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Inequality Symbols Alt CodesPress the key or keys on the numpad while holding ALT.ALT CodeSymbolALT + 8800ALT + 62>ALT + 242ALT + 60 strict inequality greater than 5 > 45 is greater than 4 < strict inequality less than 4 < 54 is less than 5 inequality greater than or equal to 5 4,x y means x is greater than or equal to y inequality less than or equal to 4 5,x y means x is less than or equal to y ( ) parentheses calculate expression inside first 2 (3+5) = 16 [ ] brackets calculate expression inside first [(1+2)(1+5)] = 18 + plus sign addition 1 + 1 = 2 minus sign subtraction 2 1 = 1 plus - minus both plus and minus operations 3 5 = 8 or -2 minus - plus both minus and plus operations 3 5 = -2 or 8 * asterisk multiplication 2 * 3 = 6 times sign multiplication 2 3 = 6 multiplication dot multiplication 2 3 = 6 division sign / obelus division 6 2 = 3 / division slash division 6 / 2 = 3 horizontal line division / fraction mod modulo remainder calculation 7 mod 2 = 1 . period decimal point, decimal separator 2.56 = 2+56/100 ab power exponent 23 = 8 a^b caret exponent 2 ^ 3 = 8 a square root a a = a 9 = 3 3a cube root 3a 3a 3a = a 38 = 2 4a fourth root 4a 4a 4a 4a = a 416 = 2 na n-th root (radical) for n=3, n8 = 2 % percent 1% = 1/100 10% 30 = 3 per-mille 1 = 1/1000 = 0.1% 10 30 = 0.3 ppm per-million 1ppm = 1/1000000 10ppm 30 = 0.0003 ppb per-billion 1ppb = 1/1000000000 10ppb 30 = 310-7 ppt per-trillion 1ppt = 10-12 10ppt 30 = 310-10 Symbol Symbol Name Meaning / definition Example angle formed by two rays ABC = 30 measured angle ABC = 30 spherical angle AOB = 30 right angle = 90 = 90 degree 1 turn = 360 = 60 deg degree 1 turn = 360deg = 60deg prime arcminute, 1 = 60 = 6059 double prime arcsecond, 1 = 60 = 605959 line infinite line AB line segment line from point A to point B ray line that start from point A arc arc from point A to point B = 60 perpendicular perpendicular lines (90 angle) AC BC parallel parallel lines AB CD congruent to equivalence of geometric shapes and size ABC XYZ ~ similarity same shapes, not same size ABC~ XYZ triangle triangle shape ABC BCD |x-y| distance distance between points x and y | x-y | = 5 pi constant = 3.141592654... is the ratio between the circumference and diameter of a circle c = d = 2r rad radians radians angle unit 360 = 2 rad c radians radians angle unit 360 = 2 c grad gradians / gons grads angle unit 360 = 400 grad g gradians / gons grads angle unit 360 = 400 g Symbol Symbol Name Meaning / definition Example x x variable unknown value to find when 2x = 4, then x = 2 equivalence identical to equal by definition equal by definition := equal by definition equal by definition ~ approximately equal weak approximation 11 ~ 10 approximately equal approximation sin(0.01) 0.01 proportional to proportional to y x when y = kx, k constant lemniscate infinity symbol much less than much less than 1 1000000 much greater than much greater than 1000000 1 ( ) parentheses calculate expression inside first 2 * (3+5) = 16 [ ] brackets calculate expression inside first [(1+2)*(1+5)] = 18 { } braces set x floor brackets rounds number to lower integer 4.3 = 4 x ceiling brackets rounds number to upper integer 4.3 = 5 x! exclamation mark factorial 4! = 1*2*3*4 = 24 | x | vertical bars absolute value | -5 | = 5 f (x) function of x maps values of x to f(x) f (x) = 3x+5 (f g) function composition (f g) (x) = f (g(x)) f (x)=3x,g(x)=x-1 (f g)(x)=3(x-1) (a,b) open interval (a,b) = {x | a < x < b} x (2,6) [a,b] closed interval [a,b] = {x | a x b} x [2,6] delta change / difference t = t1 - t0 discriminant = b2 - 4ac sigma summation - sum of all values in range of series xi= x1+x2+...+xn sigma double summation capital pi product - product of all values in range of series xi=x1x2...xn e e constant / Euler's number e = 2.718281828... e = lim (1+1/x)x , x Euler-Mascheroni constant = 0.5772156649... golden ratio golden ratio constant pi constant = 3.141592654... is the ratio between the circumference and diameter of a circle c = d = 2r Symbol Symbol Name Meaning / definition Example dot scalar product a b cross vector product a b AB tensor product tensor product of A and B A B inner product [ ] brackets matrix of numbers ( ) parentheses matrix of numbers | A | determinant determinant of matrix A det(A) determinant determinant of matrix A || x || double vertical bars norm AT transpose matrix transpose (AT)ij = (A)ji A Hermitian matrix matrix conjugate transpose (A)ij = (A)ji A* Hermitian matrix matrix conjugate transpose (A*)ij = (A)ji A -1 inverse matrix A A-1 = I rank(A) matrix rank rank of matrix A rank(A) = 3 dim(U) dimension dimension of matrix A dim(U) = 3 Symbol Symbol Name Meaning / definition Example P(A) probability function probability of event A P(A) = 0.5 P(A B) probability of events intersection probability that of events A and B P(AB) = 0.5 P(A B) probability of events union probability that of events A or B P(AB) = 0.5 P(A | B) conditional probability function probability of event A given event B occured P(A | B) = 0.3 f (x) probability density function (pdf) P(a x b) = f (x) dx F(x) cumulative distribution function (cdf) F(x) = P(X x) population mean mean of population values = 10 E(X) expectation value expected value of random variable X E(X) = 10 E(X | Y) conditional expectation expected value of random variable X given Y E(X | Y=2) = 5 var(X) variance variance of random variable X var(X) = 4 2 variance variance of population values 2 = 4 std(X) standard deviation standard deviation of random variable X std(X) = 2 X standard deviation standard deviation value of random variable X X = 2 median middle value of random variable x cov(X,Y) covariance covariance of random variables X and Y cov(X,Y) = 4 corr(X,Y) correlation correlation of random variables X and Y corr(X,Y) = 0.6 X,Y correlation correlation of random variables X and Y X,Y = 0.6 summation summation - sum of all values in range of series double summation double summation Mo mode value that occurs most frequently in population MR mid-range MR = (xmax+xmin)/2 Md sample median half the population is below this value Q1 lower / first quartile 25% of population are below this value Q2 median / second quartile 50% of population are below this value = median of samples Q3 upper / third quartile 75% of population are below this value x sample mean average / arithmetic mean x = (2+5+9) / 3 = 5.333 s 2 sample variance population samples variance estimator s 2 = 4 s sample standard deviation population samples standard deviation estimator s = 2 zx standard score zx = (x-x) / sx X ~ distribution of X distribution of random variable X X ~ N(0,3) N(,2) normal distribution gaussian distribution X ~ N(0,3) U(a,b) uniform distribution equal probability in range a,b X ~ U(0,3) exp() exponential distribution f (x) = e-x , x0 gamma(c,) gamma distribution f (x) = c xc-1e-x / (c), x0 2(k) chi-square distribution f (x) = xk/2-1e-x/2 / (2k/2 (k/2)) F (k1, k2) F distribution Bin(n,p) binomial distribution f (k) = nCk pk(1-p)n-k Poisson() Poisson distribution f (k) = ke- / k! Geom(p) geometric distribution f (k) = p(1-p) k HG(N,K,n) hyper-geometric distribution Bern(p) Bernoulli distribution Symbol Symbol Name Meaning / definition Example n! factorial n! = 123…n 5! = 12345 = 120 nPk permutation 5P3 = 5! / (5-3)! = 60 nCk combination 5C3 = 5!/[3!(5-3)!]=10 Symbol Symbol Name Meaning / definition Example { } set a collection of elements A = {3,7,9,14},B = {9,14,28} A B intersection objects that belong to set A and set B A B = {9,14} A B union objects that belong to set A or set B A B = {3,7,9,14,28} A B subset A is a subset of B. set A is included in set B. {9,14,28} {9,14,28} A B proper subset / strict subset A is a subset of B, but A is not equal to B. {9,14} {9,14,28} A B not subset set A is not a subset of set B {9,66} {9,14,28} A B superset A is a superset of B. set A includes set B {9,14,28} {9,14,28} A B proper superset / strict superset A is a superset of B, but B is not equal to A. {9,14,28} {9,14} A B not superset set A is not a superset of set B {9,14,28} {9,66} 2A power set all subsets of A power set all subsets of A A = B equality both sets have the same members A={3,9,14},B={3,9,14},A=B Ac complement all the objects that do not belong to set A A \ B relative complement objects that belong to A and not to B A = {3,9,14},B = {1,2,3},A-B = {9,14} A - B relative complement objects that belong to A and not to B A = {3,9,14},B = {1,2,3},A-B = {9,14} A B symmetric difference objects that belong to A or B but not to their intersection A = {3,9,14},B = {1,2,3},A B = {1,2,9,14} A B symmetric difference objects that belong to A or B but not to their intersection A = {3,9,14},B = {1,2,3},A B = {1,2,9,14} aA element of,belongs to set membership A={3,9,14}, 3 A xA not element of no set membership A={3,9,14}, 1 A (a,b) ordered pair collection of 2 elements AB cartesian product set of all ordered pairs from A and B AB = {(a,b)|aA , bB} |A| cardinality the number of elements of set A A={3,9,14}, |A|=3 #A cardinality the number of elements of set A A={3,9,14}, #A=3 | vertical bar such that A={x|3} or less than (6 Less Than and Greater Than The "less than" sign and the "greater than" sign look like a "V" on its side, don't they? To remember which way around the "" signs go, remember that the wide open side faces the larger number: The "small" end always points to the smaller number, like this: Greater Than Symbol: BIG > small 10 > 5 "10 is greater than 5" Or the other way around: 5 < 10 "5 is less than 10" Do you see how the symbol "points at" the smaller value? ... Or Equal To ... Sometimes we know a value is smaller, but may also be equal to! Example, a jug can hold up to 4 cups of water. So how much water is in it? It could be 4 cups or it could be less than 4 cups: So until we measure it, all we can say is "less than or equal to" 4 cups. To show this, we add an extra line at the bottom of the "less than" or "greater than" symbol like this: The "less than or equal to" sign: The "greater than or equal to" sign: All The Symbols Below is a summary of all the symbols: Symbol Words Example Use = equals 1 + 1 = 2 not equal to 1 + 1 3 > greater than 5 > 2 < less than 7 < 9 greater than or equal to marbles 1 less than or equal to dogs 3 Why Use Them? Because there are things we do not know exactly ... ... but can still say something about.So we have ways of saying what we do know (which may be useful!) Example: John had 10 marbles, but lost some. How many has he now? Answer: He must have less than 10: Marbles < 10 If John still has some marbles we can also say he has greater than zero marbles: Marbles > 0 But if we thought John could have lost all his marbles we would say Marbles 0 In other words, the number of marbles is greater than or equal to zero. Combining We can sometimes say two (or more) things on the one line: Answer: Something greater than $0 and less than $10 (but NOT $0 or $10): "What Becky Spends" > $0"What Becky Spends" < $10 This can be written down in just one line: $0 < "What Becky Spends" < $10 That says that $0 is less than "What Becky Spends" (in other words "What Becky Spends" is greater than $0) and what Becky Spends is also less than $10. Notice that ">" was flipped over to "