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# gamma with mean and variance
rGamma<-function(n=10000,mn=1,sd=1){
  x<-if(length(sd)==1){
    if(sd==0.0){
      rep(mn,length=n)
    } else {
      a<-(mn/sd)^2
      s<-sd^2/mn
      rgamma(n,a,scale=s)
    }
  } else {
    mxlen<-max(n,length(mn),length(sd))
    mxlen<-min(n,mxlen)
    mn<-rep(mn,length=mxlen)
    sd<-rep(sd,length=mxlen)
    x<-mapply(function(mn,sd){
      if(sd==0){
        mn
      } else {
        a<-(mn/sd)^2
        s<-sd^2/mn
        rgamma(1,a,scale=s)
      }
    },mn,sd)
  }
  return(x)
}

pGamma<-function(q,mn=1,sd=1){
  pval<-ifelse(sd==0,ifelse(q==mn,1,0),{
    a<-(mn/sd)^2
    s<-sd^2/mn
    pgamma(q,a,scale=s)
  })
  return(pval)
}

dGamma<-function(q,mn=1,sd=1){
  d<-if(length(sd)==1){
    if(sd==0.0){
      ifelse(q==mn,1,0)
    } else {
      a<-(mn/sd)^2
      s<-sd^2/mn
      dgamma(q,a,scale=s)
    }
  } else {
    mxlen<-max(q,length(mn),length(sd))
    q<-rep(q,length=mxlen)
    mn<-rep(mn,length=mxlen)
    sd<-rep(sd,length=mxlen)
    x<-mapply(function(q,mn,sd){
      if(sd==0){

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      mn
    } else {
      a<-(mn/sd)^2
      s<-sd^2/mn
      dgamma(q,a,scale=s)
    }
  },mn,sd)
}
return(d)
}

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qGamma<-function(p,mn=1,sd=1){
  a<-(mn/sd)^2
  s<-sd^2/mn
  q<-qgamma(p,shape=a,scale=s)
  return(q)
}

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rNBinom<-function(n,mu=1,od=0.0){
  if(od==0.0){
    rpois(n,mu)
  } else {
    rnbinom(n,mu,size=mu/od)
  }
}

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rBinom<-function(nSim=1,p,Conc,SD=sqrt(p*(1-p)*Conc)){
  ifelse(SD==0,p,{
    SD<-ifelse(SD^2>p*(1-p),{
      warning("SD greater than the maximum binomial SD.")
      SD<-sqrt(p*(1-p))
    },SD
  )
  Fac<-p*(1-p)/SD^2-1
  a<-p*Fac
  b<-(1-p)*Fac
  rbeta(1,a,b)
})
}

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rBinom<-function(n=1,p,conc,sd=sqrt(p*(1-p)*conc)){
  sd<-ifelse(sd^2>p*(1-p),{
    warning("sd greater than the maximum binomial sd.")
    sd<-sqrt(p*(1-p))
  },sd
)
x<-if(length(sd)==1){
  if(sd==0.0){
    rep(p,length=n)
  } else {
    fac<-p*(1-p)/sd^2-1
    a<-p*fac
    b<-(1-p)*fac
  }
}

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    rbeta(n,a,b)
  }
} else {
  mxlen<-max(n,length(p),length(sd))
  mxlen<-min(n,mxlen)
  p<-rep(p,length=mxlen)
  sd<-rep(sd,length=mxlen)
  mapply(function(p,sd){
    if(sd==0){
      p
    } else {
      fac<-p*(1-p)/sd^2-1
      a<-p*fac
      b<-(1-p)*fac
      rbeta(1,a,b)
    }
  },p,sd)
}
return(x)
}

dBinom<-function(q,p,conc,sd=sqrt(p*(1-p)*conc)){
  sd<-ifelse(sd^2>p*(1-p),{
    warning("sd greater than the maximum binomial sd.")
    sd<-sqrt(p*(1-p))
  },sd
)
x<-if(length(sd)==1){
  if(sd==0.0){
    rep(p,length=n)
  } else {
    fac<-p*(1-p)/sd^2-1
    a<-p*fac
    b<-(1-p)*fac
    dbeta(q,a,b)
  }
} else {
  mxlen<-max(n,length(q),length(p),length(sd))
  mxlen<-min(n,mxlen)
  q<-rep(q,length=mxlen)
  p<-rep(p,length=mxlen)
  sd<-rep(sd,length=mxlen)
  mapply(function(q,p,sd){
    if(sd==0){
      p
    } else {
      fac<-p*(1-p)/sd^2-1
      a<-p*fac
      b<-(1-p)*fac
      dbeta(q,a,b)
    }
  },q,p,sd)
}
return(x)
}

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