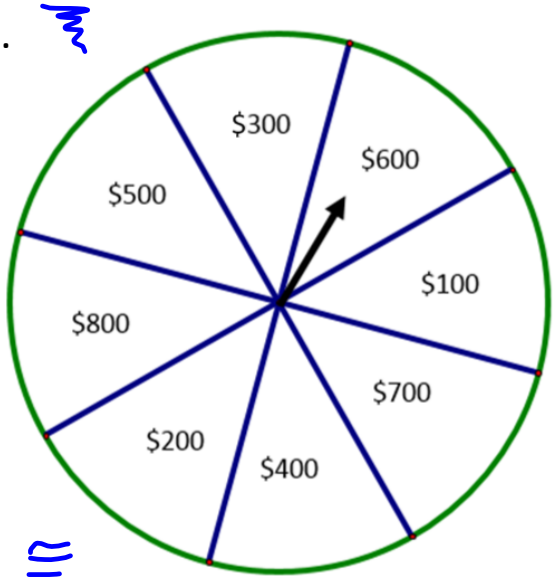
Section #1 – Basic Probability

Assume that the spinner to the right is fair. Find each of the following probabilities given one spin.



1. P($800) = $\frac{1}{8}$

2. P($400) = $\frac{1}{8}$

3. Does P($100) = P($800)? Yes

   Explain: Each section is ≅, therefore has = probability of happening.

4. P(at least $500) =

   P(500) or P(600) or P(700) or P(800)

   $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{4}{8} = \boxed{\frac{1}{2}}$

5. P(less than $200) =

   $P(100) = \frac{1}{8}$

6. P(at most $500) =

   P(500) + P(400) + P(300) + P(200) + P(100)

   $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{5}{8}$

Calculate the following probabilities given two spins

7. P(sum of $200)

Sample space: (100, 100)

$P(100 \text{ and } 100) = \frac{1}{8} \cdot \frac{1}{8} = \boxed{\frac{1}{64}}$

8. P(sum of at most $400)

Possible Sums	Sample Space
400	(100, 300) (300, 100) (200, 200)
300	(100, 200) (200, 100)
200	(100, 100)

P(400) or P(300) or P(200)

$P(300,100) + P(200,200) + P(100,300) + P(100,200) + P(200,100) + P(100,100)$

$= \left(\frac{1}{8}\cdot\frac{1}{8}\right) + \left(\frac{1}{8}\cdot\frac{1}{8}\right) + \left(\frac{1}{8}\cdot\frac{1}{8}\right) + \left(\frac{1}{8}\cdot\frac{1}{8}\right) + \left(\frac{1}{8}\cdot\frac{1}{8}\right) + \left(\frac{1}{8}\cdot\frac{1}{8}\right)$

$= \frac{1}{64} + \frac{1}{64} + \frac{1}{64} + \frac{1}{64} + \frac{1}{64} + \frac{1}{64} = \frac{6}{64}$

$= 3/32$

9. P(sum of at least $1500)

Possible Sums	Sample Space
1500	(700, 800) (800, 700)
1600	(800, 800)

P(sum 1500) or P(sum 1600)

$= P(700, 800) + P(800, 700) + P(800, 800)$

$= \left(\frac{1}{8} \cdot \frac{1}{8}\right) + \left(\frac{1}{8} \cdot \frac{1}{8}\right) + \left(\frac{1}{8} \cdot \frac{1}{8}\right)$

$= \frac{1}{64} + \frac{1}{64} + \frac{1}{64} = \boxed{\frac{3}{64}}$

10. P(sum of at least $300)

* Too many to list!

$P(\text{event}) + P\left(\begin{matrix}\text{complement}\\ \text{of event}\end{matrix}\right) = 1$

$P(\text{event}) = 1 - P\left(\begin{matrix}\text{complement}\\ \text{of event}\end{matrix}\right)$

Complement of event: sum less 300.

P(less than 300):

$P(200) = P(100, 100) = \frac{1}{8} \cdot \frac{1}{8} = \frac{1}{64}$

$\therefore P(\text{at least } 300) = 1 - \frac{1}{64} = \boxed{\frac{63}{64}}$

11. P(sum of \$200 | first spin lands on \$100)

"given that"

Sample Space: (100, 100)

$P(100 \text{ on } 1^{st} \text{ spin}) = 1$

$P(100 \text{ on } 2^{nd} \text{ spin}) = \frac{1}{8}$

$\therefore P(100 \underline{\text{and}} 100) = 1 \cdot \frac{1}{8} = \boxed{\frac{1}{8}}$

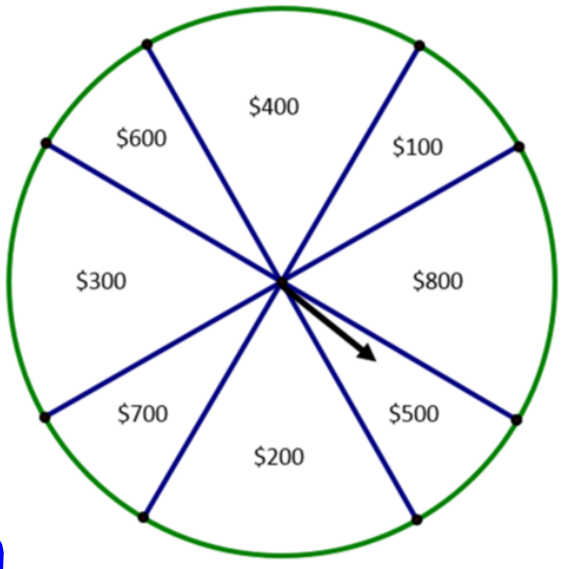
12. P(sum of at least \$1000 | 1st spin lands on 800)

$= 1 - P\left(\begin{matrix}\text{Sum less} \\ \text{than 1000}\end{matrix} \middle| 1^{st} \text{ spin is } 800\right)$

$= 1 - P(800, 100)$

$= 1 - \left(1 \cdot \frac{1}{8}\right) = 1 - \frac{1}{8} = \boxed{\frac{7}{8}}$

In the new spinner to the right, assume that the \$100, \$500, \$700 and \$600 regions are half the size of the \$800, \$200, \$300 and \$400 regions.



13. P(\$800) = $\frac{2}{12} = \frac{1}{6}$

14. P(\$400) = $\frac{2}{12} = \frac{1}{6}$

15. Does P(\$100) = P(\$800)? No!

Explain: The areas or each sections are not $\cong$.

16. P(at least \$500) =

$P(500) + P(600) + P(700) + P(800)$

$\frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{2}{12} = \frac{5}{12}$

17. P(less than \$200) =

$P(100) = \frac{1}{12}$

18. P(at most \$500) =

$P(500) + P(400) + P(300) + P(200) + P(100)$

$= \frac{1}{12} + \frac{2}{12} + \frac{2}{12} + \frac{2}{12} + \frac{1}{12} = \frac{8}{12} = \boxed{\frac{2}{3}}$

Calculate the following probabilities given two spins

19. P(sum of $200)

Sample Space: (100, 100)

P(100 <u>and</u> 100)

$= \frac{1}{12} \cdot \frac{1}{12} = \boxed{\frac{1}{144}}$

20. P(sum of at most $400)

possible sums	Sample Space
400	(100, 300) (200, 200) (300, 100)
300	(100, 200) (200, 100)
200	(100, 100)

$P(100,300) + P(200,200) + P(300,100) + P(100,200) + P(200,100) + P(100,100)$

$= \left(\frac{1}{12} \cdot \frac{2}{12}\right) + \left(\frac{2}{12} \cdot \frac{2}{12}\right) + \left(\frac{2}{12} \cdot \frac{1}{12}\right) + \left(\frac{1}{12} \cdot \frac{2}{12}\right) + \left(\frac{2}{12} \cdot \frac{1}{12}\right) + \left(\frac{1}{12} \cdot \frac{1}{12}\right)$

$= \left(\frac{2}{144}\right) + \left(\frac{4}{144}\right) + \left(\frac{2}{144}\right) + \left(\frac{2}{144}\right) + \left(\frac{2}{144}\right) + \left(\frac{1}{144}\right)$

$= \frac{13}{144}$

21. P(sum of at least $1500)

Possible Sums	Sample Space
1500	(700, 800) or (800, 700)
1600	(800, 800)

$$P(700,800)+P(800,700)+P(800,800)$$

$$=\left(\frac{1}{12}\cdot\frac{2}{12}\right)+\left(\frac{2}{12}\cdot\frac{1}{12}\right)+\left(\frac{2}{12}\cdot\frac{2}{12}\right)$$

$$=\frac{2}{144}+\frac{2}{144}+\frac{4}{144}=\frac{8}{144}=\boxed{\frac{1}{18}}$$

22. P(sum of at least $300)

$$P(\text{event})=1-P\left(\begin{matrix}\text{complement}\\ \text{of event}\end{matrix}\right)$$

$$P(\text{less } 300)=P(200)=P(100,100)$$

$$=\frac{1}{12}\cdot\frac{1}{12}=\frac{1}{144}$$

$$\therefore (P@\text{least } 300)=\left(1-\frac{1}{144}\right)=\boxed{\frac{143}{144}}$$

23. P(sum of $200 | first spin lands on $100)

$P(100 \text{ on } 1^{st} \text{ spin}) = 1$

$P(100 \text{ on } 2^{nd} \text{ spin}) = \frac{1}{12}$

$\therefore 1 \cdot \frac{1}{12} = \boxed{\frac{1}{12}}$

24. P(sum of at least $1000 | 1st spin lands on 800)

$1 - P\left(\begin{matrix}\text{less than} \\ 1000\end{matrix} \,\middle|\, 1^{st} \text{ spin } 800\right)$

$1 - P(800, 100)$

$1 - \left(1 \cdot \frac{1}{12}\right) = \boxed{\frac{11}{12}}$

In this last spinner, we are not given any informationabout the areas of each section.

25. How could we determine the probability of landing on each individual amount?

26. Determine each of the following probabilities:

P($100) = $\frac{60}{360} = \frac{1}{6}$

P($200) = $\frac{75}{360} = \frac{5}{24}$

P($300) = $\frac{55}{360} = \frac{11}{72}$

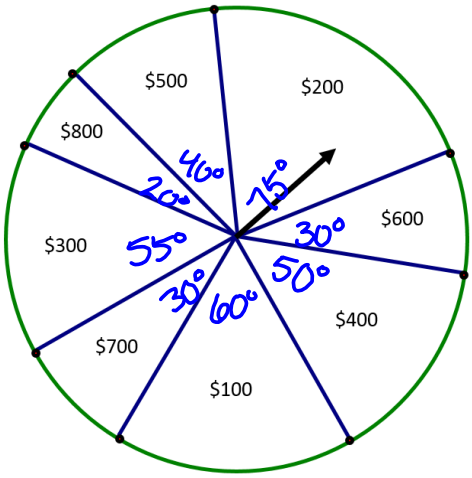
P($400) = $\frac{50}{360} = \frac{5}{36}$

P($500) = $\frac{40}{360} = \frac{1}{9}$

P($600) = $\frac{30}{360} = \frac{1}{12}$

P($700) = $\frac{1}{12}$

P($800) = $\frac{1}{18}$



Calculate the following based on one spin:

27. P(at least $500)

28. P(less than $200)

29. P(at most $500)

Calculate the following based on two spins:

30. P(a sum of $200)

31. P(a sum of at most $300)

32. P(at least $1500)