This is a straightforward translation of the Dutch newspaper article (only the questions)

10 Multiple Choice Questions:

1. If you flip a coin twice, what is the probability of twice Heads?
   a. **25%**
   b. **50%**
   c. Something else

Answer: a., since we have a symmetrical probability space of ordered pairs {HH, HT, TH, TT}

2. A real estate agency informs customers that the average value of houses in a specific quarter of the town is € 400 000. We know that in the outskirts of this quarter some luxurious villas (worth several millions). What does that tell us about the median, the value such that 50% of the houses are worth more and 50% less.
   a. **Below € 400 000**
   b. **Exactly € 400 000**
   c. **Above € 400 000**

Answer: c., since the expensive houses increase the mean, but not the median.
Remark: it is possible to construct such an unexpected distribution where this is not true. For example, if two villa's are each worth 1.6 million, you can construct an example where the average is € 400 000 and the median is greater:
2 villa's of each *M*€ 1.6, 15 houses of € 500 000 and 13 houses € 100 000:
these 30 houses are on average worth € 400 000 but the median is € 500 000.

3. A vase contains 200 red and 800 black marbles. Repeatedly a marble is chosen at random, without replacement. What is the probability that the last marble is red?
   a. **1/20**
   b. **1/5**
   c. **1/10**

Answer: b. (reasoning: if you would order the 200+800 marbles at random in position 1 (the first marble chosen) to 1000 (the last one chosen), it is clear that at each position the probability of a read marble is $\frac{200}{1000} = \frac{1}{5}$)

4. How many chickens are killed for meat consumption in The Netherlands in February 2014, according to the Dutch "Centraal Bureau voor Statistiek" (data bank Statline)?
   a. **143 500**
   b. **2 672 300**
   c. **41 977 400**

Answer: c. Zie http://statline.cbs.nl/StatWeb/publication/?PA=7123slac
2014: 557 328,6 × 1000, so in February, approximately, $\frac{557\ 328\ 600}{12} = 46\ 444\ 050$.

5. What is the probability of the result "4" if we roll a (fair) dice.
   a. ½
   b. ¼
   c. 1/6

Answer: c. (no comment)

6. One out of ten thousand people has a certain disease. The test for this disease is 99% accurate: that means that if someone has the disease the test will be positive in 99% of these cases. And 99% of the people who do not have the disease, will test negative. Suppose you have a positive test result, what is the probability that you have the disease?
   a. 1%
   b. 50%
   c. 99%

Answer: a. reasoning can be done by taking e.g. a population of 10000, but more professional is a proof using assumptions in terms of probabilities of events:
D = "having the disease" and $+$ = "positive test" (complement -)
Given: $P(D) = \frac{1}{10000}$, $P(+|D) = 0.99, P\left(-\middle|\overline{D}\right) = 0.99$
Solution: note that $P\left(+\middle|\overline{D}\right) = 1 - P\left(-\middle|\overline{D}\right) = 0.01$

(Bayes rule): $P(D|+) = \frac{P(D\cap+)}{P(+)} = \frac{P(+|D)P(D)}{P(+|D)P(D)+P\left(+\middle|\overline{D}\right)P(\overline{D})} = \frac{0.99\times0.0001}{0.99\times0.0001+0.99\times0.01} \approx 0.0099 \approx 1\%$

7. Results of statistical survey are called "significant" if the p-value is less than 5%. What does that mean?
   a. The probability that the observed effect is coincidence, is less than 5%
   b. If there is no effect, then the probability that by chance such a result (or stronger) is observed, is less than 5%.
   c. If you repeat the survey, the probability of not obtaining the same result is less than 5%.

Answer: b. (the p-value is the probability of a so called type I error, the probability of statistically "proving" an effect, though in reality there is no affect.)

8. The Supermarket chain AH has a space-slides action, for free if you buy at the store. The aim is to gather all 160 different images. Assume that you are given a random a space slides each time you buy something. How many space slide should you gather on average to obtain all different space slides?
   a. 320
   b. 685
   c. 905

Answer: c. This is the most difficult question to answer exactly:
Note that if you have e.g. 159 different images, you need only the 160th to complete the

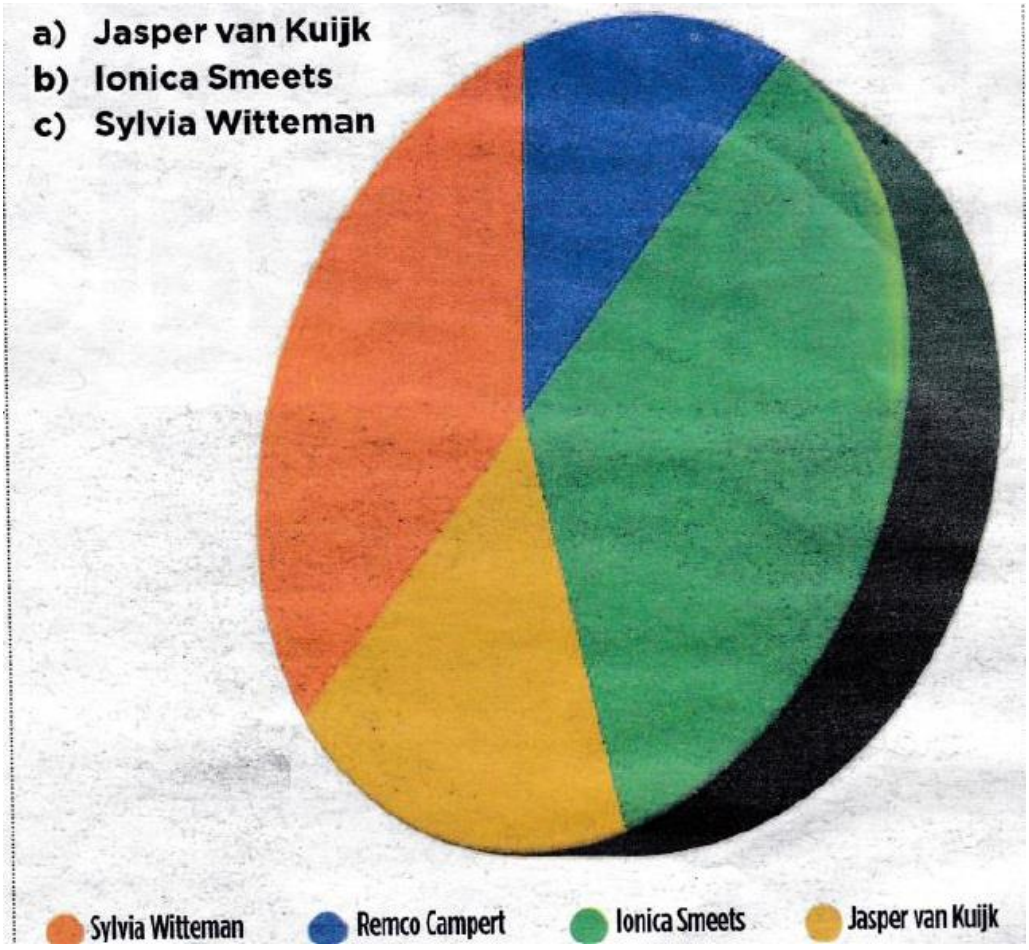
total set: an arbitrary image will be the correct one with probability $\frac{1}{160}$, so since the number X_{160} of trials to get the last is geometrically distributed with $p = \frac{1}{160}$ and $E(X_{160}) = \frac{1}{p} = 160$.

If we miss 2 images we have # trials $X_{159} \sim gemometric\left(\frac{2}{160}\right)$ and $E(X_{159}) = \frac{1}{p} = 80$, etc.

The expected number of trials to get from 0 to 160 is:

$$E(X_1) + E(X_2) + \cdots + E(X_{159}) + E(X_{160}) = \frac{160}{160} + \frac{160}{159} + \cdots + \frac{160}{3} + \frac{160}{2} + \frac{160}{1} \approx 904.8$$

9. Who is your favourite columnist of The Volkskrant according the following pie diagram?



Answer: c. Compare the two largest area's, green and orange: extend the straight line between the yellow and green area: it cuts a part of the orange area, implying that orange area is greater than the green one.

10. What is your estimate of the number of readers of De Volkskrant who gave the correct answer to all of the first 9 questions?
    Answer: 199 (?)