

Normal Distribution Examples and Problem Pairs

EG1: The diameters of a rivet produced by a particular machine, X mm, is modelled as $X \sim N(8, 0.2^2)$. Find: $P(X > 8.3)$ $P(7.8 < X < 8.2)$	PP1: IQ ("Intelligence Quotient") for a given population is, by definition, distributed using $Y \sim N(100, 15^2)$. Find: $P(70 < Y < 130)$ $P(Y > 115)$
EG3. A rivet is classed as 'faulty' if it has a diameter of less than 7.5mm or greater than 8.5mm. Assuming the diameter has a distribution $Y \sim N(8, 0.2^2)$ for the machine, determine: a) What percentage of rivets are faulty. b) If 150 rivets are selected at random, the probability that at least 5 of them will be faulty.	PP3. The criteria for joining Mensa is an IQ of at least 131. Assuming that IQ has the distribution $Y \sim N(100, 15^2)$ for a population, determine: a) What percentage of people are eligible to join Mensa. b) If 30 adults are randomly chosen, the probability that at least 3 of them will be eligible to join.
EG4. $X \sim N(80, 49)$ Using your calculator, a) calculate $P(X - 80 < 10)$ b) calculate $P(X - 80 > 15)$	PP4. $X \sim N(100, 225)$ Using your calculator, a) calculate $P(X - 100 < 30)$ b) calculate $P(X - 100 > 25)$

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EG5. $X \sim N(80, 49)$

Using your calculator,

a) determine a such that $P(X > a) = 0.65$

b) determine a such that $P(75 < X < a) = 0.4$

c) determine the interquartile range of X .

PP5: If IQ of a population is distributed using $Y \sim N(100, 225)$

a) Determine the IQ corresponding to the top 30% of the population.

b) Determine b such that $P(b < Y < 118) = 0.4$

c) Determine the interquartile range of IQs

EG 6. The CRV X follows a normal distribution with standard deviation 1.2. An experiment estimated that $P(X > 3.4) = 0.2$. Estimate the **mean** to 2 sig fig.

PP 6. The CRV Y follows a normal distribution with variance 1.21. An experiment estimated that $P(Y > 7.4) = 0.6$. Estimate the **mean** to 2 sig fig.

EG 7. The masses of gerbils are thought to be normally distributed. If 30% of gerbil have a mass of more than 65g and 20% have a mass of less than 40g, estimate the mean and the variance of the mass of a gerbil.

PP 7. The waiting time in a doctors surgery is normally distributed. If 20% of people wait for under 7 minutes and 10% of people wait for over 16 minutes, find the mean and the variance for the wait.