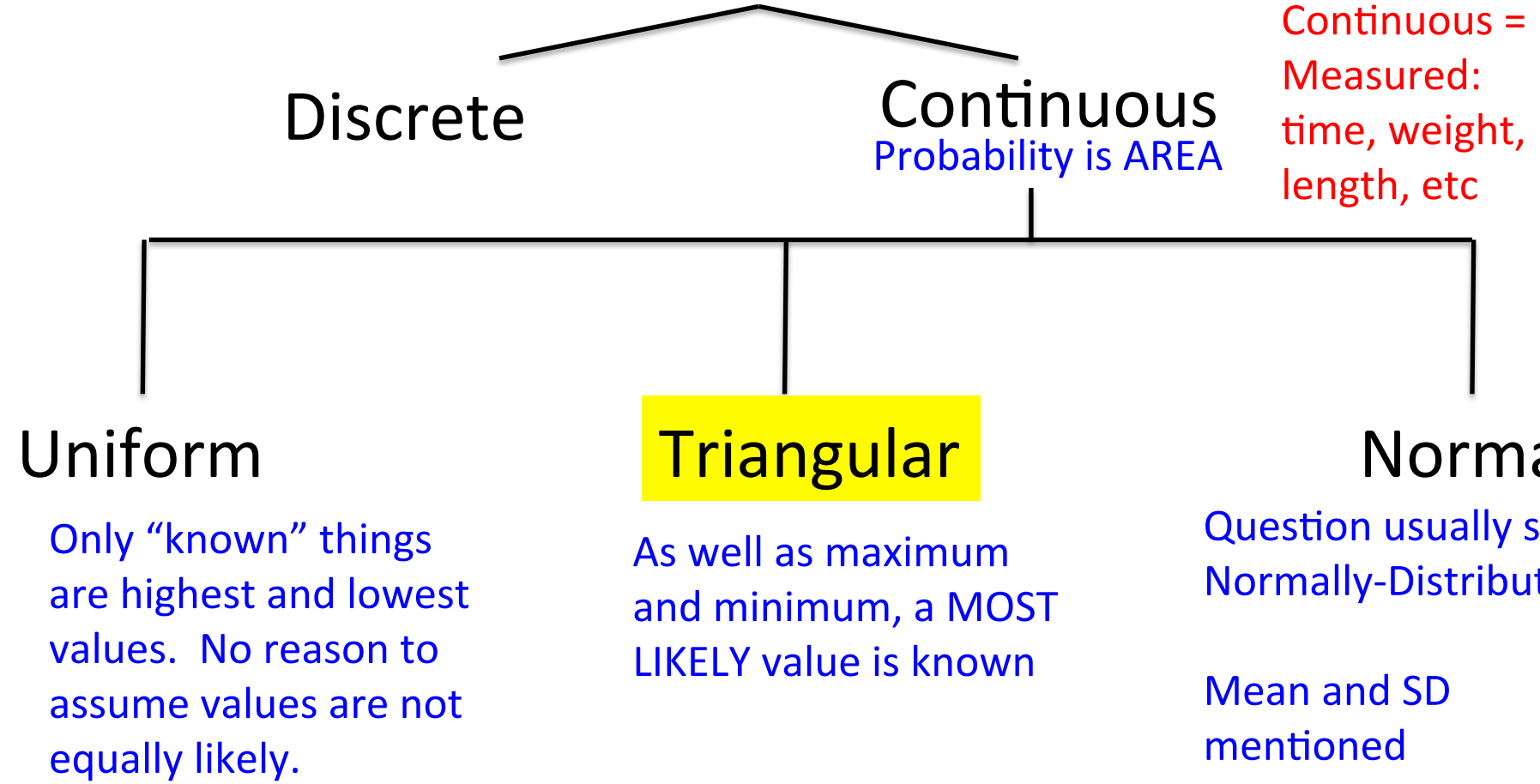
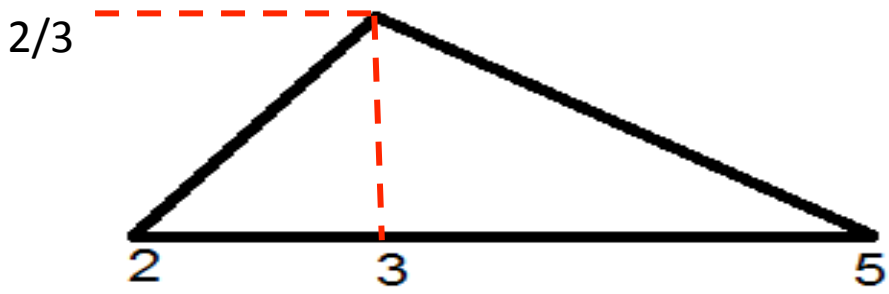

Discrete
Continuous
Probability is AREA
Continuous = Measured: time, weight, length, etc
Uniform
Only “known” things are highest and lowest values. No reason to assume values are not equally likely.
Triangular
As well as maximum and minimum, a MOST LIKELY value is known
Normal
Question usually says Normally-Distributed!
Mean and SD mentioned

Triangular distribution diagram setup

A parcel will take somewhere between 2 and 5 hours to be delivered. It is most likely to be delivered in 3 hours.



Width of triangle = 3

Area must be 1.
½ base x height = 1
½ of 3 x height = 1
Height = 1 / 1.5 = 2/3

In general, height = 1 ÷ (HALF base) or 2 ÷ base

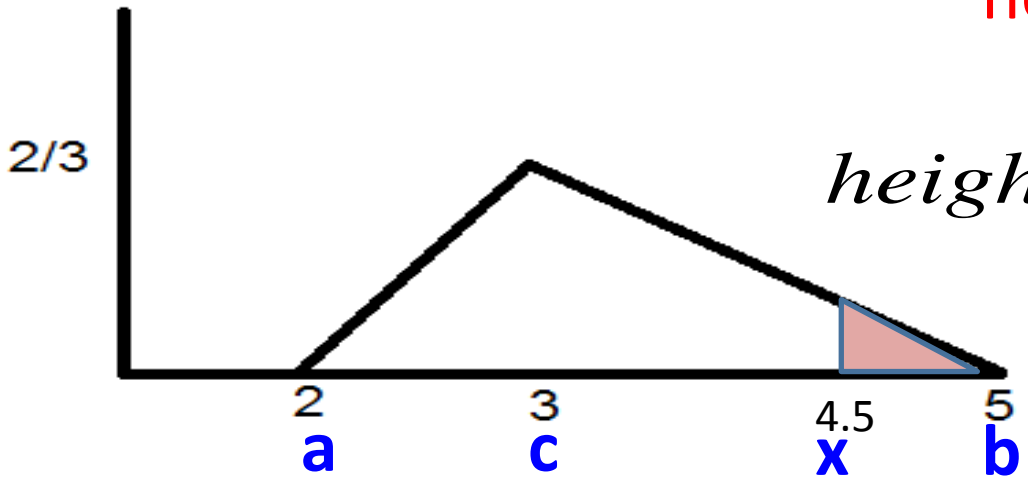
The height at any point on the triangle is given by this formula

$$f(x) = \begin{cases} 0, & x < a \\ \dfrac{2(x-a)}{(b-a)(c-a)}, & a \le x \le c \\ \dfrac{2(b-x)}{(b-a)(b-c)}, & c \le x \le b \\ 0, & x > b \end{cases}$$

Where a is lowest, c is peak, b is highest, x is the edge of the shading

What is the probability that the parcel will take longer than 4.5 hours?

Use the formula to find the height of the pink triangle.



$$height = \frac{2(5-4.5)}{(5-2)(5-3)} = \frac{1}{6}$$

$$f(x) = \begin{cases} 0, & x < a \\ \frac{2(x-a)}{(b-a)(c-a)}, & a \le x \le c \\ \frac{2(b-x)}{(b-a)(b-c)}, & c \le x \le b \\ 0, & x > b \end{cases}$$

x is in between c and b

Area = ½ x base x height
= ½ x ½ x 1/6
= 1/24 = 0.042

Steps to take in a triangle distribution

- Draw the triangle and calculate the height.
- Shade the area being described
- IDENTIFY THE TRIANGLE/S YOU CAN USE.
- Use the formula to find the heights of the triangles you can use.
- Calculate area of small triangle.
- *Finding the shaded area may involve a subtraction*

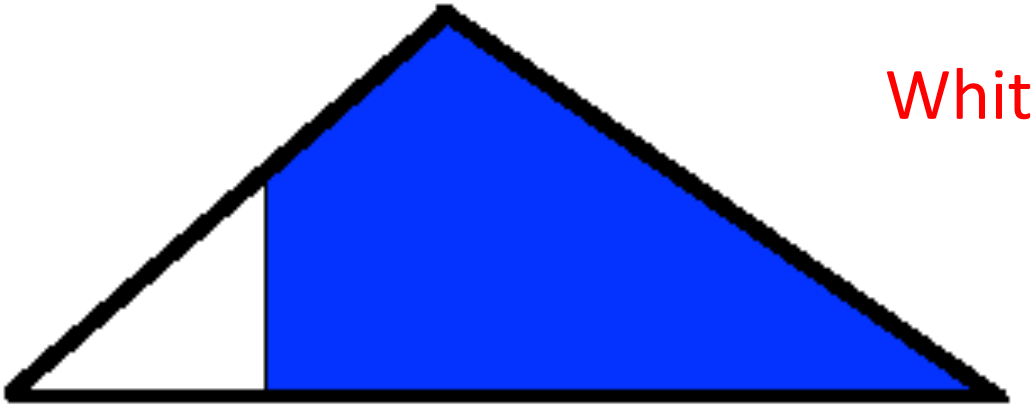
How would you find these areas?

You want the blue section

It's already a triangle

Answer will be
area of blue triangle

How would you find these areas?



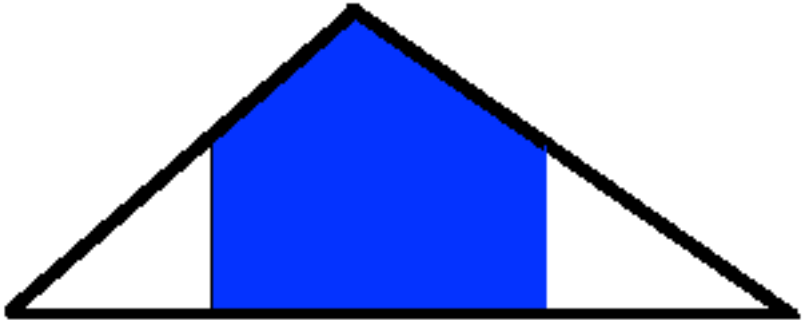
You want the blue section

White area is a triangle

Calculate white area

Answer will be
1 – white area

How would you find these areas?



You want the blue section

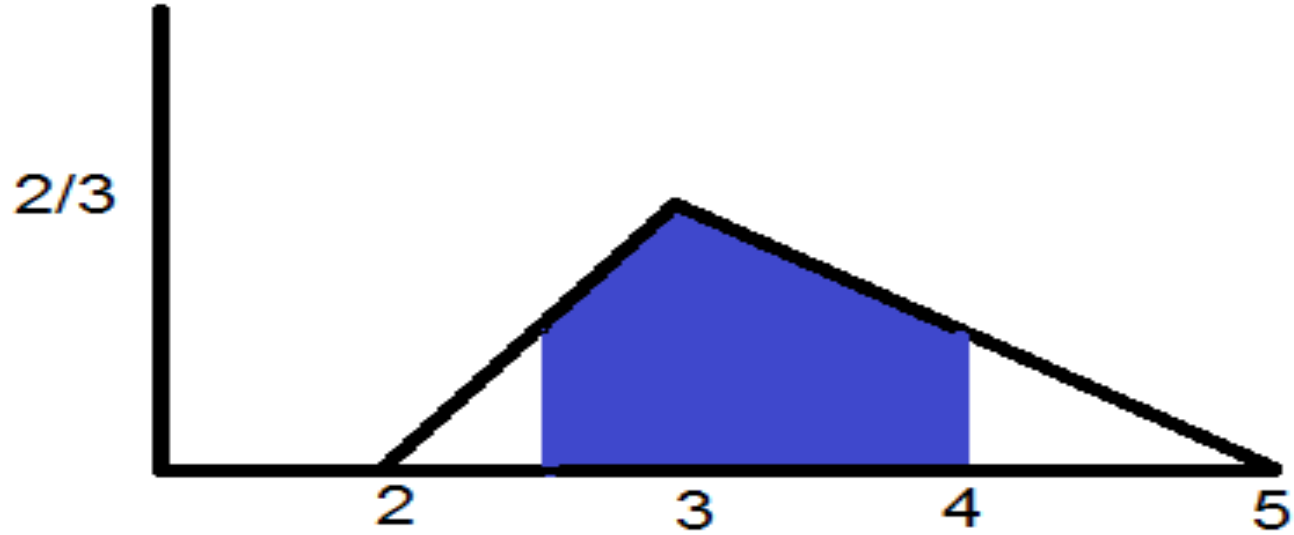
White triangles can be calculated

Answer will be
1 – BOTH white areas

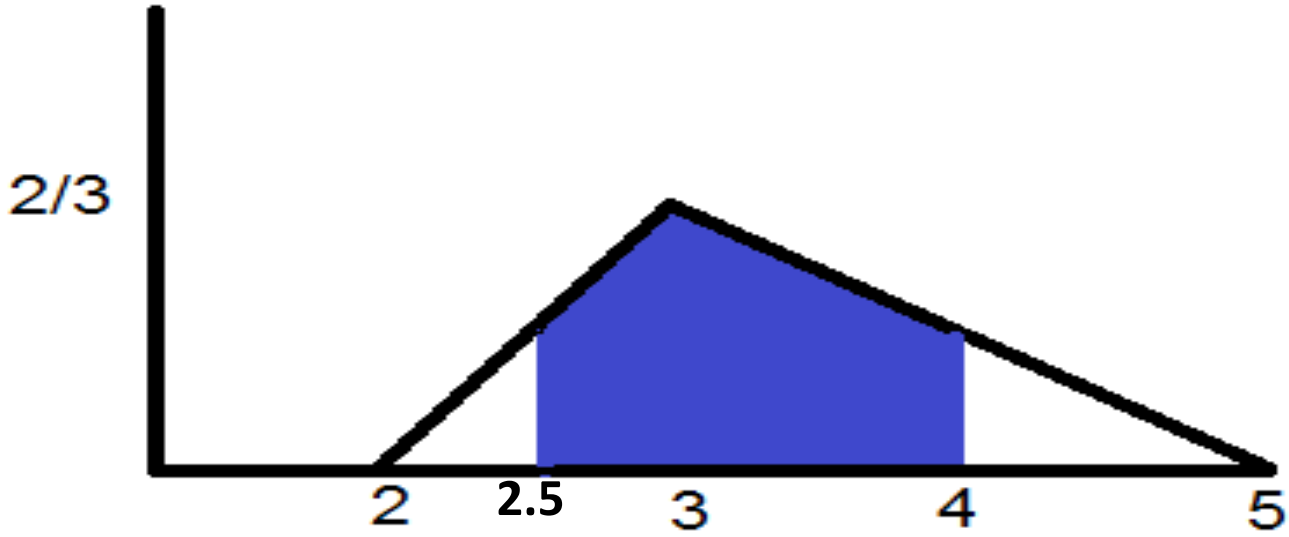
These are often Excellence!

Probability Q use similar triangles

Nasty one: What is the probability that the parcel takes between 2.5 and 4 hours?

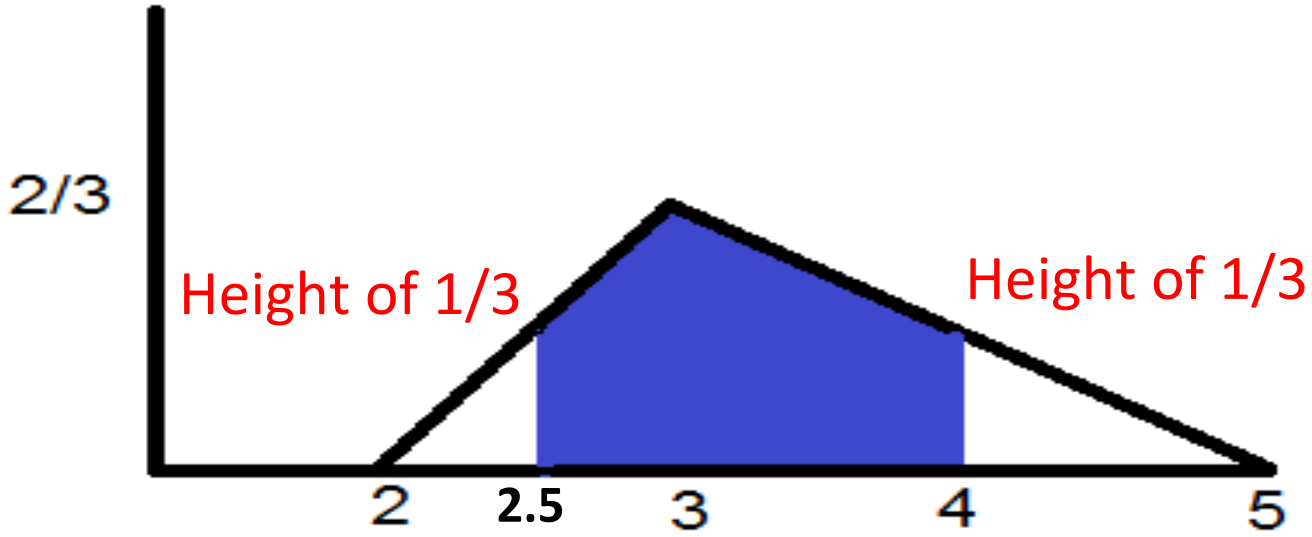


Working:



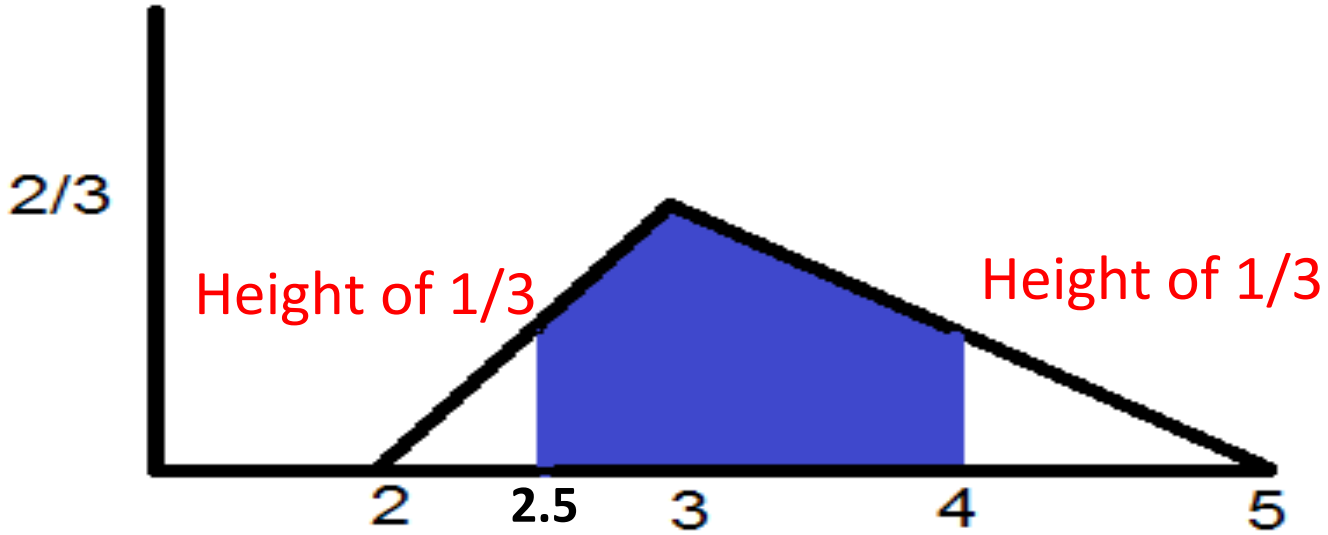
Need to subtract the two small white triangles from 1 (the total area). This will leave the blue shaded area

Working:



Heights are calculated using the formula

Working:



Area = 1 – (½ x ½ x 1/3) – (½ x 1 x 1/3)

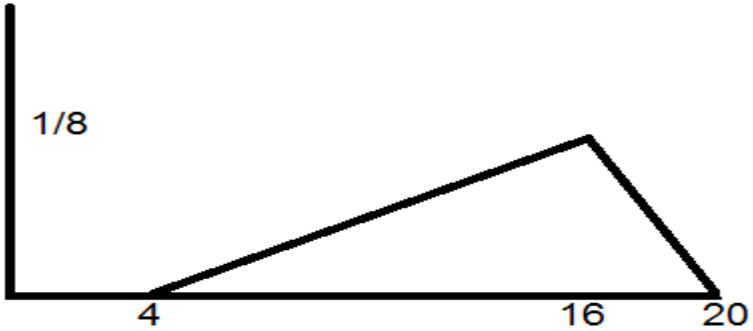
= 1 – 1/12 – 1/6 = 0.75

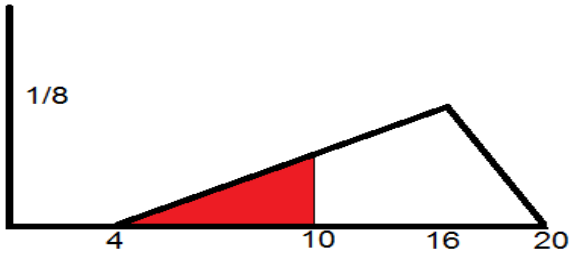
Try these:

It is known that a certain cat will sleep between 4 and 20 hours in a day, with the most likely time being 16 hours

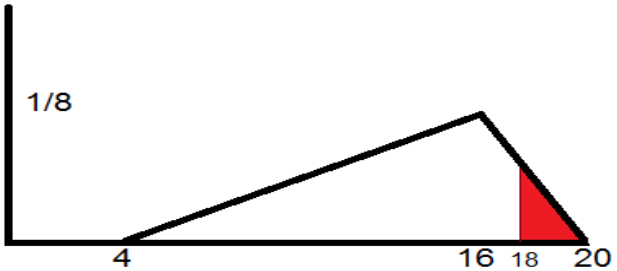
1. Draw the probability diagram. Work out the height
2. Use this to calculate the probability of a cat sleeping
    (a) Less than 10 hours
    (b) More than 18 hours
    (c) 6 – 16 hours
    (d) 10 – 17 hours

Answers

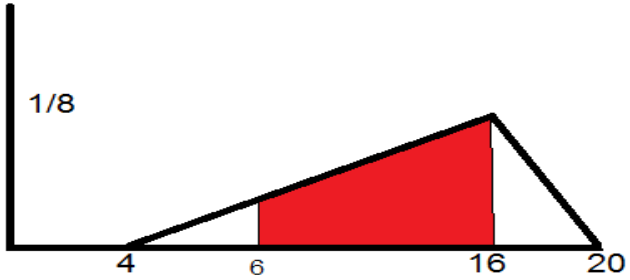




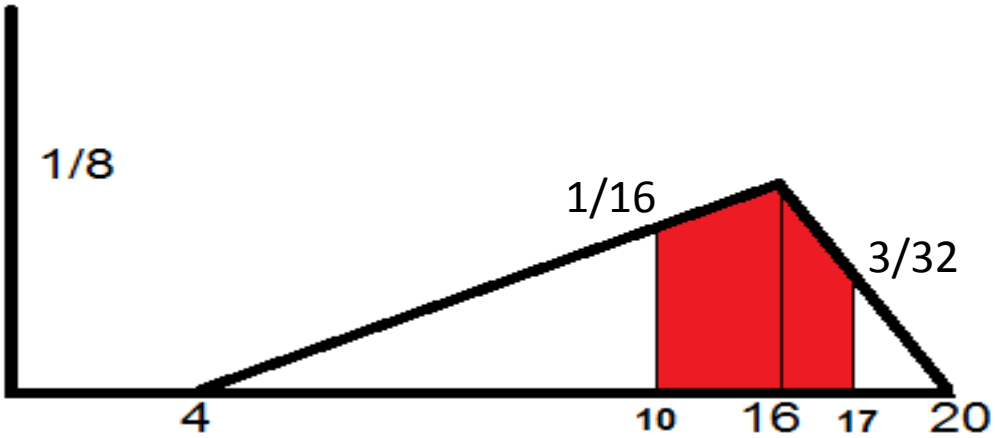
Area = 0.5 x 6 x 1/16 = 0.1875



Area = 0.5 x 2 x 1/16 = 0.0625



Area of triangle from 4-16 minus area of triangle from 4 – 6 = 0.73 (2 d.p.)



Area of triangle from 4 to 16 minus area of triangle from 4 to 10
PLUS
Area of triangle from 16 to 20 minus area of triangle from 17 to 20
= ½ of 12 x 1/8 – ½ of 6 x 1/6 + ½ of 4 x 1/16 – ½ of 3 x 3/32
= 0.234