

Algebra I Test
UH Math Contest 2015

Name: _____ School: _____

1. Solve for x : $2x^2 + 4x - 6 = -x + 6$.

- (A) $\{-3, 1\}$ (B) $\{\frac{1}{2}, 6\}$ (C) $\{-4, \frac{3}{2}\}$ (D) $\{-\frac{5}{2}, 3\}$ (E) $\{-\frac{1}{2}, 2\}$

2. Carl has 24 coins consisting of nickels, dimes, and quarters. If the number of nickels is 8 less than twice the number of quarters, and the number of dimes is 5 more than the number of nickels, how much money does Carl have?

- (A) \$2.55 (B) \$2.65 (C) \$2.85 (D) \$3.05 (E) \$3.15

3. If $f(x) = 3x - 11$ and $f(a - 2) = -5$, find a .

- (A) -4 (B) -2 (C) 0 (D) 2 (E) 4

4. Let G and L represent the greatest common factor and least common multiple, respectively, of numbers 18, 30, 54. Compute the quotient L/G .

- (A) 15 (B) 45 (C) 90 (D) 150 (E) 240

5. Determine the range of the given function:

$$f(x) = \begin{cases} x, & \text{if } x < 1 \\ 1, & \text{if } 1 \leq x < 3 \\ 1 - (x - 3)^2, & \text{if } x \geq 3 \end{cases}$$

- (A) $(-\infty, \infty)$ (B) $(-\infty, 1)$ (C) $(-\infty, 1]$ (D) $(3, \infty)$ (E) $[3, \infty)$

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6. Find the 75th term in the given sequence: $-13, -10, -7, -4, \dots$

- (A) 200 (B) 203 (C) 206 (D) 209 (E) 212

7. Eric is five years older than Peter, and in three years Eric's age will be four-thirds of Jim's age. Four years ago, seven times Peter's age equaled 8 times Jim's age. What is the average age of Eric, Peter, and Jim?

- (A) 21 (B) 25 (C) 27 (D) 30 (E) 32

8. If $u(s) = \sqrt{-2s^3 + 4s - 6}$, find $u(-3)$.

- (A) *undefined* (B) -4 (C) -2 (D) 3 (E) 6

9. Determine the y-intercept of the line which passes through the point $(-2, -4)$ and which is parallel to the line $3x - 2y + 6 = 0$.

- (A) -2 (B) -1 (C) 0 (D) 1 (E) 2

10. Determine the largest **integer** x which satisfies the given inequality:

$$\frac{1}{3}(5 - 2x) \leq -\frac{1}{7}(6x + 1)$$

- (A) -12 (B) -11 (C) -10 (D) -9 (E) -8

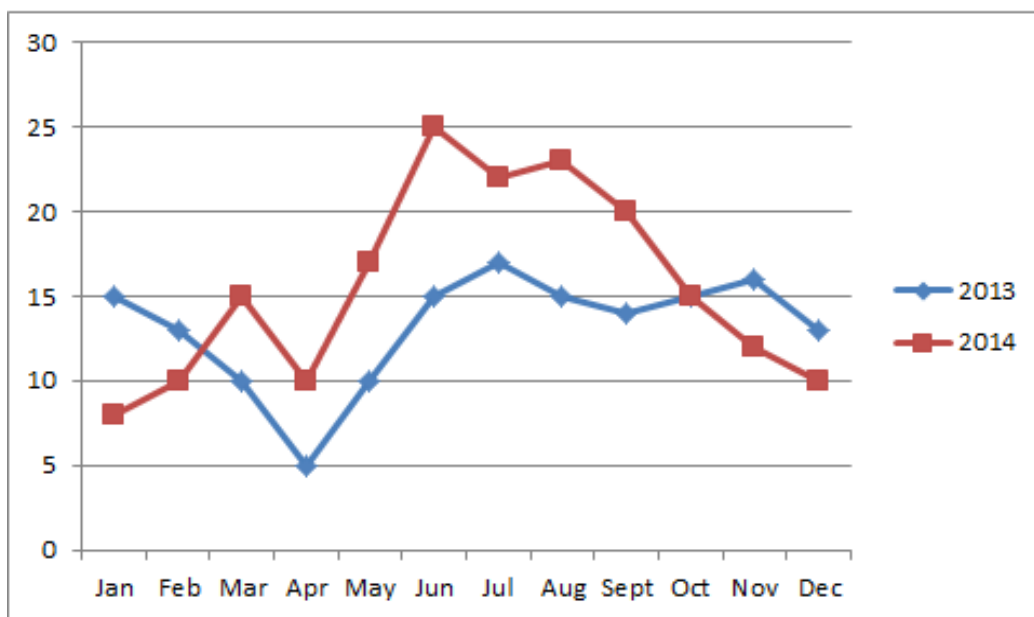
11. Simplify: $2\left(\frac{1}{4}\right)^{-\frac{5}{2}}$

- (A) 2^{-4} (B) 2^{-1} (C) 2^2 (D) 2^4 (E) 2^6

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12. A company's monthly profits (in thousands of dollars) for the years 2013 and 2014 is shown the graph below. In what month did the company see the largest **percentage** increase in profits from 2013 to 2014?



- (A) March (B) April (C) May (D) June (E) August

13. The graph of a quadratic function has x -intercepts at -3 and 4 , and a y -intercept at -8 . If the function is written in the form $y = ax^2 + bx + c$, find the value of a .

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

14. Determine the domain of the given function: $f(x) = \frac{1}{\frac{x}{3} - \frac{x}{2} - 1}$

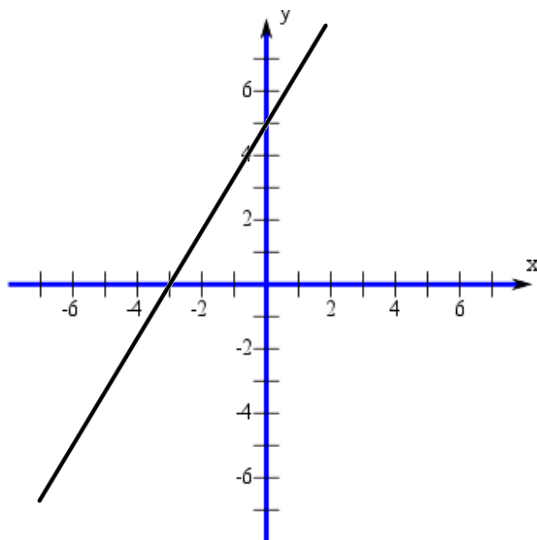
- (A) *all real numbers* (B) $\{x \mid x \neq -1\}$ (C) $\{x \mid x \neq -2\}$
 (D) $\{x \mid x \neq -3\}$ (E) $\{x \mid x \neq -6\}$

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15. In how many ways can 3 boys and 3 girls be seated in a row of 6 chairs if a boy cannot sit next to another boy?

- (A) 9 (B) 18 (C) 36 (D) 72 (E) 144

16. Find an equation for the given linear graph.



- (A) $5x - 3y = -15$ (B) $-3x - y = 5$ (C) $-3x + 5y = 0$
(D) $3x - 5y = 15$ (E) $5x - 3y = 0$

17. In a biathlon, participants swim for 2 miles and run for 10 miles. Tom completed the biathlon in 3 hours. If he had swum at his running rate and run at his swimming rate, he'd have finished in 7 hours. What is the sum of Tom's running and swimming rates in miles per hour?

- (A) 7.5 (B) 8.5 (C) 9.5 (D) 10.5 (E) 11.5

18. If $h(t) = 3t^2 - 2bt - 5$ and $h(-2) = 7$, what is the value of b ?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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19. A positive number is 6 more than its reciprocal. What is the number?

- (A) $-3 + \sqrt{5}$ (B) $3 + \sqrt{10}$ (C) $-2 + \sqrt{3}$ (D) $2 + \sqrt{6}$ (E) $-1 + \sqrt{3}$

20. Simplify: $\frac{\sqrt{x-1}}{\sqrt{x^2-x} + \sqrt{x^2-1}}$

- (A) $\frac{1}{\sqrt{2x+1}}$ (B) $\sqrt{x+1} - \sqrt{x}$ (C) $\frac{x}{\sqrt{x+1}}$
(D) $1 - \sqrt{x}$ (E) $x\sqrt{x-1}$

21. A hardware store is offering a 30% discount on certain brand of paint. If the discounted price is \$21, what is the original price?

- (A) \$70 (B) \$60 (C) \$40 (D) \$36 (E) \$30

22. Solve for b : $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$

- (A) $\frac{ac}{ac-a-c}$ (B) $\frac{a+c}{ac}$ (C) $3-a-c$ (D) $\frac{a-c}{ac}$ (E) $(1-a)(1-c)$

23. Sam can ride up an escalator in 40 seconds. If Sam walks up the escalator, it takes her only 30 seconds to make the ascent. If the escalator were broken, how many seconds would it take Sam to walk to the top?

- (A) 10 (B) 60 (C) 80 (D) 120 (E) 150

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24. If a and b are integers such that $\frac{7}{12} < \frac{a}{b} < \frac{3}{5}$, which of the following is **not** a possible value of b .

- (A) 29 (B) 30 (C) 99 (D) 100 (E) 120

25. Describe the solution set of the given linear system:

$$\begin{aligned} -4x + 2y &= 8 \\ 6x - 3y &= -12 \end{aligned}$$

- (A) Unique solution: $(x, y) = (-2, 0)$
(B) Unique solution: $(x, y) = (0, 4)$
(C) No solution
(D) Infinitely many solutions: $\{(x, y) : y = 2x + 4\}$
(E) Infinitely many solutions: $\{(x, y) : y = x + 2\}$

26. The volume V of a gas varies inversely as the pressure P . When the pressure is 40 pounds per square inch, the volume is 60 cubic feet. Find the pressure, in pounds per square inch, when the volume is 75 cubic feet.

- (A) 112.5 (B) 32 (C) 50 (D) 24 (E) 0.02

27. Find the sum of the first 49 positive odd integers.

- (A) 600 (B) 625 (C) 2352 (D) 2401 (E) 2500

28. Two positive numbers exist such that their product, their sum, and their difference of squares are equal. Find the product of the two numbers.

- (A) $\frac{3 + \sqrt{3}}{2}$ (B) $\sqrt{5}$ (C) 6 (D) $\frac{3 + 4\sqrt{3}}{4}$ (E) $2 + \sqrt{5}$