

SHOOTOUT MATHEMATICS

2005-2006 Test 1

1) Barry's Hotdogs sells two kinds of dogs. The Monster Dog sells for \$4.50 and the Regular sells for \$3.25. One day, Barry sells 121 hotdogs for \$492.00. How many Monster Dogs did he sell on that day?

- A) 42 B) 64 C) 87 D) 79 E) 57

2) Evaluate: $(14 + 13) \div (13 - 10)^2 + 11 \times 19$

- A) 75 B) 173 C) 212 D) 403 E) 185

3) The set of rational numbers is not closed under what operation?

- A) division B) square root C) multiplication
D) addition E) subtraction

4) Which of the following equations has a graph of a line with a positive slope which intersects the positive x-axis?

- A) $3y - 21x = 12$ B) $4y - 3x = -2$ C) $5y + 20x = 5$ D) $2y + 15x = -12$
E) $y - 6x = 20$

5) How many 4 letter "words" can be constructed of the form "cvcv" where "c" is a consonant, "v" is a vowel, and the letter "y" isn't used?

- A) 6,400 B) 720 C) 10,000 D) 1,200 E) 60

6) Evaluate: $(\log_2 16)(\log_3 27)(\log_4 64)$

- A) 42 B) 48 C) 18 D) 36 E) 64

7) The sum of three consecutive multiples of five equals 195. The largest of these multiples is:

- A) 80 B) 75 C) 70 D) 65 E) 60

8) Find $f(g(3))$ when $f(x) = 2x^2 - 3$ and $g(x) = 4x - 7$.

- A) 17 B) 61 C) 53 D) 47 E) 73

9) Let $X = \{3, 5, 9\}$, $Y = \{2, 4, 8\}$, and $Z = \{2, 3, 7\}$. How many elements are in $(X \cup Y) \cap (Y \cup Z)$?

- A) 5 B) 4 C) 7 D) 2 E) 0

10) The arithmetic mean of 307 and 407 is _____% of the geometric mean of 307 and 407. (To the nearest whole %.)

- A) 112% B) 101% C) 99% D) 75% E) 87%

11) Find the ratio of the surface area of a sphere, with radius r , to its volume.

- A) $\frac{3r^2}{4}$ B) $\frac{2\pi}{r}$ C) $\frac{r}{2\pi}$ D) $\frac{3}{r}$ E) $\frac{\sqrt{2}}{r}$

12) What is 10% of 30 plus 20% of 40 plus 50% of 20 minus 8% of 200?

- A) 18 B) 2 C) 8 D) 5 E) 10

13) The point $(5,0)$ is rotated $\frac{3\pi}{2}$ counterclockwise about the origin. The coordinate of the point after rotation is _____.

- A) $(\sqrt{5}, -\sqrt{5})$ B) $(0,5)$ C) $(0,-5)$ D) $(-5,0)$ E) $(5,0)$

14) If $f'(x) = 9x^2 + 2$ and $f(3) = 92$, find $f(-1)$.

- A) 3 B) 5 C) 4 D) 14 E) 0

15) Find the numerical value of $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{5} \times \frac{4}{7} \times \frac{5}{11} \times \frac{6}{13} \times \frac{7}{17}$.

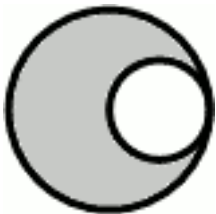
- A) $\frac{42}{3421}$ B) $\frac{24}{2431}$ C) $\frac{18}{4125}$ D) $\frac{36}{1345}$ E) $\frac{36}{3421}$

16) Find b if 131 base b represents the same number as the base 10 number 55.

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

17) 24 marbles are in a bag. $\frac{5}{12}$ are white. $\frac{1}{3}$ are blue. $\frac{1}{4}$ are red. Two marbles are drawn at random from the bag. If the first marble is put back in the bag after it is drawn and the marbles are mixed again, what is the probability that both marbles drawn are blue?

- A) $\frac{1}{9}$ B) $\frac{2}{3}$ C) $\frac{7}{12}$ D) $\frac{1}{3}$ E) $\frac{1}{5}$



18) If the radius of the larger circle to the left is 4, what is area of the shaded region? (to the nearest tenth)

- A) 37.7 B) 41.3
C) 42.9 D) 50.3
E) 28.4

19) How many gallons can be stored in a cylindrical water tank that is 8 feet high and has a diameter of 6 feet?

- A) 1432 B) 1542 C) 1692 D) 1842 E) 2012

20) Two cars start at the same intersection and travel in opposite directions. Car A moves at 60 mph and Car B travels at 50 mph. In how many minutes will the two cars be 100 miles apart?

- A) 52.4 B) 50.8 C) 63.7 D) 54.5 E) 51.3

21) Which of the following numbers is considered to be an “abundant” number?

- A) 26 B) 22 C) 14 D) 15 E) 24

22) Sarah removes the clubs from a standard deck of cards. She then shuffles the clubs and randomly draws 3 without replacement. How many outcomes are there in the sample space of Sarah’s random draws?

- A) 1728 B) 1331 C) 1872 D) 2197 E) 1716

23) Determine the range of $f(x) = 5 + 3\cos 4(2x + 5\pi)$.

- A) $[-3,3]$ B) $[3,7]$ C) $[0,10]$ D) $[2,8]$ E) $[-5,6]$

24) If $(2 + 3i)(4 - 6i)(1 + 4i) = a + bi$, then a equals:

- A) 96 B) 32 C) 26 D) -18 E) 16

25) Bonnie is going to make a cylinder from a 20 inch square sheet of paper by taping two opposite sides of the paper together so that they overlap by 1 inch. What’s the volume of the cylinder that Bonnie will make? (in cubic inches)

- A) 803 B) 516 C) 703 D) 412 E) 619

26) An operation “ \boxplus ” is defined by: $A \boxplus B = (A + B) \div (A - B)$. What is the value of $(8 \boxplus 4) + (113 \boxplus 13)$?

- A) 8.42 B) 4.26 C) 6.25 D) 8.46 E) 7.32

27) Let a and b be the roots of $3x^2 - 21x + 18 = 0$. Find $a^3 + 3ab + b^3$.

- A) 135 B) 235 C) 196 D) 201 E) 175

28) $2\sin(22.5^\circ)\cos(22.5^\circ)$ equals:

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

29) Two sets of parallel lines intersect each other. One of the sets has 3 lines. The other set has 4 lines. At how many points do the two sets of lines intersect each other?

- A) 15 B) 7 C) 8 D) 12 E) 16

30) What is the probability that a positive integral divisor of 100 is prime?

- A) $1/3$ B) $2/9$ C) $1/5$ D) $3/7$ E) $1/8$

40) $8 + 13 + 18 + 23 + 28 + \dots + 83$ equals:

- A) 596 B) 728 C) 644 D) 908 E) 1024

41) Richard runs 10 miles in 2 hours. What is his average speed in feet per minute?

- A) 680 B) 360 C) 440 D) 480 E) 520

42) Sarah draws several regular polygons. She draws a pentagon, a heptagon, a nonagon, and a dodecagon. What's the total number of distinct diagonals of the figures that Sarah drew?

- A) 212 B) 108 C) 120 D) 100 E) 144

43) The surface area of a rectangular solid with edges of length 4", 8", and 14" is _____ square inches.

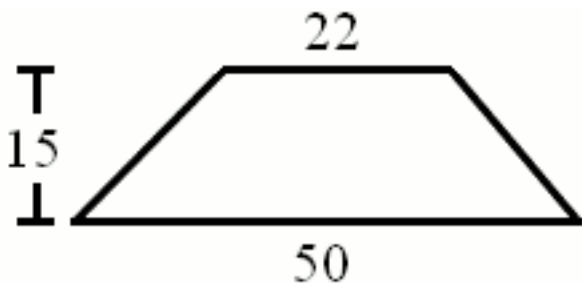
- A) 400 B) 360 C) 244 D) 200 E) 144

44) The number of combinations of 8 distinct objects taken 5 at a time is:

- A) 32 B) 64 C) 24 D) 48 E) 56

45) If $12 \equiv x \pmod{23}$ and $15 < x < 45$, then x equals:

- A) 19 B) 41 C) 35 D) 17 E) 24



46) What is the area of the trapezoid to the left?

- A) 480 B) 360
C) 350 D) 720
E) 540

47) If you roll three dice 10,000 times, how many times can you expect to get three 1's?

- A) 46 B) 37 C) 84 D) 25 E) 1667

48) The polar coordinates $(-3, 95^\circ)$ are converted to rectangular coordinates. Where is the point located on the x-y plane?

- A) Q II B) Q IV C) Q I D) Q III E) x-axis

49) Simplify $a^{-5}b^5 \times a^4 \div (b^4a^{-3} \times b^{-8})$.

- A) a^6b^3 B) ab^7 C) a^4b^5 D) a^2b^9 E) a^3b^7

50) Find the value of $\frac{1}{(1)(4)} + \frac{1}{(3)(8)} + \frac{1}{(5)(16)} + \frac{1}{(7)(32)} + \dots$ to the nearest hundredth.

- A) .372 B) .371 C) .312 D) .321 E) .317

51) Let $f(x) = \frac{9x^3 - 18x^2}{x - 2}$. As $x \rightarrow 2$, $f(x) \rightarrow$ _____.

- A) 36 B) 68 C) 80 D) 204 E) 0

52) $\sum_{n=1}^5 n2^n$ equals:

- A) 160 B) 258 C) 408 D) 184 E) 204

53) 10111011 (base 2) equals _____ (base 8).

- A) 316 B) 147 C) 163 D) 273 E) 164

54) If $A = \begin{bmatrix} 1 & 0 & 3 \\ -2 & -2 & 4 \\ 3 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 4 & 3 \\ 2 & 3 & -2 \\ 5 & 1 & 0 \end{bmatrix}$, then $AB = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$. What is the

value of d?

- A) 1 B) -10 C) 18 D) 7 E) 3

55) Find the area (in square units) of the region bounded by the curve $y = 4x^2 + x$ and the x-axis. (to the nearest hundredth)

- A) .08 B) .07 C) .05 D) .04 E) .01

56) The first day of the week of the 2003 calendar was a Wednesday. What day of the week did the 2002 calendar begin on?

- A) Friday B) Saturday C) Thursday D) Wednesday E) Tuesday

57) What is the sum of the base 4 numbers 321, 232, and 122 in base 4?

- A) 1102 B) 1022 C) 2131 D) 2001 E) 1211

58) How many positive integers divide 576?

- A) 21 B) 12 C) 33 D) 18 E) 28

59) A sequence is defined recursively as $a_0 = 3$, $a_1 = 5$, and $a_n = a_{n-1} + a_{n-2}$, $n \geq 2$. Find the value of a_{10} .

- A) 407 B) 451 C) 610 D) 377 E) 233

60) $\int (\sec^2 x) dx =$ _____ $+ C$, where C is some arbitrary constant.

- A) $\sec x$ B) $\csc x$ C) $\tan x$ D) $\cos x$ E) $\sin x$

SHOOTOUT MATHEMATICS ANSWER SHEET
2005-2006 Test 1

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|-------|-------|-------|
| 1) D | 21) E | 41) C |
| 2) C | 22) E | 42) D |
| 3) B | 23) D | 43) A |
| 4) B | 24) C | 44) E |
| 5) C | 25) B | 45) C |
| 6) D | 26) B | 46) E |
| 7) C | 27) B | 47) A |
| 8) D | 28) B | 48) B |
| 9) B | 29) D | 49) D |
| 10) B | 30) B | 50) C |
| 11) D | 31) E | 51) A |
| 12) D | 32) A | 52) B |
| 13) C | 33) A | 53) D |
| 14) E | 34) E | 54) C |
| 15) B | 35) D | 55) E |
| 16) B | 36) C | 56) E |
| 17) A | 37) B | 57) D |
| 18) A | 38) C | 58) A |
| 19) C | 39) A | 59) D |
| 20) D | 40) B | 60) C |