MASARYK INSTITUTE OF ADVANCED STUDIES

SPECIMEN OF ADMISSION TEST

Master´s degree programme – Academic Year 2021/22 – English language

Read the sentences and write the correct answers (A, B, C or D) on your answer sheet.

1. They could not pay their debt and faced _____.

   A warranty B overpayment **C bankruptcy** D equity

2. If we'd tested the product properly, we _____ about this problem.

   A knew B would know **C would have known** **D** had known

3. Simone wasn't at the meeting. She _____ at the airport.

   A might be delayed B must have delayed

   C **might have been delayed** D should have been delayed

4. Peter _____ with an interesting idea.

   A came in **B came up** **C** came across D came on

Complete these conversations with suitable phrases and mark them on your answer sheet.

5. "You might need to get in touch with Mr. Palaszczuk."
   "Sorry, Bernard, I _____. Could you please spell it?"
   a. didn't really reach that
   b. didn't quite catch that
   c. didn't actually point that

6. "We're planning a big advertising campaign for your new laser printer, the HGX-9037 model."
   "That's good. Could you _____ while I get a pen?"
   a. just hang out
   b. hang up a minute
   c. hold on a second

7. "Hello. Haven't we met somewhere before?"
   "Yes, it was last year, _____? At the conference in St Petersburg?"
   a. wasn't it
   b. didn't it
   c. was it

8. "Have you approached any other bank, if I may ask?"
   "Yes, two banks, but they _____."
   a. turned me in

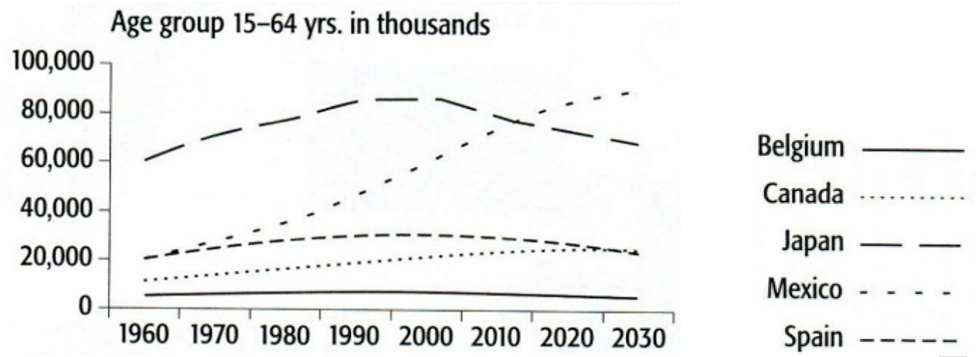
Texts and sentences adapted from:

O'DRISCOLL, SCOTT-BARRETT: *BEC Vantage Masterclass Upper-Intermediate* Oxford: Oxford University Press, 2000.

COTTON, FALVEY, KENT: *Market Leader Upper-Intermediate 3rd edition* Essex: Pearson Education Limited, 2011.

b. turned me on
c. turned me down

Read the following graph



9. Decide which statement is not true
    a. The population of Mexico has risen dramatically.
    b. The population in Belgium has remained stable over the last forty years.
    c. This age group in Canada has been increasing steadily.
    d. The population of Spain is falling dramatically.

10. Decide, whether the statement is true or false (T/F)

    The population of Mexico is expected to continue growing significantly over the next decade. (**T**/F)

Read the text below and mark the correct answer (A, B, C or D) on your answer sheet.

Business travel today

Long distance travel is now a routine part of workers' lives, yet what was once considered a perk of the job is now seen as a headache by frequent fliers. Business travel isn't as exciting as it sounds. The reality for most travellers is that they rarely see anything beyond the airport, the office and the hotel. Even after a long overnight flight in a cramped seat without sleep, staff were frequently expected to be in the office next morning, ready to do a good day's work.

Despite alternatives such as fax, e-mail and teleconferencing, business travel continues to grow. Many companies have teleconferencing equipment, but not know how to use it. In the global economy increasing numbers of people deal with more and more countries, and are required to travel for their jobs. Travel across the globe for business has also become much more cost-effective for companies. In the early eighties, a round-the world ticket was at least £1,250. Now it's £700.

Stephen Joy, a marketing director at US toy maker Mattel, has been a frequent traveller during his sixteen-year career. He believes business travel has become more stressful. 'As your life gets fuller, with children and so on, it becomes a lot more difficult,' he says. 'But, it's not just to do with age. Modern communications mean that the only time you're truly out of reach is on the plane. When you get to the hotel you log on and get your e-mail. In the past when you were away, you were away. Now you're expected to take the in-tray with you, and managing your work from afar can be very difficult, especially in you're in a different time zone.

As the volume of business travel has grown, companies have begun to pay increasing attention to its impact on costs. 'Now I don't travel in as much comfort as I did as a junior years ago,' says Joy. Today, costs are scrutinised, and many companies are concerned with little more than cheap travel.

There may also be as many health risks associated with the long-distance flights as there are passengers in economy class. Because most airlines re-circulate the air inside planes, mixing half-

fresh air with half-recycled air, flu and colds are among the most frequent problems for travellers. New research suggests that jet lag, once seen as a minor inconvenience, may be far more upsetting to travellers' health and routines than earlier thought. More worryingly, a recent study identified a possible link between long-distance travel and an increased risk of heart attacks, especially amongst older passengers. Is it time for companies to reassess attitudes to travel and show a little more concern for their travelling staff?

11. Paragraph 1: Why are many business travellers unhappy about long distance travel?
    a. It can cause headaches
    b. They usually have to fly at night
    c. Aircraft have become very uncomfortable
    d. They often don't get time to recover from their journeys

12. Paragraph 2: According to the writer, what is the expansion in business travel due to?
    a. Employees' unwillingness to use alternative methods of communicating
    b. Companies' ignorance about new communications technology
    c. The overall growth of international business
    d. The fact that long-distance flights cost less than half of what they used to

13. Paragraph 3: Stephen Joy thinks the main reason business travellers suffer more these days is because
    a. Typically people who travel for business have young children
    b. Many of them are too old to travel regularly
    c. They receive too many mobile phone calls
    d. While they are abroad, they still have to carry out their normal duties

14. Paragraph 4: How are companies dealing with the increase of business travel?
    a. By keeping travel costs as low as possible
    b. By sending younger staff on business trips
    c. By using less comfortable airlines
    d. By reducing the number of days the employees spend out of the office

15. Paragraph 5: Which of these points is made about long distance travel?
    a. It leads to breathing problems
    b. It is no longer thought to cause jet lag
    c. It may be dangerous for elderly people
    d. It causes serious health problems for everyone who flies regularly

Complete the text below with the right verbs:

Good communicators really listen to people and take in what is said. They maintain eye contact and have a relaxed body language, but they seldom (16) _____ and stop people talking. If they don't understand and want to (17) _____ something, they wait for a suitable opportunity.

When speaking, effective communicators are good at giving information. They do not (18) _____ their listener, they make their points clearly. Furthermore, although they may (19) _____ in order to elaborate a point and give additional information where appropriate, they will not (20) _____ and lose sight of their main message.

16. A digress	**B interrupt**	C explain	D clarify
17. **A clarify**	B digress	C confuse	D engage

18. **A confuse**	B ramble	C interrupt	D explain
19. A engage	B listen	C avoid	**D digress**
20. A emerge	B interrupt	**C ramble**	D elaborate

MASARYK INSTITUTE OF ADVANCED STUDIES

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SPECIMEN OF ADMISSION TEST

Master´s degree programme – Academic Year 2021/22

1) Solve the matrix equation X·A = B for the following matrices

$$A=\begin{pmatrix}1 & 0 & -1\\ 2 & -1 & 1\\ 1 & 1 & -2\end{pmatrix};B=\begin{pmatrix}1 & 1 & 1\\ 1 & 2 & 0\\ 0 & 2 & 2\end{pmatrix}$$

a) $\frac{1}{2}*\begin{pmatrix}0 & 3 & 1\\ -4 & 3 & 1\\ -2 & 1 & -1\end{pmatrix}$

b) $\frac{1}{2}*\begin{pmatrix}0 & -4 & -2\\ 3 & 3 & 1\\ 1 & 1 & -1\end{pmatrix}$

c) $\frac{1}{2}*\begin{pmatrix}-9 & 3 & 5\\ -11 & 3 & 7\\ -16 & 4 & 8\end{pmatrix}$

d) $\frac{1}{2}*\begin{pmatrix}-9 & -11 & -16\\ 3 & 3 & 4\\ 5 & 4 & 8\end{pmatrix}$

2) Find the equation of a tangent line to the following function

$$y=\ln\left(2-x^2\right) \quad \text{at} \quad x=1$$

a) $y=2-x$
b) $y=2-2x$
c) $y=x-1$
d) $y=2x+2$

3) Calculate the area under the curve of the following function

$y = e^{2x-1} \in the\ interval \langle 0,1 \rangle$

a) $\frac{e^2 - 1}{e}$

b) $\frac{e^2 - 1}{2e}$

c) $\frac{e - 1}{2}$

d) $e - 1$

4) A rational consumer is trying to attain an optimal consumption basket: Her income is $1,000, the price of good X is $100, the price of good Y is $200. The marginal rate of substitution in consumption of good Y for good X equals 1.5. This consumer maximizes the total utility but she is also restricted by the income budget. She decides

a) To increase the amount of good Y (2 units), decrease in good X (1 unit) → to increase in the total utility
b) To increase the amount of good X (2 units), decrease the amount of good Y (1 unit) → to increase the total utility
c) To increase the amount of good X (2 units), decrease the amount of good Y (1 unit) → to increase the income
d) To increase the amount of good Y (2 units), decrease the amount of good X (1 unit) → to increase the total expenditures

5) Bicycles are manufactured using an automated production line with $100,000 annual fixed costs and $5 unit costs and a $50 selling price. What is the lowest price acceptable for the firm in the short run?

a) $50 selling price
b) $40 selling price
c) $5 selling price
d) $0 selling price

6) Our economy has a negative output gap. Which of these would you expect in a developed EU economy?

a) The inflation increases, so does the economy output, there is high unemployment rate
b) The inflation falls, so does the economy output, there is high unemployment rate
c) The inflation is stable, so is the economy output, there is low unemployment rate
d) The inflation is falling, economy output is growing, there is low unemployment rate

7) A company without debts owned by its founder gets the opportunity to take out a loan. Its return on assets (ROA) is 10%, the interest rate is 4%, the corporate income tax rate is 20%. When the debt reaches 20% of total assets, the owner can expect

a) a decrease in the return on equity (ROE) while the return of assets (ROA) remains unchanged
b) a decrease in the return on assets (ROA) while the return of equity (ROE) remains unchanged
c) an increase in the return on assets (ROA) while the return of equity (ROE) remains unchanged
d) an increase in the return on Equity (ROE) while the return of assets (ROA) remains unchanged

8) Determine the **mean value** of the random variable $\mu_{10} = \mathbf{E(X)}$ from the random vector **(X, Y)**, which is given in Table 1.

Table 1

X\Y	**1**	**2**
2	0.4	0.2
2	0.2	0.2

a) 0.25
b) 0.80
c) 1.20
d) 2.00

9) Determine the **variance** of the random variable $\mathbf{v_{02}}$ **= D(Y)** from the random vector **(X, Y)**, which is given in Table 1.

a) 0.024
b) 0.512
c) 0.240
d) 1.200

10) Find the constant **c** so that the function:

$$f(x,y)=\begin{cases} c\times\dfrac{x^2}{1+y^2} \text{ for values } 2\le x\le 3\,;0\le y\le 1 \\ 0 \text{ for other values} \end{cases}$$

is the **probability density** of some random vector (X, Y).

a) $\frac{1}{2}\pi$

b) $\frac{3}{4}\pi$

c) $\frac{12}{19\pi}$

d) $\frac{2}{5\pi}$

Solution: 1c; 2b; 3b, 4b; 5c; 6b; 7d, 8d; 9c; 10c.

Solution procedures

Mathematics

Ad 1) $X*A*A^{-1} = B*A^{-1}$

$X = B*A^{-1}$

Gauss elimination for the left matrix which shows the inverse matrix on the right side

$$\left(\begin{array}{ccc|ccc} 1 & 0 & -1 & 1 & 0 & 0 \\ 2 & -1 & 1 & 0 & 1 & 0 \\ 1 & 1 & -2 & 0 & 0 & 1 \end{array}\right)\sim\left(\begin{array}{ccc|ccc} 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & -1 & 3 & -2 & 1 & 0 \\ 0 & 1 & -1 & -1 & 0 & 1 \end{array}\right)\sim\left(\begin{array}{ccc|ccc} 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & -1 & 3 & -2 & 1 & 0 \\ 0 & 0 & 2 & -3 & 1 & 1 \end{array}\right)\sim$$

$$\left(\begin{array}{ccc|ccc} 2 & 0 & 0 & -1 & 1 & 1 \\ 0 & -2 & 0 & 5 & -1 & -3 \\ 0 & 0 & 2 & -3 & 1 & 1 \end{array}\right)\sim\left(\begin{array}{ccc|ccc} 1 & 0 & 0 & \frac{-1}{2} & \frac{1}{2} & \frac{1}{2} \\ 0 & 1 & 0 & \frac{-5}{2} & \frac{1}{2} & \frac{3}{2} \\ 0 & 0 & 1 & \frac{-3}{2} & \frac{1}{2} & \frac{1}{2} \end{array}\right)$$

$$A^{-1} = \frac{1}{2}\begin{pmatrix} -1 & 1 & 1 \\ -5 & 1 & 3 \\ -3 & 1 & 1 \end{pmatrix}$$

$X = B * A^{-1} = = \frac{1}{2}\begin{pmatrix} -9 & 3 & 5 \\ -11 & 3 & 7 \\ -16 & 4 & 8 \end{pmatrix}$

Ad 2) $x=1 \rightarrow y=\ln\left(2-1^2\right)=\ln 1=0$

equation of tangent line at poit $\left(x_0; y_0\right)$ is $y-y_0=k*\left(x-x_0\right)$ where slope $k=y'\left(x_0\right)$

$$y'=\frac{1}{2-x^2}*(-2x)=\frac{-2x}{2-x^2} \qquad \text{and } k=y'(1)=\frac{-2}{1}=-2$$

$$y-0=-2*(x-1)$$
$$y=-2x+2=2-2x$$

Ad 3) $S=\int_0^1 e^{2x-1}dx=\frac{1}{2}\int_0^1 e^{2x-1}*2\,dx=\frac{1}{2}\int_{-1}^1 e^t\,dt=\frac{1}{2}\left[e^t\right]_{-1}^1=\frac{1}{2}*\left(e-\frac{1}{e}\right)=\frac{e^2-1}{2e}$

Substitution $t=2x-1 \rightarrow dt=2\,dx$

Statistics

Ad 8) We start from the relation for the first initial moment of the random variable X:

$$\mu_{10}=\mu_x=E(X)=\sum_i x_i \times p_1\left(x_i\right)$$

Then:

$X \backslash Y$	**1**	**2**	$p_1(x_i)$	$x_{i\times}\, p_1(x_i)$
2	0.4	0.2	0.6	1.2
2	0.2	0.2	0.4	0.8
x	x	x	1	**E(X) =2**

Ad 9) We start from the relation for the second central moment of the discrete random variable Y:

$$v_{02} = \sigma_y^2 = \sum_j \left(y_j - E(Y)\right)^2 \times p_2(y_j)$$

Then:

$X \backslash Y$	1	2	x
2	0.4	0.2	x
2	0.2	0.2	x
$p_2(y_j)$	0.6	0.4	1
$y_j \times p_2(y_j)$	0.6	0.8	E(Y) = 1.4
$(y_j - \mu_j)^2 \times p_2(y_j)$	0.096	0.144	**D(Y) = 0.240**

Ad 10) The probability density properties are:

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(x,y)\,dxdy = 1$$

Then:

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} c\frac{x^2}{1+y^2}\,dxdy = 1$$

$$c.\int_2^3 dx\int_0^1 \frac{x^2}{1+y^2}\,dy = 1$$

$$c.\int_2^3 dx\left[x^2.\operatorname{arctg} y\right]_0^1 = 1$$

$$c.\int_2^3 \frac{\pi}{4}x^2\,dx = 1$$

$$\frac{\pi}{4}c.\left[\frac{x^3}{3}\right]_2^3 = 1$$

$$\frac{\pi}{4}c.\left(9-\frac{8}{3}\right) = 1$$

$$c = \frac{12}{19\pi}$$