

Quest Review – Unit 8: Statistics

1-7: On each problem, do the following:

- A. State whether the given scenario is an independent (I) or dependent (D) event.
- B. State the type of problem represented - Permutation (P), Combination (C), or Fundamental Counting Principle (FCP).
- C. Show your work when using the Fundamental Counting Principle and the substitution of appropriate values when using the Permutation or Combination Formulas. If you are using the calculator operations, then type what you entered.
- D. Write your final answer.

1. How many ways can a track coach arrange eight runners on a four-person relay team?

A. D B. Type: P c. $8P_4 = \frac{8!}{4!} = 8 \cdot 7 \cdot 6 \cdot 5$ D. Answer: 1680 ways

2. Griffin is buying video games and has narrowed his choices to 6. If he plans to buy 2 video games, how many different pairs of games is he choosing from?

A. D B. Type: C c. $6C_2 = \frac{6!}{2!4!} = \frac{6 \cdot 5}{2 \cdot 1}$ D. Answer: 15 pairs

3. The names of 28 students are written on pieces of paper and placed in a jar. The teacher is choosing a team of 4 students to go to an assembly. How many different groups are possible?

A. D B. Type: C c. $28C_4 = \frac{28!}{4!24!} = \frac{28 \cdot 27 \cdot 26 \cdot 25}{4 \cdot 3 \cdot 2 \cdot 1}$ D. Answer: 20,475 groups

4. How many different lunch meals are possible when choosing from the following menu?

A. I B. Type: FCP
 c. 5 \cdot 3 \cdot 4

| Sandwiches | Sides | Beverages |
|---|---|--|
| <ul style="list-style-type: none"> • hot dog • hamburger • veggie burger • bratwurst • grilled chicken | <ul style="list-style-type: none"> • chips • apple • pasta salad | <ul style="list-style-type: none"> • bottled water • soda • juice • milk |

D. Answer: 60 meals

5. A television news channel has 9 reporters available to cover 4 different stories. How many ways can the reporters be assigned to cover the stories?

A. D B. Type: P c. $9P_4 = \frac{9!}{5!} = 9 \cdot 8 \cdot 7 \cdot 6$ D. Answer: 3024 ways

6. Skinny Dip has 6 flavors of frozen yogurt, 4 types of syrup, and 15 toppings. If you choose one flavor, one syrup, and one topping, how many different Skinny Dip treats could you create?

A. I B. Type: FCP c. 6 \cdot 4 \cdot 15 D. Answer: 360 treats

7. **Challenge:** A grocery store manager employs a total of 5 cashiers and 4 baggers. The manager plans to select 3 cashiers and 2 baggers to work on a particular afternoon. What is the number of different groups the owner could choose to work that afternoon?

A. D B. Type: C c. $5C_3 \cdot 4C_2 = \frac{5!}{3!2!} \cdot \frac{4!}{2!2!}$ *below D. Answer: 60 groups

8-10: Circle the correct answer. Show ALL of your work. If you choose "None of the above", provide the correct solution.

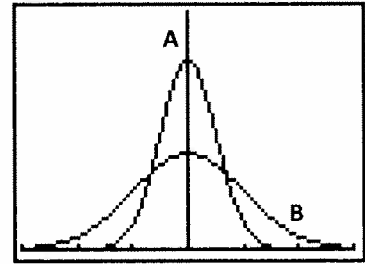
8. Which of the following is NOT a property of a normal distribution graph?

- A. The mean, median and mode are equal.
- B. The graph intercepts the x-axis at -1 and 1.
- C. The graph is bell-shaped and symmetrical about the mean.
- D. The total area under the curve is equal to one.
- E. None of the above

it will never intersect because the x-axis is an asymptote

* $\frac{5 \cdot 4}{2 \cdot 1} \cdot \frac{4 \cdot 3}{2 \cdot 1} = 10 \cdot 6 = 60$

9. Given the 2 normal distribution graphs A and B shown, which of the following statements appears to be true?



- A. The mean of A is greater than the mean of B.
- B. The mean of B is greater than the mean of A.
- C. The standard deviation of A is greater than the standard deviation of B.
- D. The standard deviation of B is greater than the standard deviation of A.**
- E. None of the above.

10. In 1985, the average ACT math score was 18 with a standard deviation of 6. Also in 1985, the average SAT math score was 500 with a standard deviation of 80. Your math teacher took both tests in 1985 and scored a 32 on the math portion of the ACT and a 680 on the math portion of the SAT. Which statement accurately reflects the comparison of your teacher's scores?

$$\text{ACT } \frac{32-18}{6} = 2.33 \qquad \text{SAT } \frac{680-500}{80} = 2.25$$

- A. The ACT score was better, since the z-score of the ACT is higher than the z-score of the SAT.**
- B. The SAT score was better, since the z-score of the SAT is higher than the z-score of the ACT.
- C. Neither of these answers applies.

11-15: Solve each problem, showing all calculations used to find the answers. Draw a shaded graph of each scenario.

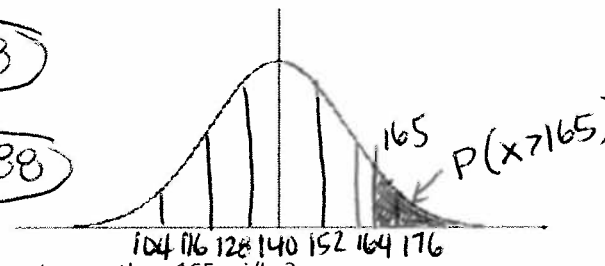
Remember: If I ask for the area, your answer should be less than or equal to 1, but if I ask for a probability or a percentage, your answer should be less than or equal to 100.

11. A radar unit is used to measure speeds of cars on a NASCAR speedway. The speeds are normally distributed with a mean of 140 mi/hr and a standard deviation of 12 mi/hr.

- a. Label the mean and 3 standard deviations above and below the mean on the graph provided below.
- b. Shade the region under the curve that represents the probability a car would travel more than 165 mi/hr.

c. What is the z-score for 165 mi/hr? $\frac{165-140}{12} = 2.08$

d. What is the area of the shaded region? $1 - .9812 = .0188$



e. What is the probability (percent) that a car picked at random is travelling at more than 165 mi/hr?

1.88%

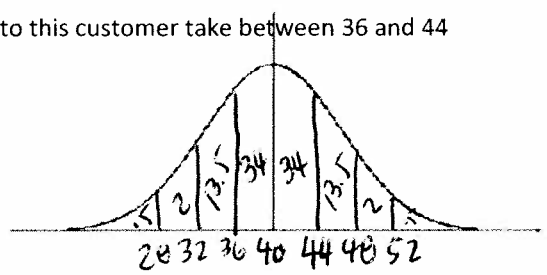
12. The time it takes a bicycle courier to deliver a parcel to his farthest regular customer is normally distributed with a mean of 40 minutes and a standard deviation of 4 minutes.

a. According to the empirical rule, about what percent of the courier's trips to this customer take between 36 and 44 minutes?

68%

b. According to the empirical rule, about what percent of the courier's trips to this customer take between 40 and 48 minutes?

$34 + 13.5 = 47.5\%$



c. According to the empirical rule, about what percent of the courier's trips to this customer take less than 32 minutes?

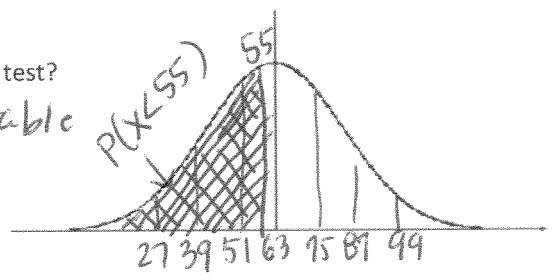
2.5%

13. The average time it takes students in a math class to complete a test is normally distributed with a mean of 63 minutes and a standard deviation of 12 minutes.

a. What percent of the students take less than 55 minutes to complete the test?

$$z = \frac{55 - 63}{12} = -0.666 = -0.67 \Rightarrow .2514 \text{ in the table}$$

$$\therefore \text{25.14\%}$$

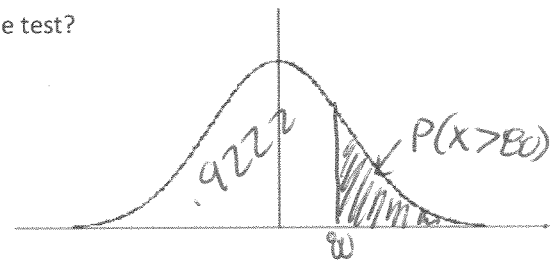


b. What percent of the students take more than 80 minutes to complete the test?

$$z = \frac{80 - 63}{12} = 1.416 = 1.42 \Rightarrow .9222$$

$$1 - .9222 = .0778$$

$$\therefore \text{7.78\%}$$



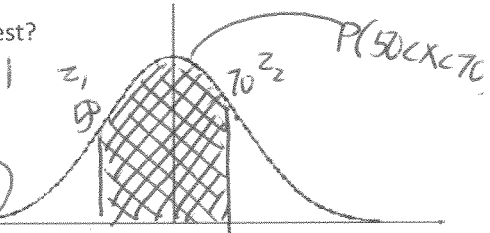
c. What percent of the students take between 50 and 70 minutes to complete the test?

$$z_1 = \frac{50 - 63}{12} = -1.083 = -1.08 \Rightarrow .1401$$

$$z_2 = \frac{70 - 63}{12} = .583 = .58 \Rightarrow .7190$$

$$.7190 - .1401 = .5789$$

$$\therefore \text{57.89\%}$$



d. If 95 students take the test, approximately how many of the students will take more than 80 minutes to complete the test? in b, $P(X > 80) = 7.78\%$, so $.0778(95) = 7.391$

Around 7 students will take more than 80 min.

e. Approximately how many of the 95 students will take less than 55 minutes to complete the test?

$$.2514(95) = \text{23.88 students} \approx \underline{23 \text{ students}}$$

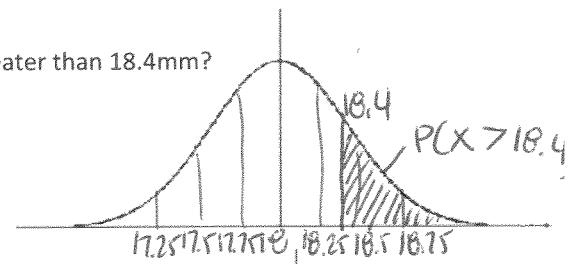
14. The diameter of bolts produced by a manufacturing plant is normally distributed with a mean of 18mm and a standard deviation of 0.25mm.

a. What percent of bolts coming off of the assembly line have a diameter greater than 18.4mm?

$$z = \frac{18.4 - 18}{.25} = 1.6 \Rightarrow .9452$$

$$1 - .9452 = .0548$$

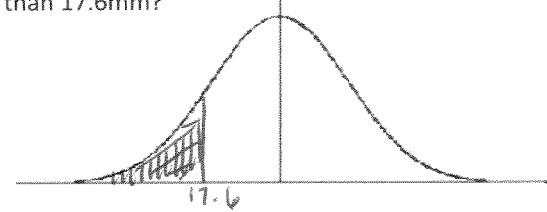
$$\therefore \text{5.48\%}$$



b. What percent of bolts coming off of the assembly line have a diameter less than 17.6mm?

$$z = \frac{17.6 - 18}{.25} = -1.6 \Rightarrow .0548$$

$$\therefore \text{5.48\%}$$



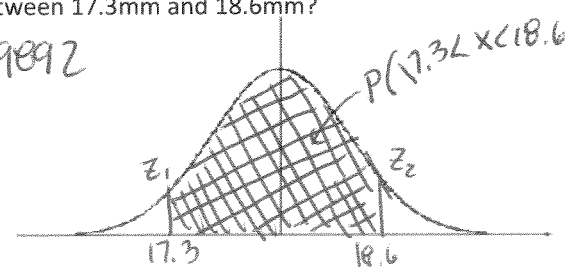
c. What percent of bolts coming off of the assembly line have a diameter between 17.3mm and 18.6mm?

$$z_1 = \frac{17.3 - 18}{.25} = -2.8 \Rightarrow .0026$$

$$z_2 = \frac{18.6 - 18}{.25} = 2.4 \Rightarrow .9918$$

$$.9918 - .0026 = .9892$$

$$\therefore \text{98.92\%}$$



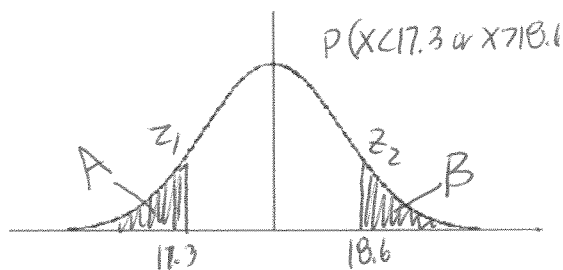
* see c. to see work for the z score!

d. What percent of bolts coming off of the assembly line have a diameter less than 17.3mm and greater than 18.6mm?

* $17.3 \rightarrow z_1 = -2.8 \Rightarrow .0026$

* $18.6 \rightarrow z_2 = 2.4 \Rightarrow .9918$

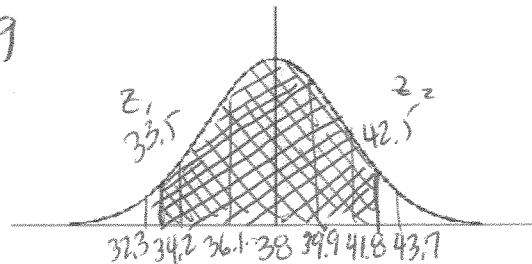
$P = A + B = .0026 + (1 - .9918)$
 $.0026 + .0082 = .0108$
 $\therefore 1.08\%$



15. The heights of 250 kindergarten students at Luxford Elementary School are normally distributed with a mean height of 38 inches and a standard deviation of 1.9 inches. Approximately how many students have a height between 33.5 inches and 42.5 inches?

$z_1 = \frac{33.5 - 38}{1.9} = -2.368 = -2.37 \Rightarrow .0089$ $.9911 - .0089$

$z_2 = \frac{42.5 - 38}{1.9} = 2.368 = 2.37 \Rightarrow .9911$ $.9822$
 $= 98.22\%$



$.9822(250) = 245.55$ 245.6 students

16: Alex deposited \$50 into an account and then forgot about it and made no further deposits or withdrawals. The table below shows account balance for several years. Answer the questions based on the data.

| Time (years) | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|--------------|---------|---------|---------|---------|----------|----------|----------|
| Balance (\$) | \$50.00 | \$55.80 | \$64.80 | \$83.09 | \$101.40 | \$123.14 | \$162.67 |

a. What is the best model/function to represent your data? Hint: There are several models that fit this data, but use the one that would best model the scenario.

Exponential is best because it starts low and the \$ will continue to grow over time.

b. State the regression equation of your model rounded to the nearest hundredth.

$y = 46.47(1.10)^x$

c. What is the value of the correlation coefficient (r)? What does this value mean?

$r = .9936$ This means that the exponential function is a very good model since r is almost 1.

d. Based upon the new equation, what would be the balance in the account after 25 years?

$\$558.58$ This is the value of y when $x = 25$

If you use the rounded equation, the answer will be $46.47(1.10)^{25} = 503.49$

e. How many years would it take for the balance to be \$300?

$300 = 46.47(1.10)^x \rightarrow \log 6.45... = x$ $\therefore \frac{\log 6.45...}{\log 1.10} = 19.57$

* Best Answer

pt. of int $\rightarrow 18.75$ 18 yrs, 9 months

After 19.57 years (19 yrs, 6.84 mo.)

off b/c we are w/ a rounded value