

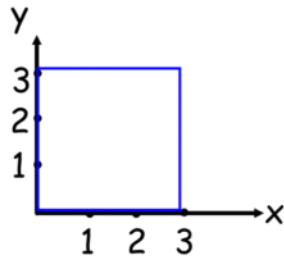
Sunday, October 22, 2017
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KEY

Statistics Honors Chapter 2: Normal Distributions Day 1

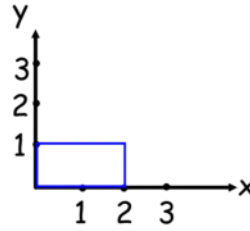
DO NOW: Find the area for each shape: $A = L \times W$

1.



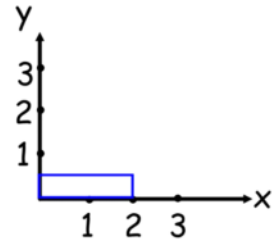
$$A = 3 \times 3 = 9$$

2.



$$A = 1 \times 2 = 2$$

3.



$$A = \frac{1}{2}(2) = 1$$

CLASSWORK:

A **density curve** is a curve that...

- Is always on or above the horizontal axis, and
- Has area exactly 1 underneath it.
- Which of the examples from the DO NOW above are valid density curves? #3

A **density curve** describes the overall pattern of a distribution.

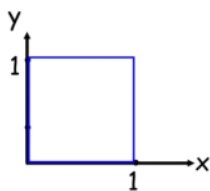
The area under the curve and above any interval of values on the horizontal axis is the proportion of all observations that fall in that interval.

EXAMPLES:

Any continuous shape with a total area of 1 under it might be a density curve.

Verify that each diagram is a valid **density curve**:

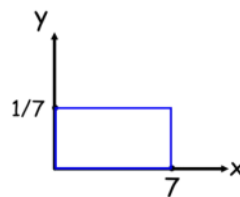
1.



$$\text{Area} = 1(1) = 1$$

yes

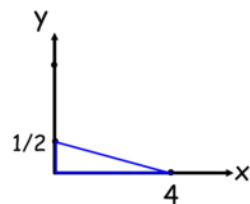
2.



$$\text{Area} = \left(\frac{1}{7}\right)(7) = 1$$

yes

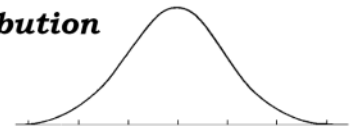
3.



$$A = \frac{1}{2}bh$$
$$= \frac{1}{2}(4)\left(\frac{1}{2}\right)$$
$$= 2\left(\frac{1}{2}\right) = 1$$

yes

FACT: A bell-shaped curve also known as a **Normal Distribution** is a special **density curve** that we'll be studying in Chapter 2 ☺



4. The graph on the right is a valid **density curve**.

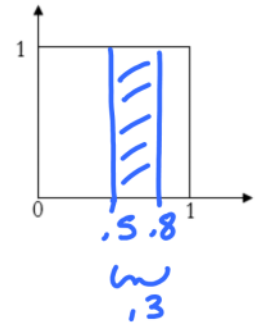
* We define the area = 1.

a. What is the area under the curve at the *x*-value 0.5?

$$A = l \times w = 1(0) = \boxed{0}$$

b. What is the area under the curve between the *x*-values 0.5 and 0.8?

$$A = l \times w = (.3)(1) = \boxed{.3}$$



c. What is the area under the curve below the *x*-value of 0.5 and above the *x*-value of 0.8?

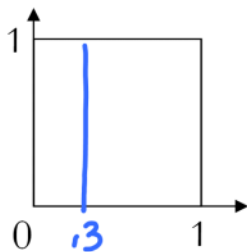
$$1 - .3 = \boxed{.7} \quad \text{OR} \quad (.5)(1) + (.2)(1) = \boxed{.7}$$

c. Shade in the area under the curve between the *x*-values 0.5 and 0.8.

What is the *percentage* of the shaded region? 30%

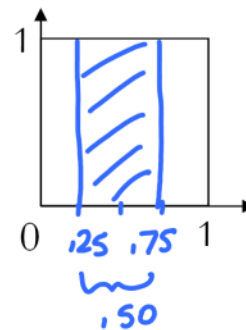
What is the *percentage* of the unshaded region? 70%

5. Find the area when $X = 0.3$.



$$A = (0)(1) = \boxed{0}$$

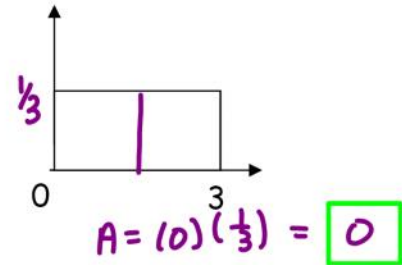
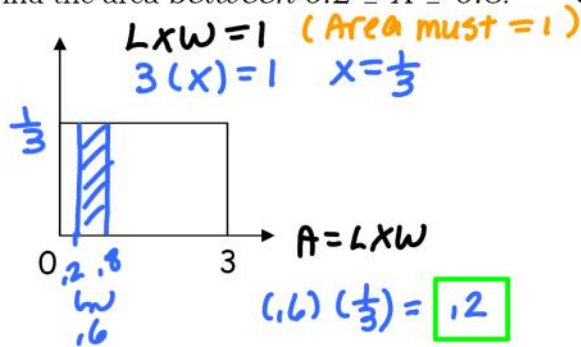
6. What is the probability that $0.25 < X < 0.75$?



$$A = L \times w = (.50)(1) = \boxed{.50}$$

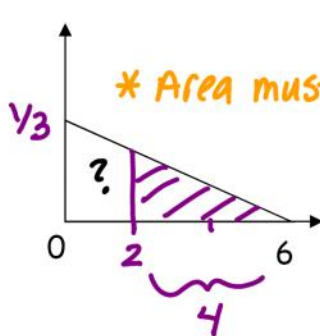
For each **Rectangle**, fill in the missing side; then answer the given question.

7. Find the area *between* $0.2 \leq X \leq 0.8$. 8. Find the probability that $X = 1.5$.



For each **Triangle**, fill in the missing side; then answer the given question.

9. Find the area of the shaded region represented by $2 \leq X \leq 6$.

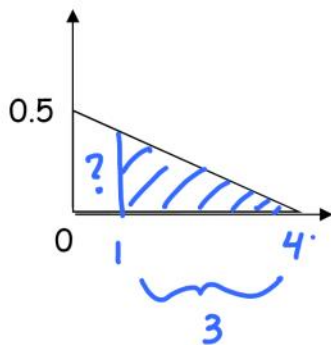


① FIND Height of Big Δ
 * Area must = 1
 $A = \frac{1}{2}bh$
 $1 = \frac{1}{2}(6)(x)$
 $1 = \frac{3x}{3}$
 $x = \frac{1}{3}$

② FIND Height of Small Δ
 * Similar Δ s are proportional
 $\frac{x}{4} = \frac{\frac{1}{3}}{6}$
 $6x = \frac{4}{3}$
 $x = \frac{4}{3} \cdot \frac{1}{6} = \frac{4}{18}$

③ FIND Area of small Δ : $A = \frac{1}{2}bh = \frac{1}{2}(4)(\frac{4}{18}) = 2(\frac{4}{18}) = \frac{8}{18} = \frac{4}{9}$

10. Find the area of the shaded region represented by $1 \leq X \leq 4$.



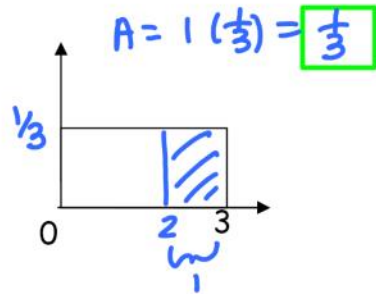
① Find base of big Δ
 $A = \frac{1}{2}bh$
 $1 = \frac{1}{2}x(\frac{1}{2})$
 $1 = \frac{1}{4}x$
 $x = 4$

② FIND Height of small Δ * use proportions
 $\frac{\frac{1}{2}}{4} = \frac{x}{3}$
 $\frac{4x}{4} = \frac{1.5}{4}$
 $x = .375$ or $\frac{3}{8}$

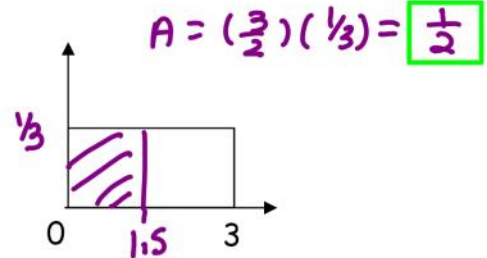
③ Find area of small Δ $A = \frac{1}{2}bh = \frac{1}{2}(3)(\frac{3}{8}) = \frac{9}{16}$

PARTNER PRACTICE: Fill in the missing side; then answer the given question.

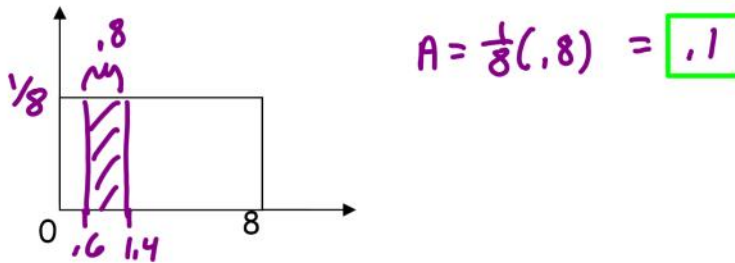
11. The probability that the x -value is at least 2.



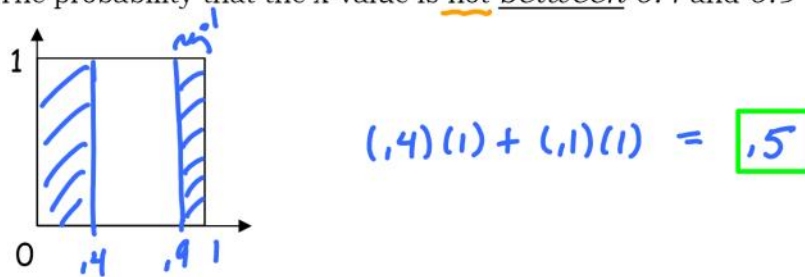
12. Find the shaded represented by $X \leq 1.5$.



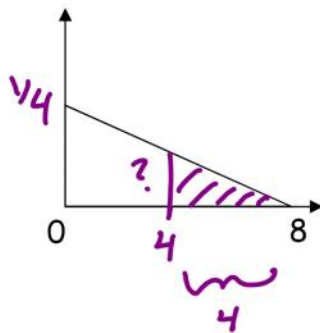
13. What is the probability that x -value is between 0.6 and 1.4?



14. The probability that the x -value is not between 0.4 and 0.9



15. Find the $P(4 \leq X \leq 8)$.



① FIND Height of Big Δ

$$A = \frac{1}{2}bh$$

$$1 = \frac{1}{2}(8)x$$

$$1 = 4x$$

$$x = \frac{1}{4}$$

② FIND Height of Small Δ

$$\frac{1}{4} = \frac{x}{4}$$

$$8x = 4 \left(\frac{1}{4}\right)$$

$$8x = 1$$

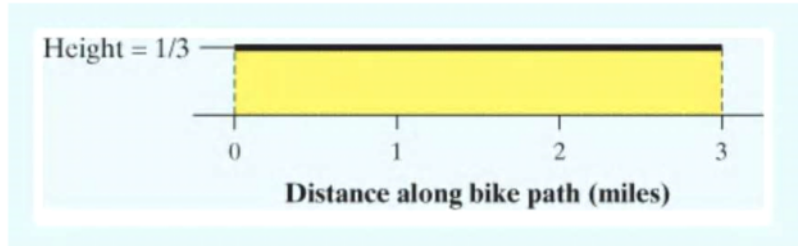
$$x = \frac{1}{8}$$

③ FIND Shaded Region

$$A = \frac{1}{2}(4) \left(\frac{1}{8}\right)$$

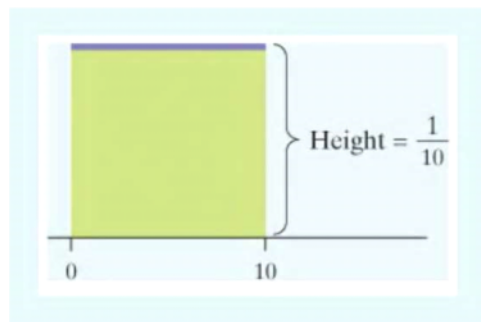
$$= 2 \left(\frac{1}{8}\right) = \frac{2}{8} = \frac{1}{4}$$

35.) Accidents on a level, 3-mile bike path occur uniformly along the length of the path. The figure below displays the density curve that describes the uniform distribution of accidents.



- a) Explain why this curve satisfies the two requirements for a density curve.
- b) The proportion of accidents that occur in the first mile of the path is the area under the density curve between 0 miles and 1 mile. What is this area?
- c) Sue's property adjoins the bike path between the 0.8 mile mark and the 1.1 mile mark. What proportion of accidents happen in front of Sue's property? Explain.

36.) Sally takes the same bus to school every morning. The amount of time (in minutes) that she has to wait for the bus to arrive is described by the uniform distribution below.



- a) Explain why this curve satisfies the two requirements for a density curve?
- b) On what percent of days does Sally have to wait more than 8 minutes for the bus?
- c) On what percent of days does Sally wait between 2.5 minutes and 5.3 minutes for the bus?

37.)

- a) What is the mean of the density curve pictures in #35? (That is, where would the curve balance?)
- b) What is the median? (That is where is the point with the area 0.5 on either side?)