1. Why, according to Campbell-Kelly, was Babbage's dream coming true, in the words of Leslie Comrie?

-Because Comrie regarded the Harvard Mark I as the first machine, that came close to the ideas by Charles Babbage
-Because Comrie was always using opportunities to promote the work of Babbage
-Because Comrie knew that this was a good way of getting the attention of Watson, who could help him fund his ideas about digital computers
-Because Comrie resented the fact that the British government had not supported Babbage to complete his analytical engine
-Because Comrie was the only one who truely appreciated the ideas of the IBM engineers, and was shocked by the way that Aiken had claimed sole credit for constructing the Harvard Mark I

2. The boom in human computing coincided with the boom in inventions of one-of-a-kind digital computing machines. Why was that, according to Campbell-Kelly?

-Because here were several human computers that were getting so extremely bored by the tedious work they were doing, that they started inventing these machines
-Because 1935-1945 there was an enormous increase in the demand for computing
-That was sheer coincidence, and Campbell-Kelly merely mentions it as a fun fact
-Because the costs of human computing began to rise, whereas machines could do the work faster and more efficient (regarding costs)
-Because the remnants of the Babbage engine were found, and these spurred interest in creating these kind of devices, while the human computers could check whether the machines were actually correct

3. What is the general function of chapter 3?

-The chapter tries to tie in the problems of financing into the story, whereas chapter 2 focused on people and machines
-It completes the picture of what was going on in computing, mostly from a science perspective, whereas chapter 2 focussed on machines being built in industry
-The chapter is completely about how Babbage is used by present-day computer scientist to boast their ego by tying their achievements in with Babbage's research
-The entire chapter is a flashback to describe machines, whereas chapter 2 focussed on people
-The chapter focusses on a group of people who were very much believing in Babbage's ideas, whereas chapter 2 is about people who were unaware of the Babbage engines

4. What feature did the Harvard Mark I not posses, that was present in designs of, for example, the analytical engine?
-The Harvard Mark I didn't have a keyboard for operating
-The Harvard Mark I didn't allow for multiple tasks to run simultanuously
-The Harvard Mark I could not use conditional branching
-The Harvard Mark I could not do very lengthy programs
-The Harvard Mark I was not programmable

5. What was special about the Scientific Computing Service Limited?
-In 1902 it was the first for-profit calculation center
-In 1902 it was the first calculation center using automatic calculators
-In 1946 it was the first calculation center using automatic calculators
<u>-In 1937 it was the first for-profit calculation center</u>
-In 1937 it was the first calculation center using automatic calculators
-In 1945 it was the first for-profit calculation center

6. What was the relevance of the Moore school lectures to the history of computing?
-By means of the Moore school lectures, many scientists, on invitation from all over the world, came in touch with the ideas of human computing, in a more efficient way
-By means of the Moore school lectures, many scientists, on invitation from all over the world, came in touch with the ideas of building an atomic bomb, which involved huge computer facilities
-By means of the Moore school lectures, many scientists, on invitation from all over the world, learned that conditional branching could easily be applied in electronics
-By means of the Moore school lectures, many scientists, on invitation from all over the world, learned that it was possible to build a digital electronic computer, which was much more efficient than a decimal electronic computer
<u>-By means of the Moore school lectures, many scientists, on invitation from all over the world, came in touch with the ideas of the stored program computer</u>

7. What was the relevance of radar technology in computing?
-There was some overlap in technology, that electronic computer builders could use from radar technology, but radar also required a lot of computing
-It was impossible to produce radar without computing, so radar developed only after the first issues in computing were solved
-There were a lot of spare parts from radar technology, that could be used to build computers after WW II
-Radar engineers all went into computing once World War II was over
-Computing technology turned out to be virtually the same as radar technology, so once Eckert and Mauchly had noted that, constructing ENIAC or EDVAC had become simple

8. What was project PX about?
-It was a project to construct ballistic tables with help of Moore school engineers
-It was a project that was kept secret by Vannevar Bush, to do the calculation in the Manhattan project
<u>-It was a secret project, to construct the ENIAC</u>
-It was a highly commercial project by IBM that was kept secret from the competition
-It was a prequel to project X

9.What role did the Moore school play in the history of computing?
-It was the place where Herman Goldstine and John von Neumann created the ENIAC
<u>-It was the place from where the plans of ENIAC and EDVAC were shared with the scientific community interested in automatic calculators</u>
-It was the place where Eckert and Mauchly created the first commercial succes in computing
-It was the place where IBM trained it's sales force, and therefor the first key to success in the branche of selling computers was born

-It was the place where the first ideas about automatic calculators were born

10. Campbell-Kelly describes in some detail a chance meeting between Goldstine and Von Neumann in the summer of 1944. Why is this relevant?
-Von Neumann would never have been drawn into the Manhattan project, but for this chance meeting
-Goldstine learned of the possibility to turn his ENIAC project into a stored program computer
-Goldstine learned that the only thing that ENIAC was missing, was conditional branching
-Chance meetings are always relevant if they occur between people of this caliber
-This meeting made Von Neumann realize that the ENIAC project could be just wat he needed, and drew him into computing

11. Where did the metaphors of "store" and "mill" originate from, with respect to the Babbage Analytical Engine?

-These words indicate that Babbage was regarding his work on engines as similar to his ideas in business efficiency, such as the Clearing house procedures he proposed
-Like the word "engine", they refer to the origin of Babbage's thinking, which was in the looming industry
-There was absolutely no reason whatsover to use these terms. He just thougth they would "sell" better. After all, he had ignorant British government officials to convince
-Like the word "engine", they make use of the fact that people (except for a few Luddites) were enthusiastic about machines in the steam age
-*Both terms originate from Babbage's custom to create easy and recognizable words that resembled the functions of the machine he was building, to prevent people being scared for it*

12. Why was the Harvard Mark I relevant?
-It was the first computer build to be commercially sold
-It illustrates how ubiqutous computing was growing in the late 1930s, and it reveals that IBM engineers were aware of the usefulness of their machines to scientific computing
-It was the first stored program computer
-It was the first attempt ever to automatize computing processes that had previously been executed by human computers
-It was the only machine that Aiken produced that actually worked

13. What is the reason for the flashback on Babbage?
-*To inform the reader about the many pitfalls that inventors can come accross (and perhaps a little, how to evade them)*
-*To illustrate what history has to learn from computer pioneers (and what we should have learned by now about automation)*
-Offering another example of how difficult it is to turn a great idea into a commercial success (and what that means for future inventions)
-To show the importance of government funding for science (and the problems that occur when this goes wrong)
-To show how a complicated story sometimes becomes simplified (and in this form functions as an incentive)

14.What problems did Aiken face that made him go outside Harvard to build an automatic calculator?

- The charming personality of Thomas Watson sr

-The impossibility to get funding from the physics department to re-build the Babbage analytical engine

-The fact that everyone was quite satisfied with human computers solving all the computing problems for them

-Non linear differential equations and the fact that he didn't know there was a Babbage engine in the attic

-Non linear differential equations and unwilling board members

15. To what extent does Campbell-Kelly agree with calling John Vincent Atanasoff the "forgotten father of the computer"?

-He says the evidence for him being earlier than Eckert and Mauchly, and Mauchly drawing upon some of his ideas is extensive, but the project was both obscure and much more theoretical

-Campbell-Kelly agrees with Atanasoff being earlier and Mauchly using some of his ideas, and he points out that the other projects being secret, it is completely understandable that Atanasoffs claims were made in the 1960s only, when the computer had become an important machine

-He agrees coHe points out that Atanasoff was rather late in claiming his parental right, therefor at least casting some doubt on his original ideas with the project

-Campbell-Kelly is inconclusive on this point

-He doesn't agree

16. Who or what was "Annie", working at Moore school during World War II?

-A differential analyzer at work in the basement of the building

-The automatic calculator that Eckert and Mauchly were trying to assemble at Moore school

-The wife of Mauchly, training hundreds of women to become human computers

-One of the human computers, trained at Moore school, to do the calculations for the BRL

-One of the most advanced desk calculators that was being used to serve for calculational efforts at Moore school

17. What did Maurice Wilkes do to earn a place in the history of computing?

-He learned about EDVAC at the Moore school lectures and went home to the UK, to improve on these idease and invented the stored program computer

-He and his team constructed EDSAC

-He managed to build the first electronic computer outside the US

-He was one of the most notable lecturers, and notably the only one NOT from the US, at the Moore school lectures

-He invented the stored program computer concept

18. Why was EDVAC also called "project PY"?
-Because there was no name for the project, and some of the engineers working on it thought that this was a cool name, until later the acronym EDVAC became widespread
-Because it was a sequel to "project PX"
-It was refering to the first names of the principal engineers involved
-Because it was a classified project, and therefor had a codename until it was cleared
-Campbell-Kelly is inconclusive about that

19. What was the atmosphere in which the popular press called the Harvard Mark I a "robot mathematician"?
-Depressed
-Exalted
-Ferocious
-Furious
-Uncomprehending

20. Which of the following reasons to introduce Lewis Richardson, fits the story by Campbell-Kelly?

-His ideas about numerically solving problems in weather forecasting were perfectly fitted to the problems people were facing at the time, and like Babbage, he once again illustrates how the British government was unwilling to pay for great ideas
-His ideas about computing were so extremely innovative, that it stimulated everybody in the business, including IBM and many governments
-His weather forecast factory was the most advanced computational effort taking place before WW II
-His ideas about automation, beautifully illustrate both the need for more calculations and the toughness of the habit of using human computers to achieve that
-He beautifully illustrates what was new in scientific computing in the 1920s

21. As a student and as a young instructor in electrical engineering, Vanevar Bush was actively involved in computing. Which of the following machines did he design?

-The IBM molde 405 Electric Accounting Machine
-The Zuse Z1
-The NCR Class 2000
-The differential analyzer
-The Harvard Mark I

22. Why does Campbell-Kelly use "Eckert and Mauchly" as a section title in chapter 4?
-Because Eckert ans Mauchly were the people who managed to draw IBM into scientific computing, and thereby managed to build the Harvard Mark I (together with IBM engineers)
-Because Eckert and Mauchly were both fascinated by analog computing and saw in that technology the future of the Ballistics Research Laboratory
-Because Eckert and Mauchly were the two people creating ENIAC, Eckert being the hands-on engineer, Mauchly being the drafts-man who came up with ideas
-Because Eckert and Mauchly were the first two to actually delve deep into the heritage by Babbage, and realized that they could build an automatic calculator also without the moving parts, speeding up the process of calculation tremendously
-Because Eckert was doing the calculations by hand, and Mauchly had the idea to mechanize them, since he had been working with the differential analyzer, and could think beyond the limitations of that machine

23. What, according to Campbell-Kelly, was the contribution of Vannevar Bush to the invention of automatic calculators?
-Purely administrative, as head of the OSRD, he never paid much attention to the project, although he had constructed the differential analyzer before the war
-He was actively involved in the project of constructing a computer, as he headed the OSRD and therefor was aware of the developement of computers, which he considered interesting since his invention of the differential analyzer
-*The involvement was in the form of mental and financial support to the group that was trying to develop a computer, since Bush was aware of the need for automatic calculators and they were one of his top priorities, although, as director of OSRD, he no longer was actively pursuing this research interest himself*
-Bush was actively involved in building computers since he had constructed his differential analyzer and he knew how important these machines were to the war effort
-He was not involved, for he thougt that constructing automatic calculators had long been solved, since he had engineered the differential analyzer long before the war, so he didn't think it would be worth while to investigate further

24. What was the relevance of the Moving Target Indicator project in the history of computing?
-Since it inspired a lot of people to use radar (making it much easier to use and interpret radar signals), it not only helped to win the war, but it opened possibilities for the Moore school to invest in computing
-It was one of the critical elements in Radar installations, to be able to subtract the signal of steady objects from a later signal, so that the resulting signal would only contain moving objects
-*It was the fist project that actually could not be performed by human computers, and as such, made the construction of an electronic computer even more important to the military*
-It was the most relevant element in the "Star Wars" project, locking the tracking device of a missile to an incoming projectile. Since this recquired a lot of coding, it helped a lot of young engineers to a job in computing, which gave the subject an enormous boost
-It was one of the Moore school projects, commissioned by MIT, that yielded the Mercury delay line which was of importance for Eckert and Mauchly to produce their ENIAC

25. In what way(s) did Babbage influence Aiken?

-<u>A fragment of the Babbage engine in one of the attics of Harvard university, stimulated him to research Babbage, which made a huge impression on him and stimulated him to continue</u>
-Aiken was annoyed by the fact that Babbage had not been funded properly, so it encouraged him to ste things straight
-In no way at all: Aiken never heard of Babbage, since there was an ocean and a hundred years between the two
-Babbage personally spoke to Aiken about his machines and convinced him of the brilliance of the ideas. Although Babbage's technology was outdated by then, it offered Aiken a lot of food for thought and made him realize what he could achieve with the technology he could get hold of
-Aiken immediately recognized the brilliance in the designs of Babbage and started to re-create them

26. Why was analogy such a strong computing option in land reclamation and large electrical systems?

-Both water management and large electrical systems were not easily modelled, because the resulting sets of equations were too complicated to solve, or unexpected amplifying processes could occur
-Analogue computing was always strong in land reclamation and large electrical systems
-Because human computers could only find approximate solutions to these kind of problems, and with both land reclamation and electic networks it is too important to have a solution as precise as possible
-Both land reclamation and large electrical systems were impossible to model mathematically until the 1950s
-*Analogy was offering much more precision than the competing digital computing option*

27. What did Lewis Richardson achieve that Campbell-Kelly pays attention to him in his book?

-He constructed several analog computers to assist with the work of the British weather forecast agency
-He wrote a science fiction novel on a weather forecast factory, that was received with enthusiasm
-He wrote a book on numerical weather forecasting, thereby creating more interest in computing from scientific, government and commerical circles. Moreover, he wrote a fantasay about a weather forecast factory
-He headed the weather forecast factory, that would be in telegraph contact with all the weather stations in the world, constantly calculating what was going to be the weather
-He was the first one to make good use of the Differential analyzer outside the US

28. What was EDSAC?

-The sequel to ENIAC, produced by Eckert and Mauchly in 1946, using, for the first time in history, the stored program concept
-The British stored program computer, built at Cambridge 1947-1949
-The sequel to EDVAC, built under supervision of Von Neumann 1948, proving the feasability of the stored program concept
-The first stored program computer ever built, operational in May 1949, designed and constructed by Alan Turing
-A one of a kind machine that never came beyond its paper design, but that was invented by John Atanasoff in 1943

29. What was the Manchester baby, "born" June 21, 1948?

-The, according to Campbell-Kelly, most significant machine built outside the US at the time
-The first actual proof of the feasability of building an electronic computer, that excelled human computers both in speed and accountability
<u>-The first actual proof of the feasability of the stored program computer, produced at Manchaster by Newman and Williams</u>
-The name of the ideas by Alan Turing, that would later turn into both the concept of electronic computing and the Turing test
-The first electronic digital computer in the world, according to Campbell-Kelly

30. Why does Campbell-Kelly conclude that the EDVAC report illustrates that the engineers and the logicians were driven even further apart?

-Because in the report Von Neumann claimed sole credit for the design of EDVAC, whereas Eckert was the one who had solved all the engineering problems and also wanted credit
-Because the report was never published, because it was so controversial that it resulted in a split between the two groups that had been building the EDVAC
-Because the EDVAC report appeard as a mathematics report, whereas the engineers wanted it to be an electrotechnical report
-Because Von Neumann in the report used all kind of biological metaphors, whereas Eckert thought that by doing that, he obscured the fundamental engineering problems he had solved
-Because the EDVAC report quickly grew famous, whereas the engineers had wanted the whole project to be kept silent, so they could gain some commercial benefit from it

31. What role did Ada Lovelace play in the work of Babbage?
-She was the daughter of lord Byron and therefor her support was invaluable to Babbage, even though she clearly never really grasped his ideas
-She was one of the few who recognized the genius of his plans, and tried to sell them
-She managed to explain to Babbage why he should continue to try and construct his engines
-She was from a wealthy family and would ralley support for Babbage in government circles. She didn't manage, though
-She was the first computer programmer ever

32. What relationship did the Ballistic Research Laboratory have to inventing computers?
- They had the first computers operational during WW II, because that helped them enormously by constructing tables for all the new types of guns that were produced during the war
-It had over a hundred human computers at work, constructing ballistic tables, and during the war, with all the new tables to be constructed, was in dire need of automatic computers
-It had a long standing tradition of computing by human computers, and during WW II they had quite a lot of work, so they weren't interested at all in changing that, because they rather stuck to their traditional way of working
-If they had ever heard about computers they might have shown some interest, but they weren't even aware of the existence of the differential analyser that had been up and running since the 1930s, and could have reduced their number of errors enormously
-It was a major investor in computing technology, because they were very well aware of the fact that automatic computers would greatly reduce their costs and increase the effectiveness of their work

33. What were, according to Campbell-Kelly, the two major contributions of science to the (WW II) war effort in the US?
-The aircraft carrier and the helicopter
-Tanks and bombarding planes
-The atomic bomb and the invention of radar
-The Howitzer and the computer
-The computer and submarine warfare

34. What was the role of mathematician Herman Goldstine in the construction of ENIAC?
-He was the one who took Mauchly's report on high speed calculating with vaccuum tubes seriously and helped him sell it to the people who had to invest in it
-He was the one who convinced Vannevar Bush to invest in the ENIAC project, but he was not in any way involved himself, he just did his friend Mauchly a favor
-He was the one who wrote the report that offered Mauchly the opportunity to start working on the ENIAC
-He was the one who managed to translate the mathematical demands into technically feasible steps that were implemented by the ENIAC team
-He was the one who provided the theoretical backing of the ENIAC, thereby inventing the concept of the stored program computer

35. What role did dean Pender play in the history of computing?
-He was the one who managed to get Goldstine, Burks and Von Neumann into the ENIAC project, thereby establishing it as a scientific project, instead of a commercial project as it was regarded by Eckert and Mauchly
-He recognized that Moore school, after the war, had an obligation to spread the knowledge of ENIAC and EDVAC, and organised the Moore school lectures
-He was the one and only person at Moore school, who believed in the ideas by Eckert and Mauchly, and therefor managed to guarantee funding for the ENIAC project
-He was the person who designed ENIAC and set Eckert and Mauchly to work on the engineering aspects of the machine, while he tried to solve the logical parts of the project
-He was the one who coordinated the huge publicity campaign that surrounded the launch of ENIAC to the public in earty 1946