Indiana State Mathematics Contest 2018

Algebra I/Integrated Math I

Do not open this test booklet until you have been advised to do so by the test proctor.

This test was prepared by faculty at University of Southern Indiana

Next year's math contest date: Saturday, April 24, 2019

	1. Solve the equation $0.2(5000) + 0.3x = 0.25(5000 + x)$										
	a. $-\frac{250}{19}$	<u>900</u> Ə	b.	$-\frac{250}{7}$	00	C.	$\frac{25000}{29}$	d.	$-\frac{57500}{11}$	e.	5000
				2.	Solve	the ir	nequality	$\frac{1}{4} < \frac{1}{3} -$	$x < \frac{1}{2}$		
a.	-2 < x < 1		b. –	l < <i>x</i> < 1	C	$-\frac{1}{6}$	$< x < \frac{1}{12}$	d.	$-\frac{4}{3} < x <$	$-\frac{2}{3}$	e. None of these
		3	8. Solv	ve the o	compou	ind in	equality	$8x-1 \leq 1$	–17 or 8.	x - 1 > 7	
	a. (−∞,-	-2]∪($(1,\infty)$	b.	[-2,1)		C. (−∞,	–2)∪[1,∝	o) d	. Ø	e . (−∞,∞)
				4	. Solve	e the e	equation	$\frac{x-2}{3} = \frac{4}{5}$	$\frac{x}{5} - 6$		
		a.	$\frac{8}{7}$	b.	$\frac{80}{7}$	C	$-\frac{4}{7}$	d. $\frac{4}{3}$	e	33	
			5. WI	nat is t	he solu	tion s	et of the	equatior	x-3 -1	l=4 ?	
		a.	{8}	b.	{2}	C.	{-2,8}	d. {0,	8} e.	{6}	
	6. Th	e sun th	n of thr ne diffe	ree tim rence	es a nu of -11 a	mber Ind tw	and 7 m vice the r	nore than number.	the num What is t	ber is the	e same as per?
	а. —6.	4	k	о. —б		C.	-3	d.	$-\frac{11}{12}$	e	e. $\frac{2}{3}$
	7.	Del disco	ores b ounted	ought a price v	a sweat was \$34	er on 1.00, v	sale for vhat was	15% off the orig	the origin inal cost	al price. of the sw	If the veater?
	a. \$28.9	90	b.	\$36.	15	C.	\$39.10	d.	\$40.00	e.	\$41.40
	8. The 1	e popi .3%.	ulation By ab	of Indi out ho	a is cur w much	rently will t	1.3 bill he popu	lion and lation of	growing a India incr	annually ease in o	at a rate of one day?

a. 2,713 b. 46,300 c. 1 million d. 1.7 million e. 17 million

9. Hoosier Carpentry makes bookcases and desks. Each bookcase requires 5 hours of woodworking and each desk requires 10 hours of woodworking. Each month the shop has a maximum of 600 hours available for woodworking. If b is the number of bookcases and d the number of desks, which constraint models this information?

a.
$$5b+10d \le 600$$
 b. $5b+10d \ge 600$ c. $10b+5d \ge 600$
d. $5b-10d \ge 600$ e. $5b-10d \le 600$
10. What is the the y-intercept of the line $-3x + \frac{2}{5}y = 8$?
a. $\left(0, \frac{2}{5}\right)$ b. $\left(0, -\frac{2}{5}\right)$ c. $\left(0, \frac{15}{2}\right)$ d. $\left(0, -\frac{15}{2}\right)$ e. $\left(0, 20\right)$
11. Which of the following statements is true?
a. The lines $x-2y=14$ and $2x+y=3$ are parallel.
b. The lines $x-2y=14$ and $x+2y=4$ are parallel.
c. The lines $2x+y=3$ and $x+2y=4$ are parallel.
d. The lines $2x+y=3$ and $x+2y=4$ are perpendicular.
e. The lines $2x+y=3$ and $x+2y=4$ are perpendicular.
a. -45 b. 25 c. 45 d. 53 e. 90
13. Assume there is a linear relation between air temperature (°F) and elevation (m) on Pikes Peak. If the temperature is 56° F at 1500 m and 63° F at 1000 m, estimate the temperature at 3000 m.
a. 28° F b. 35° F c. 49° F d. 53° F e. 77° F
14. How many ordered pairs satisfy the system of equations $\left\{\frac{1}{3}x-7=2y}{x-6y=21}\right\}$
a. None b. Exactly one c. Exactly two
d. An infinite number, but not all. e. All ordered pairs.

a.
$$\left\{\frac{3}{2},9\right\}$$
 b. $\left\{\frac{9}{2},15\right\}$ c. $\left\{\frac{3\pm 6\sqrt{6}}{2}\right\}$ d. $\left\{\frac{3\pm 6\sqrt{2}}{2}\right\}$ e. $\left\{3\pm \frac{3\sqrt{6}}{2}\right\}$

16. The width of a rectangular patio is 2 yards less than its length. If the area of the patio is 64 square yards, which equation could be used to find the dimensions of the patio?

a.
$$x^2 - 4 = 64$$

b. $x^2 - 2x = 64$
c. $x^2 - 4x + 4 = 64$
d. $x^2 - 4x - 4 = 64$
e. $x^2 = 64$

17. Solve
$$z = xy - xy^2$$
 for x .

a.
$$x = \frac{z}{y - y^2}$$

d. $x = \frac{z + xy^2}{y}$
b. $x = \frac{y - y^2}{z}$
c. $x = \frac{xy - z}{y^2}$
e. This equation cannot be solved for x .

18. Which equation represents the data shown in the table?

a.
$$y = 2x+2$$
 b. $y = 2x^2+2$ c. $y = 3^x+1$ d. $y = \frac{6x+2}{x+1}$ e. $y = 12x-8$
19. Which is the graph of $y = -\frac{1}{2}|x-1|+2$?

20. Which of the following is the sum of a rational number and an irrational number?

a. $5\sqrt{5}(\sqrt{5}+\sqrt{20})$ b. $7.2+\sqrt{-16}$ c. $2\pi+\sqrt{7}$ d. $7+\sqrt{2.25}$ e. $2.5+\sqrt{7.1}$

а



25. Let $A = \{10, 11, 12, 13, \dots, 98, 99\}$.

Which of the following does **not** describe a function with a domain of A.

- a. The difference of the ones digit and the tens digit of a member of A.
- b. The difference of the tens digit and the ones digit of a member of A.
- c. The quotient of the ones digit and the tens digit of a member of A.
- d. The quotient of the tens digit and the ones digit of a member of A.
- e. Reversing the order of the digits of a member of A.

26.Let $f(x) = \sqrt{-x}$ and $g(x) = \sqrt{25 - x^2}$. What is the domain of $\left(\frac{f}{g}\right)(x)$? a. [-5,5] b. [0,5) c. (0,5] d. [-5,0) e. (-5,0]

27. The operation * is defined for non-zero integers as follows:
$$a*b = \frac{1}{a} - \frac{1}{b}$$

If $a-b=3$ and $ab=15$, what is the value of $a*b$?
a. -5 b. 5 c. $-\frac{1}{5}$ d. $\frac{1}{5}$ e. -12
28. Simplify completely: $(-2a^4b^2)^3(4a^3b^2)$
 $-4a^5b^2$
a. $8a^{10}b^6$ b. $-8a^{10}b^6$ c. $8a^3b^4$ d. $-8a^3b^4$ e. $8a^6b^6$
29. Let $g(2x+5)=4x^2-3x+2$. Find $g(-3)$.
a. -4 b. -3 c. -1 d. 9 e. 78
30. Simplify leaving the answer with no grouping symbols and no negative
exponents: $(2n-3)^3 \cdot (2n-3)^{-5}$
a. $\frac{1}{4n^2+9}$ b. $-\frac{1}{4n^2+9}$ c. $\frac{1}{4n^2-9}$ d. $\frac{1}{4n^2-12n+9}$ e. $-2(2n-3)$
31. The volume of a rectangular prism is $6x^3 - 11x^2 - 57x + 20$. If the length
is $2x+5$ and the height is $x-4$, what is the width?
a. $-3x$ b. $3x+1$ c. $3x-1$ d. $-3x-2$ e. $-2x-1$
32. Divide: $\frac{30x^3 - 15x^2 + 5x}{-15x^2}$
a. $-5x$ b. $-5x+1$ c. $-2x - \frac{1}{3x}$
d. $30x^3 + 5x$ e. $-2x+1-\frac{1}{3x}$

Use the graph of y = f(x) below for questions 3H3Í.



The graph below represents the total circulation of US newspapers in millions (*C*), and the number of years after 2000 (*t*). Use the graph and the trend line equation to answer questions $3\hat{i} - 4 \in \mathbb{R}$.



 $3\hat{i}$. In the trend line equation, what does the number 1.25 signify?

- a. The number of newspapers read in 2000.
- b. The number of newspapers read in 2011.
- c. The yearly drop in newspaper readership.
- d. The overall drop in newspaper readership.
- e. The average cost of a newspaper.

HJ. In the trend line equation, what does the number 58.3 signify?

- a. The number of newspapers read in 2000.
- b. The number of newspapers read in 2011.
- c. The yearly change in newspaper readership.
- d. The overall change in newspaper readership.
- e. The number of years until nobody reads newspapers.

4€ What is the best approximate value for the correlation coefficient (r)?

a.	-1.25	b0.9	c. 0.9	d. 46.64	e. 58.3