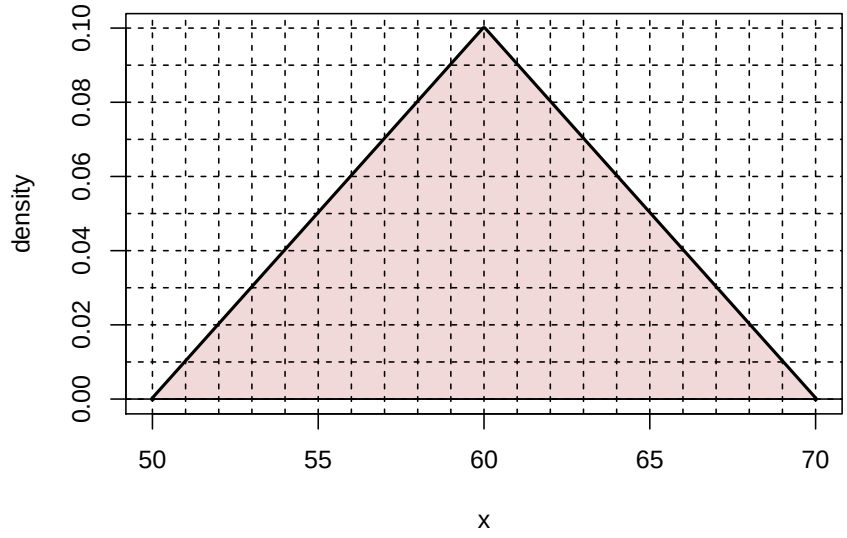
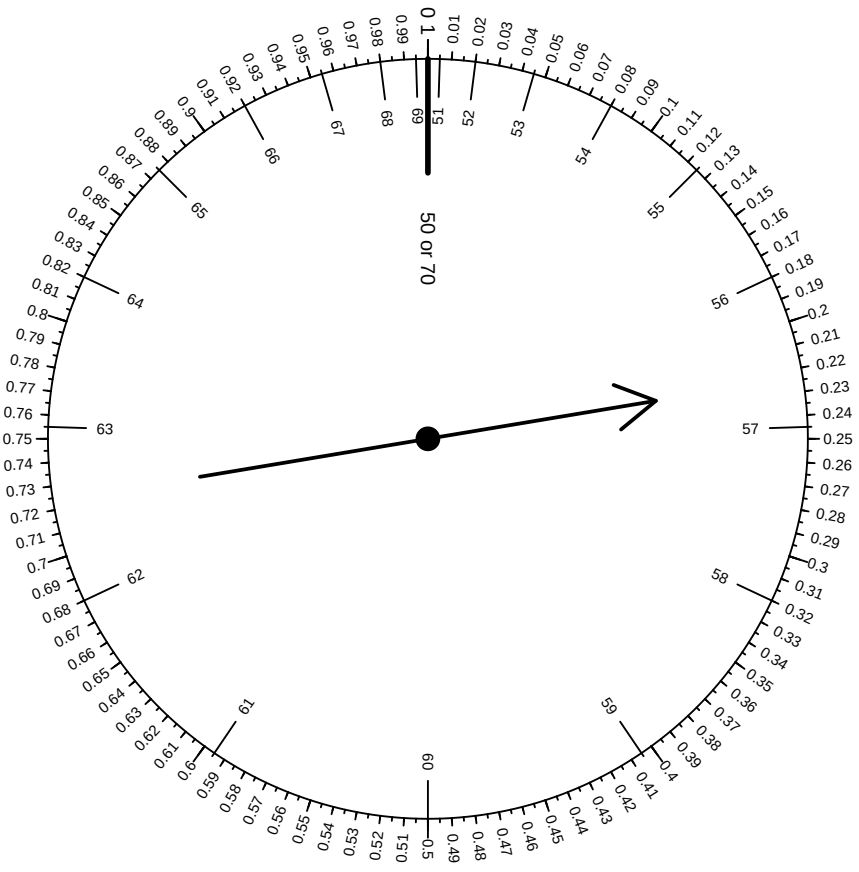
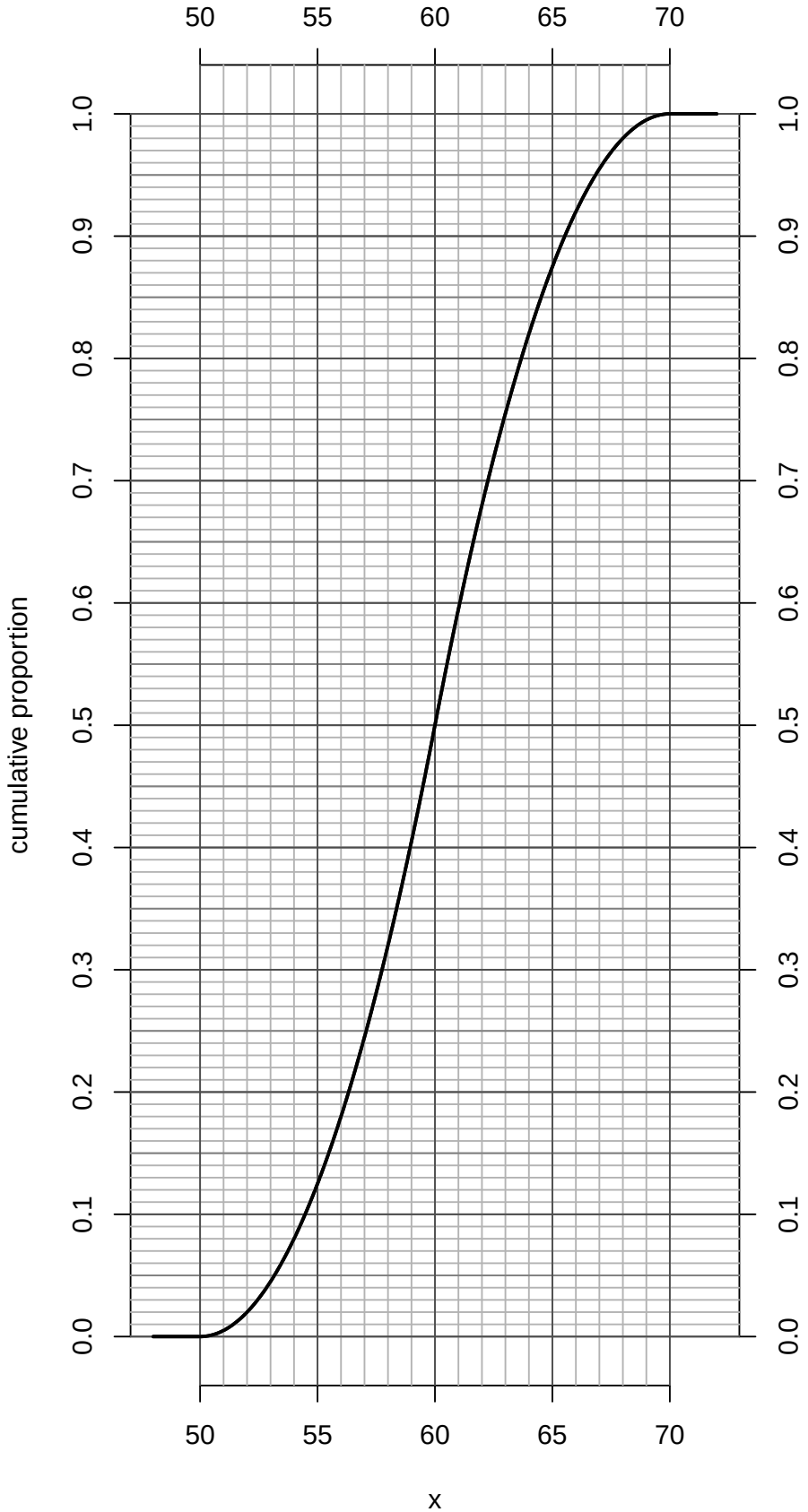
1. **Problem**
   A continuous random variable (spinner/random number generator/infinite population) can be visualized with a density curve, a spinner, and a cumulative curve.




50 or 70


50
55
60
65
70
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
cumulative proportion
x

(a) Evaluate prop[$\mathbf{x} < 68$]

(b) Evaluate prop[$\mathbf{x} > 54$]

(c) Evaluate prop[$|\mathbf{x} - 60| < 2$]

(d) Determine integer b such that prop[$\mathbf{x} < b$] $= 0.82$

(e) Determine integer b such that prop[$\mathbf{x} > b$] $= 0.82$

(f) Determine integer r such that prop[$|\mathbf{x} - 63| < r$] $= 0.42$

Solution
For each problem, you can use any of the visualizations. In short, the answers:

```
## 0.98 0.92 0.36 64 56 3
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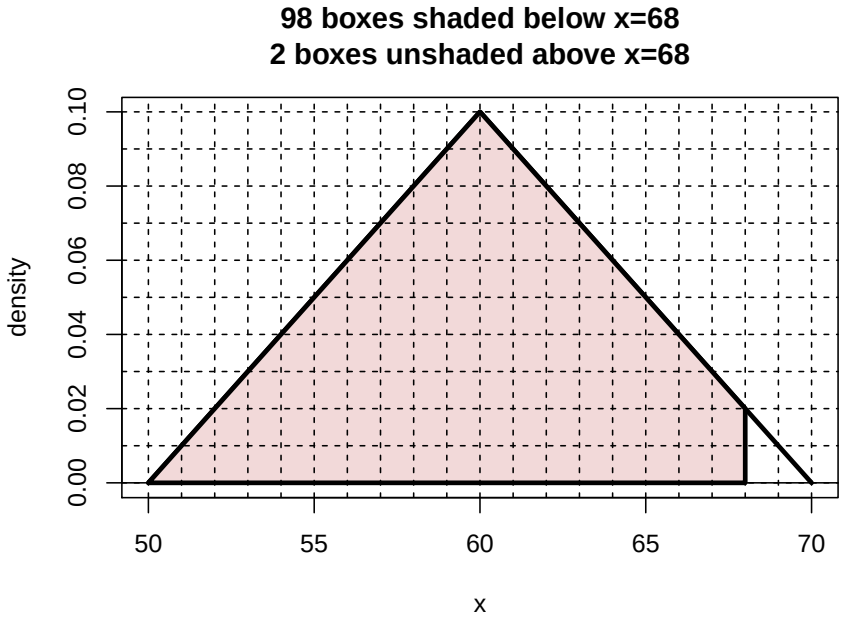
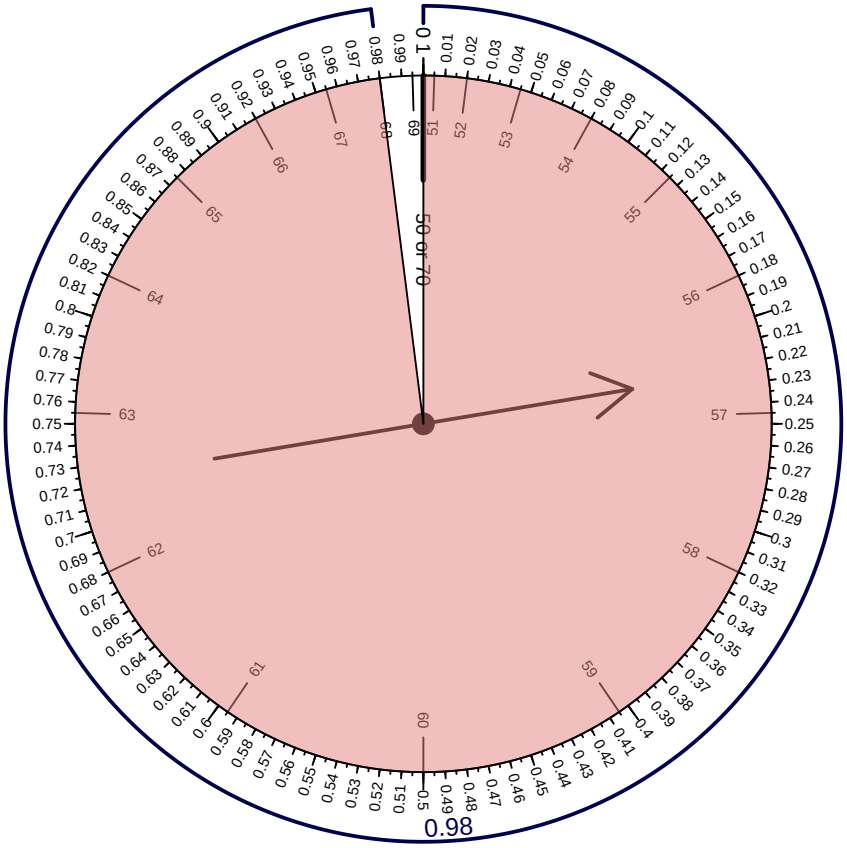
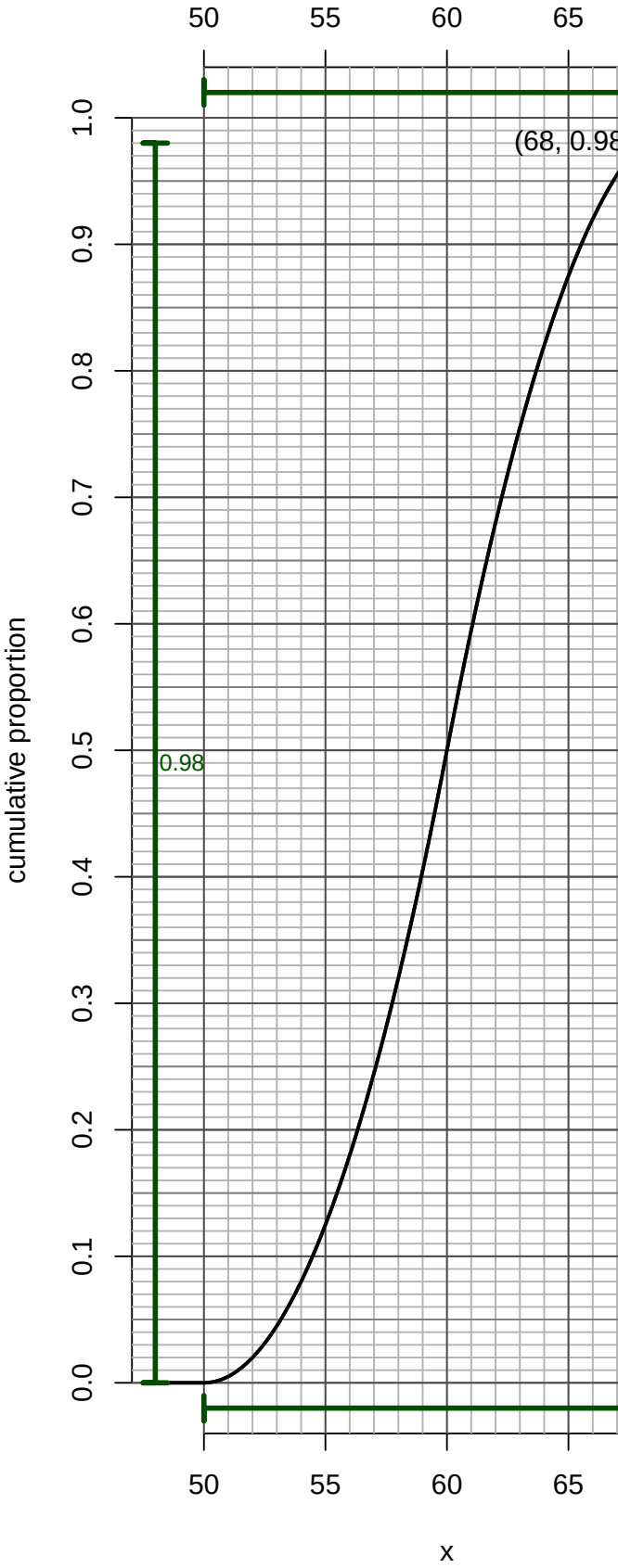
(a) The answer is 0.98 because prop[$\mathbf{x} < 68$] $= 0.98$. The following visualizations show this. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes, or find partial boxes that add to whole



boxes. On the spinner, you can determine the size of a region by using the outside tickmarks.

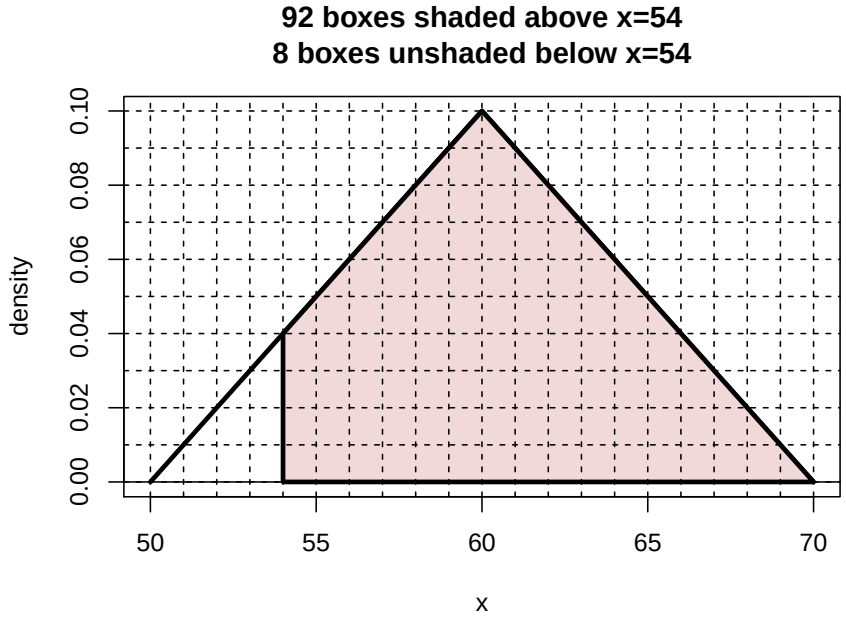


You need



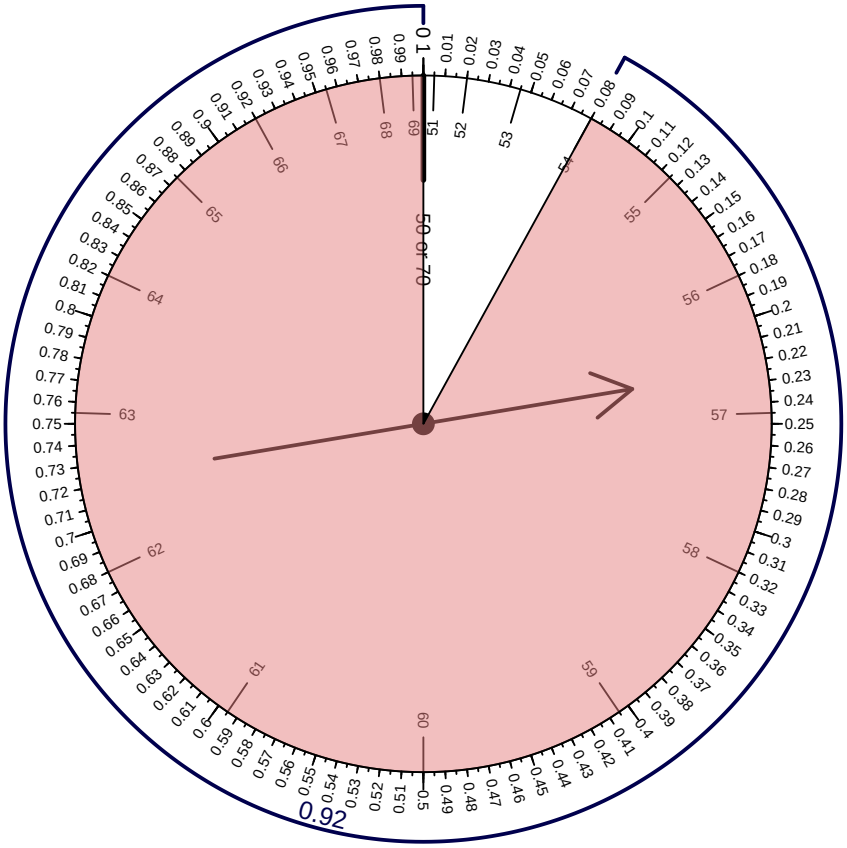
to read coordinates to use the cumulative curve.

(b) The answer is 0.92 because prop[$\mathbf{x} > 54$] = 0.92. The following visualizations show this. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes, or find partial boxes that add to whole



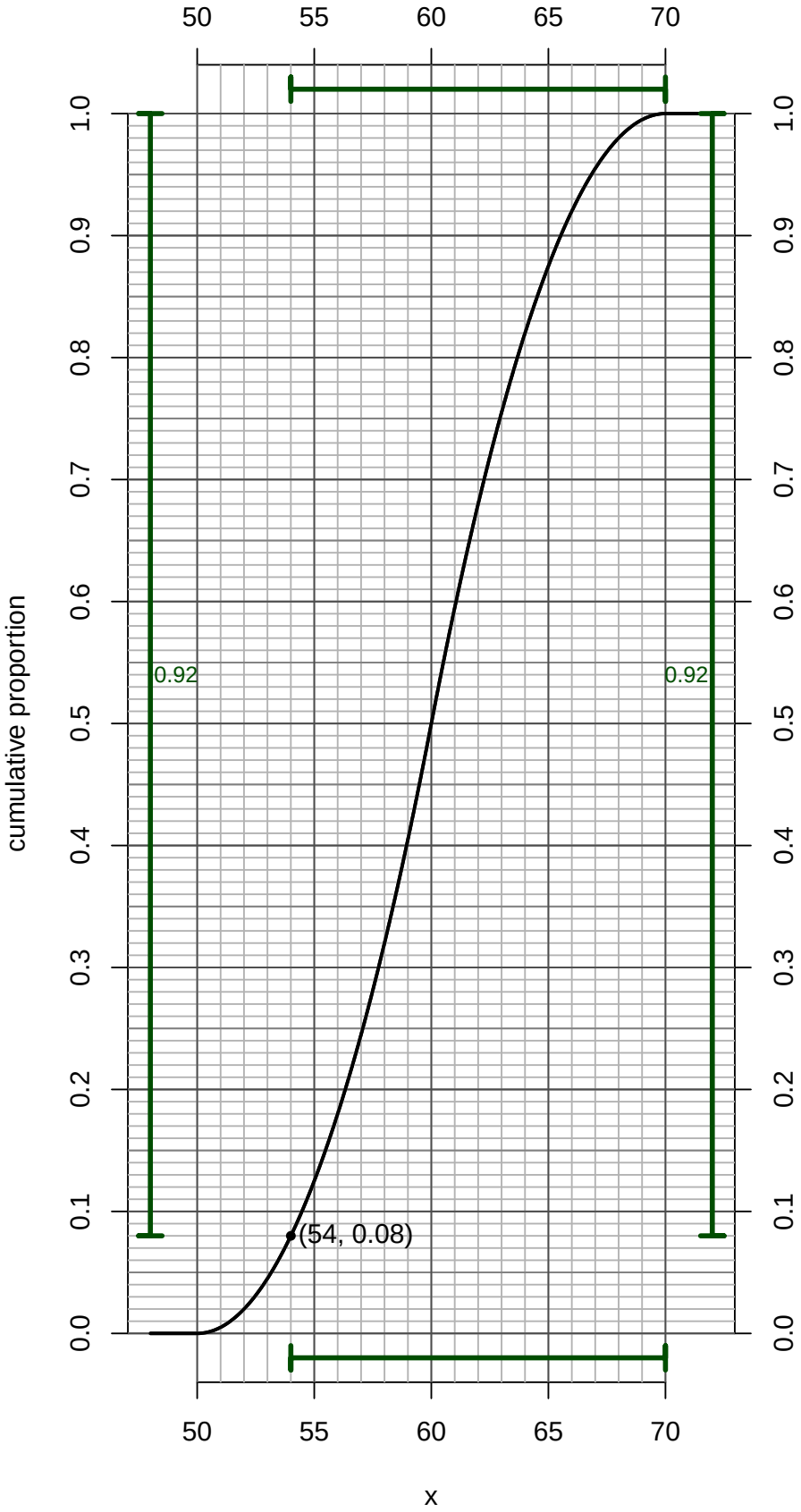
boxes. On the spinner, you can determine the size of a region by using the outside tickmarks.

$$1 - 0.08 = 0.92$$

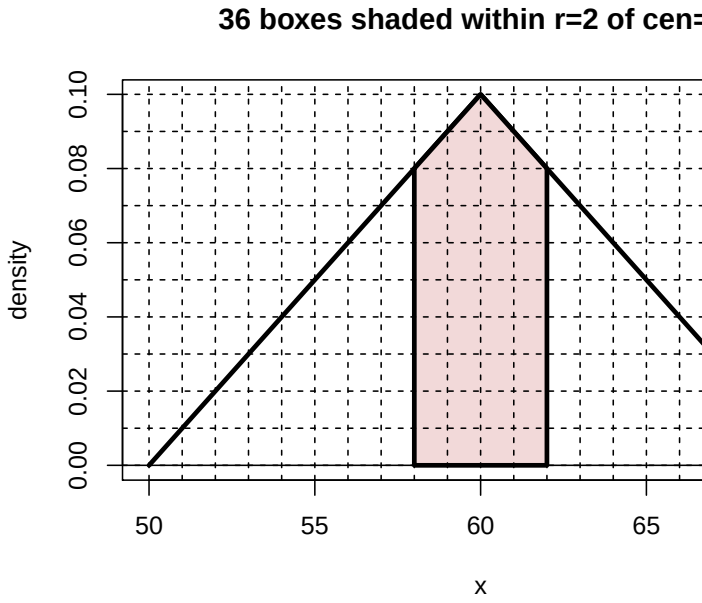


You need to read coordinates to use the cumulative curve.

$$1 - 0.08 = 0.92$$

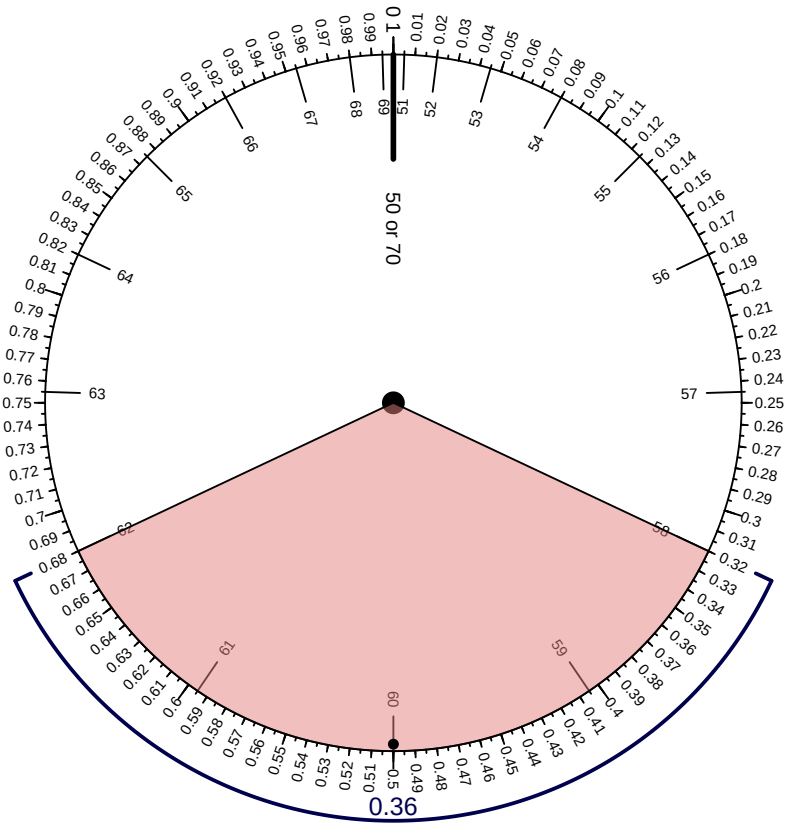

50
55
60
65
70
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
cumulative proportion
0.92
0.92
(54, 0.08)
x

(c) The answer is 0.36 because prop[$|\mathbf{x} - 60| < 2$] = 0.36. It helps to point out this interval has a center of 60 and a radius of 2, and thus a lower bound of 58 and an upper bound of 62. The following visualizations show this. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes,



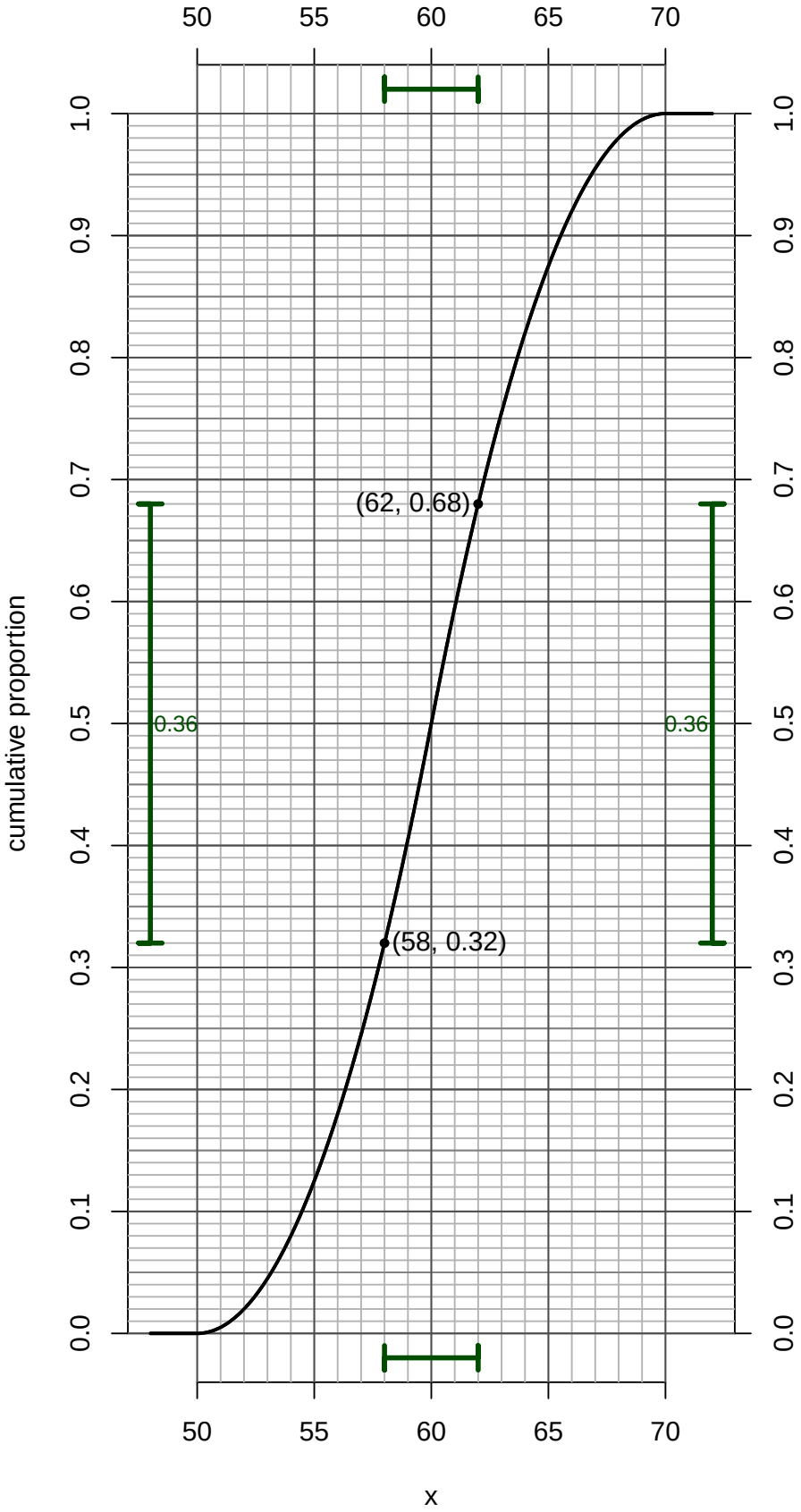
or find partial boxes that add to whole boxes.
On the spinner, you can determine the size of a region by using the outside tickmarks. The lower bound is at $x = 58$, which corresponds to a cumulative proportion of 0.32. The upper bound is at $x = 62$, which corresponds to a cumulative proportion of 0.68.

$$0.68 - 0.32 = 0.36$$

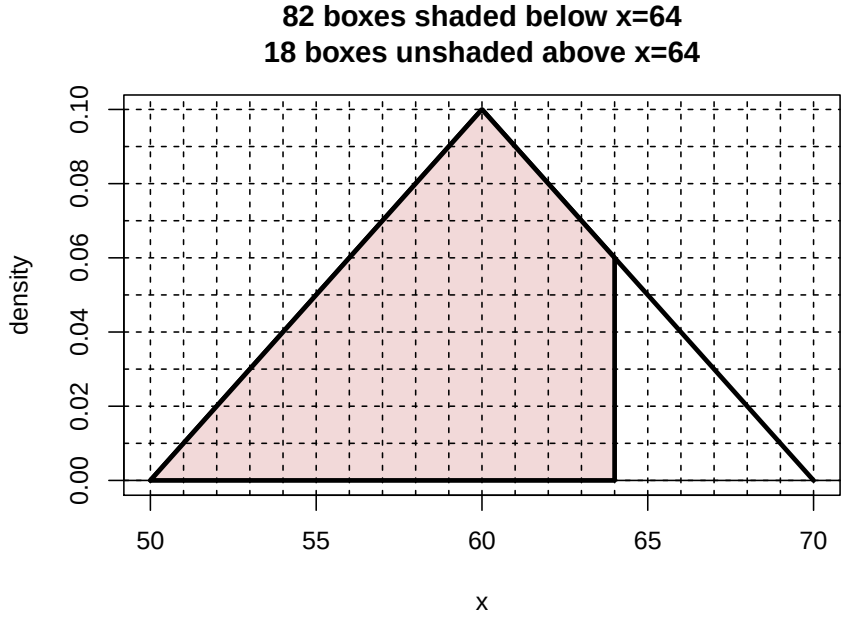


You need to read coordinates to use the cumulative curve. The lower bound is at $x = 58$, which corresponds to a cumulative proportion of 0.32. The upper bound is at $x = 62$, which corresponds to a cumulative proportion of 0.68.

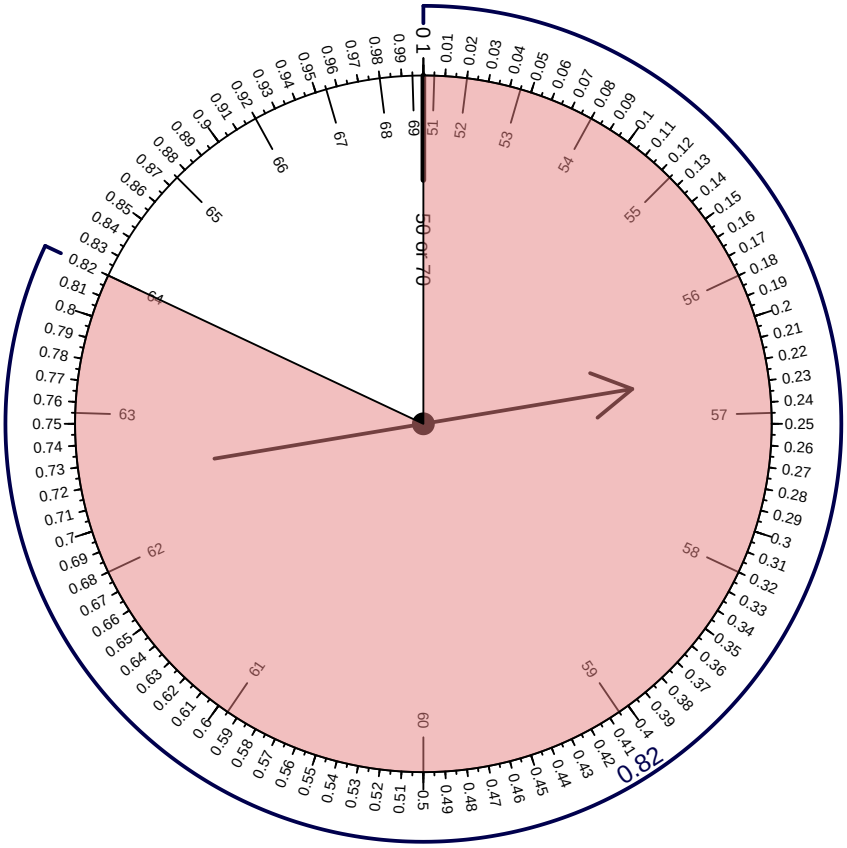
$$0.68 - 0.32 = 0.36$$


50
55
60
65
70
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
cumulative proportion
(62, 0.68)
(58, 0.32)
0.36
0.36
x

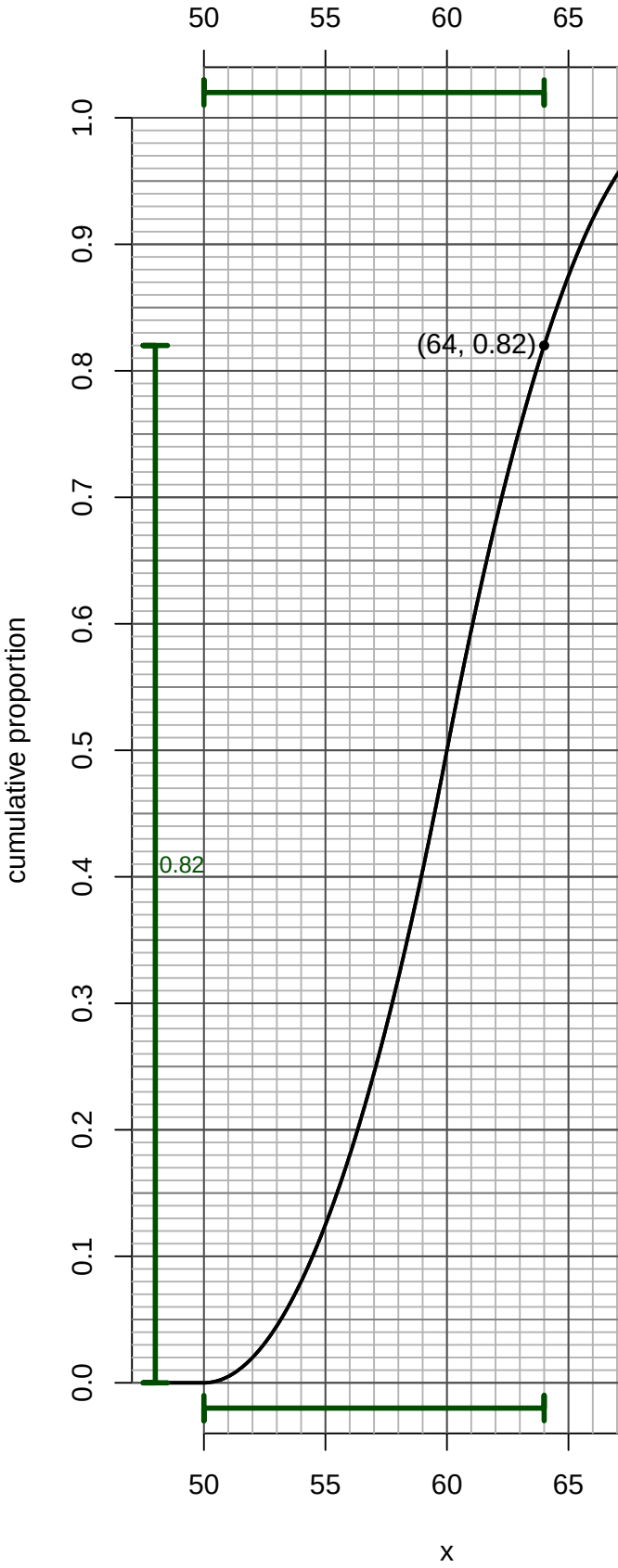
(d) The answer is 64 because prop[$\mathbf{x} < 64$] = 0.82. The following visualizations show this. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes, or find partial boxes that add to whole



boxes. On the spinner, you can determine the size of a region by using the outside tickmarks.

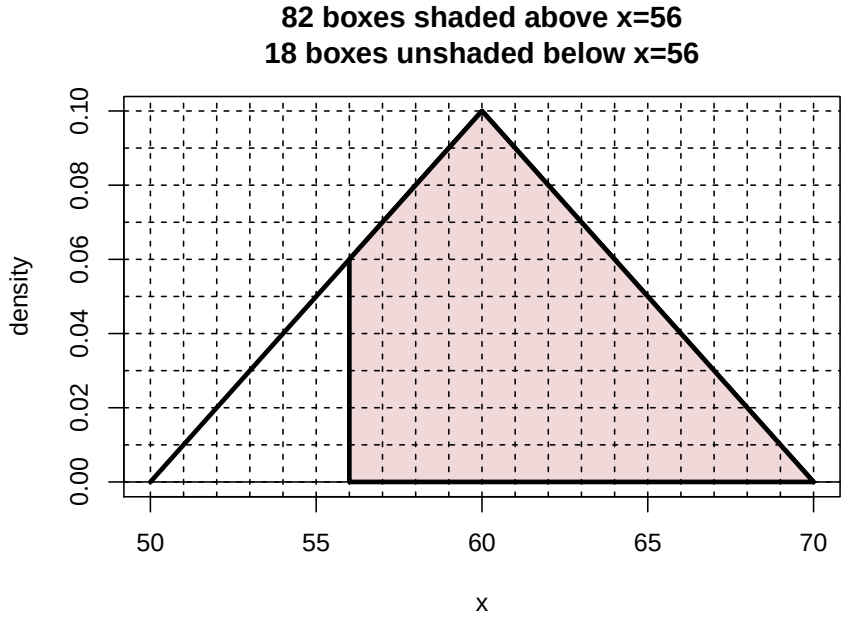


You need



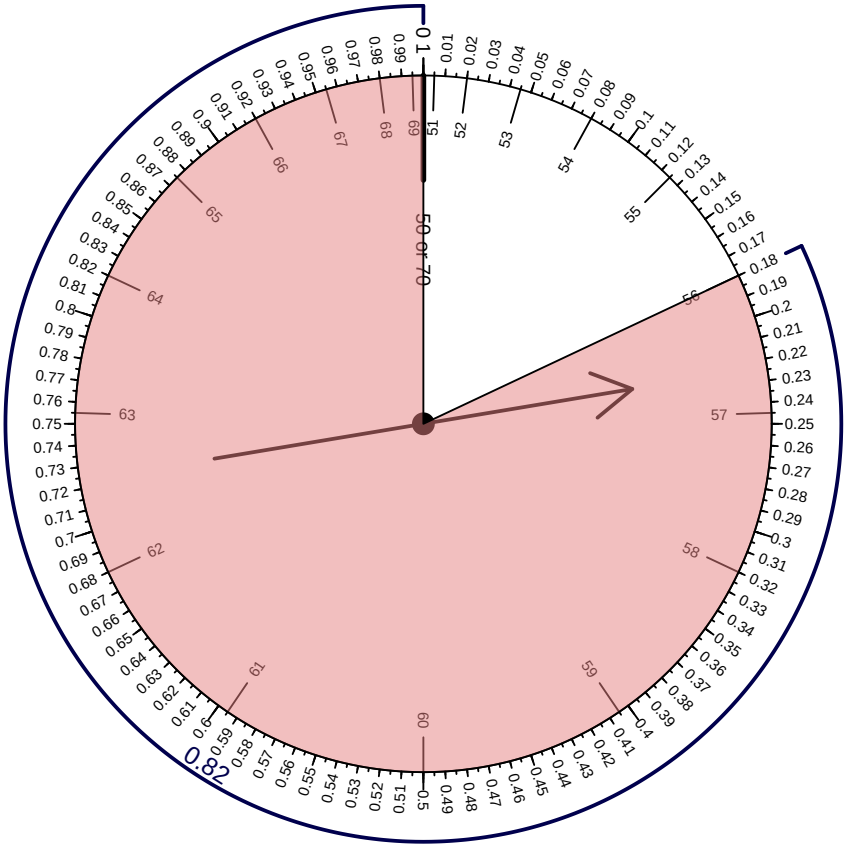
to read coordinates to use the cumulative curve.

(e) The answer is 56 because prop[$\mathbf{x} > 56$] = 0.82. The following visualizations show this. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes, or find partial boxes that add to whole



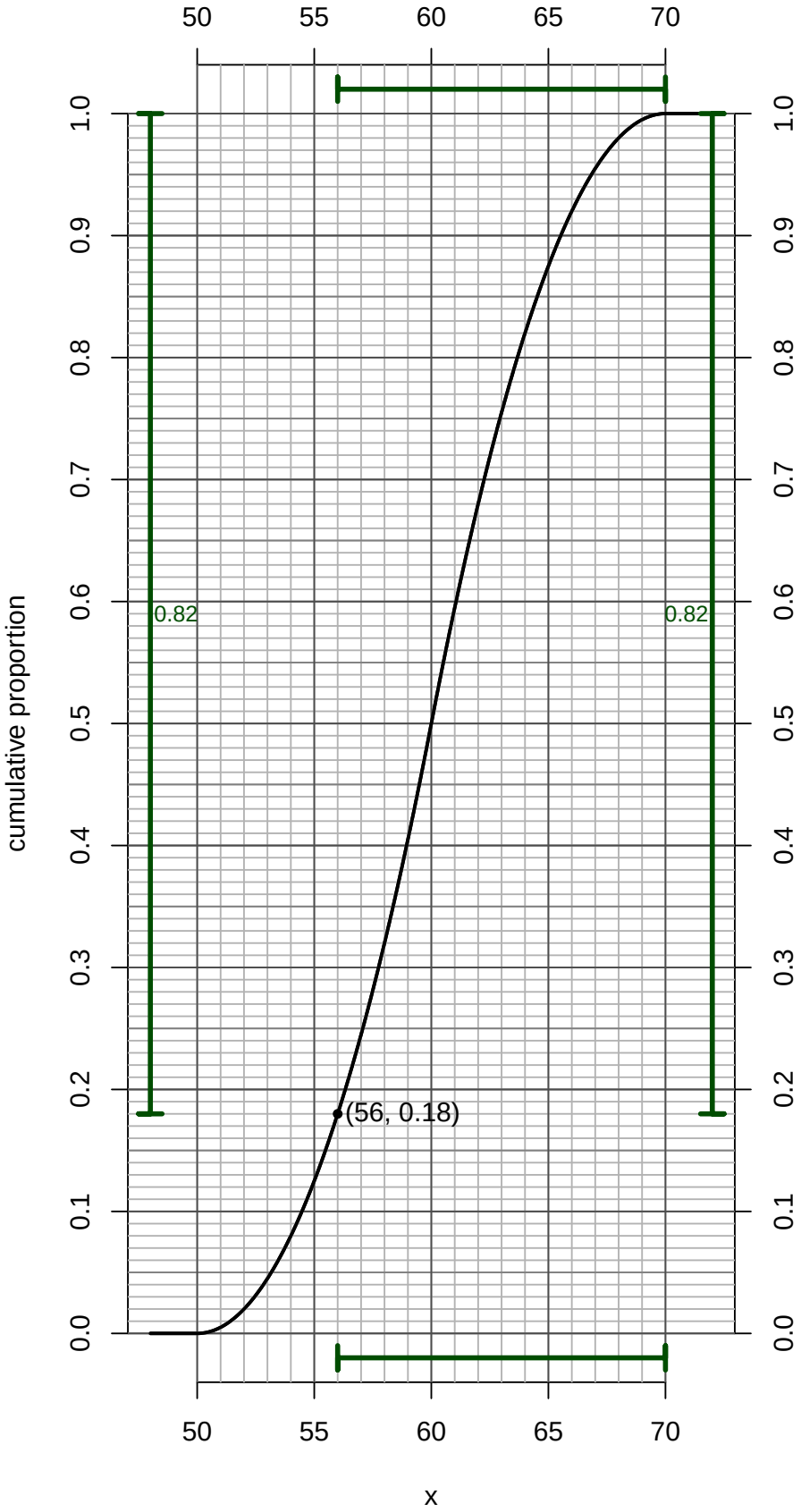
boxes. On the spinner, you can determine the size of a region by using the outside tickmarks.

$$1 - 0.18 = 0.82$$



You need to read coordinates to use the cumulative curve.

$$1 - 0.18 = 0.82$$


50
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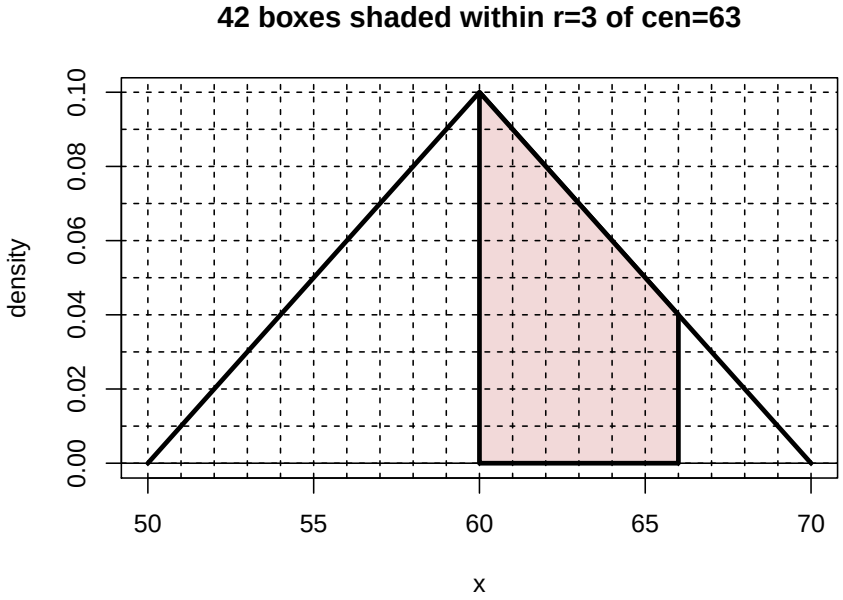
60
65
70
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
cumulative proportion
0.82
0.82
(56, 0.18)
x

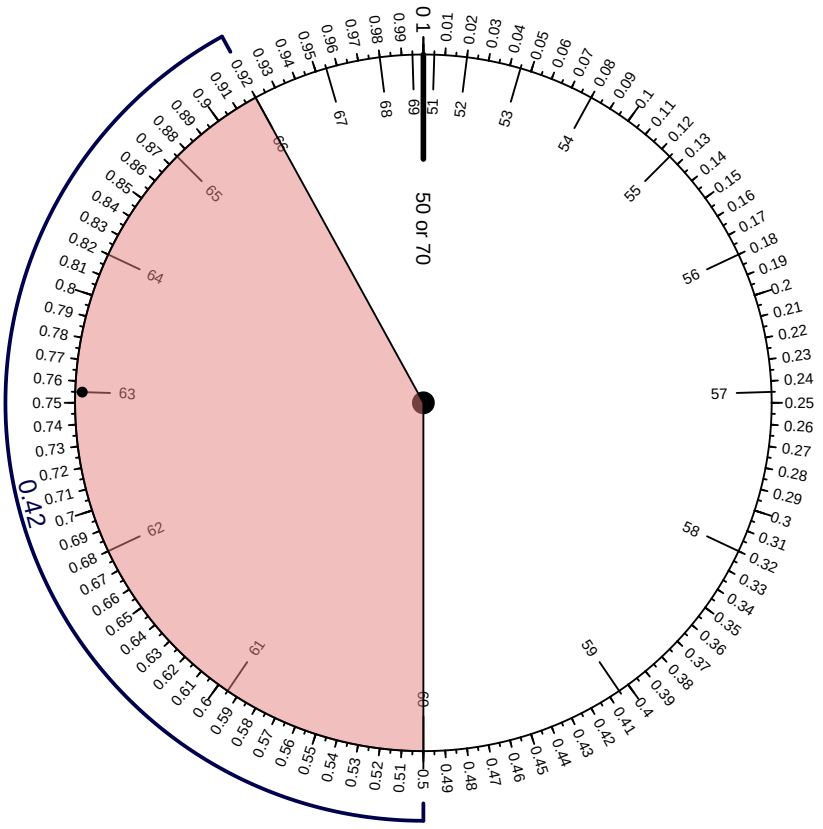
(f) The answer is 3 because prop$[|\mathbf{x} - 63| < 3] = 0.42$. You will need to guess and check to arrive at this answer. The following shows how to check after making the correct guess. This interval has a center of 63 and a radius of 3, and thus a lower bound of 60 and an upper bound of 66. The density curve can be used by counting percent boxes. Each box adds 0.01 to the proportion. You may need to count half boxes, or find partial boxes that



add to whole boxes.

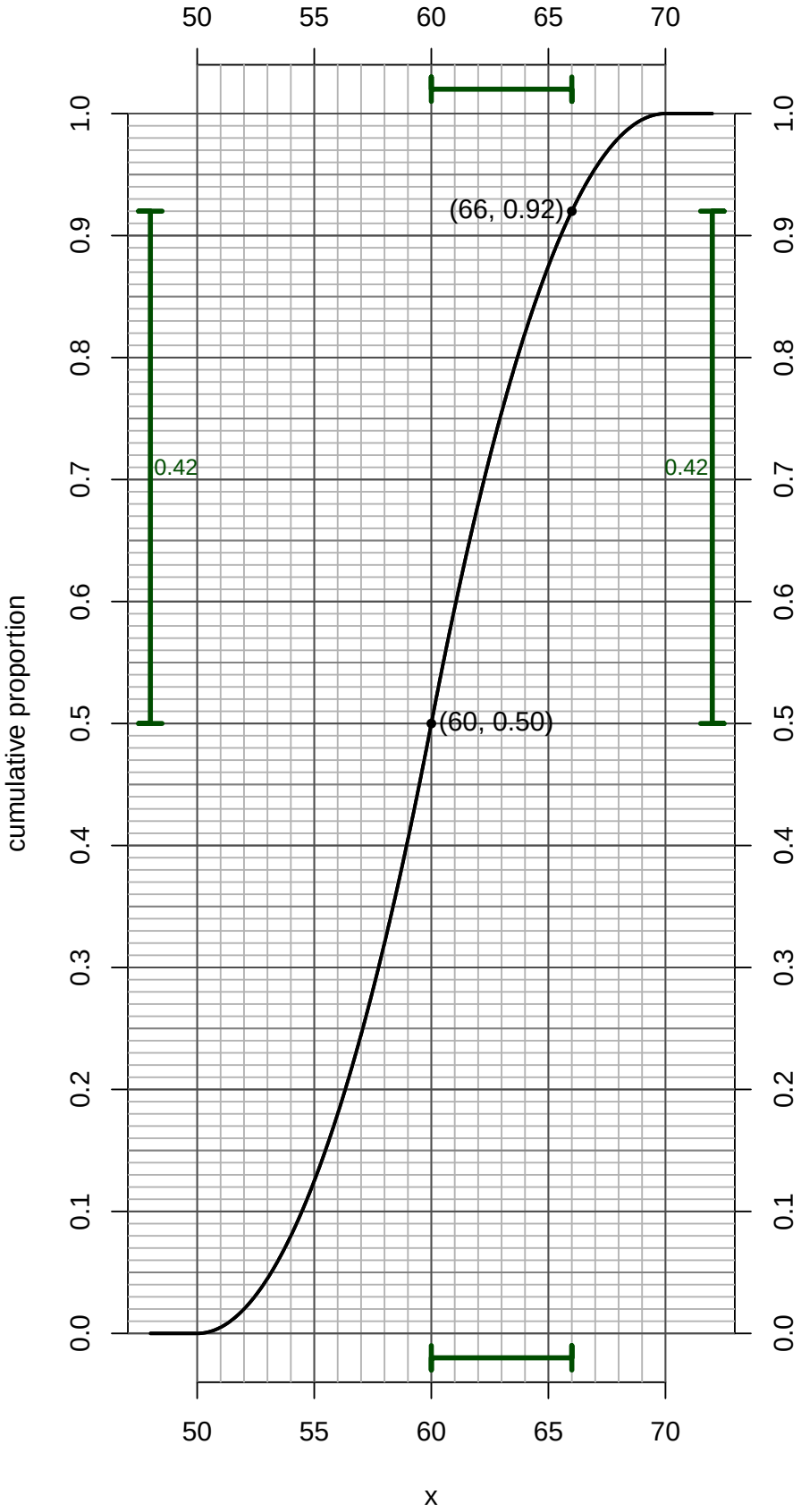
On the spinner, you can determine the size of a region by using the outside tickmarks. The lower bound is at $x = 60$, which corresponds to a cumulative proportion of 0.5. The upper bound is at $x = 66$, which corresponds to a cumulative proportion of 0.92.

$$0.92 - 0.5 = 0.42$$



You need to read coordinates to use the cumulative curve. The lower bound is at $x = 60$, which corresponds to a cumulative proportion of 0.5. The upper bound is at $x = 66$, which corresponds to a cumulative proportion of 0.92.

$$0.92 - 0.5 = 0.42$$


50
55
60
65
70
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
cumulative proportion
x
(66, 0.92)
(60, 0.50)
0.42
0.42