

The Mathematics Subject Tests

The Mathematics Subject Tests are Mathematics Level I, Mathematics Level IC, and Mathematics Level IIC. (Note: the Mathematics Level I Test was discontinued as of January 1998.)

Mathematics Level IC

Format - This is a one-hour test with 50 multiple-choice questions. The “C” after Level I indicates that a calculator is required to solve some of the questions. Students who take this test without a calculator will be at a disadvantage. The calculator used must be at least a scientific calculator. (Graphing calculators are permitted.) Test questions are on the following topics:

- algebra
- geometry (plane Euclidean geometry, coordinate geometry, solid geometry)
- basic trigonometry
- algebraic functions
- elementary statistics, including probability, counting problems, data interpretation, and mean, median, and mode
- miscellaneous topics, including logic, elementary number theory, and arithmetic and geometric sequences.

Recommended Preparation - It is assumed that you have taken three years of college-preparatory mathematics (two years of algebra and one year of geometry). You are not expected to have studied every topic on the test. Choose to take this test only if you use a calculator routinely in your mathematics classes.

Calculator Use - It is NOT necessary to use a calculator to solve every question on Level IC, so it is important to *know when and how to use one*. For about 60 percent of the questions there is no advantage, perhaps even a disadvantage, to using a calculator. For about 40 percent of the questions a calculator may be useful or necessary.

Calculator Policy

You may use almost any scientific or graphing calculator on Level IC. NOT permitted are: pocket organizers, “hand-held” and laptop computers, electronic writing pads and pen-input devices, calculator with QWERTY (i.e., typewriter-like) keypads, calculators that require paper tapes, calculators that make noise or “talk”, and calculators that require electrical outlets. Students may not share calculator.

You should be thoroughly familiar with the operation of the calculator you plan to use on the test. Your degree of familiarity with the calculator may affect how well you do on the test.

To minimize the chance of a calculator malfunction, you should put in fresh batteries and make certain before the test that your calculator is in good working order. Test center staff cannot assist you if your calculator malfunctions. No batteries or calculators will be available at the test center for your use. You may bring batteries and a backup calculator to the test center.

Mathematics Level IC

Directions: 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) The only angle measure used on this test is degree measure. Make sure your calculator is in 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.

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

$$\text{height } h: V = \frac{1}{3} \pi r^2 h$$

Lateral Area of a right circular cone with circumfer-

$$\text{ence of the base } c \text{ and slant height } \ell: S = \frac{1}{2} c \ell$$

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 :

$$V = \frac{1}{3} B h$$

15. Jeff and Sue left for a week's vacation on the same day. Jeff took \$380 as spending money and spent \$32 per day. Sue took \$300. She did not spend any money on the first 2 days, but thereafter she spent \$29 per day.

Which of the following expresses the difference between the amount Jeff has left and the amount Sue has left x days after leaving on vacation, where $x \geq 2$?

- (A) $22 - 3x$
(B) $80 - 3x$
(C) $138 - 3x$
(D) $80 + 3x$
(E) $80 + 61x$

16. What is the length of the line segment on the line

$y = \frac{1}{2}x - 3$ whose endpoints have x -coordinates 4 and 10?

- (A) 6
(B) $\sqrt{27}$
(C) $\sqrt{37}$
(D) $\sqrt{45}$
(E) $\sqrt{205}$

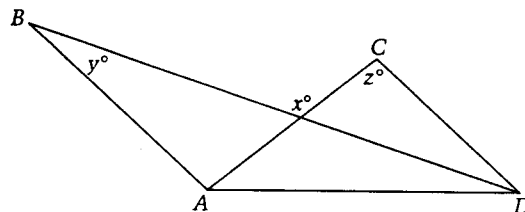


Figure 6

17. In Figure 6, line segments AB and CD are parallel. What is x in terms of y and z ?

- (A) $y + z$
(B) $2y + z$
(C) $2y - z$
(D) $180 - y - z$
(E) $180 + y - z$

18. If $\sqrt[3]{x + 8} = -0.5$, then $x =$

- (A) -15.625
(B) -8.794
(C) -8.125
(D) -7.875
(E) -7.750

19. If a and b are real numbers, $i^2 = -1$, and $(a + b) + 5i = 9 + ai$, what is the value of b ?

(A) 4
 (B) 5
 (C) 9
 (D) $4 + 5i$
 (E) $5 + 4i$

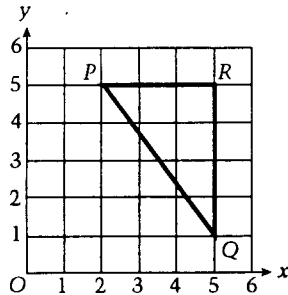


Figure 7

20. In right triangle PRQ in Figure 7, $\cos \angle QPR =$

(A) $\frac{3}{5}$ (B) $\frac{3}{4}$ (C) $\frac{4}{5}$ (D) $\frac{4}{3}$ (E) $\frac{5}{3}$

21. If $f(x) = x + 3$ and $g(x) = \frac{x^2 - 9}{x - 3}$, how are the graphs of f and g related?

(A) They are exactly the same.
 (B) They are the same except when $x = 3$.
 (C) They are the same except when $x = -3$.
 (D) They have the same shape but only a finite number of points in common.
 (E) They have no points in common.

22. If line ℓ is the perpendicular bisector of the line segment with endpoints $(2, 0)$ and $(0, -2)$, what is the slope of line ℓ ?

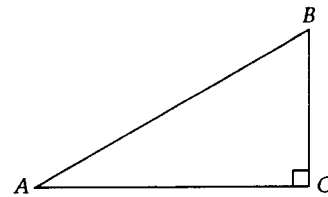
(A) 2
 (B) 1
 (C) 0
 (D) -1
 (E) -2

23. Twenty students have each sampled one or more of three kinds of candy bars that a school store sells. If 3 students have sampled all three kinds, and 5 have sampled exactly two kinds, how many of these students have sampled only one kind?

(A) 8
 (B) 12
 (C) 15
 (D) 17
 (E) 18

24. If $\log_{10} abc = 16$ and $\log_{10} ac = 12$, then $b =$

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) 4 (D) 4^{10} (E) 10^4



Note: Figure not drawn to scale.

Figure 8

25. In Figure 8, $\triangle ABC$ has a right angle at C . If the length of side AC is 10 and the measure of $\angle BAC$ is 22° , what is the length of side BC ?

(A) 3.7
 (B) 4.0
 (C) 5.8
 (D) 6.8
 (E) 9.3

26. If x is the mean of the numbers r , s , and t , which of the following must be true?

I. $x = \frac{r+s+t}{3}$

II. $(x - r) + (x - s) + (x - t) = 0$

III. $x + 10 = \frac{r+s+t+10}{3}$

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

27. The front, side, and bottom faces of a rectangular solid have areas of 24 square centimeters, 8 square centimeters, and 3 square centimeters, respectively. What is the volume of the solid?

(A) 24 cubic centimeters
 (B) 96 cubic centimeters
 (C) 192 cubic centimeters
 (D) 288 cubic centimeters
 (E) 576 cubic centimeters

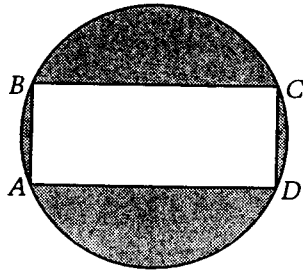


Figure 9

Answers to the Mathematics Level IC Subject Test questions

28. Rectangle $ABCD$ is inscribed in the circle shown in Figure 9. If the length of side AB is 5 and the length of side BC is 12, what is the area of the shaded region?

- (A) 40.8
 (B) 53.1
 (C) 72.7
 (D) 78.5
 (E) 81.7

- | | |
|-------|-------|
| 15. A | 24. E |
| 16. D | 25. B |
| 17. A | 26. D |
| 18. C | 27. A |
| 19. A | 28. C |
| 20. A | 29. E |
| 21. B | 30. D |
| 22. D | 31. A |
| 23. B | 32. B |

29. If $f(x) = \sqrt{3-x}$, which of the following numbers is not included in the domain of f ?

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

30. A drawer contains only 4 socks — 2 red and 2 green. If 2 socks are randomly drawn from the drawer, what is the probability that both socks will be the same color?

- (A) $\frac{1}{12}$ (B) $\frac{1}{6}$ (C) $\frac{1}{4}$ (D) $\frac{1}{3}$ (E) $\frac{1}{2}$

This attachment describes the Mathematics Level IC portion of the SAT II: Mathematics Test administered on the UT Austin campus. For a description of the test available in national administrations, see *Taking SAT II: Subject Tests*.

31. Which of the following equations have two distinct real solutions?

- I. $|x| = 5$
 II. $x = \sqrt{16}$
 III. $x^2 - 2x + 1 = 0$

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

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32. If the measure of one angle of a rhombus is 60° , then the ratio of the length of its longer diagonal to the length of its shorter diagonal is

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