

SERERE TOWNSHIP SS

Normal Distribution – Scenario Questions

Basic Applications

1. The weights of loaves of bread from a bakery are normally distributed with mean 500 g and standard deviation 20 g. Find the probability that a loaf weighs:
(a) less than 480 g,
(b) between 490 g and 520 g.
 2. Heights of S5 students in a Ugandan school are normally distributed with mean 170 cm and standard deviation 8 cm. What proportion of students are taller than 182 cm?
 3. The marks of candidates in a Math test are normally distributed with mean 55 and SD 10. Find the probability a randomly chosen candidate scores above 70.
 4. The length of metallic rods produced in a factory has mean 2 m and standard deviation 0.05 m. Find the probability a rod measures between 1.95 m and 2.05 m.
 5. A machine fills sugar packets with weights normally distributed around mean 1 kg and SD 0.02 kg. Find the probability that a packet weighs less than 0.98 kg.
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Percentiles & Cut-offs

6. In a class, test scores are normally distributed with mean 60 and SD 12. What is the minimum score required to be in the top 10% of the class?
 7. A normal distribution has mean 100 and SD 15. Find the 90th percentile of this distribution.
 8. The time taken to run 100 m by athletes is normally distributed with mean 12 s and SD 0.6 s. What is the maximum time allowed for the fastest 5% of runners?
 9. IQ scores are normally distributed with mean 100 and SD 15. What is the probability a person has an IQ between 85 and 115?
 10. The weights of adult males are normally distributed with mean 72 kg and SD 6 kg. Find the middle 80% range of weights.
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Inverse Normal Applications

11. The lifespan of batteries is normally distributed with mean 1000 hours and SD 100 hours. A guarantee is issued so that only 5% of batteries fail within the guaranteed time. What should the guarantee time be?
 12. In an exam, marks are normally distributed with mean 50 and SD 8. What mark separates the top 25% of students?
 13. The braking distance of a car at 80 km/h is normally distributed with mean 60 m and SD 5 m. What distance should be quoted so that only 1% of cars exceed it?
 14. Salaries of workers in a company follow $N(1,200,000, 200,000^2)$. What salary level separates the lowest 15% of earners?
 15. A standardized test has scores normally distributed with mean 500 and SD 100. What is the minimum score for the highest 2.5% of candidates?
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Comparing & Transforming Normal Variables

16. Heights of men are $N(170, 8^2)$ while heights of women are $N(160, 6^2)$. A man and a woman are chosen at random. What is the probability the woman is taller than the man?
 17. The diameter of a bolt is $N(12, 0.04^2)$. Two bolts are chosen independently. Find the probability their mean diameter is less than 11.98 cm.
 18. The lifetime of a bulb is $N(2000, 300^2)$. What is the probability the average lifetime of 25 bulbs exceeds 2100 hours?
 19. The weight of maize flour sacks is $N(90, 2^2)$. A sample of 9 sacks is taken. Find the probability the sample mean is between 89 and 91 kg.
 20. Two machines A and B produce light bulbs with lifetimes $N(1000, 60^2)$ and $N(1020, 80^2)$ respectively. If one bulb is chosen from each, what is the probability the bulb from B lasts longer?
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Applied Real-Life Cases

21. A university entrance exam has mean 65 and SD 7. If only the top 12% of candidates are admitted, what is the cut-off score?

22. A factory produces nails whose lengths follow $N(10, 0.1^2)$. If nails shorter than 9.9 cm or longer than 10.2 cm are rejected, what proportion is rejected?
23. The daily sales of a shop follow $N(200,000, 25,000^2)$. What is the probability sales exceed 250,000?
24. The volume of soft drink bottles follows $N(500, 5^2)$. What percentage of bottles are underfilled (less than 495 ml)?
25. In a national exam, results follow $N(55, 12^2)$. A student scores 80. Find their percentile rank among all candidates.

Normal Distribution – Extended Scenario Questions (26–50)

Cut-offs & Pass Marks

26. In a mathematics exam, marks are normally distributed with mean 64 and SD 9. If the pass mark is set so that 80% of candidates pass, what should the pass mark be?
27. The life span of mobile phones is normally distributed with mean 3 years and SD 0.5 years. A company gives a warranty such that only 2% of phones fail before it. What should the warranty period be?
28. The weights of maize harvest bags are normally distributed with mean 50 kg and SD 2 kg. Find the probability a bag weighs at least 55 kg.
29. Marks of candidates in a physics exam follow $N(50, 12^2)$. What proportion score between 40 and 70?
30. The time taken by students to complete a test is $N(45, 6^2)$. If the test must be completed by 60 minutes, what percentage of students fail to finish?

Industrial Quality Control

31. The diameter of machine screws is $N(8, 0.02^2)$. Screws outside the interval (7.96, 8.04) are rejected. What proportion is rejected?
32. The thickness of glass sheets follows $N(5, 0.1^2)$. If specifications allow between 4.9 and 5.1 cm, what fraction of sheets is acceptable?
33. A steel rod factory produces rods with $N(10, 0.15^2)$. A customer requires rods longer than 9.85 cm. What percentage of rods meet this requirement?

34. The lifetime of electric fuses follows $N(2000, 250^2)$. If a fuse is considered faulty if it lasts less than 1600 hours, what percentage are faulty?
35. A packing machine fills flour bags to mean 2 kg with SD 0.05 kg. What proportion of bags weigh between 1.95 and 2.1 kg?
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Agriculture & Environment

36. The daily rainfall in a region is $N(12, 3^2)$. Find the probability a day has rainfall above 15 mm.
37. A farmer's maize cobs weigh $N(250, 30^2)$. What is the probability a cob weighs between 200 g and 300 g?
38. The weight of fish caught from a lake is normally distributed with mean 1.5 kg and SD 0.3 kg. What percentage weigh less than 1 kg?
39. The height of a maize plant is $N(180, 12^2)$. Find the proportion of plants taller than 200 cm.
40. A cow produces daily milk output of $N(20, 2^2)$. What proportion produce less than 18 liters daily?
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Medicine & Health

41. The systolic blood pressure of adults is $N(120, 15^2)$. What percentage of adults have blood pressure above 140?
42. Human body temperature is normally distributed with mean 37°C and SD 0.5°C . What is the probability a person's temperature is between 36°C and 38°C ?
43. A drug is effective if its concentration in blood is above 15 mg/l. Concentrations follow $N(18, 2^2)$. What is the probability the drug is effective in a patient?
44. The weights of newborn babies follow $N(3.2, 0.5^2)$. What percentage are considered underweight (less than 2.5 kg)?
45. The lifespan of heart pacemakers is $N(8, 1.5^2)$ years. What is the probability a pacemaker fails within 6 years?
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Finance & Economics

46. Daily demand for bread in a shop follows $N(500, 60^2)$. If the shop stocks 580 loaves daily, what is the probability of running out of bread?
47. The monthly electricity consumption of households follows $N(250, 40^2)$. Find the probability a household consumes more than 300 units.
48. The monthly salary of workers in a company is $N(1,000,000, 150,000^2)$. What fraction earn between 900,000 and 1,200,000 shillings?
49. Weekly petrol consumption in a district follows $N(50,000, 6,000^2)$. What is the probability consumption is below 45,000 liters?
50. The price of a commodity is normally distributed with mean 2,000 UGX and SD 200. What is the probability the price exceeds 2,300 UGX?