2023 SCSU MATH CONTEST 9th and 10th grade exam

DIRECTIONS: Select the BEST response from those given. Scientific and graphing calculators are allowed. Symbolic and programmable calculators are not allowed.

1. In order to prepare for a new patio, you need to dig a hole that is in the shape of a quarter of a circle with a radius of 24 feet. It is to be 6 inches deep. You will remove the dirt by repeatedly filling a pail whose capacity

C. 192

C. 12

2. Suppose that 743,2A5,11B is divisible by 12, where A and B are digits from 0 to 9 inclusive.

D. 576

D. 13

E. 1152

E. 17

is $\pi/8$ cubic feet. How many times will you need to fill the pail?

B. 96

B. 11

What is the largest possible sum of A and B?

A. 48

8.

9.

3	way. Person # half as much n	2 will receive 30 dolla noney as Person #2. F	rs less than twice the n	noney Person #1 will re aree times the money P	emselves in the following ceive. Person #3 will receive erson #3 will receive plus 20
	A. \$575	B. \$585	C. \$590	D. \$605	E. \$610
4	Let <i>M</i> and <i>N</i> be What is the mir	positive integers who	ose least common mult	iple is 84 and whose gro	eatest common factor is 4.
	A. 32	B. 40	C. 56	D. 84	E. 88
5.	Joe runs around the same spot a track?	I the track at a pace o and meet every 30 sec	f 80 seconds per lap. Jir onds. How many secon	m runs it in the opposite nds does it take Jim to r	e direction. They start at un each lap around the
	A. 30	B. 36	C. 48	D. 60	E. 80
6.	Two of the fish,	Fred and Bob, cannot	blue, for her 6 fish. Sh be put into the same to choose 3 fish to put into	ank as one another.	a tank.
	A. 8	B. 10	C. 12	D. 14	E. 24
7.		rs old. Jonathan is 4 y sum of their ages (in y	ears old. years) when Salman is 4	times as old as Jonath	an?
	A. 60	B. 65	C. 70	D. 75	E. 80
8.		numbers is 14, and the of the reciprocals of the	product of the same to ne two numbers?	wo numbers is 7.	
	$A. \frac{2}{7 + \sqrt{42}}$	B. $\frac{1}{4}$	C. $\frac{1}{2}$	D. 2	E. $\frac{2}{7-\sqrt{42}}$
€.	The area of a rhor whole numbers. \	mbus is 120 square un Which of the following	its, and the perimeter i	s 52 units. The lengths	of the diagonals are
	A. 5	B. 6	C. 12	D. 24	E. 28

- 10. Jeff wrote a math book. It takes 852 digits to number the pages of Jeff's book. (For example, it takes 8 digits to number pages 99-101 of the book.) How many times does the digit 7 appear in the page numbers of Jeff's book? C. 62 D. 64 B. 60 A. 58 11. The expression 3,333,333,334² is equal to a 20-digit number. What is the sum of those 20 digits? C. 55 D. 58 A. 45 B. 51
- 12. Find the area of the region in the fourth quadrant bounded by the coordinate axes and the lines y=x-3 and x-y=7.
 - A. 16
- B. 20
- C. 33
- D. 40
- E. 42

E. 66

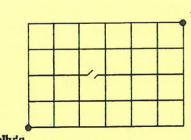
E. 61

- 13. If $9^x 9^{x-1} = 24$, find $(6x)^x$.

- E. 27

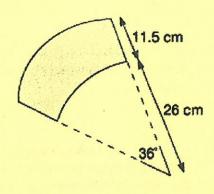
- 14. Find the sum of the solutions to $6x^2 + x 6 = x^2 + 1$.
- B. $-\frac{1}{5}$
- C. 0

Use the three diagrams below to answer questions 15, 16 and 17.



work

1 2 3 5 6 8 9 10



Sally's home

Question 15

Question 16

Question 17

- 15. Sally travels to work but must travel only north or east. Furthermore, because of construction, a section of road is unusable, as shown above left. Determine the number of ways Sally can get to work.
 - A. 30
- B. 90
- C. 150
- D. 180
- E. 210
- 16. Assume that the triangular array will continue in the manner shown above center. What number will be directly below 94?
 - A. 104
- B. 106
- C. 108
- D. 110
- E. 112
- 17. In the figure shown above right, the angle at the center of the sector is degrees. Find the area in square centimeters of the shaded region. Round your answer to the nearest square centimeter.
- B. 132
- C. 181
- D. 229
- E. 299

		A. 54			B. 5	ectangle is		r, what C. 70			of the of	original squ	are? E.	140
1	t	o Hubl	pardsville i	s 12 m	riles.	m Danville t Let <i>D</i> be the statements	e stra	ight-lin	e distance	iles. The from I	he straight Danville to	-line distan Hubbards	ce fro	om Johnsonville
		II. D	could be 2 could be 4 could be 5	2 mile	es.									
	A	. Ior	nly	В	. la	nd II only	C	. II a	nd III only	D.	. all of th	nem	E. n	one of them
20). A	three-	digit numb	er is s	electe	ed at rando	m. W	hat is t	the probab	oility th	at none of	f the three	digits	is prime?
	A	. $\frac{1}{5}$		В	$\frac{1}{4}$		С	150	<u></u>	D.	<u>3</u> 5		$\frac{2}{3}$	
21	. If	x-2	= p and x	<2, tl	nen x	– p MUST b	e equ	ial to v	hich of th	e follo	wing?	,		
	A.	2-2	2 <i>p</i>	В.	-2		C.	2-	2 <i>p</i>	D.	2	- · E	. 2 <i>µ</i>	p-2
22.	Sin	nplify t				$\frac{(1+2+1)}{(201+202)}$								
	A.	1 12		В.	$\frac{1}{6}$		C.	1/4		D.	<u>1</u> 3	E.	1/2	
23.	Fine	d the c	ircumferer	nce of	the ci	rcle given b	y the	equati	on $x^2 + y^2$	$\frac{2}{-14x}$	+8y+1=0	0.		
	Α.	8π		В.	12π		C.	16π		D.	25π	E.	642	τ
24,	Sup	pose <i>x,</i>	y and z ar	e posi	tive ir	itegers with	n x < j	/ <z a<="" td=""><td>$nd\frac{1}{x} + \frac{1}{y} +$</td><td>$\frac{1}{z}=1$.</td><td>What is t</td><td>he value of</td><td>x + y +</td><td>+ z ?</td></z>	$nd\frac{1}{x} + \frac{1}{y} +$	$\frac{1}{z}=1$.	What is t	he value of	x + y +	+ z ?
	A.	1		В.	4		C.	9		D.	11	E.	no s integ	uch gers exist
25.	How A.		integers k	satisfy B.		$-6k > k^4 - k$	k ² ?	_			6			
	۸.	3		D.	•		C.	3		D. (0	E.	Intin	itely many
26.	The a	area of	a circle is	given	by $\frac{81}{16}$	π . What is	s the _l	perime	ter of the	largest	square th	at fits inside	e of th	nis circle?
	A.	3		В. 2	2		C.	9√2		D. 3	3√2	E.	9√2	

27. For how many integers x does a triangle with side lengths 12, 25 and x have all its angles acute?

C. 7

D. 8

E. 9

B. 6

A. 5

18. A square piece of paper is folded in half twice: from top to bottom, then from top to bottom again.

28. Two identical cylindrical tanks were full of water. Two different models of pumps were used to empty the tanks. The pumps were started at the same time and each pumped at a constant rate. The first tank was emptied in 3 hours, and the second tank was emptied in 4 hours. How many minutes after the pumps were started was the water depth in one tank twice the depth in the other tank?

A. 60

B. 72

C. 120

D. 132

E. 144

29. The solution of the equation $7^{x+7} = 8^x$ can be expressed in the form $x = \log_b 7^7$. What is b?

A. $\frac{7}{15}$

B. $\frac{7}{8}$ C. $\frac{8}{7}$ D. $\frac{15}{8}$

30. If f is a function such that $f(x-1)=x^2-3x+5$, then f(x+1) is equal to which of the following?

A. $x^2 + x + 3$

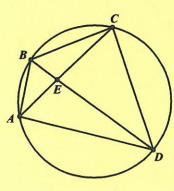
B. $x^2 - x + 3$

C. $x^2 + x$

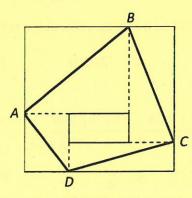
D. $x^2 - 3x + 7$

E. $x^2 - 2x + 6$

Use the Figures below to answer questions 31, 32, 33 and 34.



Question 31



Question 32

	Exceed Limit if Possible?							
Age	Always	Not Always	Total					
Under 30	100	100	200					
Over 30	40	160	200					
Total	140	260	400					

Questions 33 and 34

In the circle shown (not to scale) above left, arc AC measures 126°, ∠BDC measures 35°, and arc AD measures 31. 140°. Find the measure of ∠BEC.

A. 90°

B. 95°

C. 100°

D. 102°

E. 105°

32. A rectangle of area 22 cm² is placed inside a square whose side lengths are 12 cm with the sides of the rectangle parallel to the sides of the square, as shown above center. (The diagram is not drawn to scale.) Perpendiculars are drawn from the corners of the rectangle to the sides of the square. What is the area of quadrilateral ABCD in square centimeters?

A. 72

B. 83

C. 86.4

D. 108

E. 132

A survey asked people how often they exceeded speed limits. The data were then entered into a contingency table of counts, categorized by age group and response. THE TABLE IS SHOWN ABOVE RIGHT AND WILL BE USED FOR **QUESTIONS 33 AND 34.**

33. What percentage of people over age 30 reported that they always exceeded the speed limit?

A. 10

B. 20

C. 33

D. 40

E. 50

34. What are the odds that a randomly-selected respondent said that they did not always exceed the speed limit?

A. 1 to 1

B. 1 to 2

C. 2 to 1

D. 7 to 13

E. 13 to 7