

Test 9

**Dr. John Chung's
SAT II Mathematics Level 2**

MATHEMATICS LEVEL 2 TEST**REFERENCE INFORMATION**

THE FOLLOWING INFORMATION IS FOR YOUR REFERENCE IN ANSWERING SOME OF THE QUESTIONS IN THIS TEST

Volume of a right circular cone with radius r and height h : $V = \frac{1}{3}\pi r^2 h$

Lateral Area of a right circular cone with circumference of the base c and slant height ℓ : $S = \frac{1}{2}c\ell$

Volume of a sphere with radius r : $V = \frac{4}{3}\pi r^3$

Surface Area of a sphere with radius r : $S = 4\pi r^2$

Volume of a pyramid with base area B and height h : $V = \frac{1}{3}Bh$

Dr. John Chung's SAT II Math Level 2

Answer Sheet

- | | | | |
|----|---------------------|----|---------------------|
| 01 | (A) (B) (C) (D) (E) | 26 | (A) (B) (C) (D) (E) |
| 02 | (A) (B) (C) (D) (E) | 27 | (A) (B) (C) (D) (E) |
| 03 | (A) (B) (C) (D) (E) | 28 | (A) (B) (C) (D) (E) |
| 04 | (A) (B) (C) (D) (E) | 29 | (A) (B) (C) (D) (E) |
| 05 | (A) (B) (C) (D) (E) | 30 | (A) (B) (C) (D) (E) |
| 06 | (A) (B) (C) (D) (E) | 31 | (A) (B) (C) (D) (E) |
| 07 | (A) (B) (C) (D) (E) | 32 | (A) (B) (C) (D) (E) |
| 08 | (A) (B) (C) (D) (E) | 33 | (A) (B) (C) (D) (E) |
| 09 | (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) |

The number of right answers:

The number of wrong answers:

$$\frac{\text{# of correct}}{\text{# of correct}} - \frac{1}{4} \times \frac{\text{# of wrong}}{\text{# of wrong}} = \text{Raw score}$$

Score Conversion Table

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
50	800	28	640	6	480
49	800	27	630	5	470
48	800	26	620	4	470
47	800	25	620	3	460
46	800	24	610	2	460
45	800	23	610	1	450
44	800	22	600	0	450
43	800	21	600		
42	800	20	590		
41	800	19	590		
40	780	18	580		
39	760	17	570		
38	750	16	560		
37	740	15	550		
36	720	14	540		
35	710	13	530		
34	700	12	520		
33	690	11	510		
32	680	10	500		
31	670	9	490		
30	660	8	490		
29	650	7	480		

MATHEMATICS LEVEL 2 TEST

For each of the following problems, decide which is the BEST of the choices given. If the exact numerical value is not one of the choices, select the choice that best approximates this value. Then fill in the corresponding circle on the answer sheet

Note: (1) A scientific or graphing calculator will be necessary for answering some (but not all) of the questions in this test. For each question you will have to decide whether or not you should use a calculator.

(2) For some questions in this test you may have to decide whether your calculator should be in the radian mode or the degree mode.

(3) Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated.

(4) Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number. The range of f is assumed to be the set of all real numbers $f(x)$, where x is in the domain of f .

(5) Reference information that may be useful in answering the questions in this test can be found on the page preceding Question 1.

USE THIS SPACE FOR SCRATCHWORK

1. If $2(a - b) = 5(a - b)$, then which of the following must be true?

- (A) $a = 0$
- (B) $b = 0$
- (C) $a = b$
- (D) $a = -b$
- (E) $a + b > 0$

2. If $f(x) = -f(-x)$ for all real x and a point $(3, 5)$ is on the line, then which of the following points is also on the line?

- (A) $(-3, 5)$
- (B) $(3, -5)$
- (C) $(-5, -3)$
- (D) $(-3, -5)$
- (E) $(5, 3)$

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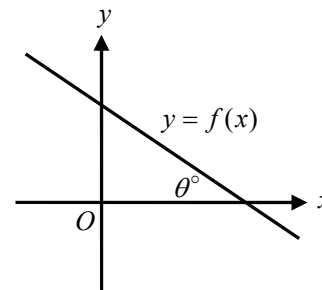
MATHEMATICS LEVEL 2 TEST - Continued

USE THIS SPACE FOR SCRATCHWORK.

3. If $\frac{10!}{90 \cdot 56} = n!$, then $n =$

- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

4. Figure 1 shows the graph of the linear function whose equation is defined by $f(x) = -\frac{3}{4}x + 3$. What is the value of θ formed by the line and x -axis?



Note: Figure not drawn to scale.

Figure 1

5. If $f(x) = \sqrt[3]{x-1}$ and $g(x) = 5$, then $g(f(-7.82)) =$

- (A) -10.3
(B) -5
(C) 5
(D) 10.3
(E) 15.6

6. Two circles are symmetric with respect to $y = x$. If the equation of a circle is $x^2 + y^2 - 2x - 4y + 1 = 0$, then which of the following is the equation of the other circle?

- (A) $(x-2)^2 + (y-1)^2 = 4$
(B) $(x-1)^2 + (y-2)^2 = 2$
(C) $(x-1)^2 + (y-2)^2 = 4$
(D) $(x-2)^2 + (y-2)^2 = 4$
(E) $(x+1)^2 + (y+2)^2 = 4$

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MATHEMATICS LEVEL 2 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

7. If $\left|6 - \frac{n}{2}\right| - 3 < 4$, which of the following is the solution set?

- (A) $-1 < n < 13$
- (B) $-2 < n < 13$
- (C) $-2 < n < 26$
- (D) $n < -1$ or $n > 26$
- (E) $n < -2$ or $n > 13$

8. If $\tan \theta = 4.5$, what is the value of $\sqrt{\cos \theta}$?

- (A) 0.116
- (B) 0.201
- (C) 0.217
- (D) 0.328
- (E) 0.466

9. If $x < 3$, then $\sqrt{(x-10)^2} =$

- (A) $10 - x$
- (B) $10 + x$
- (C) $x - 10$
- (D) $-x - 10$
- (E) $\pm(x - 10)$

10. Which of the following is true?

- (A) $\sin(-\theta) = \sin \theta$
- (B) $\cos(-\theta) = -\cos \theta$
- (C) $\tan(-\theta) = \tan \theta$
- (D) $\sec(-\theta) = \sec \theta$
- (E) $\csc(-\theta) = \csc \theta$



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MATHEMATICS LEVEL 2 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

11. When a polynomial $P(x) = x^2 + ax + b$ is divided by $(x-1)$, the remainder is 3, and when the polynomial is divided by $(x-2)$, the remainder is -3 . What are the values of a and b ?

- (A) $a = 9, b = -11$
(B) $a = -9, b = 11$
(C) $a = -5, b = 3$
(D) $a = -5, b = -3$
(E) $a = -3, b = -5$

12. If $\sin a^\circ = \cos(2a + 30)^\circ$, then what is the value of $\tan a^\circ$?

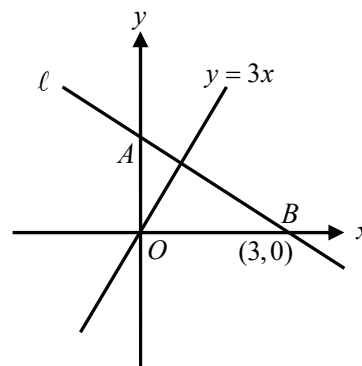
- (A) 0.21
(B) 0.36
(C) 0.42
(D) 0.60
(E) 0.75

13. What is the range of the function $f(x) = -\sqrt{3x-9} + 4$?

- (A) $y \geq 3$
(B) $y \leq 3$
(C) $y \geq 4$
(D) $y \leq 4$
(E) $y \leq -4$

14. If line ℓ is perpendicular to the line $y = 3x$, then what is the area of $\triangle ABO$?

- (A) 1
(B) 1.5
(C) 2
(D) 2.5
(E) 3



Note: Figure not drawn to scale.

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MATHEMATICS LEVEL 2 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

15. If $xy = 1$, then $\frac{x}{x+1} + \frac{y}{y+1} =$
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
16. If one of the roots of $2x^2 + ax + b = 0$ is $-1 + 2i$, what is the value of b ?
- (A) -2
(B) 2
(C) -5
(D) 5
(E) 10
17. If $\log_{\sqrt{3}} x = 10$, then $\log_3 x^3 =$
- (A) 10 (B) 15 (C) 30 (D) 45 (E) 60
18. If $\tan \theta = 3$ and $\pi < \theta < \frac{3\pi}{2}$, what is the value of $\cos(2\theta)$?
- (A) 0.2
(B) 0.4
(C) 0.8
(D) -0.8
(E) -0.4
19. If the surface area of a cylinder, whose height is twice the radius, is 50, then what is the value of the radius?
- (A) 1.63
(B) 1.84
(C) 2.45
(D) 3.87
(E) 4.56

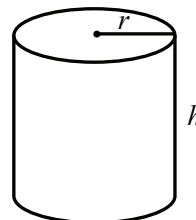


Figure 3

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MATHEMATICS LEVEL 2 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

20. If $f(x) = \log(x+1) + \log(x-1)$, then $f^{-1}(x) =$

- (A) 10^{x^2-1}
- (B) $x^2 - 10$
- (C) $\sqrt{10^x + 1}$
- (D) $-\sqrt{10^x + 1}$
- (E) $\pm\sqrt{10^x + 1}$

21. In Figure 2, $f(x) = x + b$ is tangent to the graph of a circle whose equation is $x^2 + y^2 = 4$. What is the value of b ?

- (A) -5.45
- (B) -3.48
- (C) -2.14
- (D) -2.21
- (E) -2.83

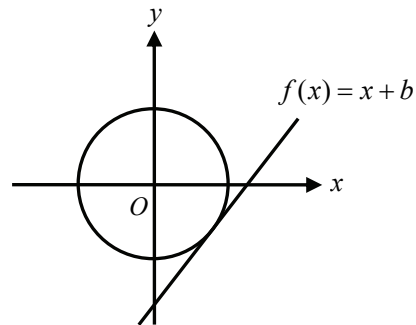


Figure 4

22. What is the distance between the two points of intersection of the circles whose equations are $x^2 + y^2 = 16$ and

$$(x-4)^2 + (y-4)^2 = 16?$$

- (A) 1.12
- (B) 2.73
- (C) 3.35
- (D) 4.87
- (E) 5.66

23. If $\vec{a} = (3, 2, 3)$ and $\vec{b} = (1, 5, 2)$, which of the following is the value of $|\vec{a} - \vec{b}|$?

- (A) 2.52
- (B) 3.74
- (C) 4.25
- (D) 7.58
- (E) 8.02

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MATHEMATICS LEVEL 2 TEST - *Continued*

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24. A pencil holder contains only five black pencils and three white pencils. If three pencils are drawn at random, what is the probability to have two black pencils and one white pencil?
- (A) $\frac{3}{5}$ (B) $\frac{3}{8}$ (C) $\frac{15}{28}$ (D) $\frac{5}{7}$ (E) $\frac{2}{3}$
25. If $\frac{(x-1)^2}{x} \geq 0$, then which of the following is the complete solution set of the inequality?
- (A) $\{x \leq 0\}$
(B) $\{0 \leq x < 1\}$
(C) $\{x > 0\}$
(D) $\{x < 0 \text{ or } x > 1\}$
(E) $\{x \leq 0 \text{ or } x > 1\}$
26. Which of the following includes all asymptotes of the rational function $f(x) = \frac{x^3}{x^2 - 1}$?
- (A) $x = 1, x = -1$
(B) $x = 1, y = 0$
(C) $x = 1, x = -1, \text{ and } y = 0$
(D) $x = 1, x = -1, \text{ and } y = x$
(E) $x = 1, x = -1, \text{ and } y = -1$
27. Which of the following is the distance from the origin to the plane $x - y - z - 3 = 0$?
- (A) $\sqrt{2}$
(B) $\sqrt{3}$
(C) 2
(D) $\sqrt{5}$
(E) $\sqrt{6}$

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MATHEMATICS LEVEL 2 TEST - *Continued*

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28. If $\cos^2 \theta - 3 \cos \theta - 1 = 0$, then what is the smallest positive value of θ ?
- (A) 8.16
(B) 4.40
(C) 1.88
(D) 0.92
(E) 0.46
29. What is the interquartile range of the following set of data
10, 13, 15, 18, 25, 30, 40, 60, 75, 80, 80?
- (A) 20
(B) 40
(C) 50
(D) 60
(E) 70
30. If angle A is obtuse and $\tan A = -\frac{3}{2}$, which of the following is the value of $\cos 2A$?
- (A) -0.38
(B) -0.30
(C) -0.15
(D) 1.5
(E) 3.6
31. What is the value of $\arccos\left(\frac{\sqrt{3}}{2}\right) + \arcsin\left(-\frac{\sqrt{3}}{2}\right)$?
- (A) 0°
(B) -30°
(C) -45°
(D) 30°
(E) 45°

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MATHEMATICS LEVEL 2 TEST - *Continued*

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32. If $f(x) = \sqrt[3]{2x+3}$, then $f^{-1}(3) =$
- (A) 3.6
(B) 5
(C) 8
(D) 10
(E) 12
33. The function $f(x) = x^2 - 4x + 9$ is a shift of $f(x) = x^2$
- (A) 4 units to the right and 9 units up
(B) 2 units to the right and 5 units down
(C) 2 unit to the left and 5 units up
(D) 4 units to the left and 9 units up
(E) 2 units to the right and 5 units up
34. If $(\cos \theta + i \sin \theta)(\cos \theta - i \sin \theta) = a - 1 + bi$, where a and b are real numbers, which of the following is true?
- (A) $a = 1, b = 1$
(B) $a = 1, b = 0$
(C) $a = 2, b = 0$
(D) $a = 2, b = -2$
(E) $a = -2, b = -2$
35. If the difference of the roots of $x^2 + 2mx = 7$ is 8, then what is the positive integer value of m ?
- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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