

**MATHEMATICS LEVEL IIC 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 : $S = \frac{1}{2}cl$

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 : $V = \frac{1}{3}Bh$

DO NOT DETACH FROM BOOK.

GO ON TO THE NEXT PAGE 

2C

2C

2C

2C

2C

2

MATHEMATICS LEVEL IIC 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 oval on the answer sheet.

Notes: (1) A 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. The calculator you use must be at least a scientific calculator; programmable calculators and calculators that can display graphs are permitted.

(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.

(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 $1 - \frac{1}{x} = 3 - \frac{3}{x}$, then $1 - \frac{1}{x} =$

- (A) $-\frac{1}{2}$ (B) 0 (C) $\frac{1}{2}$ (D) $\frac{2}{3}$ (E) 3

2. $a\left(\frac{1}{b} + \frac{1}{c}\right) =$

- (A) $\frac{a}{bc}$
 (B) $\frac{a}{b+c}$
 (C) $\frac{2a}{b+c}$
 (D) $\frac{ab+ac}{bc}$
 (E) $\frac{1}{ab+ac}$

GO ON TO THE NEXT PAGE 

MATHEMATICS LEVEL IIC TEST—Continued

USE THIS SPACE FOR SCRATCHWORK.

3. Figure 1 shows one cycle of the graph of the function $y = \sin x$ for $0 \leq x \leq 2\pi$. If the minimum value of the function occurs at point P , then the coordinates of P are

- (A) $\left(\frac{4\pi}{3}, -\pi\right)$
 (B) $\left(\frac{4\pi}{3}, -1\right)$
 (C) $\left(\frac{3\pi}{2}, -\pi\right)$
 (D) $\left(\frac{3\pi}{2}, -1\right)$
 (E) $\left(\frac{3\pi}{2}, 0\right)$

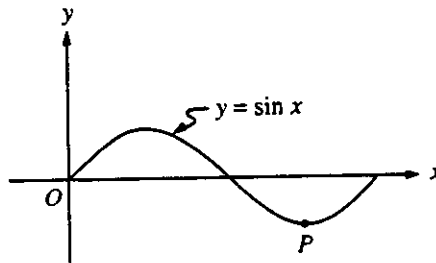


Figure 1

Note: Figure not drawn to scale.

4. If P and Q are different points in a plane, the set of all points in this plane that are closer to P than to Q is

- (A) the region of the plane on one side of a line
 (B) the interior of a square
 (C) a wedge-shaped region of the plane
 (D) the region of the plane bounded by a parabola
 (E) the interior of a circle

5. If $\sqrt{6y} = 4.73$, then $y =$

- (A) 0.62 (B) 1.93 (C) 3.73 (D) 5.33 (E) 11.59

GO ON TO THE NEXT PAGE

MATHEMATICS LEVEL IIC TEST—Continued

USE THIS SPACE FOR SCRATCHWORK

6. In Figure 2, $r \cos \theta =$

- (A) x
 (B) y
 (C) r
 (D) $x + y$
 (E) $r + y$

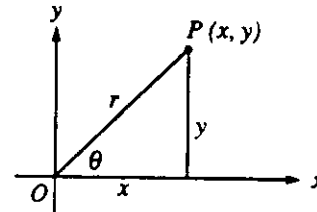


Figure 2

7. If $f(x) = \sqrt{0.3x^2 - x}$ and $g(x) = \frac{x+1}{x-1}$, then $g(f(10)) =$

- (A) 0.2 (B) 1.2 (C) 1.6 (D) 4.5 (E) 5.5

8. If n , p , and t are nonzero real numbers and if

$$n^4 p^7 t^9 = \frac{4n^3 p^7}{t^{-9}}, \text{ then } n =$$

- (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) 4 (D) $4p^2 t^2$ (E) $4p^{18} t^{18}$

9. In the triangle in Figure 3, if $OA = AB$, what is the slope of segment AB ?

- (A) $\sqrt{2}$
 (B) $\frac{\sqrt{2}}{2}$
 (C) $-\frac{\sqrt{2}}{2}$
 (D) $-\sqrt{2}$

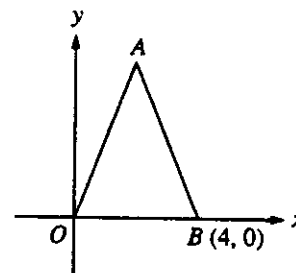


Figure 3

(E) It cannot be determined from the information given.

GO ON TO THE NEXT PAGE

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—Continued

USE THIS SPACE FOR SCRATCHWORK.

10. Where defined, $\csc(2\theta) \sin(2\theta) =$

- (A) 1
- (B) 0
- (C) -1
- (D) $2 \csc(4\theta)$
- (E) $2 \sec(4\theta)$

11. The graph of $y = f(x)$ is shown in Figure 4. Which of the following could be the graph of $y = |f(x)|$?

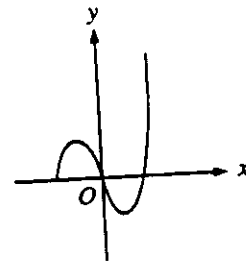
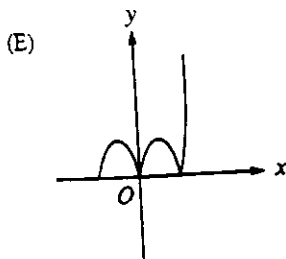
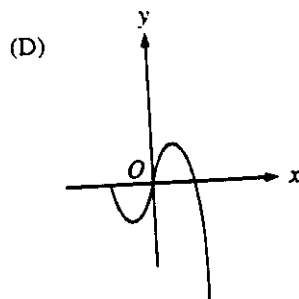
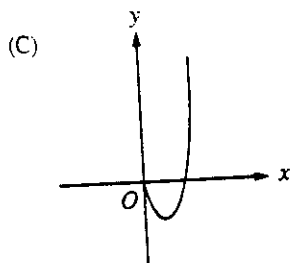
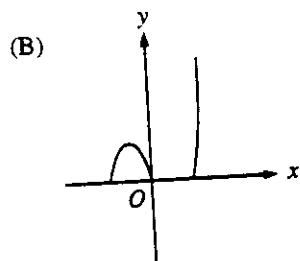
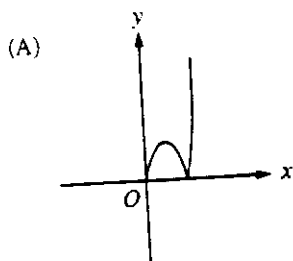


Figure 4



GO ON TO THE NEXT PAGE

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST — *Continued*

USE THIS SPACE FOR SCRATCHWORK.

12. If 3 and -2 are both zeros of the polynomial $p(x)$, then a factor of $p(x)$ is
- (A) $x^2 - 6$
(B) $x^2 - x - 6$
(C) $x^2 + 6$
(D) $x^2 + x - 6$
(E) $x^2 + x + 6$
13. A kite string is attached to a peg in the ground. If 100 meters of kite string are played out on the kite and the string makes an angle of 49° with the ground, what is the distance, in meters, from the kite to the ground? (Assume that the string is taut and the ground is level.)
- (A) 133 (B) 115 (C) 75 (D) 66 (E) 52
14. If $f(x) = 3x + 5$ and $f(g(1)) = 11$, which of the following could be $g(x)$?
- (A) $7x - 5$
(B) $5x + 7$
(C) $5x - 7$
(D) $5x + 3$
(E) $-5x + 3$

GO ON TO THE NEXT PAGE

MATHEMATICS LEVEL IIC TEST — *Continued*

USE THIS SPACE FOR SCRATCHWORK.

Figure 5 shows a cube with edge of length 3 centimeters. If points A and C are midpoints of the edges of the cube, what is the perimeter of region $ABCD$?

- (A) 6.71 cm
- (B) 11.25 cm
- (C) 13.42 cm
- (D) 22.50 cm
- (E) 45.00 cm

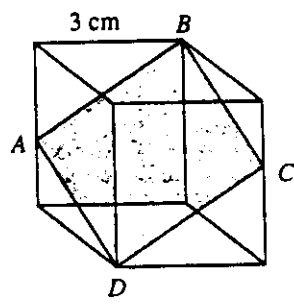


Figure 5

An equation of line ℓ in Figure 6 is

- (A) $x = 2$
- (B) $y = 2$
- (C) $x = 0$
- (D) $y = x + 2$
- (E) $x + y = 2$

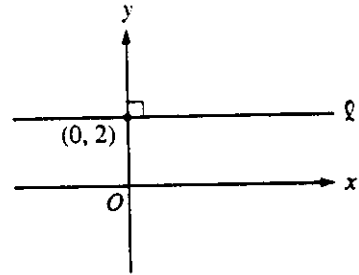


Figure 6

The mean weight of the 19 members of an algebra class was 112 pounds. When a new student enrolled, the mean decreased to 111 pounds. What was the weight, in pounds, of the new student?

- (A) 91
- (B) 92
- (C) 93
- (D) 101
- (E) 110

GO ON TO THE NEXT PAGE

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—*Continued*

USE THIS SPACE FOR SCRATCHWORK

18. If $0 < x < \pi$ and $\cos x = 0.875$, what is the value of

$$\tan\left(\frac{x}{2}\right)?$$

- (A) 0.008
(B) 0.017
(C) 0.258
(D) 0.277
(E) 0.553
19. Recently 30,744 residents of Lyon County and 20,496 residents of Saline County voted on a referendum. A total of 38,430 residents of the two counties voted yes. If the same percentage of the voters in each county voted yes, how many of the residents of Lyon County voted yes?
- (A) 7,686
(B) 10,248
(C) 15,372
(D) 17,934
(E) 23,058
20. If $f: (x, y) \rightarrow (x + 2y, y)$ for every pair (x, y) in the plane, for what points (x, y) is it true that $(x, y) \rightarrow (x, y)$?
- (A) The set of points (x, y) such that $x = 0$
(B) The set of points (x, y) such that $y = 0$
(C) The set of points (x, y) such that $y = 1$
(D) $(0, 0)$ only
(E) $(-1, 1)$ only

GO ON TO THE NEXT PAGE 

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—*Continued*

USE THIS SPACE FOR SCRATCHWORK.

21. What number should be added to each of the three numbers 1, 7, and 19 so that the resulting three numbers form a geometric progression?
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6
22. If $f(x) = ax^2 + bx + c$ for all real numbers x and if $f(0) = 1$ and $f(1) = 2$, then $a + b =$
- (A) -2 (B) -1 (C) 0 (D) 1 (E) 2
23. What is the degree measure of the largest angle of a triangle that has sides of length 7, 6, and 6?
- (A) 31.00°
(B) 54.31°
(C) 71.37°
(D) 125.69°
(E) 144.31°
24. What is the domain of $f(x) = \sqrt[3]{-x^2 + 13}$?
- (A) $x > 0$
(B) $x > 2.35$
(C) $-2.35 < x < 2.35$
(D) $-3.61 < x < 3.61$
(E) All real numbers

GO ON TO THE NEXT PAGE

2C

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—Continued

USE THIS SPACE FOR SCRATCHWORK.

25. If $\cos x = \tan x$, which of the following is a possible radian value of x ?

(A) -1.00
(B) -0.52
(C) 0.00
(D) 0.52
(E) 0.67

26. Figure 7 shows a portion of the graph of $y = 3^x$. What is the sum of the areas of the three inscribed rectangles shown?

(A) 4.698 (B) 1,638 (C) 819 (D) 182 (E) 91

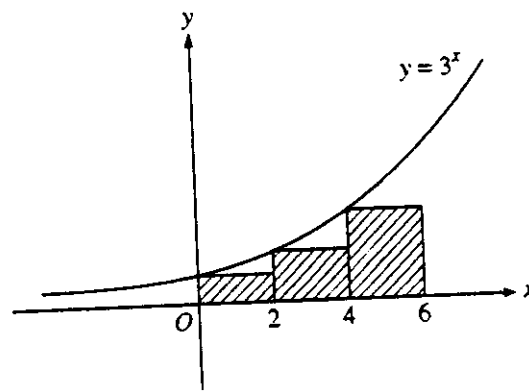


Figure 7

Note: Figure not drawn to scale.

GO ON TO THE NEXT PAGE

MATHEMATICS LEVEL IIC TEST — *Continued*

USE THIS SPACE FOR SCRATCHWORK.

27. When a certain radioactive element decays, the amount that exists at any time t can be calculated by the function $E(t) = ae^{\frac{-t}{1,000}}$, where a is the initial amount and t is the elapsed time in years. How many years would it take for an initial amount of 600 milligrams of this element to decay to 300 milligrams?

- (A) 0.5
- (B) 500
- (C) 693
- (D) 1,443
- (E) 5,704

28. Which of the following lines are asymptotes of the graph of $y = \frac{1+x}{x}$?

- I. $x = 0$
- II. $y = 0$
- III. $y = 1$

- (A) I only
- (B) II only
- (C) I and II only
- (D) I and III only
- (E) I, II, and III

29. If $f(2x + 1) = 2x - 1$ for all real numbers x , then $f(x) =$

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

GO ON TO THE NEXT PAGE 

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST — *Continued*

USE THIS SPACE FOR SCRATCHWORK.

30. Which of the following could be the coordinates of the center of a circle tangent to the x -axis and the y -axis?

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

31. What is the range of the function defined by

$$f(x) = \begin{cases} x^{\frac{1}{3}}, & x > 2 \\ 2x - 1, & x \leq 2 \end{cases} ?$$

- (A) $y > 2^{\frac{1}{3}}$
 - (B) $y \leq 3$
 - (C) $2^{\frac{1}{3}} < y < 3$
 - (D) $y \geq 3$
 - (E) All real numbers
32. If $3x - 4y + 7 = 0$ and $2y - x^2 = 0$ for $x \geq 0$,
then $x =$
- (A) 1.27
 - (B) 2.07
 - (C) 2.77
 - (D) 4.15
 - (E) 5.53

GO ON TO THE NEXT PAGE 

MATHEMATICS LEVEL IIC TEST—Continued

NRK

USE THIS SPACE FOR SCRATCHWORK.

33. If $f(x) = \log_2 x$ for $x > 0$, then $f^{-1}(x) =$

- (A) 2^x
- (B) x^2
- (C) $\frac{x}{2}$
- (D) $\frac{2}{x}$
- (E) $\log_x 2$

34. If $x_0 = 0$ and $x_{n+1} = \sqrt{6 + x_n}$, then $x_3 =$

- (A) 2.449
- (B) 2.907
- (C) 2.984
- (D) 2.997
- (E) 3.162

35. Figure 8 shows a triangle inscribed in a semicircle. What is the area of the triangle in terms of θ ?

- (A) $\frac{\theta\pi}{2}$
- (B) $\frac{\theta}{2}$
- (C) $\tan \theta$
- (D) $\sin \theta$
- (E) $2 \sin \theta \cos \theta$

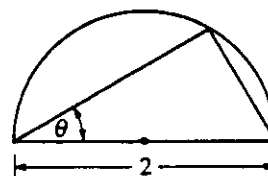


Figure 8

GO ON TO THE NEXT PAGE

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—*Continued*

USE THIS SPACE FOR SCRATCHWORK.

36. In a certain experiment, there is a 0.2 probability that any thermometer used is in error by more than 1°C . If 4 thermometers are used, what is the probability that all of them are in error by more than 1°C ?

(A) 0.0016
(B) 0.0081
(C) 0.16
(D) 0.25
(E) 0.80

37. If the magnitudes of vectors \mathbf{a} and \mathbf{b} are 5 and 12, respectively, then the magnitude of vector $(\mathbf{b} - \mathbf{a})$ could NOT be

(A) 5
(B) 7
(C) 10
(D) 12
(E) 17

38. If $(6.31)^m = (3.02)^n$, what is the value of $\frac{m}{n}$?

(A) -0.32 (B) 0.32 (C) 0.48 (D) 0.60 (E) 1.67

**GO ON TO THE NEXT PAGE**

2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST — *Continued*

USE THIS SPACE FOR SCRATCHWORK.

39. If $\arccos(\cos x) = 0$ and $0 \leq x \leq \frac{\pi}{2}$, then x could equal

(A) 0

(B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$ (E) $\frac{\pi}{2}$

40. If the 20th term of an arithmetic sequence is 100 and the 40th term of the sequence is 250, what is the first term of the sequence?

(A) -50

(B) -42.5

(C) 5

(D) 42.5

(E) 50

41. If n distinct planes intersect in a line, and another line ℓ intersects one of these planes in a single point, what is the least number of these n planes that ℓ could intersect?

(A) n (B) $n - 1$ (C) $n - 2$ (D) $\frac{n}{2}$ (E) $\frac{n - 1}{2}$ GO ON TO THE NEXT PAGE

2C



2C



2C



2C



2C

MATHEMATICS LEVEL IIC TEST—*Continued*

USE THIS SPACE FOR SCRATCHWORK.

42. For all θ , $\sin \theta + \sin(-\theta) + \cos \theta + \cos(-\theta) =$

- (A) 0 (B) 2 (C)
- $2 \sin \theta$
- (D)
- $2 \cos \theta$
- (E)
- $2(\sin \theta + \cos \theta)$

43.
$$\frac{[(n-1)!]^2}{[n!]^2} =$$

(A) $\frac{1}{n}$

(B) $\frac{1}{n^2}$

(C) $\frac{n-1}{n}$

(D) $\left(\frac{n-1}{n}\right)^2$

(E) $(n-1)^2$

44. The radius of the base of a right circular cone is 6 and the radius of a parallel cross section is 4. If the distance between the base and the cross section is 8, what is the height of the cone?

(A) 11

(B) $13\frac{1}{3}$

(C) 16

(D) 20

(E) 24

GO ON TO THE NEXT PAGE

C
2C

2C

2C

2C

2C

MATHEMATICS LEVEL IIC TEST—*Continued*

USE THIS SPACE FOR SCRATCHWORK.

45. An indirect proof of the statement "If $x = 2$, then \sqrt{x} is not a rational number" could begin with the assumption that
- (A) $x = \sqrt{2}$
 - (B) $x^2 = 2$
 - (C) \sqrt{x} is rational
 - (D) \sqrt{x} is not rational
 - (E) x is nonnegative
46. Suppose the graph of $f(x) = -x^2$ is translated 3 units left and 1 unit up. If the resulting graph represents $g(x)$, what is the value of $g(-1.6)$?
- (A) 2.96
 - (B) -0.96
 - (C) -1.56
 - (D) -1.96
 - (E) -2.56
47. In how many ways can 10 people be divided into two groups, one with 7 people and the other with 3 people?
- (A) 120 (B) 210 (C) 240 (D) 5,040 (E) 14,400

GO ON TO THE NEXT PAGE

MATHEMATICS LEVEL IIC TEST—Continued

USE THIS SPACE FOR SCRATCHWORK

48. Which of the following has an element that is less than any other element in that set?

- I. The set of positive rational numbers
- II. The set of positive rational numbers r such that $r^2 \geq 2$
- III. The set of positive rational numbers r such that $r^2 > 4$

- (A) None
- (B) I only
- (C) II only
- (D) III only
- (E) I and III

49. What is the length of the major axis of the ellipse whose equation is $60x^2 + 30y^2 = 150$?

- (A) 1.26
- (B) 2.50
- (C) 3.16
- (D) 4.47
- (E) 5.00

50. Under which of the following conditions is $\frac{a-b}{ab}$ positive?

- (A) $0 < a < b$
- (B) $a < b < 0$
- (C) $b < a < 0$
- (D) $b < 0 < a$
- (E) None of the above

S T O P

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS TEST ONLY
DO NOT TURN TO ANY OTHER TEST IN THIS BOOK.

UNAUTHORIZED REPRODUCTION OR USE OF ANY PART OF THIS TEST IS PROHIBITED.

TABLE A
Answers to the SAT II: Mathematics Level IIC Subject Test, Form 3RBC2,
and Percentage of Students Answering Each Question Correctly

Question Number	Correct Answer	Right	Wrong	Percentage of Students Answering the Question Correctly*	Question Number	Correct Answer	Right	Wrong	Percentage of Students Answering the Question Correctly*
1	B			79	26	D			66
2	D			81	27	C			57
3	D			89	28	D			56
4	A			52	29	C			54
5	C			94	30	D			84
6	A			84	31	E			48
7	C			89	32	C			52
8	C			80	33	A			52
9	E			82	34	C			42
10	A			84	35	E			34
11	E			74	36	A			60
12	B			84	37	A			24
13	C			85	38	D			45
14	A			89	39	A			56
15	C			71	40	B			28
16	B			96	41	B			22
17	B			80	42	D			56
18	C			85	43	B			51
19	E			65	44	E			32
20	B			59	45	C			28
21	D			64	46	B			33
22	D			79	47	A			26
23	C			67	48	A			14
24	E			61	49	D			24
25	E			68	50	C			45

*These percentages are based on an analysis of the answer sheets of a random sample of 9,983 students who took the original form of this test in June 1995, and whose mean score was 649. They may be used as an indication of the relative difficulty of a particular question. Each percentage may also be used to predict the likelihood that a typical SAT II: Mathematics Level IIC Subject Test candidate will answer correctly that question on this edition of the test.

TABLE B
Scaled Score Conversion Table
Mathematics Level IIC Test (Form 3RBC2)

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
50	800	28	650	6	480
49	800	27	640	5	470
48	800	26	630	4	460
47	800	25	630	3	450
46	800	24	620	2	440
45	800	23	610	1	430
44	800	22	600	0	410
43	800	21	590	-1	390
42	790	20	580	-2	370
41	780	19	570	-3	360
40	770	18	560	-4	340
39	760	17	560	-5	340
38	750	16	550	-6	330
37	740	15	540	-7	320
36	730	14	530	-8	320
35	720	13	530	-9	320
34	710	12	520	-10	320
33	700	11	510	-11	310
32	690	10	500	-12	310
31	680	9	500		
30	670	8	490		
29	660	7	480		

Time—40 minutes

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 oval on the answer sheet.

Notes: (1) A 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.

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 : $S = \frac{1}{2} cl$

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 : $V = \frac{1}{3} Bh$

USE THIS SPACE FOR SCRATCHWORK.

Handwritten text on the left side of the page, including "USE THIS SPACE FOR SCRATCHWORK" and other illegible notes.

What is the value of $\sum_{k=1}^5 k^2$?

- (A) 15 (B) 25 (C) 30 (D) 55 (E) 91