Part I: Determine the following amounts.

In a popular legend, a British King (Arthur) ruled over Camelot in peace and prosperity.

1. As the story goes, King Arthur was given a special sword (EXCALIBUR) by the Lady of the Lake.
   a) How many different names could the Lady of the Lake have chosen, if she used the same letters?
   b) How many names could she have chosen, if she kept the vowels together?
   c) How many names could she have chosen, if she began with an ‘A’?
   d) How many names could she have chosen, if she kept the consonants in alphabetical order?
   e) How many names could she have chosen, if she used only 5 of the letters?
   f) How many names could she have chosen, if she used only the consonants?

2. King Arthur accepted all men who were “good of heart” to be Knights of the Round Table. Although there are stories of the more famous knights (Lancelot, Percival, Caius,...), we don’t really know how many knights in total sat at the Round Table. Suppose that King Arthur had 18 Knights of the Round Table.
   a) How many ways could King Arthur seat his knights at the Round Table (all chairs were identical)?
      note: circle permutations is an enrichment topic and will not be tested on the diploma exam
   b) During a battle, King Arthur and his knights formed a straight line to defend Camelot. How many different formations could the king and knights assume?
   c) Before the battle began, King Arthur moved to exact centre of the formation. With King Arthur at the centre and Lancelot beside him, how many different formations could the king and knights assume?
3. King Arthur and the Knights of the Round Table are known for Quests that tested the knights’ courage and faith. Perhaps the best known is the “Quest for the Holy Grail” or the chalice that was used during the Last Supper.
   a) King Arthur sent 12 knights on such a quest. How many different ways can Arthur select 12 knights for the quest?
   b) If those 12 knights rode forth from Camelot in fours (on three consecutive days), then how many different ways could the knights be grouped for the quest?
   c) After completing the quest, the 12 knights return triumphant. If the knights rode back into Camelot three abreast (i.e. four rows of three knights), then how many arrangements could the 12 knights have assumed?

4. Another story had Merlin (a Druid who advised King Arthur) instruct Arthur to visit the “Fisher King” on the island of Avalon.
   a) If Arthur and Merlin went to Avalon with four other knights, then how many different parties could have travelled to Avalon?
   b) If Arthur and Merlin went to Avalon with a maximum of three other knights, then how many different parties could have travelled to Avalon? (assume that at least one knight went along with Arthur and Merlin)?
Part II: Complete the following.

1. A series of $n$ points are spaced equally along the circumference of a circle. Suppose that 45 lines can be drawn between any two of these points.
   a) How many points are on the circumference of the circle?

   b) How many triangles could be formed using the points?

   c) How many septagons (seven sided polygons) could be formed using the points?

2. In a popular game of chance, 6 numbers are chosen by the player and 6 numbers are chosen at random from 49 numbers. To win the ‘jackpot,’ all six numbers chosen by the player must match the 6 chosen at random. However, prizes are also awarded for any series of numbers as long as at least three of the 6 numbers chosen by the player were drawn in the game.
   a) What is the probability of winning the jackpot prize (i.e. getting all 6 numbers) in this game of chance?

   b) What is the probability of winning the minimum (i.e. getting 3 numbers) prize in this game of chance?
Part III: Use the following diagram to answer the following questions.

1. How many paths can a checker be moved from point A to point B?

2. How many paths can a checker be moved from point A to any white square in the bottom row?

3. Assuming that the checker is “crowned” once it reaches point B and then can move backwards, how many different paths (i.e. not retracing the exact path taken to get to B) can the checker be moved from point A to point B and then back again to point A?

Part IV: Determine the number of paths from “A” to “B”

1. A  

2. A

3. A