

## Statistics Worksheet — Normal Distribution Day 2

1. Suppose that the IQ scores of students at a certain college follow a normal distribution with mean 115 and standard deviation 12.



- a. Draw a sketch of this distribution.
- b. Shade in the area corresponding to the proportion of students with an IQ below 100.
- c. Use the normal model to determine the proportion of students with an IQ score below 100.  $\text{normalcdf}(-999999, 100, 115, 12) = 0.106$

- d. Find the proportion of these undergraduates having IQs greater than 130.

$$\text{normalcdf}(130, 999999, 115, 12) = 0.106$$

- e. Find the proportion of these undergraduates having IQs between 110 and 130.

$$\text{normalcdf}(110, 130, 115, 12) = 0.556$$

- f. With his IQ of 75, Forest Gump would have a higher IQ than what percentage of these undergraduates?

$$\text{normalcdf}(-999999, 75, 115, 12) = 0.00429 \quad 0.429\%$$

- g. Determine how high one's IQ would have to be in the top 1% of all the IQs at this college.

$$\text{invnorm}(0.99, 115, 12) = 142.92$$

2. The Graduate Record Examination (GRE) is widely used to help predict the performance of applicants to graduate school. The range of possible scores on a GRE is 200 to 900. The math department at a university finds that the scores of its applicants on the verbal portion of the GRE (VGRE) are approximately normal with mean of 612 and standard deviation of 103. If we select an applicant file at random, find:

- a. The probability VGRE exceeds 800.  $\text{normalcdf}(800, 999999, 612, 103) = 0.34$

- b. The probability VGRE is between 400 and 800.  $\text{normalcdf}(400, 800, 612, 103) = 0.946$

- c. The value  $x$  such that 10% of applicants score below  $x$ .

$$\text{invnorm}(0.10, 612, 103) = 480.00$$

3. The length of human pregnancies from conception to birth varies according to a distribution that is approximately normal with mean 264 days and standard deviation 16 days.

- a. What is the probability a pregnancy lasts less than 250 days?

$$\text{normalcdf}(-999999, 250, 264, 16) = 0.191$$

- b. What is the probability a pregnancy lasts between 240 and 270 days?

$$\text{normalcdf}(240, 270, 264, 16) = 0.579$$

- c. What is the probability a pregnancy lasts more than 272 days?

$$\text{normalcdf}(272, 999999, 264, 16) = 0.309$$

- d. Doctors agree that serious thought to labor-inducing procedures ought to accompany any pregnancy that runs in the longest 2% of all pregnancies. At what day should these procedures be considered?

$$\text{invnorm}(0.98, 264, 16) = 296.9 \text{ day}$$

4. The average (mean) number of calories in a bar is 210 and has a standard deviation of 10. The number of calories per bar is approximately normally distributed. What percent of candy bars contain between 200 and 220 calories?

$$\text{normalcdf}(200, 220, 210, 10) = 0.683$$

$$68.3\%$$

5. The length of useful life of a fluorescent tube used for indoor gardening is normally distributed. The useful life has a mean of 600 hours and a standard deviation of 40 hours. Determine the probability that

a. a tube chosen at random will last between 620 and 680 hours.

$$\text{normalcdf}(620, 680, 600, 40) = .286$$

b. such a tube will last more than 740 hours?

$$\text{normalcdf}(740, 999999, 600, 40) = .00233$$

6. Suppose X is normally distributed with a mean of 25 and a standard deviation of 8. Find:

a.  $P(17 < X < 23)$   $\text{normalcdf}(17, 23, 25, 8) = .243$

b.  $P(X < 10)$   $\text{normalcdf}(-999999, 10, 25, 8) = .030$

c.  $P(X > 32)$   $\text{normalcdf}(32, 999999, 25, 8) = .191$

d. the 10<sup>th</sup> percentile of X

$$\text{invnorm}(.10, 25, 8) = 14.75$$

7. Mike is in the 99<sup>th</sup> percentile for his height. U.S. men have an average height of 69.3 inches with a standard deviation of 2.8 inches. How tall is he?

$$\text{invnorm}(.99, 69.3, 2.8) = 75.81 \text{ inches}$$

8. The lifetimes of zip drives marketed by Zippers, Inc. are normally distributed, with a mean lifetime of 11 months and a standard deviation of 3 months. Zippers plans to offer a new warranty guaranteeing the replacement of failed zip drives during the warranty period. It can afford to replace up to 4 percent of its drives. How many months of warranty should the company offer with these drives? Round your answer to the nearest month.

$$\text{invnorm}(.04, 11, 3) = 5.748 \text{ 6 months}$$

9. Final grade averages are typically approximately normally distributed with a mean of 72 and a standard deviation of 12.5. Your teacher states that the top 8% of the class will receive A; the next 20%, B; the next 42%, C; the next 18%, D; and the bottom 12%, F.

a. What average must you exceed to obtain an A?

$$\text{invnorm}(.92, 72, 12.5) = 89.6$$

b. What average must you exceed to receive a grade better than a C?

$$\text{invnorm}(.72, 72, 12.5) = 79.3$$

c. What average must you obtain to pass the course?

$$\text{invnorm}(.12, 72, 12.5) = 57.3$$

A: 92-100  
B: 72-92  
C: 30-72  
D: 12-18  
F: 0-12

10. Small newborn seal pups have a lower chance of survival. Suppose that the length of a new born seal pup follows a Normal distribution with a mean length of 29.5 inches and a standard deviation of 1.2 inches.

a. What is the probability that a newborn pup, selected a random, is shorter than 28.0 inches?

$$\text{normalcdf}(-999999, 28, 29.5, 1.2) = .106$$

b. What is the probability that a randomly selected newborn seal pup will be between 27 inches and 29 inches long?

$$\text{normalcdf}(27, 29, 29.5, 1.2) = .320$$