Exercise Solutions

1. (a) $36^\circ = \frac{360^\circ}{n} \to n = 10$ so this is a decagon.
   (b) $45^\circ = \frac{360^\circ}{n} \to n = 8$ so this is an octagon.
   (c) $140^\circ = \frac{(n-2)180^\circ}{n} \to n = 9$ so this is a nonagon.

2. (a) The number of ways to order 37 people is P(37,37)=37!.
   (b) Since the positions have distinct salaries, this is a permutation. We have P(37,5)= $37 \cdot 36 \cdot 35 \cdot 34 \cdot 33$.
   (c) The positions are not distinct, so the order doesn't matter. We have C(37,5)= $\frac{37 \cdot 36 \cdot 35 \cdot 34 \cdot 33}{5!}$.

3. There exists curves which are not simple nor closed like a spiral. A curve which is closed but not simple is a figure eight. A curve which is simple but not closed could be the letter W. A circle is an example of a simple closed curve.

4. See the textbook.

5. (a) Use the Multiplicative Principle of Counting. Because repetition is allowed choosing each digit, our events of choosing the first digit, second digit, and so on are independent. We have 10 choices for the first digit, i.e. the numbers $0, 1, 2, \ldots, 9$. Similarly, we have 10 choices for each of the other digits, because repetition is allowed. That is $10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 10^5$.
   (b) Use the Multiplicative Principle again but not choosing the 2nd digit is not independent of the first. We have $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6$ ways to choose the number.
   (c) Use Multiplicative Principle. We can place the 2 ones C(5,2) ways. After this we can place the 1 two C(3,1) ways. Then we can place the 2 sevens C(2,2) ways. That is $C(5,2) \cdot C(3,1) \cdot C(2,2) = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2!1!2!} = \frac{5!}{2!2!1!}$.
   (d) We place the 2 twos C(5,2) ways. We can place the other digits 10 ways each, that is 10^3. So we have $C(5,2) \cdot 10^3 = \frac{5 \cdot 4 \cdot 10^3}{2!} = 10^4$.

6. A circle is not a polygon. It is not formed from line segments which is required by the definition of polygon.

7. (a) The first statement "Rectangles are always square" is false. A counterexample is perhaps the border of a piece of notebook paper. The second statement "Rhombuses are never squares" is also false. A rhombus with 90° angles is a square. The third statement is true.
   (b) One nice way is to use a Venn diagram. See the textbook.

8.

Outcome	Black	Red	Blue	Other
Value	1	0	-1	-2
Probability	.05	.10	.15	.7

$e = 1(.05) + 0(.10) - 1(.15) - 2(.7) = -1.50.$

9. Note, making the first basket and making the second basket are independent events.
P(make both)=P(make first)P(make second)=$\frac{3}{4}\frac{3}{4}$
P(make exactly one)=P(make first and not second)+P(make second and not first)=$\frac{3}{4}\frac{1}{4} + \frac{1}{4}\frac{3}{4}$.

Outcome	Make Both	Make Exactly One	Make Neither
Value	3	-2	-7
Probability	$\frac{9}{16}$	$\frac{6}{16}$	$\frac{1}{16}$

$e = 3\frac{9}{16} - 2\frac{6}{16} - 7\frac{1}{16} = 0.5$

10. On average you lose $1.50 on the bean bag game and earn 50 cents on the basketball game. You should definitely play the basketball game.

11.