

CONTESTANT NUMBER:

**FOR GRADER USE ONLY**

Score Test Below:

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

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

**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**

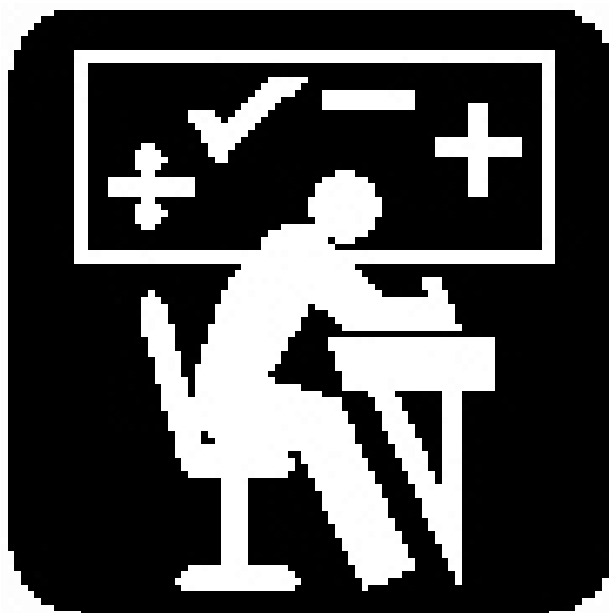
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|-----|---|---|---|---|---|-----|---|---|---|---|---|
| 1.  | A | B | C | D | E | 26. | A | B | C | D | E |
| 2.  | A | B | C | D | E | 27. | A | B | C | D | E |
| 3.  | A | B | C | D | E | 28. | A | B | C | D | E |
| 4.  | A | B | C | D | E | 29. | 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 2020-2021**

**A+ ACADEMICS**



University Interscholastic League



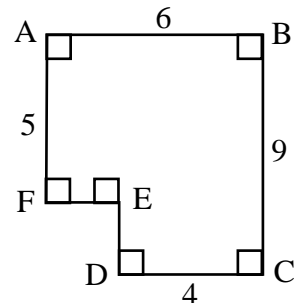
# Mathematics

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

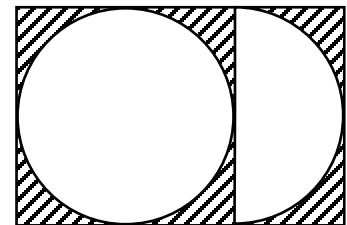
## 2020 – 2021 University Interscholastic League JH/MS Mathematics Contest A

- (1) Evaluate:  $2^4 \div 2^3 \times 2^2 \div 2^1 \times 2^0 \div 2^{-1}$   
 A) 16                      B) 8                      C) 4                      D) 2                      E)  $\frac{1}{2}$
- (2) Twenty-five percent of twenty percent of 100 is equal to what amount?  
 A) 8                      B) 2.5                      C) 20                      D)  $\frac{1}{20}$                       E) 5
- (3)  $0.1 + 0.2 + 0.3 + \dots + 2.0 =$   
 A) 0.21                      B) 2.1                      C) 21                      D) 210                      E) 2.01
- (4) 15 hours = \_\_\_\_\_ minutes.  
 A) 900                      B) 90                      C) 4                      D) 360                      E) 9
- (5) What is the length of one side of a rectangle with perimeter of 24 cm if the adjacent side is 8 cm?  
 A) 8                      B) 4                      C) 16                      D) 2                      E) None of These
- (6) What is the total number of days between September 18<sup>th</sup> and December 25<sup>th</sup> in the same calendar year?  
 A) 99                      B) 98                      C) 97                      D) 96                      E) 95
- (7) If the sales tax for an item is  $6\frac{1}{4}\%$ , what does an item valued at \$8 cost including tax?  
 A) \$.85                      B) \$12.80                      C) \$8.63                      D) \$8.50                      E) \$8.05
- (8) 4.5% is equivalent to what fraction?  
 A)  $\frac{9}{100}$                       B)  $\frac{9}{20}$                       C)  $\frac{9}{200}$                       D)  $\frac{1}{45}$                       E)  $4\frac{1}{20}$
- (9) Twenty-four liquid ounces is equal to how many pints?  
 A) 1.5                      B)  $\frac{2}{3}$                       C)  $1\frac{2}{3}$                       D)  $\frac{3}{4}$                       E) 3
- (10) When it is 7:00 AM in Fort Worth, Texas, it is 8:00 AM in Fairfax, Virginia and 1:00 PM in London, England on the same day. So, if it is 2:00 AM in London on a Monday, what time is it in Fort Worth?  
 A) 1 AM Monday    B) 8 AM Sunday    C) 10 PM Monday    D) 1 PM Monday    E) 8 PM Sunday
- (11)  $0.008 \text{ km}^2 =$  \_\_\_\_\_  $\text{m}^2$ .  
 A) 8                      B) 80                      C) 800                      D) 8,000                      E) 800,000

- (12) What is the area of polygon ABCDEF to the right, in square units? (Note that figure is not drawn to scale.)  
 A) 24  
 B) 30  
 C) 46  
 D) 66  
 E) 74



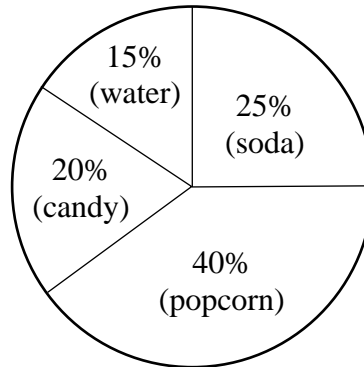
- (13) Richards Elementary School has 600 students. Each student takes 5 classes a day. Each teacher teaches 4 classes. Each class has 30 students and 1 teacher. How many teachers are there at Richards Elementary School?  
 A) 25                      B) 30                      C) 35                      D) 50                      E) 100
- (14) If the length and width of a rectangle are each increased by 20%, then the perimeter of the rectangle is increased by what percent?  
 A) 2%                      B) 20%                      C) 40%                      D) 200%                      E) 400%
- (15)  $4\frac{1}{8} \times 4\frac{7}{8} =$   
 A)  $16\frac{7}{64}$                       B)  $16\frac{7}{8}$                       C)  $20\frac{7}{8}$                       D)  $20\frac{7}{64}$                       E)  $18\frac{7}{8}$
- (16) If the area of a rhombus with diagonals 16 and  $d$  is 80, what is the length of the other diagonal?  
 A) 5                      B) 10                      C) 32                      D) 64                      E) 70
- (17) If  $\frac{3}{8} - \frac{1}{n} = \frac{1}{4}$ , then  $n =$   
 A)  $-\frac{1}{4}$                       B)  $-\frac{1}{8}$                       C)  $\frac{3}{32}$                       D) 4                      E) 8
- (18) If the mean of 16, 5 and  $m$  is 12, then what is  $m$ ?  
 A) -1                      B) 1                      C) 11                      D) 15                      E) 47
- (19) If your average score on your first six mathematics tests was 84 and your average score on your first seven mathematics tests was 85, then what is your score on the seventh test?  
 A) 86                      B) 88                      C) 90                      D) 91                      E) 92
- (20) A square and a triangle have equal perimeters. The lengths of the three sides of the triangle are 6.2 cm, 8.3 cm and 9.5 cm. What is the area of the square?  
 A)  $24 \text{ cm}^2$                       B)  $36 \text{ cm}^2$                       C)  $48 \text{ cm}^2$                       D)  $64 \text{ cm}^2$                       E)  $144 \text{ cm}^2$
- (21) 15 miles per hour = \_\_\_\_\_ feet per second (ft/s).  
 A) 60 ft/s                      B) 48 ft/s                      C) 44 ft/s                      D) 24 ft/s                      E) 22 ft/s
- (22) The figure to the right is a rectangle circumscribing a circle and a semicircle. If the area of the circle is  $4\pi$ , what is the shaded area equal to?  
 A)  $24 - 6\pi$   
 B)  $24 - 5\pi$   
 C)  $24 - 4\pi$   
 D)  $20 - 6\pi$   
 E)  $20 - 5\pi$



- (24) What is the sum of the two largest prime numbers less than 100?  
 A) 186                      B) 188                      C) 190                      D) 192                      E) 196

**For problems #25 – #28 please use the pie chart graph below.**

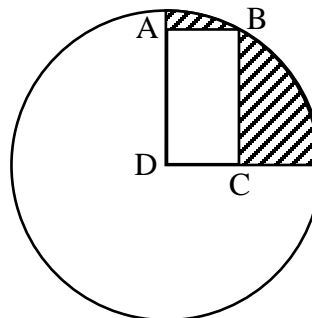
**Refreshments While at the Movies**



- (25) In a survey of 200 students from a local middle school the pie chart above gave a breakdown of favorite refreshments of the students when going to a movie theater. How many more students preferred soda to water as a refreshment?  
 A) 10                      B) 15                      C) 20                      D) 30                      E) 50
- (26) In a survey of 200 students from a local middle school, the pie chart above gave a breakdown of favorite refreshments of the students when going to a movie theater. If a box of popcorn cost \$2.50, how much money was spent buying popcorn?  
 A) \$200                      B) \$800                      C) \$80                      D) \$2,000                      E) \$500
- (27) In a survey of 200 students from a local middle school, the pie chart above gave a breakdown of favorite refreshments of the students when going to a movie theater. If the students bought a box of popcorn that cost \$2.50 plus a bottle of water that cost \$1.50, how much money was spent buying this combination of refreshments?  
 A) \$2,200                      B) \$800                      C) \$275                      D) \$440                      E) \$22,000
- (28) In a survey of 200 students from a local middle school, the pie chart above gave a breakdown of favorite refreshments of the students when going to a movie theater. How many students did not prefer to consume any beverage?  
 A) 80 students                      B) 120 students                      C) 60 students                      D) 160 students                      E) 125 students
- (29) A father, whose age is forty-two, has a daughter whose age is nine. In how many years will the age of the daughter be one-fourth that of the father?  
 A) 2 years                      B) 3 years                      C) 4 years                      D) 6 years                      E) 12 years
- (30) With a tail wind, a jet plane flew 2400 miles in 4 hours, but the plane required 6 hours for the return trip against the wind. What is the speed of the wind in miles per hour (mph)?  
 A) 25 mph                      B) 40 mph                      C) 50 mph                      D) 60 mph                      E) 100 mph
- (31) If  $5^{(x-2)} = 9$ , then  $5^x$  equals what number?  
 A) 25                      B) 36                      C) 90                      D) 225                      E) 900

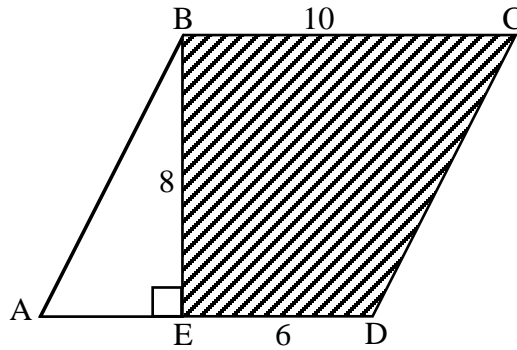
- (32) What is the greatest common factor (GCF) for  $-18a^2b$  and  $30a^2$ ?  
 A)  $90ab$                       B)  $90a^2b$                       C)  $-90a^2b$                       D)  $6a^2b$                       E)  $6a^2$
- (33) The degree measures of three angles of a triangle have the ratio of  $4 : 4 : 7$ . What is the measure of the largest angle?  
 A)  $42^\circ$                       B)  $44^\circ$                       C)  $48^\circ$                       D)  $64^\circ$                       E)  $84^\circ$
- (34)  $0.08333 \dots =$   
 A)  $2\frac{1}{8}$                       B)  $2\frac{1}{3}$                       C)  $8\frac{1}{3}$                       D)  $\frac{83}{99}$                       E)  $\frac{1}{12}$
- (35) What is the area of a square with a diagonal length of 12-m?  
 A)  $144 \text{ m}^2$                       B)  $96 \text{ m}^2$                       C)  $84 \text{ m}^2$                       D)  $72 \text{ m}^2$                       E) None of these
- (36) What is the amount of simple interest for a loan of \$1200 at 8% annual interest rate for 9 months?  
 A) \$72                      B) \$60                      C) \$48                      D) \$36                      E) \$24
- (37) If the sum of  $x$  numbers is 56 and their arithmetic mean is 7, what is  $x$ ?  
 A) 14                      B) 28                      C) 56                      D) 112                      E) None of these
- (38) What is the probability of drawing a face card or a ten from a standard deck of 52 cards?  
 A)  $\frac{1}{8}$                       B)  $\frac{4}{13}$                       C)  $\frac{5}{26}$                       D)  $\frac{11}{26}$                       E)  $\frac{1}{13}$
- (39) How many whole numbers are between  $\sqrt{8}$  and  $\sqrt{80}$ ?  
 A) 5                      B) 6                      C) 7                      D) 8                      E) 9
- (40) If  $a*b$  means  $\frac{a+b}{2}$ , then  $(3*5)*8$  equals what number?  
 A) 6                      B) 8                      C) 12                      D) 16                      E) 30
- (41) An ancient society seemed to have measured angles in cliks (cks). If there are 500 cliks in a full circle, how many cliks are in a right angle?  
 A) 90 cks                      B) 100 cks                      C) 125 cks                      D) 180 cks                      E) 250 cks

- (42) In the figure to the right ABCD is a rectangle. D is the center of the circle and B is on the circle. If  $AD = 4$  and  $CD = 3$ , then the area of shaded region is between



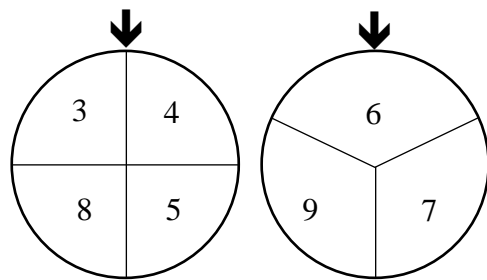
- A) 4 and 5.  
 B) 5 and 6.  
 C) 6 and 7.  
 D) 7 and 8.  
 E) 8 and 9.
- (43) The average weight of 6 boys is 150 pounds and the average weight of 4 girls is 120 pounds. What is the average weight of the 10 children?  
 A) 135 lbs.                      B) 137 lbs.                      C) 138 lbs.                      D) 140 lbs.                      E) 141 lbs.

- (44) What is the area of the shaded region BCDE (in the figure to the right) in parallelogram ABCD?  
 A) 24  
 B) 48  
 C) 60  
 D) 64  
 E) 80



- (45) In how many ways can 47 be written as the sum of two primes?  
 A) 1                      B) 2                      C) 3                      D) 4                      E) None of these

- (46) Every time the two wheels in the illustration to the right are spun, two numbers are selected by the pointers. What is the probability that the sum of the two numbers selected is even?



- A)  $\frac{1}{6}$   
 B)  $\frac{3}{7}$   
 C)  $\frac{1}{2}$   
 D)  $\frac{2}{3}$   
 E) None of these
- (47) A dress originally priced at \$80 was put on sale at 25% off. If 10% tax was added to the sale price, then how much is the total selling price of the dress?  
 A) \$45                      B) \$52                      C) \$54                      D) \$66                      E) \$68
- (48) A black bag contains only blue marbles and green marbles. There are only 6 blue marbles. If the probability of drawing a blue marble at random is  $\frac{1}{4}$ , then how many green marbles are there in the bag?  
 A) 12                      B) 18                      C) 24                      D) 30                      E) 36
- (49) There are 120 seats in a row. What is the fewest number of seats that must be occupied so the next person to be seated must sit next to someone?  
 A) 30                      B) 40                      C) 41                      D) 60                      E) 119
- (50) A straight concrete sidewalk is to be 3 feet wide, 60 feet long and 3 inches thick. How many cubic yards of concrete must a contractor order for the sidewalk if concrete must be ordered in a whole number of cubic yards?  
 A) 2 yds<sup>3</sup>                      B) 5 yds<sup>3</sup>                      C) 12 yds<sup>3</sup>                      D) 20 yds<sup>3</sup>                      E) 22 yds<sup>3</sup>

**2020 – 2021 University Interscholastic League JH/MS Mathematics Contest A – Key**

- |      |   |      |   |
|------|---|------|---|
| (1)  | B | (26) | A   |
| (2)  | E | (27) | D   |
| (3)  | C | (28) | B   |
| (4)  | A | (29) | A   |
| (5)  | B | (30) | E   |
| (6)  | C | (31) | D   |
| (7)  | D | (32) | E   |
| (8)  | C | (33) | E   |
| (9)  | E | (34) | E   |
| (10) | E | (35) | D   |
| (11) | C | (36) | A   |
| (12) | C | (37) | E (8)                                       |
| (13) | A | (38) | B   |
| (14) | B | (39) | B   |
| (15) | D | (40) | A   |
| (16) | B | (41) | C   |
| (17) | E | (42) | D   |
| (18) | D | (43) | C   |
| (19) | D | (44) | D   |
| (20) | B | (45) | E (There are NO two primes that add to 47.) |
| (21) | E | (46) | C   |
| (22) | A | (47) | D   |
| (23) | D | (48) | B   |
| (24) | A | (49) | B   |
| (25) | C | (50) | A   |

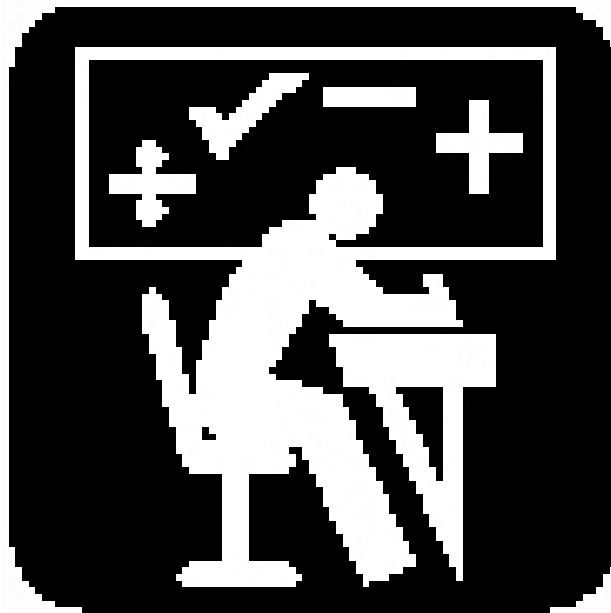


**FALL/WINTER DISTRICT 2020-2021**

**A+ ACADEMICS**



University Interscholastic League

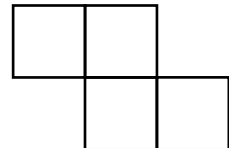


# Mathematics

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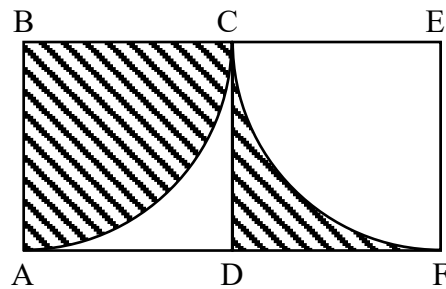
## 2020 – 2021 University Interscholastic League JH/MS Mathematics Contest B

- (1) Evaluate:  $32 \times 2^{-3} \div 2^{-1} \div 2^0$   
A) 24                      B) 16                      C) 8                      D) 4                      E) 0
- (2) The sum of twenty-five percent and twenty percent of 30 is equal to what amount?  
A)  $16\frac{1}{2}$                       B)  $1\frac{1}{5}$                       C)  $13\frac{1}{2}$                       D)  $\frac{9}{25}$                       E) 6
- (3)  $8 - 1.0 - 0.9 - 0.8 - \dots - 0.1 =$   
A) 5.5                      B) 4.5                      C) 3.5                      D) 2.5                      E) 2.25
- (4) 22 gallons = \_\_\_\_\_ quarts.  
A) 176                      B) 88                      C) 72                      D) 44                      E) 36
- (5) What is the perimeter of a square with an area of 64?  
A) 4                      B) 8                      C) 16                      D) 32                      E) 128
- (6) What is the total number of days between September 18<sup>th</sup> and October 26<sup>th</sup> in the same calendar year?  
A) 12                      B) 18                      C) 24                      D) 36                      E) None of these
- (7) If the sales tax for an item is  $7\frac{1}{2}\%$ , what does an item valued at \$2 cost including tax?  
A) \$.15                      B) \$2.15                      C) \$7.50                      D) \$14.00                      E) \$14.50
- (8) Three-sixteenths is equivalent to what percent?  
A)  $18\frac{3}{4}\%$                       B)  $16\frac{1}{2}\%$                       C)  $16\frac{3}{4}\%$                       D)  $18\frac{1}{4}\%$                       E)  $6\frac{1}{4}\%$
- (9)  $140000 \text{ cm}^2 =$  \_\_\_\_\_  $\text{m}^2$ .  
A) 1,400                      B) 14                      C) 1.4                      D) 0.14                      E) 0.014
- (10) Wesley and Noah are each riding a bicycle towards each other. They are initially 105 feet from each other. Wesley's average speed is 15 feet/second while Noah's average speed is 20 feet/second. How long does it take the brothers to reach each other?  
A) 3 seconds                      B) 0.3 second                      C) 5.25 seconds                      D) 7 seconds                      E) 12.25 seconds
- (11) If the measurement of one rod equals 16.5 feet, how many rods are in one mile?  
A)  $106\frac{2}{3}$  rods                      B) 160 rods                      C) 320 rods                      D) 640 rods                      E) 1,760 rods
- (12) The figure to the right consists of four identical size squares. If the total area enclosed by the squares is 64 square inches, what is the perimeter of the figure?  
A) 40 inches  
B) 44 inches  
C) 48 inches  
D) 64 inches  
E) 72 inches



- (13) How many quarter-inch cubes does it take to make a single one-inch cube?  
 A) 4                      B) 16                      C) 48                      D) 64                      E) 128
- (14) If the length of the diameter of a circle is doubled, then the circle's area is increased by what factor?  
 A) 2                      B) 4                      C)  $2\pi$                       D) 8                      E)  $4\pi$
- (15)  $6\frac{1}{3} \times 3\frac{1}{3} =$   
 A)  $21\frac{1}{9}$                       B)  $18\frac{1}{3}$                       C)  $18\frac{1}{9}$                       D)  $21\frac{1}{3}$                       E)  $19\frac{1}{9}$
- (16) If the area of a trapezoid with bases 4, 6 and altitude  $h$  is 80, what is the length of the altitude?  
 A) 8                      B) 10                      C) 12                      D) 14                      E) 16
- (17) If  $\frac{1}{6} - \frac{1}{n} = \frac{1}{4}$ , then  $n =$   
 A)  $-\frac{1}{12}$                       B)  $-\frac{1}{2}$                       C)  $\frac{1}{12}$                       D) -12                      E) 12
- (18) If the mean of 12, 8 and  $m$  is 4, then what is  $m$ ?  
 A) -8                      B) 3                      C) 6                      D) 10                      E) 12
- (19) The first side of a triangle is 2 inches shorter than 4 times the second side. The third side is 8 inches longer than the second side. If the perimeter is 12 feet, find the length of the longest side.  
 A) 9 feet                      B) 23 inches                      C) 5 feet                      D) 31 inches                      E) 90 inches
- (20) On a Texas map the distance between Ft. Worth and El Paso is 5 inches. The approximate distance is 550 miles. If the distance between Arlington and Sarita is 3.5 inches on the same map. What is the approximate distance from Arlington to Sarita to the nearest mile?  
 A) 320 miles                      B) 385 miles                      C) 395 miles                      D) 415 miles                      E) 420 miles
- (21) 18 kilometers per hour = \_\_\_\_\_ meters per second (m/s).  
 A)  $64\frac{4}{5}$  m/s                      B) 32 m/s                      C) 10 m/s                      D) 5 m/s                      E)  $\frac{5}{18}$  m/s

- (22) Quadrilaterals ABCD and DCEF to the right are congruent squares with each side being 10 cm in length. Arcs AC and arc CF are quarter circles. What is the area of the shaded portion?  
 A)  $10 \text{ cm}^2$   
 B)  $40 \text{ cm}^2$   
 C)  $50 \text{ cm}^2$   
 D)  $80 \text{ cm}^2$   
 E)  $100 \text{ cm}^2$



- (23) How many whole numbers will evenly divide into  $2^3 \times 3^2 \times 5^1$ ?  
 A) 6                      B) 8                      C) 10                      D) 12                      E) 24

- (24) Dan is building 2 rabbit cages in the shape of rectangular prisms. The first cage is 3 feet long, 2 feet wide, and 2 feet high. The second cage has the same width and height but is twice as long. How many times larger is the volume of the second cage compared to the volume of the first cage?  
 A) 2                      B) 4                      C) 5                      D) 6                      E) 8

**For problems #25 – #29 please use the chart below.**

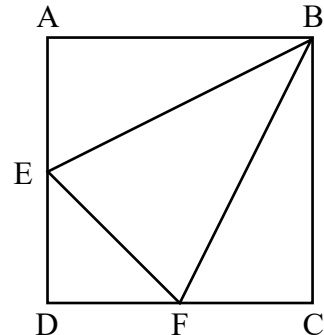
**Miles Run Each Week**

Week	Miles
1	2
2	5
3	8
4	11

- (25) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If the pattern continued how many miles did she run by the end of the twentieth week?  
 A) 40 miles              B) 43 miles              C) 56 miles              D) 59 miles              E) 62 miles
- (26) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. What is the mean number of miles she ran in the first three weeks?  
 A) 15 miles              B) 10 miles              C) 5 miles              D) 3 miles              E) 2 miles
- (27) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. What is the total number of miles she ran in the first five weeks?  
 A) 40 miles              B) 41 miles              C) 44 miles              D) 47 miles              E) 50 miles
- (28) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If she took a total of 10 hours to run her total miles during week 17, what was her average speed for that week in miles per hour (mph)?  
 A)  $2\frac{1}{2}$  mph              B) 4 mph              C)  $4\frac{1}{2}$  mph              D) 5 mph              E) 50 mph
- (29) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If the length of a single lap around the local high school track is 440 yards and there are 1,760 yards per mile, how many laps did Amanda run in week 7?  
 A) 120 laps              B) 80 laps              C) 68 laps              D) 44 laps              E) 40 laps
- (30) With a current, a raft traveled 20 miles in 4 hours, but the raft required 6 hours for the return trip against the current. What is the speed of the current in miles per hour (mph)?  
 A)  $1\frac{1}{2}$  mph              B)  $1\frac{5}{6}$  mph              C)  $\frac{5}{6}$  mph              D)  $1\frac{1}{3}$  mph              E)  $1\frac{1}{6}$  mph
- (31) If  $3^x$  equals  $\frac{9^2 \times 27^3}{3^5}$ , then what is  $x$  equal to?  
 A) 6                      B) 7                      C) 8                      D) 9                      E) 10

- (32) What is the product of the GCF and LCM of 25 and 44?  
 A) 1,100                      B) 825                      C) 750                      D) 550                      E) 500
- (33) The degree measures of three angles of a triangle have the ratio of 3 : 4 : 5. What is the measure of the largest angle?  
 A)  $15^\circ$                       B)  $45^\circ$                       C)  $60^\circ$                       D)  $75^\circ$                       E)  $90^\circ$
- (34)  $0.08333 \dots + 0.666 \dots =$   
 A)  $1\frac{3}{4}$                       B)  $\frac{3}{4}$                       C)  $1\frac{50}{99}$                       D)  $\frac{1874}{2499}$                       E)  $\frac{7}{12}$
- (35) What is the diagonal length of a square with area  $98 \text{ km}^2$ ?  
 A) 14 km                      B)  $98\sqrt{2}$  km                      C) 28 km                      D) 12 km                      E) 16 km
- (36) What is the amount of simple interest for a loan of \$1200 at 6% annual interest rate for 8 months?  
 A) \$576                      B) \$288                      C) \$48                      D) \$44                      E) \$40
- (37) What is the product of the mean and median for the numbers: 12, 4, 8 and 6?  
 A) 49                      B) 52                      C)  $52\frac{1}{2}$                       D)  $49\frac{1}{2}$                       E) 51
- (38) What is the probability of drawing a king or an ace from a standard deck of 52 cards?  
 A)  $\frac{1}{13}$                       B)  $\frac{4}{13}$                       C)  $\frac{3}{13}$                       D)  $\frac{5}{26}$                       E)  $\frac{2}{13}$
- (39) What is the distance between -12 and 8 on the number line?  
 A) 4                      B) 6                      C) 8                      D) 12                      E) 20
- (40) If  $a*b$  means  $\frac{a-b}{2}$ , then  $(4*8)*10$  equals what number?  
 A) 6                      B) -6                      C) -12                      D) -2                      E) 4
- (41) In a certain country,  $12\frac{1}{2}$  Wonkas (Wnk) equals \$1. At this rate of currency exchange, what does \$16 equal in Wonkas?  
 A) 200 Wnk                      B) 128 Wnk                      C) 150 Wnk                      D) 78 Wnk                      E) 192 Wnk

- (42) In the figure to the right quadrilateral ABCD is a square with  $AB = 2-m$ ,  $DE = 1-m$  and  $DF = 1-m$ . What is the area of triangle BFE?  
 A)  $1 \text{ m}^2$   
 B)  $\frac{3}{2} \text{ m}^2$   
 C)  $\frac{5}{2} \text{ m}^2$   
 D)  $2 \text{ m}^2$   
 E)  $3 \text{ m}^2$

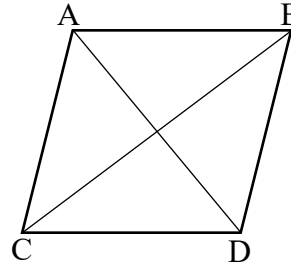


(43) Genny, who weighs 150 lbs. sits at one end of a 20-ft seesaw balanced at the middle. How far from the middle should Andy, who weighs 200 pounds, sit to balance the seesaw?

- A)  $2\frac{1}{2}$  ft.      B)  $3\frac{3}{4}$  ft.      C) 5 ft.      D)  $7\frac{1}{2}$  ft.      E)  $7\frac{3}{4}$  ft.

(44) What is the area of the rhombus ABCD to the right if diagonal AD = 18 cm and diagonal BC = 24 cm?

- A)  $216\text{ cm}^2$   
 B)  $240\text{ cm}^2$   
 C)  $324\text{ cm}^2$   
 D)  $405\text{ cm}^2$   
 E)  $432\text{ cm}^2$

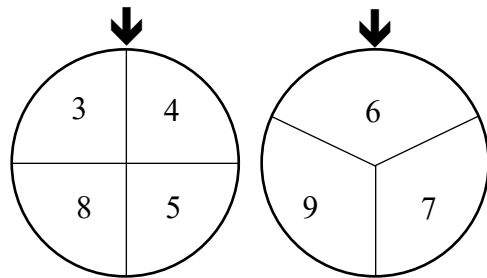


(45) In how many ways can 24 be written as the sum of two primes?

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

(46) Every time the two wheels in the illustration to the right are spun, two numbers are selected by the pointers. What is the probability that the sum of the two numbers selected is a prime number?

- A)  $\frac{1}{2}$   
 B)  $\frac{1}{4}$   
 C)  $\frac{1}{3}$   
 D)  $\frac{2}{3}$   
 E) None of these



(47) A coat originally priced at \$100 was put on sale at 30% off. If 10% tax was added to the sale price, then how much is the total selling price of the coat?

- A) \$84      B) \$77      C) \$75.50      D) \$37.50      E) \$33

(48) A black bag contains only blue marbles and green marbles. There are only 12 blue marbles. If the probability of drawing a blue marble at random is  $\frac{2}{3}$ , then how many green marbles are there in the bag?

- A) 12      B) 18      C) 4      D) 8      E) 6

(49) During the softball season, Mackenzie had 35 hits. Among her hits were 1 home run, 1 triple and 5 doubles. The rest of her hits were singles. What percent of her hits were singles?

- A) 28%      B) 35%      C) 70%      D) 75%      E) 80%

(50) What is the 2020<sup>th</sup> letter in the sequence:

ABCDEDCBAABCDEDCBAABCDEDCBA...?

- A) A      B) B      C) C      D) D      E) E

**2020 – 2021 University Interscholastic League JH/MS Mathematics Contest B – Key**

- (1) C
- (2) C
- (3) D
- (4) B
- (5) D
- (6) E (37)
- (7) B
- (8) A
- (9) B
- (10) A
- (11) C
- (12) A
- (13) D
- (14) B
- (15) A
- (16) E
- (17) D
- (18) A
- (19) E
- (20) B
- (21) D
- (22) E
- (23) E
- (24) A
- (25) D

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

**SPRING DISTRICT 2020-2021**

**A+ ACADEMICS**



University Interscholastic League



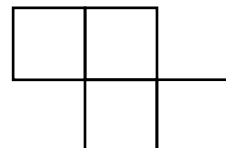
# Mathematics

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



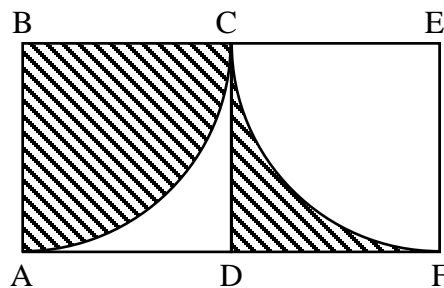
# 2020 – 2021 University Interscholastic League JH/MS Mathematics Contest C

- (1) Evaluate:  $81 \times 3^{-3} \div 3^{-1} + 3^0$   
A) 10                      B) 9                      C) 3                      D) 2                      E) 0
- (2) The sum of twenty-five percent and twenty percent of 50 is equal to what amount?  
A)  $22\frac{1}{2}$                       B)  $4\frac{1}{8}$                       C)  $15\frac{1}{10}$                       D) 10                      E) 5
- (3)  $10 - 1.0 - 0.9 - 0.8 - \dots - 0.1 =$   
A) 5.5                      B) 4.5                      C) 4.25                      D) 3.75                      E) 2.5
- (4) 24 gallons = \_\_\_\_\_ quarts.  
A) 3                      B) 6                      C) 12                      D) 48                      E) 96
- (5) What is the perimeter of a square with an area of 144?  
A) 12                      B) 24                      C) 36                      D) 48                      E) 72
- (6) What is the total number of days between June 6<sup>th</sup> and July 30<sup>th</sup> in the same calendar year?  
A) 24                      B) 29                      C) 53                      D) 54                      E) 55
- (7) If the sales tax for an item is  $7\frac{1}{2}\%$ , what does an item valued at \$4 cost including tax?  
A) \$4.30                      B) \$4.20                      C) \$7.50                      D) \$12.50                      E) \$14.30
- (8) Five-sixteenths is equivalent to what percent?  
A)  $15\frac{3}{4}\%$                       B)  $16\frac{1}{4}\%$                       C)  $16\frac{3}{4}\%$                       D)  $31\frac{1}{4}\%$                       E)  $6\frac{1}{4}\%$
- (9)  $16000 \text{ cm}^2 =$  \_\_\_\_\_  $\text{m}^2$ .  
A) 1,600                      B) 16                      C) 1.6                      D) 0.16                      E) 0.01
- (10) Wesley and Noah are each riding a bicycle towards each other. They are initially 200 feet from each other. Wesley's average speed is 12 feet/second while Noah's average speed is 8 feet/second. How long does it take the brothers to reach each other?  
A) 25 seconds                      B) 20 seconds                      C) 10 seconds                      D) 8 seconds                      E) 5 seconds
- (11) If the measurement of one rod equals 16.5 feet, how many rods are in one-half mile?  
A)  $106\frac{2}{3}$  rods                      B) 160 rods                      C) 320 rods                      D) 640 rods                      E) 1,760 rods
- (12) The figure to the right consists of four identical size squares. If the total area enclosed by the squares is 144 square inches, what is the perimeter of the figure?  
A) 36 inches  
B) 44 inches  
C) 48 inches  
D) 60 inches  
E) 70 inches



- (13) How many half-inch cubes does it take to make a single one-inch cube?  
 A) 2                      B) 4                      C) 6                      D) 8                      E) 16
- (14) If the length of the diameter of a circle is tripled, then the circle's area is increased by what factor?  
 A) 3                      B) 6                      C) 9                      D)  $3\pi$                       E)  $9\pi$
- (15)  $8\frac{1}{4} \times 4\frac{1}{4} =$   
 A)  $32\frac{1}{4}$                       B)  $32\frac{1}{16}$                       C)  $44\frac{1}{4}$                       D)  $40\frac{1}{4}$                       E)  $35\frac{1}{16}$
- (16) If the area of a trapezoid with bases 4, 5 and altitude  $h$  is 18, what is the length of the altitude?  
 A) 4                      B) 6                      C) 8                      D) 9                      E) 12
- (17) If  $\frac{1}{8} - \frac{1}{n} = \frac{1}{4}$ , then  $n =$   
 A)  $-\frac{1}{8}$                       B)  $-\frac{1}{4}$                       C) -8                      D)  $\frac{1}{8}$                       E) 4
- (18) If the mean of 10, 6 and  $m$  is 4, then what is  $m$ ?  
 A) 4                      B) 8                      C) -4                      D) -12                      E) -8
- (19) The first side of a triangle is 2 inches shorter than 4 times the second side. The third side is 8 inches longer than the second side. If the perimeter is 8 feet, find the length of the longest side.  
 A) 6 feet                      B) 58 inches                      C) 7 feet                      D) 62 inches                      E) 64 inches
- (20) On a Texas map the distance between Ft. Worth and El Paso is 5 inches. The approximate distance is 550 miles. If the distance between my home and a deer lease is 2.5 inches on the same map. What is the approximate distance from my home to deer lease to the nearest mile?  
 A) 1,375 miles                      B) 660 miles                      C) 575 miles                      D) 275 miles                      E) 110 miles
- (21) 36 kilometers per hour = \_\_\_\_\_ meters per second (m/s).  
 A)  $64\frac{4}{5}$  m/s                      B) 32 m/s                      C) 10 m/s                      D) 5 m/s                      E)  $\frac{5}{18}$  m/s

- (22) Quadrilaterals ABCD and DCEF to the right are congruent squares with each side being 12 cm in length. Arcs AC and arc CF are quarter circles. What is the area of the shaded portion?  
 A)  $36 \text{ cm}^2$   
 B)  $40 \text{ cm}^2$   
 C)  $60 \text{ cm}^2$   
 D)  $144 \text{ cm}^2$   
 E)  $288 \text{ cm}^2$



- (23) How many whole numbers will evenly divide into  $2^2 \times 3^2 \times 5^4$ ?  
 A) 16                      B) 24                      C) 36                      D) 48                      E) 45

- (24) Dan is building 2 rabbit cages in the shape of rectangular prisms. The first cage is 3 feet long, 2 feet wide, and 2 feet high. The second cage has the same width and height but is three times as long. How many times larger is the volume of the second cage compared to the volume of the first cage?
- A) 2                      B) 3                      C) 9                      D) 12                      E) 18

**For problems #25 – #29 please use the chart below.**

**Miles Run Each Week**

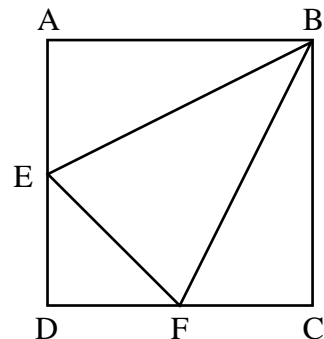
Week	Miles
1	3
2	5
3	7
4	9

- (25) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If the pattern continued how many miles did she run by the end of the twentieth week?
- A) 40 miles              B) 41 miles              C) 43 miles              D) 45 miles              E) 47 miles
- (26) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. What is the mean number of miles she ran in the first three weeks?
- A) 15 miles              B) 10 miles              C) 5 miles              D) 3 miles              E) 2 miles
- (27) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. What is the total number of miles she ran in the first five weeks?
- A) 30 miles              B) 31 miles              C) 32 miles              D) 35 miles              E) 37 miles
- (28) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If she took a total of 10 hours to run her total miles during week 17, what was her average speed for that week in miles per hour (mph)?
- A)  $3\frac{1}{2}$  mph              B) 4 mph              C)  $4\frac{1}{2}$  mph              D) 5 mph              E)  $5\frac{1}{2}$  mph
- (29) Amanda ran for exercise. The table above shows the total number of miles she ran through the end of each week. If the length of a single lap around the local high school track is 440 yards and there are 1,760 yard per mile, how many laps did Amanda run in week 7?
- A) 4 laps              B) 8 laps              C) 16 laps              D) 48 laps              E) 60 laps
- (30) With a current, a raft traveled 20 miles in 4 hours, but the raft required 8 hours for the return trip against the current. What is the speed of the current in miles per hour (mph)?
- A)  $1\frac{1}{2}$  mph              B)  $1\frac{3}{4}$  mph              C)  $\frac{3}{4}$  mph              D)  $1\frac{1}{4}$  mph              E)  $1\frac{1}{3}$  mph
- (31) If  $2^x$  equals  $\frac{4^2 \times 8^3}{2^5}$ , then what is  $x$  equal to?
- A) 5                      B) 6                      C) 8                      D) 10                      E) 19

- (32) What is the product of the GCF and LCM of 16 and 25?  
 A) 100                      B) 120                      C) 250                      D) 320                      E) 400
- (33) The degree measures of three angles of a triangle have the ratio of 6 : 8 : 10. What is the measure of the largest angle?  
 A) 15°                      B) 45°                      C) 60°                      D) 75°                      E) 90°
- (34)  $0.444 \dots + 0.666 \dots =$   
 A) 1                      B)  $1\frac{1}{10}$                       C)  $1\frac{1}{9}$                       D)  $\frac{9}{10}$                       E)  $1\frac{2}{9}$
- (35) What is the diagonal length of a square with area  $18 \text{ km}^2$ ?  
 A) 12 km                      B)  $18\sqrt{2}$  km                      C) 6 km                      D) 36 km                      E) 40 km
- (36) What is the amount of simple interest for a loan of \$800 at 6% annual interest rate for 8 months?  
 A) \$32                      B) \$36                      C) \$40                      D) \$44                      E) \$48
- (37) What is the product of the mean and median for the numbers: 12, 10, 8 and 6?  
 A) 9                      B) 81                      C) 18                      D) 90                      E) 72
- (38) What is the probability of drawing a queen or an ace from a standard deck of 52 cards?  
 A)  $\frac{1}{13}$                       B)  $\frac{4}{13}$                       C)  $\frac{3}{13}$                       D)  $\frac{5}{26}$                       E)  $\frac{2}{13}$
- (39) What is the distance between -12 and 12 on the number line?  
 A) 0                      B) 6                      C) 12                      D) 24                      E) 36
- (40) If  $a*b$  means  $\frac{a-b}{2}$ , then  $(6*8)*9$  equals what number?  
 A) -5                      B) -10                      C) 5                      D) -6                      E) 6
- (41) In a certain country  $12\frac{1}{2}$  Wonkas (Wnk) equals \$1. At this rate of currency exchange what does \$24 equal in Wonkas?  
 A) 200 Wnk                      B) 300 Wnk                      C) 350 Wnk                      D) 416 Wnk                      E) 450 Wnk

- (42) In the figure to the right quadrilateral ABCD is a square with  $AB = 4\text{-m}$ ,  $DE = 2\text{-m}$  and  $DF = 2\text{-m}$ . What is the area of triangle BFE?

- A)  $16 \text{ m}^2$   
 B)  $12 \text{ m}^2$   
 C)  $10 \text{ m}^2$   
 D)  $8 \text{ m}^2$   
 E)  $6 \text{ m}^2$

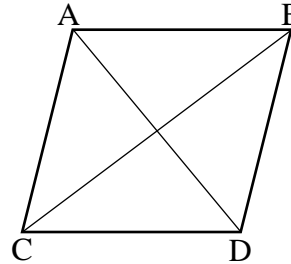


(43) Genny, who weighs 150 lbs. sits at one end of a 12-ft seesaw balanced at the middle. How far from the middle should Andy, who weighs 200 pounds, sit to balance the seesaw?

- A) 9 ft.                      B)  $4\frac{3}{4}$  ft.                      C)  $4\frac{1}{2}$  ft.                      D) 5 ft.                      E)  $5\frac{1}{4}$  ft.

(44) What is the area of the rhombus ABCD to the right  
If diagonal AD = 10 cm and diagonal BC = 12 cm?

- A)  $120\text{ cm}^2$   
B)  $44\text{ cm}^2$   
C)  $60\text{ cm}^2$   
D)  $432\text{ cm}^2$   
E)  $110\text{ cm}^2$

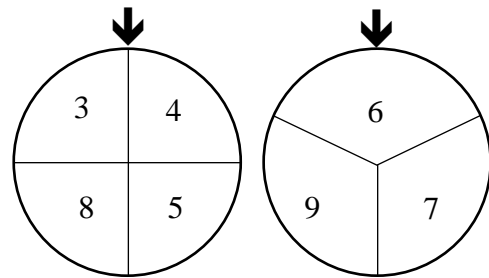


(45) In how many ways can 28 be written as the sum of two primes?

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

(46) Every time the two wheels in the illustration to the right are spun two numbers are selected pointers. What is the probability that the sum of the two numbers selected is divisible by 3?

- A)  $\frac{1}{2}$   
B)  $\frac{1}{4}$   
C)  $\frac{1}{3}$   
D)  $\frac{2}{3}$   
E)  $\frac{1}{6}$



(47) A coat originally priced at \$100 was put on sale at 40% off. If 10% tax was added to the sale price, then how much is the total selling price of the coat?

- A) \$44.40                      B) \$44                      C) \$70                      D) \$66                      E) \$77.30

(48) A black bag contains only blue marbles and green marbles. There are only 16 blue marbles. If the probability of drawing a blue marble at random is  $\frac{2}{3}$ , then how many green marbles are there in the bag?

- A) 12                      B) 18                      C) 4                      D) 8                      E) 6

(49) During the softball season, Mackenzie had 40 hits. Among her hits were 3 home runs, 2 triples and 5 doubles. The rest of her hits were singles. What percent of her hits were singles?

- A) 10%                      B) 30%                      C) 60%                      D) 75%                      E) 80%

(50) What is the 2021<sup>st</sup> letter in the sequence:

ABCDED CBA ABCDED CBA ABCDED CBA . . . ?

- A) A                      B) B                      C) C                      D) D                      E) E

## 2020 – 2021 University Interscholastic League JH/MS Mathematics Contest C – Key

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

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