

Science Bowl

MATHEMATICS

MATH-91; Short Answer: What is the volume of a sphere of radius "R"?

ANSWER: $(4/3) \pi R^3$

MATH-91; Short Answer: What is the surface area of a sphere of radius "r"?

ANSWER: $4 \pi R^2$ or $12.566 \times R^2$

MATH-91; Short Answer: How many degrees are there in π radians?

ANSWER: 180 DEGREES

MATH-91; Short Answer: Using an x-y coordinate axis, the figure represented by the equation $[x^2/36] + [y^2/16] = 1$ is centered about what x-y coordinate point?

ANSWER: (0,0)

MATH-91; Short Answer: An ellipse is represented by the equation $[x^2/36] + [y^2/16] = 1$. What is the length of the major axis of this ellipse?

ANSWER: 12

MATH-91; Short Answer: Using an x-y coordinate axis, a parabola is given by the equation $y = x^2$. Give the x-y coordinates of the focal point for this parabola.

ANSWER: (0,1/4)

MATH-91; Short Answer: Using an x-y coordinate axis, a parabola is represented by the equation $x^2 = 6y$. The vertex of this parabola is at what coordinate point?

ANSWER: (0,0) or $x = 0, y = 0$

MATH-91; Short Answer: For a right triangle, the $\sin(A)$ is $3/5$. To what value is the $\tan(A)$ (read: tangent of A) equal?

ANSWER: $3/4$

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MATHEMATICS

MATH-91; Multiple Choice: The $\tan(-A)$ (read: tangent of the angle minus A) is equal to which of the following?

- w) $\tan(A)$ (read: tangent of the angle A)
- x) $-\tan(-A)$ (read: minus the tangent of the angle minus A)
- y) $-\tan(A)$ (read: minus the tangent of the angle A)
- z) none of the above

ANSWER: Y -- $-\tan(A)$ (read: minus the tangent of the angle A)

MATH-91; Multiple Choice: The cotangent of the angle A is equal to which of the following?

- w) $\cot(-A)$ (pron: cotangent of the angle minus A)
- x) $-\cot(-A)$ (pron: minus the cotangent of the angle minus A)
- y) $-\cot(A)$ (pron: minus the cotangent of the angle A)
- z) none of the above

ANSWER: X -- $-\cot(-A)$

MATH-91; Multiple Choice: The $\tan(180^\circ + A)$ (read: tangent of the quantity 180 degrees plus A) is equal to which of the following?

- w) $\tan(A)$
- x) $-\tan(A)$
- y) $\tan(-A)$
- z) none of the above.

ANSWER: W -- $\tan(A)$

MATH-91; Multiple Choice: The $\sin(2A)$ (read: the sine of angle 2A) is equal to which of the following relationships?

- w) $\sin(A) - \cos(A)$ (read: sine of A minus the cosine of A)
- x) $3\sin(A) / \cos(A)$ (read: 3 times the sine of A divided by the cosine of A)
- y) $2 \sin(A) \cos(A)$ (read: 2 times the sine of A times the cosine of A)
- z) $\tan(A) - 1$ (read: tangent of A minus 1)

ANSWER: Y -- 2 TIMES THE $\sin(A)$ TIMES THE $\cos(A)$

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MATHEMATICS

MATH-91; Multiple Choice: The $\sin^2(A/2)$ (read: sine squared of angle A divided by 2) is equal to which of the following relationships? Is it:

- w) $(1/2)[1 - \cos(A)]$ (read: 1/2 times the quantity one minus the cosine of the angle A)
- x) $(1/2)[1 - \sin(A)]$ (read: 1/2 times the quantity one minus the sine of the angle A)
- y) $2 \sin(A) \cos(A)$
- z) none of the above

ANSWER: W -- $(1/2)[1 - \cos(A)]$

MATH-91; Short Answer: For what value of the angle "A" is the $\cos(A)$ equal to the $\sin(A)$?

ANSWER: 45° or $\pi/4$ RADIANS or $(45^\circ + n \text{ times } 180^\circ)$

MATH-91; Short Answer: Given that the $\log_{10}(3) = .477$, what is the \log_{10} of 300?

ANSWER: 2.477

MATH-91; Short Answer: What is the $\log_5(1/25)$ equal to?

ANSWER: -2

MATH-91; Short Answer: Find x if $\log_5(x) = -2$.

ANSWER: $1/25$ or .04

MATH-91; Short Answer: Given that the $\log_{10}(2) = .301$, what is the $\log_{10}(8)$ equal to?

ANSWER: .903

MATH-91; Short Answer: Given that the $\log_{10}(2) = .30$ and that the $\log_{10}(3) = .48$, what is the $\log_{10}(1.5)$ equal to?

ANSWER: .18

Science Bowl

MATHEMATICS

MATH-91; Multiple Choice: The trigonometric function $\cos(2A)$ (read: cosine of the angle $2A$) is equal to which of the following relationships?

- w) $1 - [\sin(A)]^2$ (read: one minus the sine squared of A)
- x) $[\cos(A)]^2 - [\sin(A)]^2$ (read: cosine squared of angle A minus the sine squared of angle A)
- y) $2[\sin(A)][\cos(A)]$ (read: 2 times the sine of A times the cosine of A)
- z) none of the above

ANSWER: X -- $[\cos(A)]^2 - [\sin(A)]^2$

MATH-91; Short Answer: Find the equation of the line that passes through the point (1,2) and is perpendicular to the line $y = 2x + 1$.

ANSWER: $Y = -(1/2)x + 2.5$ or $y - 2 = (-1/2)(x - 1)$

MATH-91; Multiple Choice: A "reunion of broken parts" is the meaning of the root of what word:

- w) algebra
- x) calculus
- y) mathematics
- z) none of the above

ANSWER: W -- ALGEBRA

MATH-91; Short Answer: In what number base does $1 + 2 = 10$?

ANSWER: BASE 3

MATH-91; Short Answer: How is the number 14 represented in the hexadecimal system?

ANSWER: E

MATH-91; Short Answer: If an electronic circuit operates in 100 nanoseconds, how many operations can it perform in one second?

ANSWER: 10 MILLION or 10^7

MATH-91; Short Answer: What is the imaginary unit "i" when raised to the power 10^7 ?

ANSWER: -1

Science Bowl

MATHEMATICS

MATH-91; Short Answer: If both x and y are functions of time, what is the derivative of the PRODUCT of x and y with respect to time equal to?

ANSWER: $x[dy/dt] + y[dx/dt]$ or $y[dx/dt] + x[dy/dt]$

MATH-91; Short Answer: If $x = t^4$ (read: t raised to the fourth), what is the second derivative of x with respect to t equal to?

ANSWER: $12t^2$ (read: $12t$ squared)

MATH-91; Short Answer: In calculus, what is the indefinite integral of the $\sin(U)dU$ equal to?

ANSWER: $-\cos(U) + \text{CONSTANT}$

MATH-91; Short Answer: Two off-axis lines are perpendicular if and only if the product of their slopes is equal to what?

ANSWER: -1

MATH-91; Short Answer: Give the equation of one of the circles which satisfy the following criteria: a circle with a radius of 8 which is tangent to the y -axis and whose center lies on the x -axis.

ANSWER: $(x - 8)^2 + (y)^2 = 8^2$ or $(x + 8)^2 + (y)^2 = 8^2$

MATH-91; Short Answer: What is the sum of the first 100 positive integers?

ANSWER: 5050

MATH-91; Short Answer: What is the name given to the radius of a circle that can be inscribed in any regular polygon?

ANSWER: APOTHEM

MATH-91; Short Answer: The universal set U contains the elements $\{1,2,3,4,5\}$. Set A contains the elements $\{1,3\}$. What elements does the set A' (read: A prime) contain?

ANSWER: $\{2,4,5\}$

Science Bowl

MATHEMATICS

MATH-91; Short Answer: Two fair coins are tossed and at least one is a head. What is the probability that both coins are heads?

ANSWER: $1/3$

MATH-91; Multiple Choice: The polar equation, $r = 3\sin(3t)$, (read: r equals 3 times the sine of angle $3t$) represents which of the following graphs? Is it the graph of a:

- w) cardioid (pron: car-dee-oiz)
- x) three-leaved rose
- y) Archimedian-spiral
- z) limacon (pron: lee-ma-son)

ANSWER: X -- THREE-LEAVED ROSE

MATH-91; Multiple Choice: The polar equation, $r = 3 - 2\cos(t)$, (read: r equal 3 minus 2 times the cosine of the angle t) represents which of the following graphs? Is it the graph of a:

- w) cardioid
- x) three-leaved rose
- y) Archimedian-spiral
- z) limacon (pron: lee-ma-son)

ANSWER: Z -- LIMACON

MATH-91; Short Answer: The ratio of 2 positive numbers is 3 to 8 and their product is 864. What are the two numbers?

ANSWER: 18,48

MATH-91; Short Answer: Name the famous mathematician/physicist who was born in the year Galileo died.

ANSWER: (ISAAC) NEWTON

MATH-91; Short Answer: A wheel is rolling without slipping on a flat surface. If the diameter of the wheel is 1 meter, how far does the hub of the wheel move when the wheel turns once?

ANSWER: π METERS or 3.14 METERS

Science Bowl

MATHEMATICS

MATH-91; Short Answer: Exactly how many of the prime numbers are even?

ANSWER: 1

MATH-91; Short Answer: Give two trigonometric functions which are NEGATIVE i BOTH the third and fourth quadrants.

ANSWER: SINE and COSECANT

MATH-91; Short Answer: An 8 meter length of rope is placed along the circumference of a circle whose diameter is 16 meters. At the circle's center, how many radians are subtended by the 8 meter length of rope?

ANSWER: 1

MATH-91; Short Answer: How many vertices does a tetrahedron have?

ANSWER: FOUR

MATH-91; Short Answer: What term is used to describe a triangle which has three UNEQUAL sides?

ANSWER: SCALENE

MATH-91; Short Answer: What is the slope of the straight line whose x-intercept is +4 (read: plus 4) and whose y-intercept is +8 (read: plus 8)?

ANSWER: -2 (read: minus 2)

MATH-91; Short Answer: The relation between y and x is given by the equation " $y = \text{ABS}(4 - x)$ " (read: y equals the absolute value of the quantity 4 minus x). If y equals 6, give all possible values for X.

ANSWER: 10 AND -2

MATH-91; Short Answer: The relationship between y and x is given by the equation, $y = x^2 + 7x + 14$ (read: y equals x squared plus 7 x plus 14). For what values of x will y equal +2?

ANSWER: -4 AND -3

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MATHEMATICS

MATH-91; Short Answer: The relationship between y and x is given by the equation: $y = x^2 - 2x + 8$. For what value of x is y a minimum?

ANSWER: 1

MATH-91; Short Answer: A straight line is plotted on an XY coordinate axis. The line intercepts the y axis at 3 and makes an angle of 45 degrees with respect to the x axis. Give the equation for this line.

ANSWER: $y = x + 3$ or $y = -x + 3$

MATH-91; Short Answer: A straight line intersects a circle in the first and second quadrants for x values of +3 and -3. The equation of the circle is " $x^2 + y^2 = 25$ ". What is the EQUATION of the straight line?

ANSWER: $y = 4$

MATH-91; Short Answer: Twelve socks are in a drawer; 4 are red, 7 are blue, and 1 is green. What is the maximum number of socks that you can pull out and only have 2 matching pairs?

ANSWER: 7

MATH-91; Short Answer: The scale on a blueprint of a bicycle says one half inch equals 1 foot. What will be the actual DIAMETER of the bicycle wheel if they are drawn with a RADIUS of $\frac{3}{4}$ inches.

ANSWER: 3 FEET (accept 36 inches)

MATH-91; Short Answer: What is the value of 125 to the two-thirds power?

ANSWER: 25

MATH-91; Short Answer: What is the value of the integral from 1 to e of du/u (read: $d u$ divided by u), where e is the base of the natural logarithm?

ANSWER: 1

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MATHEMATICS

MATH-91; Short Answer: What is the slope of the curve $y = x^3 - 6x + 2$ when it crosses the y axis?

ANSWER: -6

MATH-91; Short Answer: What is the area bounded by the curve $y = x^2$ and the axis between $x = 1$ and $x = 2$?

ANSWER: $7/3$ (or 2 and $1/3$ or 2.333)

MATH-91; Short Answer: What is the slope of the curve $y = \ln x$ (read: y equals the natural logarithm of x) at $x = 2$?

ANSWER: $1/2$

MATH-91; Short Answer: Name the two discoverers of the fundamental theorem of calculus. Last names only are acceptable.

ANSWER: (SIR ISAAC) NEWTON AND (BARON VON) LEIBNITZ

MATH-91; Multiple Choice: The equation: $(x - 2)^2/6 - (y - 3)^2/5 = 2$ defines which of the following?

(read: the quantity x minus 2 squared divided by 6 MINUS the quantity y minus 3 squared divided by 5 equals 2)

- w) ellipse
- x) hyperbola
- y) spiral
- z) parabola

ANSWER: X -- HYPERBOLA

MATH-91; Short Answer: What is the distance between the points P and Q if their cartesian coordinates are (5, 5, 1) and (1, 5, -2)?

(read: 5 comma, 5 comma, 1 and 1 comma, 5 comma, minus 2)

ANSWER: 5

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MATHEMATICS

MATH-91; Short Answer: What are the cartesian coordinates of the point of intersection of the two lines $x - y = 5$ and $x + y = 1$?
(read: x minus y equals 5 and x plus y equals 1)

ANSWER: (3, -2) (accept $x = 3$ and $y = -2$ but not $x = -2, y = 3$)

MATH-91; Short Answer: What is the slope of the line $2x + 3y = 7$?
(read: 2 x plus 3 y equals 7)

ANSWER: $-2/3$ or -0.667

MATH-91; Short Answer: Express the product of the following complex numbers in the form $a + bi$ (read: a plus b i) where a and b are real: $4 + 2i$ and $2 + 5i$ (read: 4 plus 2 i and 2 plus 5 i)

ANSWER: $-2 + 24i$ (read: minus 2 plus 24 i)

MATH-91; Short Answer: In the complex plane, what are the roots of the equation $x^2 + 4x + 8 = 0$?

(read: x squared plus 4 x plus 8 equals 0)

ANSWER: $-2 - 2i$ and $-2 + 2i$

MATH-91; Multiple Choice: If $\log_x 81 = 6$ (read: the log base x of 81 equals 6), then x is equal to:

- w) 3
- x) 9
- y) $1/3$
- z) $9^{1/3}$ (read: the cube root of 9)

ANSWER: Z -- $9^{1/3}$ (read: the cube root of 9)

MATH-91; Multiple Choice; Matrix C is the product of matrix A times matrix B Which of the following must be TRUE.

- w) The number of rows of A equals the number of rows of B.
- x) The number of columns of A equals the number of columns of B.
- y) The number of rows of A equals the number of columns of B.
- z) The number of columns of A equals the number of rows of B.

ANSWER: Z -- THE NUMBER OF COLUMNS OF A EQUALS THE NUMBER OF ROWS

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MATHEMATICS

MATH-91; Short Answer: For which values of X from the set of real numbers does the following inequality hold:

$$8x - 6 < 2x + 6 \quad (\text{read: } 8 \text{ x minus } 6 \text{ is less than } 2 \text{ x plus } 6)$$

ANSWER: $X < 2$ (read: X less than 2)

MATH-91; Short Answer: To what value does the infinite series $1/4 + 1/8 + 1/16 + \dots$ converge?

(read: one fourth plus one eighth plus one sixteenth, etc.)

ANSWER: $1/2$

MATH-91; Short Answer: If $(\sin(3x) + \cos(3x))^2 = 2$ (read: the quantity sine x plus cosine 3 x squared equals 2) then what does $3\sin(3x) \cos(3x)$ (read 3 sine 3 x cosine 3 x) equal?

ANSWER: $3/2$

MATH-91; Short Answer: If $q = 30^\circ$, what is $\csc^2 q - \cot^2 q$ equal to?
(read: If theta equals 30 degrees, what is cosecant squared theta minus cotangent squared theta equal to?)

ANSWER: 1

MATH-91; Short Answer: A woman is 22 years older than her daughter. Nine years ago she was twice as old as her daughter. What are their present ages?

ANSWER: THE WOMAN IS 53 YEARS OLD, THE DAUGHTER IS 31 YEARS OLD.

MATH-91; Short Answer: What is the period of the function $t = \cos 4s$?
(read: t equals the cosine of 4 s)

ANSWER: $\pi/2$ (or $1/2 \pi$)

MATH-91; Short Answer: What is the amplitude of the curve $y = -1.5 \sin x$ (read: y equals minus 1 point 5 sine x)?

ANSWER: 1.5 (do NOT accept -1.5)

Science Bowl

MATHEMATICS

MATH-91; Multiple Choice: Which of the following functions is NOT a transcendental function?
Is it:

- w) trigonometric
- x) algebraic
- y) logarithmic
- z) exponential

ANSWER: X -- ALGEBRAIC

MATH-91; Short Answer: $y = 3x^2 + 4x + 2$ (read: y equals 3 x squared plus 4 x plus 2). What is the value of the derivative of y at $x = 1$?

ANSWER: 10

MATH-91; Short Answer: $y = 4x + 3$. What is the value of the integral of y from $x = 0$ to $x = 1$?
(read: y equals 4 x plus 3)

ANSWER: 5

MATH-91; Short Answer: A circle with a radius of 2 is defined by the equation $x^2 + y^2 - 2y = 3$. What are the coordinates in the cartesian coordinate system of the center of this circle?

ANSWER: 0,1 or $x = 0, y = 1$

MATH-91; Short Answer: The polar coordinates of a point are $(3, p/2)$ (read: 3 comma p over 2). What are the cartesian coordinates of this point?

ANSWER: 0,3 or $x = 0, y = 3$

MATH-91; Short Answer: The area bounded by the race track at your high school is a rectangle with semicircles at each end. The radius of the circular parts is 30 yards and the perimeter of the area bounded by the track is 40 yards. Within ten yards, how long is each straight section of the track?

ANSWER: 106 YARDS (accept 96 to 116)

Science Bowl

MATHEMATICS

MATH-91; Short Answer: The population of a near-by town was 10,000 in January, 1990. It is estimated that the population will increase by 10% each year. What will be population of the town in January, 1992.

ANSWER: 12,100

MATH-91; Multiple Choice: A fractal is a type of:

- w) fraction
- x) geometric shape
- y) geologic fault
- z) differential equation

ANSWER: X -- GEOMETRIC SHAPE

MATH-91; Short Answer: For which values of x from the set of real numbers does the following inequality hold: $4x + 5 < x + 11$

(read: 4 x plus 5 is less than x plus 11)

ANSWER: $x < 2$ (read: x LESS THAN 2)

MATH-91; Short Answer: If two sides of a quadrilateral are parallel and the other two sides are equal but NOT parallel, the quadrilateral is known as a:

- w) parallelogram
- x) triangle
- y) square
- z) trapezoid

ANSWER: Z -- TRAPEZOID

MATH-91; Short Answer: A student finds that the numerical values for the are and the volume of a sphere are equal. What is the radius for this sphere?

ANSWER: 3 (no units specifiez)

MATH-91; Short Answer: A customer purchased a candy bar costing \$0.78 and wa 3 cents short of having the exact amount without breaking a \$1 bill. How much change did the customer have after the \$1 bill was broken?

ANSWER: \$0.97

Science Bowl

MATHEMATICS

MATH-91; Short Answer: A number minus its reciprocal is 14 larger than the original number. What was the number?

ANSWER: $-1/14$

MATH-91; Short Answer: A curve represented by the equation $y = -5x^2$ intersects the line $y = -20$ at two points. What is the straight-line distance between the two intersections?

ANSWER: 4

MATH-91; Short Answer: Solve this indefinite integral: $\int [2/x] dx$ (read: the integral of 2 over x, dx).

ANSWER: $2 \ln x + \text{CONSTANT}$

MATH-91; Short Answer: What is the volume of a right circular cone with radius r and height h?

ANSWER: $(1/3)\pi r^2 h$

MATH-91; Short Answer: What is $81^{1/4}$ (read: 81 to the one-fourth power)?

ANSWER: 3

MATH-91; Short Answer: Where does the graph of cotangent of x cross the x-axis?

ANSWER: $x = \pi/2, 3\pi/2, 5\pi/2 \dots$ or ODD INTEGERS OF $\pi/2$

MATH-91; Short Answer: A biker goes EAST for 4 miles, NORTH for 12, EAST for another 4 and SOUTH for 6. What is the magnitude of the displacement?

ANSWER: 10 MILES

MATH-91; Multiple Choice: What type of numbers are included in the real number line that are not included in the rational number line?

- w) whole numbers
- x) integers
- y) irrational numbers
- z) fractional numbers

ANSWER: Y -- IRRATIONAL NUMBERS

Science Bowl

MATHEMATICS

MATH-91; Multiple Choice: What is the length of the body diagonal of a cube inch square?

- w) $\sqrt{2}$ (read: square root of 2)
- x) $\sqrt{3}$ (read: square root of 3)
- y) 1
- z) 2

ANSWER: X -- $\sqrt{3}$

MATH-91; Multiple Choice: A square matrix which has all zeros below the main diagonal is called:

- w) upper triangular
- x) singular
- y) lower triangular
- z) invertable

ANSWER: W -- UPPER TRIANGULAR

MATH-91; Multiple Choice: The symbol " \cap " (read: inverted U) is used for whihc set operation?

- w) intersection
- x) union
- y) negation
- z) enumeration

ANSWER: W -- INTERSECTION

MATH-91; Short Answer: Express the binary number 10010 as a decimal number.

ANSWER: 18

MATH-91; Short Answer: Express the decimal number 27 in Base 16 (Hexadecimal).

ANSWER: 1B

MATH-91; Short Answer: What is the limit of the $\cos(X)$ (read: cosine of X) a X approaches zero?

ANSWER: 1

Science Bowl

MATHEMATICS

MATH-91; Short Answer: What is the limit of the fraction $1/x$ as x approaches infinity?

ANSWER: 0

MATH-91; Short Answer: What is the limit of the fraction $x/(x+1)$ as approaches infinity?

ANSWER: 1

MATH-91; Short Answer: What is the cross product of two parallel unit vectors?

ANSWER: 0

MATH-91; Short Answer: What is the next term in the following geometric progression?

0, 2, 6, 12,...

ANSWER: 20

MATH-91; Short Answer: What is the limit of the fraction $(x^2 - 25)/(x+5)$ as x approaches 5?

(read: the quantity x squared minus 25 divided by the quantity x plus 5)

ANSWER: 0

MATH-91; Multiple Choice: In the hexadecimal counting system the letter C stands for what base-10 number?

- w) 12
- x) 3
- y) 16
- z) 11

ANSWER: W -- 12

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MATHEMATICS

MATH-91; Multiple Choice: What does $\pi/4$ radians equal in degrees?

- w) 90 degrees
- x) 360 degrees
- y) 30 degrees
- z) 45 degrees

ANSWER: Z -- 45 degrees

MATH-91; Multiple Choice: The Fibonacci (pron: fee-beh-naw-che) sequence begins with the numbers 0, 1, 1, 2, 3, 5 and 8. If the eleventh and twelfth terms of the Fibonacci sequence are 55 and 89, respectively, what is the thirteenth term?

- w) 102
- x) 121
- y) 144
- z) 163

ANSWER: Y -- 144

MATH-91; Multiple Choice: How many ways are there to select three committee members from among 10 members of a group?

- w) 120
- x) 30
- y) 1000
- z) 720

ANSWER: W -- 120 ($C(10,3)=10!/7!3!=120$)

MATH-91; Multiple Choice: What is the probability that when two dice are rolled the sum on the dice is 3?

- w) $1/6$
- x) $1/18$
- y) $3/36$
- z) $1/9$

ANSWER: X -- $1/18$

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MATHEMATICS

MATH-91; Multiple Choice: The diagonal of the floor of a rectangular closet is $7\frac{1}{2}$ feet. The shorter side is $4\frac{1}{2}$ feet. What is the area of the closet floor in square feet?

- w) 37
- x) 27
- y) $54/4$
- z) $21/4$

ANSWER: X -- 27

MATH-91; Multiple Choice: A figure that can be folded over along a straight line so that the result is two equal halves which are then lying on top of another is said to have a line of symmetry. Which of the following has only one line of symmetry?

- w) rectangle
- x) circle
- y) isosceles triangle
- z) equilateral triangle

ANSWER: Y -- isosceles triangle

MATH-91; Short Answer: The equation of an ellipse is $x^2/49 + y^2/64 = 1$. What is the area of this ellipse?

ANSWER: 56 p or 176 (no units specified)

MATH-92; Short Answer: Using a rectangular x-y coordinate system, give the equation for a circle whose radius is 5 units and whose center is at the point (4,-4).

ANSWER: $(X - 4)^2 + (Y + 4)^2 = 25$

MATH-92; Multiple Choice: In a rectangular x-y coordinate system, the equation $[x^2/16] + [y^2/25] = 1$ represents which of the following?

- w) parabola
- x) hyperbola
- y) ellipse
- z) circle

ANSWER: Y -- ELLIPSE

Science Bowl

MATHEMATICS

MATH-92; Short Answer: Using an x-y coordinate system, in what direction does the parabola represented by the equation $y = -x^2$ open (read: Y equals MINUS X squared)?

ANSWER: OPENS DOWN or IN THE MINUS Y DIRECTION

MATH-92; Short Answer: In an orthogonal x-y coordinate system, in which direction does the parabola represented by the equation $y^2 = x$ (read: Y squared equals X) open?

ANSWER: IT OPENS TO THE RIGHT or IN THE + X DIRECTION

MATH-92; Short Answer: In an orthogonal x-y coordinate system, a parabola is represented by the equation $x^2 = 6y$ (read: X squared equals six Y). What is the X coordinate of the focus of this parabola?

ANSWER: $X = 0$

MATH-92; Short Answer: Using an x-y coordinate axis, a parabola is represented by the equation $x^2 = 8y$. What is the equation for the directrix of this parabola?

ANSWER: $y = -2$

MATH-92; Short Answer: A curve is given by the equation:

$(y - 5)^2 = (x + 4)$ (read: the quantity Y minus 5 squared equals X plus 4) What is the vertex of this curve?

ANSWER: $(-4,5)$

MATH-92; Short Answer: What is the sum of the internal angles of a pentagon?

ANSWER: 540 degrees (n-gon: $180 \text{ deg} \times (n-2)$)

MATH-92; Short Answer: To what value is the product of the $\sin(A)$ and the $\csc(A)$ (read: cosecant of A) equal?

ANSWER: 1

Science Bowl

MATHEMATICS

MATH-92; Multiple Choice: The $\cos(-A)$ (read: cosine of the angle minus A) is equal to which of the following?

- w) $\cos(A)$
- x) $-\cos(A)$
- y) $-\cos(-A)$
- z) none of the above

ANSWER: W -- $\cos(A)$

MATH-92; Multiple Choice: The $\csc(-A)$ (read: cosecant of the angle minus A) is equal to which of the following?

- w) $\csc(A)$
- x) $-\csc(A)$
- y) $-\csc(-A)$
- z) none of the above

ANSWER: X -- $-\csc(A)$

MATH-92; Multiple Choice: The $\cos(180^\circ + A)$ (read: cosine of the quantity 18 degrees plus A) is equal to which of the following?

- w) $\cos(A)$
- x) $-\cos(A)$
- y) $\cos(-A)$
- z) none of the above

ANSWER: X -- $-\cos(A)$

MATH-92; Multiple Choice: The $\cos^2(A/2)$ (read: the cosine squared of the quantity A over 2) is equal to which of the following expressions?

- w) $(1/2)[1 + \sin(A)]$ (read: one half times the quantity 1 plus sine of A)
- x) $(1/2)[1 + \cos(A)]$ (read: one half times the quantity 1 plus cosine of A)
- y) $2 \sin(A) \cos(A)$
- z) none of the above

ANSWER: X -- $(1/2)[1 + \cos(A)]$

Science Bowl

MATHEMATICS

MATH-92; Short Answer: For what value of the angle "A" is the cosine of A equal to the cotangent of A?

ANSWER: 90 DEG or $\pi/2$ RADIANS or (90 DEG + n times 180 DEG) or $(n + 1/2)\pi$ RADIANS

MATH-92; Short Answer: Given that the $\log_{10}(50) = 1.699$, what is the \log_{10} of 500?

ANSWER: 2.699

MATH-92; Short Answer: Given that $\log_{10}(2) = .30$ and that the $\log_{10}(3) = .48$, what is the $\log_{10}(6)$ equal to?

ANSWER: .78

MATH-92; Short Answer: When added, the two complex numbers $(5 + 5i)$ (read: five plus five eye) and $(1 + 1i)$ (read: one plus one eye) are equal to what?

ANSWER: $6 + 6i$

MATH-92; Short Answer: When the two complex numbers $(5 + 5i)$ and $(1 + 1i)$ are multiplied, what is the result?

ANSWER: $12i$

MATH-92; Short Answer: The complex number "i" when cubed is equal to what?

ANSWER: $-i$

MATH-92; Multiple Choice: A heptagon has:

- w) 5 sides
- x) 7 sides
- y) 9 sides
- z) 11 sides

ANSWER: X -- 7 SIDES

Science Bowl

MATHEMATICS

MATH-92; Multiple Choice: For a given perimeter length, the geometric shape containing the greatest area is the:

- w) circle
- x) square
- y) cycloid
- z) right triangle

ANSWER: W -- CIRCLE

MATH-92; Short Answer: What is the value of zero factorial?

ANSWER: 1

MATH-92; Short Answer: What is the time derivative of the $\cos(U)$ (read: cosine of U), if U is a function of time?

ANSWER: $-\sin(U)[dU/dt]$

MATH-92; Short Answer: What is 10 factorial divided by 8 factorial equal to?

ANSWER: 90

MATH-92; Short Answer: In a triangle, what is the name given to the intersection of the perpendicular bisectors of the sides?

ANSWER: CIRCUMCENTER

MATH-92; Short Answer: What is the period of the function " $3 \sin(X)$ "?

ANSWER: 2π or (360 DEGREES)

MATH-92; Short Answer: How many arrangements are there of 7 objects taken 3 a a time?

ANSWER: 210

Science Bowl

MATHEMATICS

MATH-92; Multiple Choice: The polar equation, $r = 6t/\pi$, (read: r equals 6t divided by pie) represents which of the following graphs? Is it the graph of a:

- w) cardioid (pron: CAR-dee-oiz)
- x) three-leaved rose
- y) Archimedian-spiral
- z) limacon (pron: lee-ma-son)

ANSWER: Y -- ARCHIMEDIAN-SPIRAL

MATH-92; Short Answer: Name the famous mathematician/physicist who was born o Christmas day (December 25th) in 1642.

ANSWER: (ISAAC) NEWTON

MATH-92; Short Answer: Give a trigonometric function, the absolute value of which varies ONLY between 1 and infinity, which is POSITIVE in the first quadrant and NEGATIVE in the fourth quadrant.

ANSWER: COSECANT

MATH-92; Short Answer: A pyramidal solid has a base which is an octagon. What is the TOTAL number of faces on this solid?

ANSWER: 9 (the 8 lateral faces in addition to the base)

MATH-92; Short Answer: What is the decimal value of the Roman Numeral CCLII?

ANSWER: 252

MATH-92; Short Answer: If $y = 5x - 2$ and $x = 3t$, what is the derivative of y with respect to t?

(read: "y equals 5x minus 2 and x equals 3t")

ANSWER: 15

MATH-92; Short Answer: The natural logarithm of A is 2. The natural logarithm of B is 3. What is the natural logarithm of the quantity A time B?

ANSWER: 5

Science Bowl

MATHEMATICS

MATH-92; Short Answer: What is the total number of diagonals in a hexagon?

ANSWER: 9

MATH-92; Short Answer: How many faces does an icosahedron (pron: eye - ko - sah - he - dron) have?

ANSWER: 20

MATH-92; Short Answer: What are the first four terms of the series expansion of $\sin x$ near $x=0$?

ANSWER: $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!}$

MATH-92; Multiple Choice: A square matrix which has all zeros above the main diagonal is called:

- w) upper triangular
- x) singular
- y) lower triangular
- z) invertible

ANSWER: Y -- LOWER TRIANGULAR

MATH-92; Short Answer: What is the limit for the $\sin x$ as x approaches zero?

ANSWER: 0

MATH-92; Short Answer: What is the sum of the binary numbers 1011 and 111, i binary and decimal?

ANSWER: 10010 BINARY and 18 DECIMAL

MATH-92; Short Answer: What is the SMALLEST prime number greater than 23?

ANSWER: 29

Science Bowl

MATHEMATICS

MATH-92; Short Answer: What is the probability of flipping a coin 3 times and getting: first a head, then a tail, and finally a head?

ANSWER: 1/8

MATH-92; Multiple Choice: A third degree polynomial with real coefficients can NOT have:

- w) 3 real roots
- x) 1 real root and 2 complex roots
- y) 2 real roots and 1 complex root

ANSWER: Y -- 2 REAL ROOTS AND 1 COMPLEX ROOT

MATH-92; Short Answer: Evaluate $\text{Log}_{10}2 + \text{Log}_{10}5$ (read: log base 10 of 2 plus the log base 10 of 5)?

ANSWER: $\text{Log}_{10}10$ or 1

MATH-92; Short Answer: How many degrees are contained IN EACH INCLUDED ANGLE of an octagon?

ANSWER: 135 DEGREES

MATH-92; Short Answer: What is the area of the square inscribed in a circle of unit radius?

ANSWER: 2

MATH-92; Short Answer: What are the four roots of the equation $x^4 = 16$?

ANSWER: 2, -2, 2i and -2i

MATH-92; Short Answer: What conic section is given by the equation

ANSWER: ELLIPSE

MATH-92; Multiple Choice: $\cos 38^\circ = ?$ (read: cosine of 38 degrees)

- w) $\sin 38^\circ$ (read: sine of 38 degrees)
- x) $-\sec 38^\circ$ (read: minus secant of 38 degrees)
- y) $\sin 52^\circ$ (read: sine of 52 degrees)
- z) $1 / \cos 52^\circ$ (read: one divided by the cosine of 52 degrees)

ANSWER: Y -- $\sin 52^\circ$

Science Bowl

MATHEMATICS

MATH-92; Short Answer: A computer sells for \$1200 after a profit of 20% on the original investment. What is the store's profit in dollars?

ANSWER: \$200

MATH-92; Short Answer: The rate of absenteeism for 45 male employees during one month was 15%. For the 60 female employees absenteeism was 5%. What was the overall rate of absenteeism?

ANSWER: 9.29% (ACCEPT 9.3%)

MATH-92; Short Answer: The temperature readings on three successive days are +10 deg, -6 deg, and +7 deg. What does the reading on the fourth day have to be if average temperature for the four days is +5 deg.

ANSWER: +9 deg

MATH-92; Short Answer: The average of six consecutive EVEN numbers is 21. What is the average of the first five of these numbers?

ANSWER: 20

MATH-92; Short Answer: The sum of four NON-ZERO integers is even. The product of the four integers is also even. How many of the four numbers could be even? Be certain to give all possible numbers of even integers.

ANSWER: 2 and 4

MATH-92; Short Answer: If $60 > x > 20$ (read: 60 is greater than x is greater than 20), what are the limits of $(250 - x)$?

ANSWER: $190 < (250 - x) < 230$ or GREATER THAN 190 and LESS THAN 230

MATH-92; Short Answer: A rope is cut into 3 equal parts. The first part is cut in 6 equal pieces; the second part is cut in 8 equal pieces; and the third part is cut in 10 equal pieces. If each of the resulting pieces has an integral length, what is the minimum length of the rope?

ANSWER: 360 UNITS

Science Bowl

MATHEMATICS

MATH-92; Multiple Choice: The sum of any three consecutive odd numbers is evenly divisible by which of the following numbers? Be certain to list all correct answers.

- w) 2
- x) 3
- y) 4
- z) 5
- e) 6

ANSWER: X -- 3

MATH-92; Short Answer: What is the sum of two supplementary angles equal to?

ANSWER: 180 degrees

MATH-92; Short Answer: The angles of a triangle are in the ratio of 3:4:5. How many degrees are in the smallest angle?

ANSWER: 45 degrees

MATH-92; Short Answer: What is the smallest perimeter, in meters, a triangle can have if the triangle has unequal sides and each side is evenly divisible by 11?

ANSWER: 99 METERS

MATH-92; Short Answer: A circle is inscribed inside a square. If the length of the square's side is 6 inches, what is the ratio of the perimeter of the square to the circumference of the circle?

ANSWER: 4 : p or 24 : 6p

MATH-92; Short Answer: A circle is inscribed inside a square. What is the ratio of the perimeter of the square to the circumference of the circle?

ANSWER 4/p

MATH-92; Short Answer: A pendulum swings through an arc of 10 p inches and a angle of 36 degrees. How long is the pendulum?

ANSWER: 50 INCHES

Science Bowl

MATHEMATICS

MATH-92; Short Answer: If it cost \$3 to paint the plane surface of a hemisphere, what will it cost to paint the hemisphere's curved surface?

ANSWER: \$6

MATH-92; Short Answer: A dog is tied with a 9-foot rope to a point where two fences meet. If the dog can roam an area of 9 p square feet, at what angle do the fences meet?

ANSWER: 40 DEGREES

MATH-92; Short Answer: The ratio of eligible women to men voters in a certai town is 2:3. If $\frac{2}{3}$ of the women and $\frac{1}{2}$ of the men voted in the last election, what fraction of the people in the town voted?

ANSWER: $\frac{17}{30}$

MATH-92; Short Answer: A child is counting the change in her piggy bank. Sh is amazed to find that she has an equal number of nickels, dimes, and quarters. If she has \$6 altogether, how many coins does she have?

ANSWER: 45 COINS

MATH-92; Multiple Choice: In hexadecimal, F equals what?

- w) 5
- x) 10
- y) 15
- z) 16

ANSWER: Y -- 15

MATH-92; Short Answer: "X" number of women can build a house in 30 days. If the number of women working on the project is increased by "Y", how many days will it take to build the house?

ANSWER: $\frac{30X}{X+Y}$

MATH-92; Short Answer: Jim lives 4 miles directly north of the train station Barbara lives directly west of the station. If the straightline distanc between Barbara and Jim's house is 2 miles less than the distance walking by the train station, how far west of the train station does Barbara live?

ANSWER: 3 MILES

Science Bowl

MATHEMATICS

MATH-92; Short Answer: Find the slope of the equation $y = x^2 + 5x + 4$ at $x = 0$.

ANSWER: 5

MATH-92; Multiple Choice: Which great mathematician is responsible for writing the Elements, the first logical axiomatic approach to mathematics?

- w) Archimedes
- x) Euclid
- y) Hippocrates
- z) Heron

ANSWER: X -- EUCLID

MATH-92; Multiple Choice: In the study of probability and statistics, which of the following is NOT a density function:

- w) bernoulli (pron: ber-new-lee)
- x) poisson
- y) binomial
- z) laplace

ANSWER: Z -- LAPLACE

MATH-93; Short Answer: The area of a trapezoid with a height of 4 meters and parallel sides of length 3 and 4 meters is equal to what?

ANSWER: 14 SQUARE METERS

MATH-93; Short Answer: Using a rectangular x-y coordinate system, give the equation for a circle whose radius is 6 units and whose center is at the origin.

ANSWER: $x^2 + y^2 = 36$

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: In an x-y rectangular coordinate system, the equation $y = x$ squared is which of the following?

- w) a circle
- x) an ellipse
- y) a parabola
- z) hyperbola

ANSWER: Y -- A PARABOLA

MATH-93; Short Answer: For a right triangle, the cosine of A is $\frac{4}{5}$. To what value is the tangent of A equal?

ANSWER: $\frac{3}{4}$

MATH-93; Multiple Choice: The $\sin(-A)$ is equal to which of the following?

(Read: sin of the angle negative A)

- w) $\sin(A)$
- x) $-\sin(A)$
- y) the product of $\tan(A)$ and the $\cos(A)$
- z) none of the above

ANSWER: X -- $-\sin(A)$

MATH-93; Multiple Choice: The $\sin(180 \text{ degrees} + A)$ is equal to which of the following?

(Read: sin of the angle 180 degrees plus A)

- w) $\sin(A)$
- x) $-\sin(-A)$
- y) $-\sin(A)$
- z) none of the above.

ANSWER: Y -- $-\sin(A)$

MATH-93; Short Answer: What is the log, base 5, of 25 equal to?

ANSWER: 2

Science Bowl

MATHEMATICS

MATH-93; Short Answer: What is the slope and y-intercept of the line $4x + 3y = 5$?

ANSWER: SLOPE = $-(4/3)$; Y-INTERCEPT = $(5/3)$

MATH-93; Short Answer: A microgram is what part of a gram?

ANSWER: ONE MILLIONTH or 10 TO THE MINUS 6

MATH-93; Short Answer: What is the hexadecimal value of the decimal number 32?

ANSWER: 20

MATH-93; Multiple Choice: A gigameter is:

- w) one billionth of a meter
- x) one billion meters
- y) one trillionth of a meter
- z) one million meters

ANSWER: X -- ONE BILLION METERS

MATH-93; Short Answer: The sum of two numbers is 12. The difference in the two numbers is 2. What is the product of the two numbers?

ANSWER: 35

MATH-93; Short Answer: What is the decimal value of the binary number 101?

ANSWER: 5

MATH-93; Short Answer: What year does the roman numeral MCMXC stand for?

ANSWER: 1990

MATH-93; Short Answer: What is a googol?

ANSWER: TEN TO THE ONE-HUNDREDTH POWER (1 followed by 100 zeroes)

Science Bowl

MATHEMATICS

MATH-93; Short Answer: What is the value of 4 factorial?

ANSWER: 24

MATH-93; Short Answer: What is 100 factorial divided by 99 factorial equal to?

ANSWER: 100

MATH-93; Short Answer: For the circle given by the equation $(x - 4)^2 + (y + 5)^2 = 49$, what is the radius of the circle?

ANSWER: 7

MATH-93; Short Answer: What is the natural logarithm of e squared equal to?

ANSWER: 2

MATH-93; Multiple Choice: A bag contains 6 red and 3 blue marbles. Suppose two marbles are drawn one at a time with replacement. What is the probability that 2 red marbles are drawn?

w) $\frac{2}{6}$

x) $\frac{4}{9}$

y) $\frac{2}{9}$

z) $\frac{5}{9}$

ANSWER: X -- $\frac{4}{9}$

MATH-93; Short Answer: What are the next two numbers in the sequence 1,3,6,10?

ANSWER: 15 and 21

MATH-93; Short Answer: There are exactly four prime numbers between 20 and 40. Name them.

ANSWER: 23, 29, 31, 37

MATH-93; Short Answer: What is the least common denominator for the fractions $\frac{5}{6}$ and $\frac{7}{10}$?

ANSWER: 30

Science Bowl

MATHEMATICS

MATH-93; Short Answer: How many unique arrangements of the letters " A, B, C, and D" are possible?

ANSWER: 24 or 4 FACTORIAL

MATH-93; Short Answer: What is the value of the complex number "i" raised to the 396th power?

ANSWER: ONE

MATH-93; Short Answer: How many faces are on a dodecahedron?

ANSWER: 12

MATH-93; Short Answer: If you flip an unbiased coin and get 7 tails in a row, what is the probability of getting a tail on the next flip?

ANSWER: 1 OUT OF 2 (Accept 0.5)

MATH-93; Short Answer: Who is considered to be the father of geometry?

ANSWER: EUCLID

MATH-93; Short Answer: What is the length of the longest rod that can be placed in a box whose dimensions are 2 inches by 4 inches by 4 inches:

ANSWER: 6 INCHES

MATH-93; Short Answer: What is the name for the sequence of numbers: 1 , 1 , 2 , 3 , 5 , 8 , 13

ANSWER: FIBONACCI

MATH-93; Short Answer: What is the next term in the Fibonacci sequence whose last three terms were -- 34, 55, 89

ANSWER: 144

Science Bowl

MATHEMATICS

MATH-93; Short Answer: In our number system, how many 2 digit numbers are there which do not contain repeated digits?

ANSWER: 81

MATH-93; True-False: The number 4644 is evenly divisible by 9.

ANSWER: TRUE

MATH-93; Short Answer: What is the value of 8 raised to the four thirds power?

ANSWER: 16

MATH-93; Multiple Choice: The equation, $4x^2 + 9y^2 = 36$, (read: 4 x squared plus 9 y squared equals 36) represents which of the following conics? Is it a:

- w) circle
- x) ellipse
- y) parabola
- z) hyperbola

ANSWER: X -- ELLIPSE

MATH-93; Short Answer: Consider a cube which has an edge length of 3 centimeters. Find the cube's surface area in square centimeters.

ANSWER: 54 SQUARE CENTIMETERS (ACCEPT 54)

MATH-93; Short Answer: A cube is to be painted. If no two adjacent faces are to be painted the same color, what is the smallest number of colors required?

ANSWER: 3

MATH-93; Short Answer: A job foreman needs to choose TWO workers out of TEN employees. How many different combinations of workers are possible?

ANSWER: 45

MATH-93; Short Answer: How many edges does a tetrahedron have?

ANSWER: SIX

Science Bowl

MATHEMATICS

MATH-93; Short Answer: What is the decimal value of the Roman Numeral DCCLIX?

ANSWER: 759

MATH-93; Short Answer: Carlos can make 10 pizzas in 5 hours. Fred can make 10 pizzas in 10 hours. How many hours will it take for the two of them to make a total of 10 pizzas while working at the same time?

ANSWER: 3 AND 1/3 HOURS or 3 HOURS AND 20 MINUTES

MATH-93; Short Answer: Two people are 10 kilometers apart, walking toward each other, each at a rate of 1 kilometer per hour. A bee flies back and forth between their noses at the rate of 10 kilometers per hour until the people meet. How many kilometers will the bee have traveled before the people meet?

ANSWER: 50 KILOMETERS

MATH-93; Short Answer: What is the value of the sine of 60 degrees divided by one half of the cosine of 30 degrees?

ANSWER: 2

MATH-93; Short Answer: Willard charged \$250 on his new credit card. He pays off \$120 of the \$250. Interest is charged on the balance at 10% per month. How much does he need in order to pay off the balance of the debt next month?

ANSWER: \$143

MATH-93; Multiple Choice: Driving at a speed of 75 miles per hour is equivalent to driving at a speed of

- w) 100 kilometers per hour
- x) 110 kilometers per hour
- y) 120 kilometers per hour
- z) 130 kilometers per hour

ANSWER: Y -- 120 KILOMETERS PER HOUR

MATH-93; Short Answer: How many prime numbers are there between 30 and 60?

ANSWER: SEVEN

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: If a vector and a scalar are multiplied, the resulting answer is:

- w) a scalar
- x) either a scalar or a vector, depending upon the conditions
- y) a vector
- z) cannot be computed

ANSWER: Y -- VECTOR

MATH-93; Short Answer: What is the sum of the interior angles in a hexagon?

ANSWER: 720 DEGREES

MATH-93; Short Answer: What is the region between two concentric circles called?

ANSWER: AN ANNULUS

MATH-93; Multiple Choice: What is the third number that completes the set (5, 12) that solves a well known triple?

- w) 10
- x) 13
- y) 14
- z) 16

ANSWER: X -- 13

MATH-93; Short Answer: Express the Hexadecimal number 14 in decimal.

ANSWER: 20

MATH-93; Short Answer: What prefix represents 10 to the power of -12 ?

ANSWER: PICO

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: Rene Descartes and Pierre Fermat are credited with the development of which area of mathematics?

- w) analytical geometry
- x) trigonometry
- y) algebra
- z) calculus

ANSWER: W -- ANALYTICAL GEOMETRY

MATH-93; Multiple Choice: How many degrees do the interior angles of a quadrilateral measure?

- w) 45 degrees
- x) 90 degrees
- y) 180 degrees
- z) 360 degrees

ANSWER: Z -- 360 degrees

MATH-93; Multiple Choice: The product of 3 REAL numbers is a negative number. The sum of the same 3 numbers is a positive number. Exactly how many of the 3 numbers must be negative?

- w) 1
- x) 2
- y) 3
- z) cannot be determined from the given information

ANSWER: W -- 1

MATH-93; Short Answer: The sum of two consecutive ODD integers is 36. What is the product of the integers?

ANSWER: 323

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: The sum of any three consecutive even numbers is evenly divisible by which of the following number or numbers? You must include all correct answers.

- w) 2
- x) 3
- y) 4
- z) 5
- e) 6

ANSWER: W, X, and E or 2, 3, and 6

MATH-93; Short Answer: One inch of snow fell on a yard by yard section of parking lot in one hour. How many cubic feet of snow fell on this section of parking lot?

ANSWER: 3/4 CUBIC FEET

MATH-93; Short Answer: A woman has an equal number of nickels, dimes and quarters. If she has \$12 in total, how many coins does she have?

ANSWER: 90 COINS

MATH-93; Short Answer: If Susan takes 3 hours to clean the house, and it takes her brother, Robert, 6 hours to clean the house, how long will it take the two of them working together?

ANSWER: 2 HOURS

MATH-93; Short Answer: In what number base does $5 + 5 = 12$?

ANSWER: BASE 8

MATH-93; Short Answer: A child counting change has equal numbers of nickels, dimes, and quarters. If the total is \$6, how many total coins does she have?

ANSWER: 45

MATH-93; Short Answer: The ratio of 2 positive numbers is 3 to 7 and their product is 84. What are the two numbers?

ANSWER: 6,14

Science Bowl

MATHEMATICS

MATH-93; Short Answer: A woman is 30 years older than her daughter. Five years ago she was three times as old as her daughter. What are their present ages?

ANSWER: THE WOMAN IS 50 YEARS OLD, THE DAUGHTER IS 20 YEARS OLD.

MATH-93; Multiple Choice: The solutions to the equation $x^2 - 7x + 6 = 0$ are:

- w) $x=1,6$
- x) $x=-1,-6$
- y) $x=1,-6$
- z) $x=3,4$

ANSWER: W -- $x=1,6$

MATH-93; Multiple Choice: The solutions to the equation $x^4 - 10x^2 + 9 = 0$ are:

- w) $\pm 1, \pm 3$ (pronounced plus or minus 1, plus or minus 3)
- x) $\pm 1, \pm 9$
- y) 1,3,6,9
- z) no solution

ANSWER: W -- $\pm 1, \pm 3$

MATH-93; Multiple Choice: The solution to the equation $(1/x) + (1/4) = 1/2$ is:

- w) $x=2$
- x) $x=1$
- y) $x=4$
- z) $x=0$

ANSWER: Y -- $x=4$

MATH-93; Multiple Choice: One of the roots of the equation $x^3 - x^2 + x - 1 = 0$ is:

- w) 1
- x) -2
- y) 2
- z) -1

ANSWER: W -- 1

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: The solution to the inequality $2x-6<0$ is:

- w) $(-\infty,-3)$ (read minus infinity, minus 3)
- x) $(-\infty,3)$
- y) $(3,+\infty)$
- z) $(-3,+\infty)$

ANSWER: X -- $(-\infty,3)$

MATH-93; Short Answer: An elevator can hold the weight of 8 adults or 12 children. How many children can ride on the elevator with 6 adults?

ANSWER: 3

MATH-93; Multiple Choice: A "googol" is 10 to the hundredth power. What is a "googolplex"?

- w) 10 to the thousandth power
- x) 10 to the millionth power
- y) a googol raised to the googol power
- z) infinity minus one

ANSWER: Y -- A GOOGOL RAISED TO THE GOOGOL POWER

MATH-93; Short Answer: Two trains are headed directly toward each other at rates of 80 mph and 100 mph. How many miles apart are they 2 minutes before they impact?

ANSWER: 6

MATH-93; Multiple Choice: The domain of the function y equals x squared is:

- w) all real numbers
- x) $x>0$ (x greater than 0)
- y) $x<0$ (x less than 0)
- z) all x except $x=0$

ANSWER: W -- ALL REAL NUMBERS

MATH-93; Short Answer: What is the smallest positive integer exactly divisible by 2,3,4,5, and 6?

ANSWER: 60

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: The value of $\sin(30) + \cos(60)$ is:

- w) $\sqrt{2}$ (read square root of 2)
- x) 2.5
- y) 1
- z) $2\sqrt{3}$

ANSWER: Y -- 1

MATH-93; Short Answer: Twelve socks are in a drawer; 1 is red, 7 are blue, and 4 are green. What is the maximum number of socks that you can pull out and only have 2 matching pairs?

ANSWER: 7

MATH-93; Multiple Choice: The maximum value of the expression $(4\cos X) - 1$ is:
(read: parenthesis 4 cos X parenthesis minus 1)

- w) 3
- x) 4
- y) 0
- z) 2

ANSWER: W -- 3

MATH-93; Short Answer: A rectangular parallelepiped has sides with lengths of 2 cm, 3cm and 4 cm. What is its surface area?

ANSWER: 52 SQUARE CENTIMETERS

MATH-93; Multiple Choice: $\sin(\pi - \theta) =$ [read sin(pi - thetw)]

- w) $\sin(\theta)$
- x) $\cos(\theta)$
- y) $-\sin(\theta)$
- z) $-\cos(\theta)$

ANSWER: W -- $\sin(\theta)$

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: If a line segment is drawn between points $(-6,1)$ and $(-1,8)$, the equation of a line perpendicular to this line segment, and which passes through the origin, is

- w) $7Y=5X+1$
- x) $5Y=7X$
- y) $5Y=-7X$
- z) $7Y=-5X$

ANSWER: Z -- $7Y=-5X$

MATH-93; Multiple Choice: $\log(64)=$

- w) $6 \log(2)$ (6 times $\log 2$)
- x) $\log(6) + \log(4)$
- y) $\log(60) + \log(4)$
- z) $6.4 \log(10)$

ANSWER: W -- $6 \log(2)$

MATH-93; Multiple Choice: What is the log (base 10) of 1456?

- w) 2.163
- x) 3.163
- y) 4.163
- z) 5.163

ANSWER: X -- 3.163

MATH-93; Short Answer: Brian and his father have an age difference of 30 years. The sum of their ages is 52 years. How old are they?

ANSWER: 11 & 41

MATH-93; Short Answer: The sum of the lengths of the diagonals of a square is 24 cm. Find the number of square centimeters in the area of the square.

ANSWER: 72

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: If $x-2y=7$ and $x+2y=5$, then $x=$

- w) $1/2$
- x) 0
- y) 5
- z) 6

ANSWER: Z -- 6

MATH-93; Short Answer: A baseball team wins 40 of its first 50 games. How many of the remaining 40 games must the team win in order to average 70% wins for the season?

ANSWER: 23

MATH-93; Multiple Choice: By completing the square, $x^2+6x=3$ is equivalent to:

- w) $(x+6)^2=39$
- x) $(x+3)^2=9$
- y) $(x+3)^2=12$
- z) $(x+6)^2=9$

ANSWER: Y -- $(X+3)^2=12$

MATH-93; Short Answer: The perimeter of a rectangle is 28 cm. The length of one side is 8 cm. What is the length of the diagonal in cm?

ANSWER: 10 (CM)

MATH-93; Multiple Choice: The number of points of inflection of the graph of $y=ax^2+bx+c$ is:

- w) 2
- x) 3
- y) 1
- z) 0

ANSWER: Z -- 0

MATH-93; Multiple Choice: In every triangle, the point of intersection of the medians is:

- w) $1/3$ from any vertex and $2/3$ from its opposite side
- x) $2/3$ from any vertex and $1/3$ from its opposite side
- y) $1/4$ from any vertex and $3/4$ from its opposite side
- z) $3/4$ from any vertex and $1/4$ from its opposite side

ANSWER: X -- $2/3$ FROM ANY VERTEX AND $1/3$ FROM ITS OPPOSITE SIDE

Science Bowl

MATHEMATICS

MATH-93; Short Answer: If the width of a rectangle measures 3 units, what is the length so that the area equals the perimeter?

ANSWER: 6 UNITS

MATH-93; Multiple Choice: If i = the square root of -1 , then i to the 4098th power is:

- w) i
- x) $-i$
- y) $+1$
- z) -1

ANSWER: Z -- -1

MATH-93; Multiple Choice: The equation $3x - 2x = 2$ must have a solution in the interval

- w) $(-2,-1)$
- x) $(-1,0)$
- y) $(0,1)$
- z) $(1,2)$

ANSWER: Z -- $(1,2)$

MATH-93; Short Answer: The area of the flat surface of a hemisphere is 4 units. What is the area of the curved surface?

ANSWER: 8 UNITS (ACCEPT 8)

MATH-93; Multiple Choice: A polygon shaped stop sign has a 18 inch side. What is the perimeter of the stop sign?

- w) 9 feet
- x) 15 feet
- y) 6 feet
- z) 12 feet

ANSWER: Z -- 12 FEET

MATH-93; Short Answer: A bag contains 100 balls numbered 1 to 100. One ball is drawn at random. What is the probability that the number on this ball is odd or greater than 80?

ANSWER: 0.6

Science Bowl

MATHEMATICS

MATH-93; Short Answer: If bacterial cells divide into two cells every 40 minutes, the number of cells produced from a single cell in 240 minutes is expected to be?

ANSWER: 64

MATH-93; Short Answer: The number 1111 in base 2 equals what number in base 10?

ANSWER: W -- 15

MATH-93; Multiple Choice: If the mean of 75 items is 40 and the mean of 25 items is 60, find the mean of the 100 items.

- w) Insufficient information
- x) 45
- y) 42
- z) 48

ANSWER: X -- 45

MATH-93; Short Answer: If 64 sugar cubes were glued into one large, solid cube and spray-painted red, how many of the original cubes would have exactly two red surfaces?

ANSWER: 24

MATH-93; Multiple Choice: A complex number can be described as the following:

- w) Number that can be associated with points on a line.
- x) Number that can be expressed as a quotient of two integers.
- y) Number that can be associated with points on a plane.
- z) Number that is not the solution of any polynomial equation with integer coefficients.

ANSWER: Y -- NUMBER THAT CAN BE ASSOCIATED WITH POINTS ON A PLANE

MATH-93; Short Answer: A room contained 3600 mosquitos when it was sprayed with an insect killer. At the end of one hour a certain fraction of the mosquitos had died, and at the end of the second hour, the same fraction of the first hour's survivors had died, leaving only 400. What fraction of the mosquitos died the first hour?

ANSWER: ONE THIRD

Science Bowl

MATHEMATICS

MATH-93; Short Answer: You have noticed that the manholes in the street have a tendency to be round. Why was a circular shape rather than a square or rectangle shape normally chosen?

ANSWER: A RECTANGLE OR SQUARE CAN FALL THROUGH THE HOLE OPENING IF THE LID IS ON THE DIAGONAL. A CIRCLE WON'T.

MATH-93; Short Answer: What is the maximum number of degrees that a triangle can have on the surface of a sphere?

ANSWER: 270

MATH-93; Multiple Choice: At a meeting of 32 people, there were 8 more men than women. How many women were there at the meeting?

- w) 10
- x) 12
- y) 20
- z) 24

ANSWER: X -- 12

MATH-93; Short Answer: What is the area of a parallelogram with sides of 4 meters and 8 meters, and one of its integral angles equal to 30 degrees?

ANSWER: 16 SQUARE METERS

MATH-93; Short Answer: What is the x-y coordinate of the intersection of the lines $y=x$ and $y=6-x$?

ANSWER: X=3, Y=3 (ACCEPT 3,3)

MATH-93; Short Answer: What is the sum of the first 20 positive integers?

ANSWER: 210

MATH-93; Short Answer: If repetitions are not permitted, how many 3 digit numbers can be formed from the six digits 1, 2, 4, 5, 6, and 8?

ANSWER: 120

Science Bowl

MATHEMATICS

MATH-93; Multiple Choice: If the areas of three of the faces of a rectangular solid are 6, 8, and 12, what is the volume of the solid?

- w) 24
- x) 48
- y) 96
- z) 184

ANSWER: W -- 24