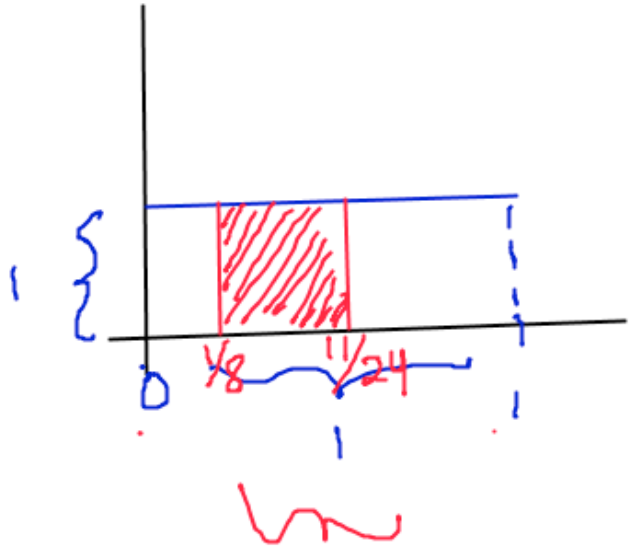
Q5 #5

Consider a spinner that, after a spin, will point to a number between zero and 1 with "uniform probability". Determine the probability: $P(1/8 \le X \le 11/24)$.



A = 1

$b = 11/24 - 1/8 = 11/24 - 3/24 = 8/24 = 1/3$

$h = 1$

$A = 1 \cdot 1/3 = \boxed{1/3}$

ehw 6

12

12. If a population has a standard deviation σ, then the standard deviation of the mean of 100 randomly selected items from this population is
    a. $\sigma/100$
    b. σ
    c. $\sigma/10$
    d. 100σ
    e. 1
    f. none of these

$\sigma_{\bar{x}}$ ← look in Wed 2/19 notes for formula

15. Power companies kill trees growing near their lines to avoid power failures due to falling limbs in storms. Applying a chemical to slow the growth of the trees is cheaper than trimming, but the chemical kills some of the trees. Suppose that one such chemical would kill 15% of sycamore trees. The power company tests the chemical on 200 sycamores. Consider these a SRS from the population of all sycamore trees. What is the probability that no more than 32 trees are killed?
    a. 0.0571
    b. 0.6540
    c. 0.3460
    d. 0.1598
    e. none of these

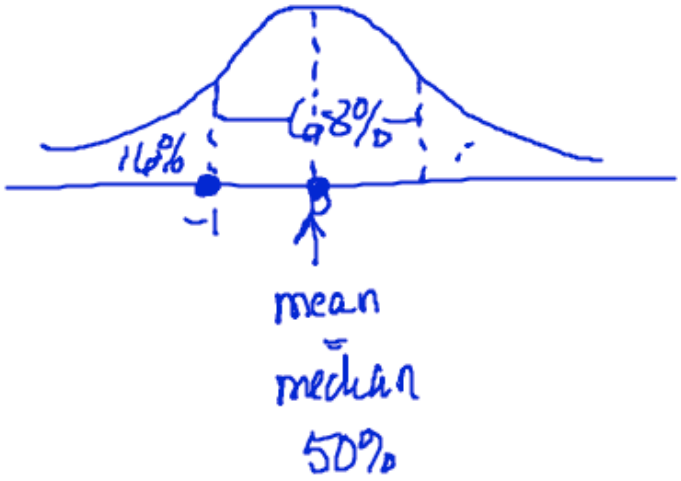
$P(x \le 32)$ ← $32/200$

$P(p \le 32/200)$

$\mu_{\hat{p}} = .15$ $\sigma_{\hat{p}} = \sqrt{\frac{.15(1-.15)}{200}}$

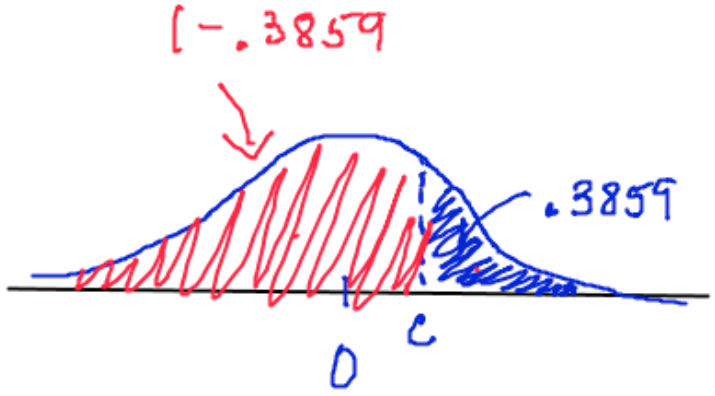
normalcdf $\left(-1000000, \frac{32}{200}, .15, \sqrt{\frac{.15(1-.15)}{200}}\right)$

6. True or False: On a statistics exam, Joe's score was at the 20th percentile and John's score was at the 40th percentile; thus, we can say that John's score was twice Joe's.
   a. True
   b. False



11. Find c such that $P(Z > c) = 0.3859$

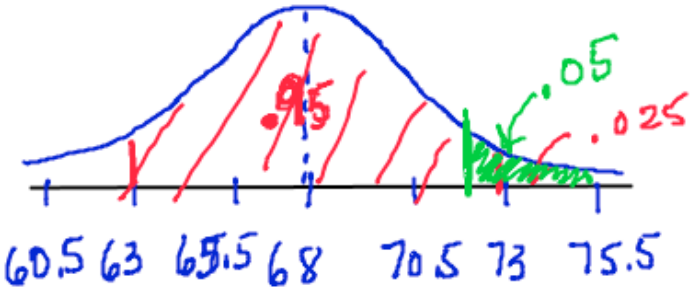
a. -0.29
b. 0.35
c. -0.35
d. 0.29
e. none of these



InvNorm is only for < or ≤

invnorm(1-.3859)

12. The heights of American men aged 18 to 24 are approximately normally distributed with mean 68 inches and standard deviation 2.5 inches. Only about 5% of young men have heights above what height?



invnorm(1−.05, 68, 2.5)

4.2

6. The length of time needed to complete a certain test is normally distributed with mean 57 minutes and standard deviation 8 minutes.

- **a.** What is the relative frequency of people who take between 49 and 65 minutes to complete the test? Sketch the distribution and shade in the area in question.
- **b.** Find the interval that contains the middle 95% of completion times for all people taking the test.

$\mu = 57 \quad \sigma = 8$

proportion

$P(49 < x < 65)$

4.4

3. A tire manufacturer claims that its tires will last an average of 40,000 miles with a standard deviation of 3,000 miles. A sample of 49 tires was taken, and the average lifetime in miles was recorded.

- a. What is the probability that the average lifetime of the tires sampled was more than 39,500?
- b. What is the probability that the average lifetime of the tires sampled was equal to 39,500?
- c. What is the probability that the average lifetime of the tires sampled was less than 39,500?

Prob. of $\bar{x}$ ⇒ use μ & $\sigma/\sqrt{n}$

$P(\bar{x} > 39{,}500) = \text{normalcdf}(39500, 1000000, 40{,}000, 3000/\sqrt{49})$

$P(\bar{x} < 39500) = \text{normalcdf}(-100000, 39500, 40000, \frac{3000}{\sqrt{49}})$

if > use 10000000

normalcdf (low, high, mean, sdev)

if 'average' or $\bar{x}$ or $\hat{p}$

if < use −10000000

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

$\sqrt{\frac{p(1-p)}{n}}$

4.3

not z

20. Suppose X is a normal distribution with $N(210, 32)$. Find the following:

a. $P(X < 230)$

b. $P(180 < X < 245)$

c. $P(X > 190)$

normalcdf

$\mu = 210$, $\sigma = 32$

d. Find c such that $P(X < c) = 0.0344$ ← invNorm(.0344, 210, 32)

qnorm

e. Find c such that $P(X > c) = 0.7486$

< 1-

↓ invnorm on calculator

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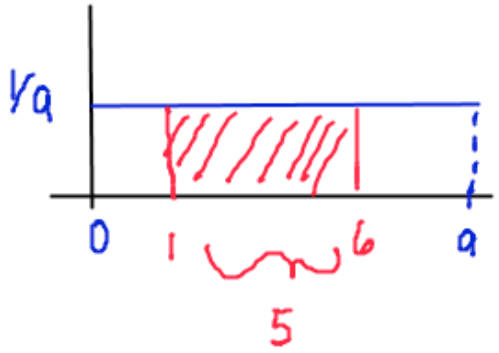
> qnorm(1-.7486,210,32)
[1]  188.5571
```

Q5

Question 4

Consider a uniform density curve defined from x = 0 to x = 9. What percent of observations fall between 1 and 6?



$b = 9 \qquad A = 1$

$9h = 1$

$h = 1/9$

$P(1 < x < 6) = 1/9\ (5) = 5/9$

Q5

Question 12

At a college the scores on the chemistry final exam are approximately normally distributed, with a mean of 75 and a standard deviation of 15. The scores on the calculus final are also approximately normally distributed, with a mean of 83 and a standard deviation of 13. A student scored 82 on the chemistry final and 80 on the calculus final. Relative to the students in each respective class, in which subject did the student do better?

82 Chem. $\mu_c = 75$ $\sigma_c = 15$

80 Calc $\mu_m = 83$ $\sigma_m = 13$

Standardize

Chem: $\frac{82-75}{15}$ Calc $\frac{80-83}{13}$

.467 $-.231$

better on chem.

10. Find $P(-1.2 < Z < 1.9)$ ← normalcdf

a. 0.9713
b. 0.8562
c. 0.8020
d. 0.7659
e. none of these

11. Find c such that $P(Z > c) = 0.3859$ ← invnorm

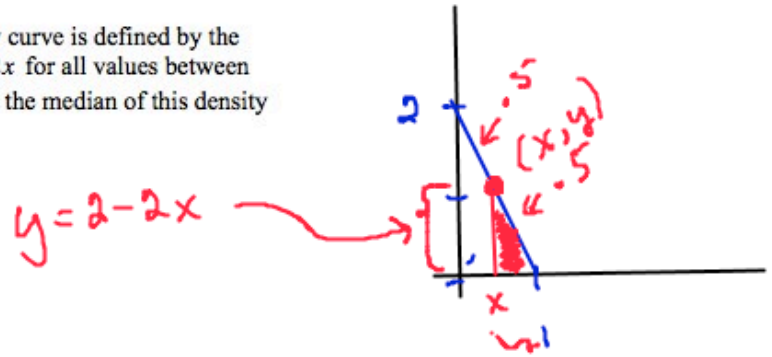
a. -0.29
b. 0.35
c. -0.35
d. 0.29
e. none of these

want probability → normalcdf

have prob. + want #, → invnorm
(must be a < prob)

4.1

6. Suppose a density curve is defined by the function $f(x)=2-2x$ for all values between $x=0$ to $x=1$. Find the median of this density curve.



$A = \frac{1}{2}(1)(2) = 1$ ✓

base $= 1-x$

$A_{\triangle} = .5 = \frac{1}{2}bh$

$.5 = \frac{1}{2}(1-x)(2-2x)$

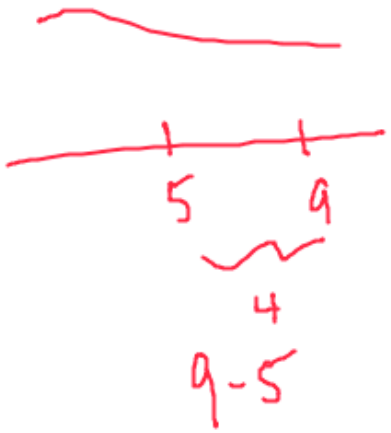
$1 = (1-x)(2-2x)$

$1 = 2-2x-2x+2x^2$

$0 = 2x^2-4x+1$

$0 = (2x-1)(2x-1)$

$x = 1/2$



Q4

Question 6

You did not answer the question.

A manufacturer of matches randomly and independently puts 23 matches in each box of matches produced. The company knows that one-tenth of 8 percent of the matches are flawed. What is the probability that a matchbox will have one or fewer matches with a flaw?

$n = 23$

binomial

$P(\text{flawed}) = \frac{1}{10}(.08) = .008 = p$

$P(X \leq 1) = \text{binomcdf}(23, .008, 1) = .9855$

$\leq$

$\text{pdf}(=)$

fewer than 3 $\rightarrow P(X \leq 2)$

Question 10

You did not answer the question.

A fish tank in a pet store has 23 fish in it. 8 are orange and 15 are white. Determine the probability that if we select 4 fish from the tank, at least 2 will be white.

$n = 23$ 8 or. 15 wh.

selecting 4 $\Rightarrow n(S) = {}_{23}C_4$

P (at least 2 white)

$= P(2\text{white})$ or $P(3\text{white})$ or $P(4\text{ white})$

$$= \frac{{}_{15}C_2 \cdot {}_{8}C_2}{{}_{23}C_4} + \frac{{}_{15}C_3 \cdot {}_{8}C_1}{{}_{23}C_4} + \frac{{}_{15}C_4 \cdot ({}_{8}C_0)}{{}_{23}C_4}$$