisor of 48, 72, and 216?  
 A) 8                      B) 12                      C) 16                      D) 18                      E) 24
- (33)  $8\frac{2}{3} \div 0.0666\dots =$   
 A) 130                      B)  $\frac{26}{45}$                       C) 30                      D)  $1\frac{19}{26}$                       E) 13
- (34) What is the perimeter of a regular hexagon with a side length of  $2\frac{2}{3}$  meters?  
 A) 16 meters                      B)  $16\frac{1}{3}$  meters                      C)  $12\frac{1}{3}$  meters                      D)  $15\frac{2}{3}$  meters                      E)  $21\frac{1}{3}$  meters
- (35) The equation  $2x^2 - 6x + 12 = 0$  has two answers. What is the sum of those two answers?  
 A)  $\frac{1}{3}$                       B) -6                      C) 3                      D) 6                      E)  $-\frac{1}{6}$
- (36) What is the area of a square with a diagonal length of 12 centimeters (cm)?  
 A)  $6\text{ cm}^2$                       B)  $24\text{ cm}^2$                       C)  $48\text{ cm}^2$                       D)  $72\text{ cm}^2$                       E)  $144\text{ cm}^2$
- (37) If the area of a rhombus is 36 square inches and one diagonal has a length of 4 inches, what is the length of the other diagonal?  
 A) 9 inches                      B) 12 inches                      C) 18 inches                      D) 20 inches                      E) 24 inches
- (38) For a traditional analog clock, what is the ratio of the speed of the hour's hand to the second's hand?  
 A)  $\frac{1}{360}$                       B)  $\frac{1}{720}$                       C)  $\frac{1}{3600}$                       D) 3600                      E) 72
- (39) How many days are between May 15<sup>th</sup> and July 12<sup>th</sup> of the same calendar year?  
 A) 61 days                      B) 60 days                      C) 59 days                      D) 58 days                      E) 57 days
- (40)  $46\text{ base }8 + 237\text{ base }8 = \underline{\hspace{1cm}}\text{?}\underline{\hspace{1cm}}\text{ base }8.$   
 A)  $283\text{ base }8$                       B)  $350\text{ base }8$                       C)  $305\text{ base }8$                       D)  $341\text{ base }8$                       E)  $203\text{ base }8$
- (41) Twenty-four percent of thirty-six is the same as seventy-two percent of what number?  
 A) 48                      B) 44                      C) 40                      D) 18                      E) 12

(42) Joseph and Jackson were riding bicycles toward each other in a straight line. Joseph is peddling at an average speed of 15 miles per hour (mph) and Jackson average speed is 10 mph. If the distance between them is 110 yards, how long does it take them to reach other?

- A) 3 minutes      B) 9 seconds      C) 45 seconds      D)  $13\frac{1}{5}$  seconds      E) 30 seconds

(43) If the point (3, 4) is reflected in the  $x$ -axis, as shown to the right, what are the coordinates of its image?

- A) (-4, 3)  
 B) (-3, 4)  
 C) (4, 3)  
 D) (3, -4)  
 E) (-3, -4)



(44) Five children had dinner. Chris ate more than Max. Brandon ate less than Kayla. Kayla ate less than Max but more than Tia. Which child ate the second most?

- A) Brandon      B) Max      C) Kayla      D) Chris      E) Tia

(45) A palindrome is a positive integer that is the same when read forwards or backwards. For example, 545 and 1331 are both palindromes. What is the positive difference between the smallest three-digit palindrome and the largest three-digit palindrome?

- A) 878      B) 888      C) 898      D) 909      E) 979

(46) Three pumpkins are weighed two at a time in all possible ways. The weights of the pairs of pumpkins are 12 lbs, 13 lbs and 15 lbs. How much does the lightest pumpkin weigh?

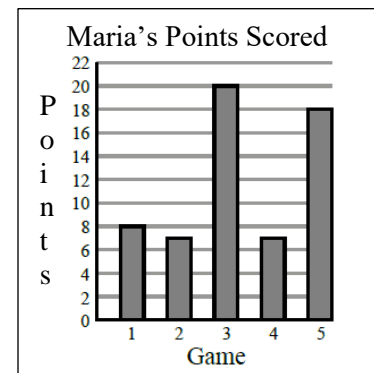
- A) 4 lbs      B) 5 lbs      C) 6 lbs      D) 7 lbs      E) 8 lbs

(47) How many positive two-digit whole numbers are divisible by 7?

- A) 9      B) 10      C) 12      D) 14      E) None of these

(48) The graph to the right shows points scored by Maria in her first five basketball games. What is the difference between the mean and the median of the number of points that she scored?

- A) 1  
 B) 2  
 C) 3  
 D) 4  
 E) 5



(49) Which of the following is equal to seventeen?

- A)  $3 - 4 \times 5 + 6$       B)  $3 \div 4 + 5 - 6$       C)  $3 \times 4 + 5 \div 6$       D)  $3 \times 4 \div 6 + 5$       E)  $3 + 4 \times 5 - 6$

(50) Ten circles are all the same size. Each pair of these circles overlap but no circle is exactly on top of another circle. What is the greatest possible total number of intersection points of these ten circles?

- A) 40      B) 80      C) 90      D) 100      E) 110



**2019 – 2020 University Interscholastic League JH/MS Mathematics Contest B – Key**

- (1) A
- (2) E
- (3) D
- (4) C
- (5) D
- (6) B
- (7) E
- (8) A
- (9) A
- (10) E
- (11) D
- (12) C
- (13) A
- (14) B
- (15) C
- (16) A
- (17) B
- (18) A
- (19) D
- (20) C
- (21) B
- (22) D
- (23) C
- (24) D
- (25) C

- (26) C
- (27) B
- (28) B
- (29) E
- (30) D
- (31) E
- (32) E
- (33) A
- (34) A
- (35) C
- (36) D
- (37) C
- (38) B
- (39) E
- (40) C
- (41) E
- (42) B
- (43) D
- (44) B
- (45) C
- (46) B
- (47) E (13)
- (48) D
- (49) E
- (50) C

**SPRING DISTRICT 2019-2020**

**A+ ACADEMICS**



University Interscholastic League

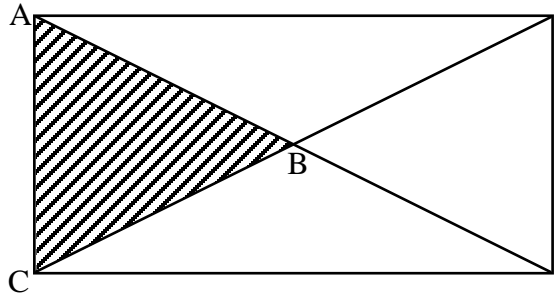


# Mathematics

**DO NOT OPEN TEST  
UNTIL TOLD TO DO SO**

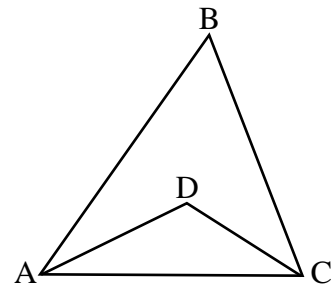
# 2019 – 2020 University Interscholastic League JH/MS Mathematics Contest C

- (1) Evaluate:  $6\frac{2}{3} \div 6^{-1}$
- A)  $1\frac{2}{3}$                       B)  $36\frac{1}{3}$                       C) 40                      D) 38                      E)  $36\frac{2}{3}$
- (2)  $8\frac{1}{4} \times 8\frac{3}{4} =$
- A)  $64\frac{3}{4}$                       B)  $72\frac{3}{16}$                       C)  $72\frac{3}{4}$                       D)  $64\frac{3}{16}$                       E)  $64\frac{1}{2}$
- (3) What is the number of hours in two and one-fourth days?
- A) 54                      B) 30                      C) 27                      D) 48                      E) 135
- (4) A rectangle with a side of length 10 centimeters (cm) has a diagonal length of 26 cm. What is the perimeter of this rectangle?
- A) 13 cm                      B) 26 cm                      C) 39 cm                      D) 52 cm                      E) 68 cm
- (5) If a rod is  $16\frac{1}{2}$  feet long, how many rods are in one-half mile?
- A) 640 rods                      B) 575 rods                      C) 500 rods                      D) 320 rods                      E) 160 rods
- (6) Wes took all the pennies he had in his piggy bank and started to make piles of pennies. In the first pile he placed one penny; in the second pile he placed two pennies, in the third pile he placed three pennies; and so on until he created 14 piles with the same pattern of penny placement. How much money did Wes have in all?
- A) \$1.40                      B) \$1.05                      C) \$1.50                      D) \$10.50                      E) \$105
- (7) There are 24 marbles in a bag. Albert reaches in the bag and pulls out one-fourth of the marbles. Elizabeth then reaches in the bag and pulls out one third of what was left. What percentage of the marbles were pulled out of the bag?
- A) 6%                      B) 12%                      C) 25%                      D) 50%                      E)  $66\frac{2}{3}\%$
- (8) The figure to the right is a rectangle. If the area of  $\triangle ABC$  is  $250\text{ cm}^2$  and  $\overline{AC} = 20\text{ cm}$ , what percent of the rectangle area is the non-shaded region?
- A) 75 %
- B)  $\frac{3}{4}\%$
- C) 25 %
- D) 40 %
- E)  $75\frac{3}{4}\%$



- (9) What is the probability of drawing a queen from a standard deck of 52 cards?  
 A)  $\frac{1}{26}$                       B)  $\frac{1}{13}$                       C)  $\frac{1}{3}$                       D)  $\frac{1}{52}$                       E)  $\frac{2}{13}$
- (10) Mario decided to read a book in a special way. He decided to read only half the number of pages that were left to read each day. If the book was 512 pages long, how many days did it take Mario to finish reading the book?  
 A) 128 days                      B) 16 days                      C) 14 days                      D) 9 days                      E) 8 days
- (11) What number multiplied by itself four times is equal to 16?  
 A) 4                      B) 2                      C) -2                      D) 2 or -2                      E) None of these
- (12) The time it took a solar car to travel around a circular track was 24 minutes. If the solar car was then to travel around a circular track with one-half the radius at the same average speed, how long would it take the car to travel around the track?  
 A) 96 minutes                      B) 48 minutes                      C) 37 minutes                      D) 12 minutes                      E) None of these
- (13) The 64 whole numbers from 1 through 64 are written, one per square, on a checkerboard (an 8 by 8 array of 64 squares). The first 8 numbers are written in order across the first row, the next 8 across the second row, and so on. After all 64 numbers are written, what will be sum of the largest numbers in each row?  
 A) 288                      B) 280                      C) 272                      D) 264                      E) 256
- (14) How many positive factors of 36 are also multiples of 2?  
 A) 2                      B) 3                      C) 4                      D) 5                      E) 6

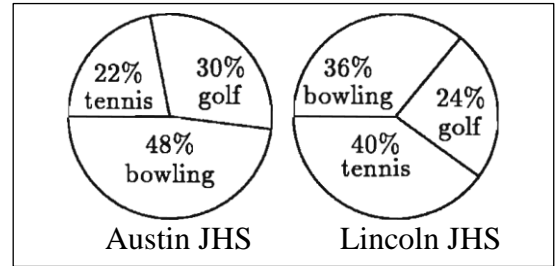
- (15) In the triangle to the right, the measure of  $\angle ABC$  is  $40^\circ$ .  $\overline{AD}$  bisects  $\angle BAC$  and  $\overline{DC}$  bisects  $\angle BCA$ . What is the measure  $\angle ADC$ ?



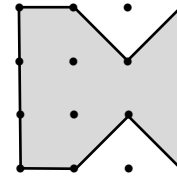
- A)  $90^\circ$   
 B)  $110^\circ$   
 C)  $115^\circ$   
 D)  $122\frac{1}{2}^\circ$   
 E)  $125^\circ$
- (16) Genny's monthly salary was \$4000 in November. In December she received a 20% raise. In January she received a 20% pay cut. After the two changes in December and January, what was Genny's monthly salary?  
 A) \$960                      B) \$3,200                      C) \$3,330                      D) \$3,840                      E) \$5,760
- (17) Noah has goldfish that quadruple every month, and Kenzie has goldfish that double every month. If Noah has 4 goldfish at the same time that Kenzie has 64 goldfish, then in how many months from that time will they have the same number of goldfish?  
 A) 4                      B) 5                      C) 6                      D) 7                      E) 8

- (18) What is the remainder when  $2014 \times 2016 \times 2018 \times 2020$  is divided by 5?  
 A) 0                      B) 1                      C) 2                      D) 3                      E) 4
- (19) The volume of a square pyramid is  $405 \text{ cm}^3$ . If the area of the base is  $81 \text{ cm}^2$ , what is the height of this pyramid?  
 A) 5 cm                      B) 9 cm                      C) 12 cm                      D) 15 cm                      E) 18 cm

- (20) The pie charts to the right indicates the percent of students that prefer golf, bowling or tennis at Austin JHS and Lincoln JHS. The total number of students at Austin is 2,000 and Lincoln is 2,500. What is the number of students who prefer bowling in the combined school populations?  
 A) 900  
 B) 960  
 C) 1,200  
 D) 1,860  
 E) 3,060

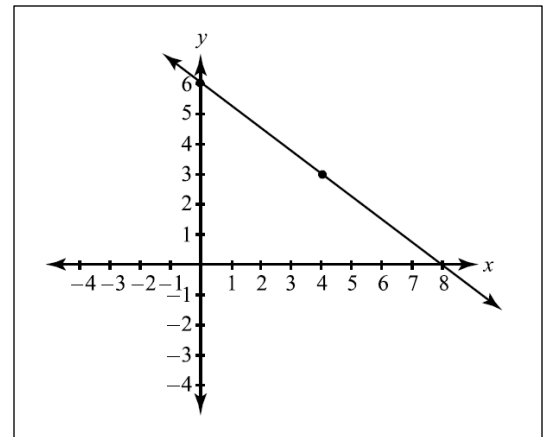


- (21) The diagram to the right shows dots that are spaced one unit apart, horizontally and vertically. How many square units are enclosed by the shaded polygon?  
 A)  $5 \text{ units}^2$   
 B)  $6 \text{ units}^2$   
 C)  $7 \text{ units}^2$   
 D)  $8 \text{ units}^2$   
 E)  $9 \text{ units}^2$

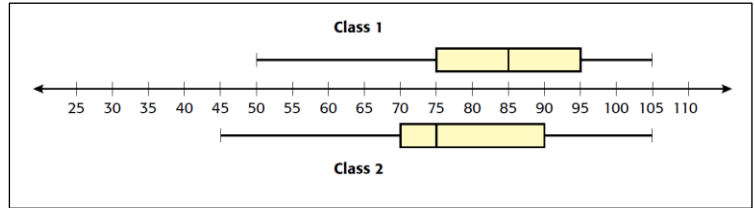


- (22) When five gallons are added to a tank that is one-third full, the tank is then one-half full. What is the capacity of the tank in gallons?  
 A) 10 gallons              B) 15 gallons              C) 20 gallons              D) 25 gallons              E) 30 gallons
- (23) If two dice are tossed, what is the probability that the product of the numbers showing on the tops of the dice is less than 10?  
 A)  $\frac{15}{22}$                       B)  $\frac{11}{36}$                       C)  $\frac{17}{36}$                       D)  $\frac{17}{18}$                       E)  $\frac{11}{18}$

- (24) What is the slope of the line in the graph to the right?  
 A)  $\frac{3}{4}$   
 B) 3  
 C)  $\frac{4}{3}$   
 D)  $-\frac{3}{4}$   
 E)  $-\frac{4}{3}$



(25) Mr. Zapata gave the same quiz to two mathematics classes he taught. The box-and-whisker plots to the right were created using the quiz scores the students earned in each class. Looking at the plot which of the following statements is true?



- A) The median scores for both classes are identical.
- B) The lowest score for class 1 is 50.
- C) The median for class 1 is 10 points less than class 2.
- D) The median for class 2 is 70.
- E) The median for class 1 is 95.

(26) Mike has a box filled with different colored marbles that are the same size and shape. To the right is a list of each color of marble and the number of each in the box. Mike will randomly choose 1 marble, record the color, and not put the marble back. If Mike does this two times, what is the probability that both marbles will be red?

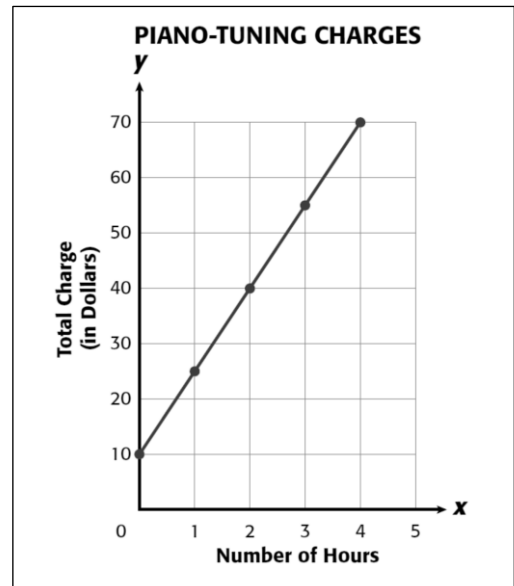
Color	Number
Red	3
Purple	2
Green	2
Black	2
Yellow	2
Orange	3

- A)  $\frac{3}{91}$
- B)  $\frac{3}{14}$
- C)  $\frac{1}{91}$
- D)  $\frac{1}{7}$
- E)  $\frac{3}{182}$

(27) The scale on Matt’s map is 0.5 inch represents 6 miles. The route from Matt’s house to his friend’s house is 3.25 inches on his map. What is the actual distance of Matt’s route?

- A) 6.50 miles
- B) 9.75 miles
- C) 13.00 miles
- D) 19.50 miles
- E) 39.00 miles

(28) Paige is a piano tuner. She charges her clients a fixed amount for a house call plus labor, which is based on an hourly rate. The graph to the right shows how much Paige charges as a function of time required to tune a piano. If Paige charged \$115, how many hours did she work?



- A) 5 hours
- B) 6 hours
- C) 7 hours
- D) 8 hours
- E) 9 hours

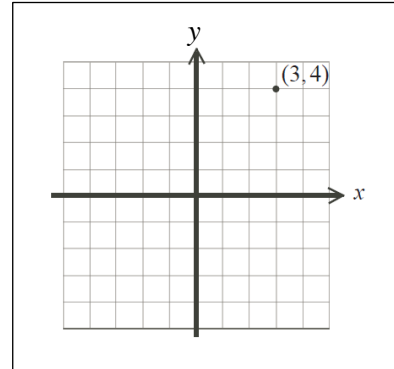
- (29)  $(1 + 2 + 3 + \dots + 14) - (2 + 4 + 6 + \dots + 14) =$   
 A) 42                      B) 49                      C) 56                      D) 91                      E) 105
- (30) I have sold  $\frac{2}{3}$  of my pencils for 15¢ each. If I have 12 pencils left, how much money did I collect for the pencils sold?  
 A) 60 ¢                      B) \$1.20                      C) \$1.80                      D) \$2.40                      E) \$3.60
- (31) If the operation  $*$  is defined as  $x*y = (x - y)(x + y)x + xy$ , then  $3*4 =$   
 A) -9                      B) 12                      C) 18                      D) 24                      E) 40
- (32) What is the greatest common divisor of 48, 36, and 96?  
 A) 288                      B) 144                      C) 72                      D) 12                      E) 2
- (33)  $5\frac{1}{3} \div 0.0666\dots =$   
 A) 75                      B) 80                      C)  $75\frac{1}{3}$                       D)  $1\frac{16}{45}$                       E)  $\frac{16}{45}$
- (34) What is the perimeter of a regular hexagon with a side length of  $1\frac{1}{6}$  meters?  
 A) 7 meters                      B)  $6\frac{1}{3}$  meters                      C)  $49\frac{1}{3}$  meters                      D)  $1\frac{7}{36}$                       E)  $5\frac{1}{7}$
- (35) The equation  $2x^2 - 6x + 12 = 0$  has two answers. What is the product of those two answers?  
 A)  $\frac{1}{3}$                       B) -6                      C) 3                      D) 6                      E)  $-\frac{1}{6}$
- (36) What is the area of a square with a diagonal length of 16 centimeters (cm)?  
 A)  $256\text{ cm}^2$                       B)  $128\text{ cm}^2$                       C)  $72\text{ cm}^2$                       D)  $64\text{ cm}^2$                       E)  $32\text{ cm}^2$
- (37) If the area of a rhombus is 24 square inches and one diagonal has a length of 4 inches, what is the length of the other diagonal?  
 A) 6 inches                      B) 12 inches                      C) 18 inches                      D) 20 inches                      E) 48 inches
- (38) For a traditional analog clock, what is the ratio of the speed of the hour's hand to the minute's hand?  
 A)  $\frac{1}{360}$                       B)  $\frac{1}{720}$                       C)  $\frac{1}{6}$                       D)  $\frac{1}{24}$                       E)  $\frac{1}{12}$
- (39) How many days are between May 21<sup>st</sup> and July 12<sup>th</sup> of the same calendar year?  
 A) 48 days                      B) 49 days                      C) 50 days                      D) 51 days                      E) 52 days
- (40)  $36\text{ base }8 + 257\text{ base }8 = \underline{\hspace{1cm}}\text{?}\underline{\hspace{1cm}}\text{ base }8.$   
 A) 293 base 8                      B) 355 base 8                      C) 353 base 8                      D) 315 base 8                      E) 213 base 8
- (41) Twenty-four percent of forty-eight is the same as seventy-two percent of what number?  
 A) 144                      B) 115                      C) 50                      D) 32                      E) 16

(42) Joseph and Jackson were riding bicycles toward each other in a straight line. Joseph is peddling at an average speed of 15 miles per hour (mph) and Jackson average speed is 10 mph. If the distance between them is 220 yards, how long does it take them to reach other?

- A) 6 seconds      B) 12 seconds      C) 18 seconds      D)  $26\frac{2}{5}$  seconds      E)  $580\frac{4}{5}$  seconds

(43) If the point (3, 4) is reflected in the y-axis, as shown to the right, what are the coordinates of its image?

- A) (-4, 3)  
 B) (-3, 4)  
 C) (4, 3)  
 D) (3, -4)  
 E) (-3, -4)



(44) Five children are celebrating birthdays. Chris is older than Max. Brandon younger than Kayla. Kayla is younger than Max but older than Tia. Which child is the second oldest?

- A) Brandon      B) Kayla      C) Max      D) Chris      E) Tia

(45) A palindrome is a positive integer that is the same when read forwards or backwards. For example, 545 and 1331 are both palindromes. What is the sum the smallest three-digit palindrome and the largest three-digit palindrome?

- A) 1,092      B) 1,096      C) 1,100      D) 1,104      E) 1,108

(46) Three pumpkins are weighed two at a time in all possible ways. The weights of the pairs of pumpkins are 12 lbs, 13 lbs and 15 lbs. How much does the largest pumpkin weigh?

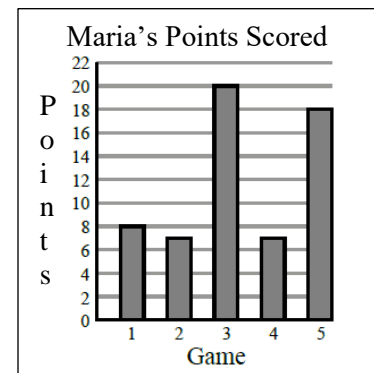
- A) 4 lbs      B) 5 lbs      C) 6 lbs      D) 7 lbs      E) 8 lbs

(47) How many positive two-digit whole numbers are divisible by 3?

- A) 29      B) 30      C) 31      D) 32      E) None of these

(48) The graph to the right shows points scored by Maria in her first five basketball games. What is the product of the mean and the median of the number of points that she scored?

- A) 74  
 B) 77  
 C) 84  
 D) 88  
 E) 96



(49) Which of the following is equal to negative eleven?

- A)  $3 - 4 \times 5 + 6$       B)  $3 \div 4 + 5 - 6$       C)  $3 \times 4 + 5 \div 6$       D)  $3 \times 4 \div 6 + 5$       E)  $3 + 4 \times 5 - 6$

(50) Eight circles are all the same size. Each pair of these circles overlap but no circle is exactly on top of another circle. What is the greatest possible total number of intersection points of these eight circles?

- A) 40      B) 42      C) 44      D) 56      E) 72



**2019 – 2020 University Interscholastic League JH/MS Mathematics Contest C – Key**

- (1) C
- (2) B
- (3) A
- (4) E
- (5) E
- (6) B
- (7) D
- (8) A
- (9) B
- (10) D
- (11) D
- (12) D
- (13) A
- (14) E
- (15) B
- (16) D
- (17) A
- (18) A
- (19) D
- (20) D
- (21) C
- (22) E
- (23) C
- (24) D
- (25) B

- (26) A
- (27) E
- (28) C
- (29) B
- (30) E
- (31) A
- (32) D
- (33) B
- (34) A
- (35) D
- (36) B
- (37) B
- (38) E
- (39) D
- (40) D
- (41) E
- (42) C
- (43) B
- (44) C
- (45) C
- (46) E
- (47) B
- (48) E
- (49) A
- (50) D