

CONCOURS INTERNE DE RECRUTEMENT D'ADMINISTRATEURS DE L'INSEE

EPREUVES ORALES 2017

(exemples)

Concours interne de recrutement d'administrateurs de l'Insee

Épreuve orale d'admission de mathématiques-statistiques

Chaque sujet est composé de **deux** exercices.

Le candidat doit les traiter **tous les deux** puis disposera de 35 minutes environ pour en présenter les résultats.

Les 10 dernières minutes seront consacrées à des questions portant a priori sur des thèmes autres que ceux déjà abordés.

P1710

On considère un entier naturel k non nul et une suite $(X_n)_{n \geq 1}$ de variables aléatoires indépendantes suivant toutes la loi uniforme sur l'intervalle $[0, k]$.

La densité de X_n est donc donnée par :

$$\forall t \in \mathbb{R}, \quad f_{X_n}(t) = \frac{1}{k} \mathbf{1}_{[0,k]}(t).$$

On définit, pour tout entier naturel n non nul, les variables aléatoires S_n et Z_n :

$$S_n = \sum_{j=1}^n X_j \text{ et } Z_n = S_n - \lfloor S_n \rfloor$$

où $\lfloor x \rfloor$ désigne la partie entière du réel x .

1. Déterminer la densité de S_2 , puis sa fonction de répartition.
2. Montrer que Z_2 suit la loi uniforme sur $[0, 1[$.
3. (a) On note f la fonction qui, à tout réel x , associe $f(x) = x - \lfloor x \rfloor$.
Calculer $f(f(S_n) + X_{n+1})$ en fonction de Z_{n+1} .
- (b) Montrer plus généralement que Z_n suit la loi uniforme sur $[0, 1[$.

EXERCICE 179

Soit $\sum u_n$ une série à termes réels, absolument convergente.

On considère la série de fonctions $\sum u_n \sin nx$ pour $x \in [0, \pi]$.

1. Montrer que cette série est convergente. On notera f sa somme : $f(x) = \sum_{n=1}^{+\infty} u_n \sin nx$
2. Soit $p \in \mathbf{N}^*$, fixé quelconque. Pour tout $x \in [0, \pi]$, on pose :

$$R_n(x) = \sum_{k=n+1}^{+\infty} u_k (\sin kx)(\sin px).$$

- a. Montrer que la suite $\{R_n(x)\}$ converge uniformément sur $[0, \pi]$.
- b. En déduire que : $u_p = \frac{2}{\pi} \int_0^\pi f(x) \sin px dx$.

On rappelle la relation, pour tous réels a et b :

$$\sin a \sin b = \frac{1}{2} [\cos(a - b) - \cos(a + b)].$$

3. Démontrer la relation : $\sum_{p=1}^{+\infty} u_p^2 = \frac{2}{\pi} \int_0^\pi f^2(x) dx$.

Concours interne de recrutement d'administrateurs de l'Insee

Epreuve orale d'admission, sujet « économie »

Le candidat dispose de 45 minutes pour préparer un sujet
Chaque sujet comporte plusieurs exercices à traiter.

Exemple de sujets :

Sujet 1

Exercice 1 (8 pts) – Equilibre de marché en CPP à court et long terme (8 pts)

On considère un marché de concurrence pure et parfaite, où sont présentes initialement 75 firmes. La fonction de coût de court terme des firmes est identique et s'écrit, pour chacune :

$$CT(q) = q^3 - 6q^2 + 15q$$

Où q est la quantité produite par la firme considérée. La demande globale sur le marché a pour expression :

$$D(p) = 375 - 5p$$

Où p est le prix unitaire du bien et D la quantité demandée.

- 1) Donnez les expressions du coût moyen, du coût marginal et du coût variable moyen (1.5 pts).
 - 2) Déterminez la fonction d'offre de chaque firme à court terme (1.5 pts) (prix en fonction de la quantité), puis l'offre de marché (même formulation, quantité globale notée Q) (1 pt).
 - 3) Vérifiez qu'à l'équilibre de court terme, le prix de vente $p=15$. Que vaut alors la quantité globale produite et vendue Q ? La quantité produite par chaque firme q ? (1.5 pt)
- On considère ici l'évolution de l'équilibre du marché à long terme. On suppose que la fonction de coût de chaque firme demeure inchangée à long terme, le nombre de firmes présentes étant lui endogène et dicté par la libre entrée
- 4) Que vaut le prix d'équilibre ? Quelle quantité sera globalement produite et vendue ? Combien de firmes seront présentes à long terme ? Décrivez l'évolution de l'équilibre du court au long terme (2.5 pts).

Exercice 2-Ménage producteur (12 pt)

- Un ménage comprend un seul individu. Sa fonction de production domestique est donnée par : $y = f(h,x) = hx$, où y est la quantité d'un bien domestique agrégé produite à partir de la fonction de production f , h représente le temps de travail domestique et x la quantité agrégée de biens marchands, de prix unitaire égal à p_x , utilisés dans la production domestique. Soit w le taux de salaire de l'individu(e) s'il/elle travaille sur le marché.

- 1) A quelle catégorie la fonction de production appartient-elle ? Tracez quelques isoquantes. Sont-elles convexes ? Quelle(s) autre(s) propriétés possèdent-elles ? (3 pt)
- 2) Déterminez les demandes conditionnelles de facteurs (fonctions de la quantité produite et des prix des facteurs), ainsi que la fonction de coût du ménage. Le lemme de Shephard permet-il ici de retrouver les demandes conditionnelles des deux facteurs ? (3 pt)
- 3) Quelle est la nature des rendements d'échelle de la production ? Supposons que le ménage puisse écouter le bien domestique qu'il produit au prix p sur un marché concurrentiel et cherche à maximiser le profit qu'il en tire. En ignorant l'existence des conditions du second ordre de la maximisation du profit, que trouverait-on pour ces différentes fonctions si l'on cherchait, dans le cadre habituel de la théorie du producteur, à calculer les demandes notionnelles de facteurs (fonctions du prix de vente et des prix des facteurs), la fonction d'offre de bien domestique par le ménage, et la fonction de profit ? La valeur trouvée pour la fonction de profit doit vous inciter à comprendre qu'il y a un problème dont on expliquera la nature en le reliant à la première partie de la question. (4 pt)
- 4) Le ménage a-t-il nécessairement intérêt à allouer tout son temps disponible hors loisirs à la production domestique ? A quelles contraintes et à quel type d'arbitrage sera-t-il soumis ? (2 pt)

Sujet 2

Exercice 1-Producteur (10 pt)

On considère un marché sur lequel la demande s'écrit: $p = 160 - 2(q_1 + q_2)$ où p est le prix de vente du bien et où deux firmes ($i=1,2$) intervenant sur ce marché, produisent chacune q_i ($i=1,2$). Leurs coûts totaux respectifs sont donnés par les expressions suivantes:

$$C_1(q_1) = 2q_1^2$$

$$C_2(q_2) = 10q_2$$

On considère que les deux firmes se font concurrence de manière symétrique, par les prix.

- 1) Comment s'appelle ce type d'environnement? (1 pt)
- 2) Calculer le prix de vente, la production et le profit de chacune des firmes, en expliquant et justifiant clairement votre démarche. (4 pts)

Considérons désormais que les fonctions de coût ont l'allure suivante:

$$C_1(q_1) = 15q_1$$

$$C_2(q_2) = 10q_2$$

- 3) Calculez le prix de vente, la production et le profit de chacune des firmes (2 pts). En quoi l'équilibre de marché diffère-t-il de celui de la question précédente? (1 pt)

Exercice 2- Consommateur-Surplus (10 pt)

On considère un consommateur de fonction d'utilité quasi-linéaire : $U_1(R_1, X_1) = R_1 + X_1 - X_1^2/2$, où X_1 représente la quantité consommée par ce consommateur d'un bien X , et R_1 représente l'ensemble de ses autres consommations. R_1 est mesuré en unités monétaires et on peut le considérer comme le numéraire. On suppose que le revenu R du consommateur est égal à 1. Soit p le prix unitaire du bien X .

- 1) Pourquoi cette fonction d'utilité est-elle appelée « quasi-linéaire » ? (1 pt)
- 2) Ecrire le programme du consommateur. A partir de sa résolution, calculer la demande du consommateur en bien X . (2 pt)
- 3) Cette demande a une caractéristique inhabituelle. Laquelle ? Tracer les courbes d'indifférence et montrer qu'elles sont homothétiques verticalement. En déduire le lieu des équilibres à rapport de prix constants. (3 pt)
- 4) Le prix unitaire du bien X est $p = 1/4$.
 - a) Déterminer la quantité de X consommée par le consommateur à l'équilibre. (1 pt)
 - b) Calculer le surplus du consommateur correspondant. (3 pt).

Concours interne de recrutement d'administrateurs de l'Insee

Epreuve orale d'admission : anglais

Le candidat dispose de 45 mn pour commenter un texte abordant un sujet d'ordre général, remis au préalable, et portant sur les domaines économique ou social, suivi d'une interrogation sur les idées principales du texte et d'un échange sur la carrière ou le projet professionnel du candidat.

Exemples de textes pouvant être traités :

TEXT 1

Trump Assures Farmers Immigration Crackdown Won't Affect Their Workers



"He assured us we would have plenty of access to workers," said the president of the American Farm Bureau Federation.

President Donald Trump said he would seek to keep his tough immigration enforcement policies from harming the U.S. farm industry and its largely immigrant workforce, according to farmers and officials who met with him.

At a roundtable on farm labor at the White House last month, Trump said he did not want to create labor problems for farmers and would look into improving a program that brings in temporary agricultural workers on legal visas.

"He assured us we would have plenty of access to workers," said Zippy Duvall, president of the American Farm Bureau Federation, one of 14 participants at the April 25 meeting with Trump and Agriculture Secretary Sonny Perdue.

During the roundtable conversation about agriculture, farmers and representatives of the sector brought up labor and immigration, the details of which have not been previously reported. Some farmers told Trump they often cannot find Americans willing to do the difficult farm jobs, according to interviews with nine of the 14 participants.

They said they were worried about stricter immigration enforcement and described frustrations with the H-2A visa program, the one legal way to bring in temporary seasonal agricultural workers.

The White House declined to comment on the specifics of the discussion, but described the meeting as "very productive." The U.S. Department of Agriculture did not respond to a request for comment on the April meeting.

About half of U.S. crop workers are in the country illegally and more than two-thirds are foreign born, according to the most recent figures from the U.S. Department of Labor's National Agriculture Workers' Survey.

During the roundtable, Luke Brubaker, a dairy farmer from Pennsylvania, described how immigration agents had recently picked up half a dozen chicken catchers working for a poultry transportation company in his county.

The employer tried to replace them with local hires, but within three hours all but one had quit, Brubaker told the gathering at the White House.

Trump said he wanted to help and asked Secretary Perdue to look into the issues and come back with recommendations, according to the accounts.

While other issues such as trade, infrastructure and technology were also discussed, participants were more positive after the meeting about the conversation on foreign labor "than about anything else we talked about," said Bill Northey, a farmer and Iowa's secretary of agriculture.

RED TAPE

Tom Demaline, president of Willoway Nurseries in Ohio, said he told the president about his struggles with the H-2A guestworker program, which he has used for 18 years.

He told Trump the program works in concept, but not in practice. "I brought up the bureaucracy and red tape," he said. "If the guys show up a week or two late, it puts crops in jeopardy. You are on pins and needles all year to make sure you get the workers and do everything right."

While use of the program has steadily increased over the past decade, it still accounts for only about 10 percent of the estimated 1.3 million farmworkers in the country, according to government data. In 2016, the government granted 134,000 H-2A visas

Employers who import workers with H-2A visas must provide free transportation to and from the United States as well as housing and food for workers once they arrive. Wage minimums are set by the government and are often higher than farmers are used to paying.

Steve Scaroni, whose company Fresh Harvest brings in thousands of foreign H-2A workers for growers in California's Central valley, says, however, that he could find work for even more people if he had more places to house them.

Trump recently signed another executive order titled "Buy American, Hire American," calling for changes to a program granting temporary visas for the tech industry, but not to visas used by farmers and other seasonal businesses, including Trump's own resorts.

Trump also signed two executive orders, just days after taking office, focused on border security that called for arresting more people in the United States illegally and speeding up deportations. Roundtable participants said that many farmers have worried about the effect of the stepped up enforcement on their workforce, but Trump told them his administration was focused on deporting criminals, not farmworkers.

"He has a much better understanding about this than some of the rhetoric we have seen," said meeting attendee Steve Troxler, North Carolina's agriculture commissioner and a farmer himself. The farmers at the meeting said they stressed to the president the need for both short-term and permanent workers. They said there should be a program to help long-time farmworkers without criminal records, but who are in the country illegally, to become legal residents.

Last Tuesday, Democrats in the House and Senate said they would introduce a bill to give farmworkers who have worked illegally in the country for two consecutive years a "blue card" to protect them from deportation.

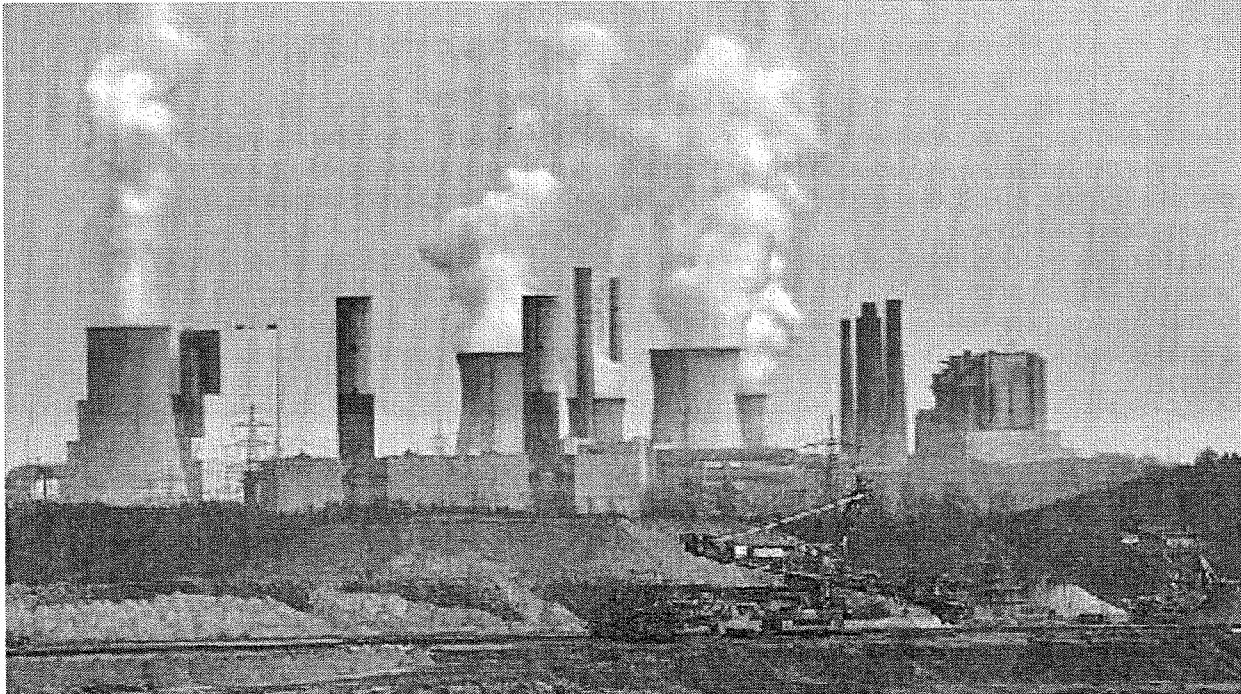
Brubaker, the Pennsylvania farmer, said he liked what he had heard about the bill and hoped it would get the president's support to make it a bipartisan effort.

"The administration has got something started here," he said of the meeting with farm leaders. "It's about time something happens."

Mica Rosenberg and Kristina Cooke, Reuters, April 2017

TEXT 2

U.S. economic growth and security outweigh climate policy review, envoy tells U.N. conference



A power plant near Grevenbroich, western Germany, in 2014. Diplomats are meeting in Bonn to discuss implementation of a landmark agreement to fight climate change. (Martin Meissner / Associated Press)

Erik Kirschbaum

The Trump administration will stay focused on economic growth and national security no matter the outcome of its climate change policy review, a U.S. official told delegates at a United Nations convention in Germany on Saturday.

"It is clear that the administration will not take actions that are contrary to the overarching focus of competitiveness and economic growth," said Trigg Talley, a deputy special envoy for climate change at the State Department.

Talley led an unusually small U.S. delegation of seven officials to the 10-day U.N. Framework Convention on Climate Change talks in Bonn. The conference was held to start designing rules for implementing the Paris accord to limit average global warming to 2 degrees Celsius above preindustrial levels.

Reflecting the shift in its government's views on climate change after President Trump's inauguration in January, the U.S. delegation was far smaller than the 44-member contingent sent to Bonn for similar talks a year ago. The previous U.S. government led by Barack Obama played a leading role in achieving the 2015 Paris agreement.

Talley dodged the most pressing question at the gathering: Will the United States remain committed to the Paris accord despite Trump's campaign vows to cancel it?

But the U.S. diplomat still managed to surprise the delegates grilling him about the U.S. pledge as part of the accord to reduce its carbon emissions by 26% to 28% by 2025, informing them that the United States would not contribute this year to the Green Climate Fund, a financial mechanism that aims to help poor nations deal with climate change.

"We have a new U.S. administration, and along with that comes a substantial change in priorities and approaches," Talley told the representatives of nearly 200 countries that signed the agreement who have been meeting all week.

"The administration has not developed a formal policy on climate change, both domestic and international climate change issues," he said.

Trump and some Republican leaders have expressed doubt about scientists' assertions that climate change is human-induced. He called it a Chinese hoax in 2012 and threatened to cancel not only U.S. participation in the Paris accord, but also the \$2 billion in pledges the Obama administration made to the Green Climate Fund.

With Trump's advisors divided about whether the United States should pull out of the accord, the White House last week said Trump would not make a decision on that until after the May 26-27 Group of 7 meeting in Sicily.

Some Trump advisors, including Secretary of State Rex Tillerson, say the United States should stay in and simply reduce its carbon emission reduction targets in the nonbinding accord.

Tillerson on Thursday signed a document that affirms the need for international action against climate change, an act that added further uncertainty to the direction of climate policy under the Trump administration.

According to the document, signed by Tillerson and foreign ministers from seven Arctic nations who met in Fairbanks, Alaska, the participants concluded their meeting "noting the entry into force of the Paris agreement on climate change and its implementation, and reiterating the need for global action to reduce both long-lived greenhouse gases and short-lived climate pollutants."

Called the Fairbanks Declaration, the document says leaders signed it "recognizing that activities taking place outside the Arctic region, including activities occurring in Arctic states, are the main contributors to climate change effects and pollution in the Arctic, and underlining the need for action at all levels."

Talley's bombshell announcement that the U.S. would stop contributing to the Green Climate Fund reverberated through the conference center on the banks of the Rhine River.

"That is very worrisome," said Mariana Panuncio-Feldman, the World Wildlife Fund's senior director of international climate cooperation. "It raises questions about whether the U.S. is committed. Honoring our pledges to the fund is not only in the interest of the world, but it's also in the interest of U.S. national security."

The 30 minutes of questioning that Talley faced after his 10-minute statement to delegates was polite and professional. Talley seemed to answer as clearly and succinctly as he could, given the unclear U.S. position, and later was praised for his efforts by a number of delegates.

Talley pointed out that U.S. carbon dioxide emissions had fallen by 11.5% from 2005 to 2015 despite steady economic growth over that period.

"I think the most salient point he made is that you actually don't need to compromise economic growth when reducing emissions," Panuncio-Feldman said. "He showed the delegates a slide and the big point that jumped out was that emissions declined as [gross domestic product] increased. The United States has shown in the last few years that it is possible to have growth with reduced emissions."

LA Times, April 24, 2017