Multiple Choice (1.7 points each)
Identify the letter of the choice that best completes the statement or answers the question.
Mark each answer clearly with a No. 2 pencil on the Scantron form.

1. When a firm is operating at efficient scale, average total cost will
   (a) fall as output is increased.
   (b) fall as output is decreased.
   (c) be at its maximum.
   (d) none of the above.

2. If marginal cost exceeds marginal revenue, then
   (a) the firm must be experiencing losses.
   (b) the firm may still be earning a profit.
   (c) the firm is most likely to be at a profit maximizing level of output.
   (d) a profit maximizing firm should increase the level of production.

3. When a competitive market that is comprised of firms that have identical cost structures experiences a sudden yet persistent increase in demand, which of the following are most likely to happen?
   (i) New firms will enter the market.
   (ii) In the long-run all firms will be producing at their efficient scale.
   (iii) The price will return to the level before the changes in demand in the long-run.

   (a) (i) and (ii) only
   (b) (i) and (iii) only
   (c) (ii) and (iii) only
   (d) (i), (ii) and (iii)

4. Excessive monopoly profits themselves represent
   (a) a deadweight loss.
   (b) a shrinkage in total surplus.
   (c) a shrinkage in consumer surplus.
   (d) all of the above.

5. Since natural monopolies have a declining average cost curve, regulating a natural monopoly by setting price equal to marginal cost would
(a) cause the monopolist to operate at a loss.
(b) maximize producer surplus.
(c) result in a less than optimal total surplus.
(d) achieve the optimal output level as in the competitive market in the long-run.

6. Consider the Chamberlin’s monopolistic competition model. In the short-run equilibrium, the price of a firm must
(a) equal to the marginal cost
(b) equal to the marginal cost times the markup and be smaller than the average cost.
(c) equal to the marginal cost times the markup and be greater or equal to the average cost.
(d) be smaller than the marginal cost.

7. Suppose there are only two firms supplying in the market and they produce a homogeneous good. Two firms produce the good with the same constant marginal cost. There is no other cost of production. Firms compete by setting price simultaneously. Consumers maximize their utilities. The equilibrium price of both firms must
(a) equal to the marginal cost times the markup.
(b) equal to the marginal cost
(c) be greater than the marginal cost but smaller than the marginal cost times the markup.
(d) equal to the average cost.

8. Everything is the same as previous question, but one firm (firm A) has higher marginal cost than the other (firm B.) The equilibrium price must
(a) equal to the marginal cost of firm A
(b) equal to the marginal cost of firm B
(c) be slightly below the marginal cost of firm A or equal to the optimal price of firm B as it has the monopoly power.
(d) equal to the average cost of firm A.

9. Suppose in a country, there is a sector where producers produce a homogeneous good with an increasing constant marginal cost. There is a negative externality when producing the good. Suppose the country is a small open economy, which means it can import the good with a constant price. Suppose also that it does not have comparative advantage in producing the good and there is no complete specialization under free trade. In the following choices, what is the best policy to resolve the problem of externality?
(a) Using an import subsidy.
(b) Using a production subsidy.
(c) Using a tariff.
(d) Using a production tax.
10. In a Ricardian trade model with two countries and two goods, suppose one country has absolute advantage in producing both goods. Goods are traded freely. The country with lower productivity must produce at least one good because
(a) both countries enjoy gains from trade.
(b) otherwise, the factor market cannot be clear.
(c) two countries complete specialize in a sector at equilibrium.
(d) both goods are demanded.

11. A simple linear demand function may be stated as \( Q = a - bP + cI \) where \( Q \) is quantity demanded, \( P \) is the product price, and \( I \) is consumer income. To compute an appropriate value for \( c \), we can use observed values for \( Q \) and \( I \) and then set the estimated income elasticity of demand equal to:
(a) \( c(I/Q) \)
(b) \( cQ/I \)
(c) \( -b(I/Q) \)
(d) \( Q/(cI) \)

12. Use the following two statements to answer this question:
I. If utility is ordinal, a market basket that provides 30 utils provides twice the satisfaction of a market basket that provides 15 utils.
II. When economists first studied utility it was believed that utility was cardinal, but it was later discovered that ordinal preferences are sufficient to explain how most individual decisions are made.
(a) Both I and II are true.
(b) I is true, and II is false.
(c) I is false, and II is true.
(d) Both I and II are false.

13. Which of the following demand functions represents a price elasticity of demand equal to -0.33 and an income elasticity of demand equal to 0.8 at all points along the curve?
(a) \( Q = 3 - 0.33P + 0.8I \)
(b) \( Q = 4.5 - 0.33\log(P) + 0.8I \)
(c) \( \log(Q) = 1.34 - 0.33\log(P) + 0.8I \)
(d) \( \log(Q) = 2.34 - 0.33 \log(P) + 0.8 \log(I) \)

14. Bob views apples and oranges as perfect substitutes in his consumption, and \( MRS = 1 \) for all combinations of the two goods in his indifference map. Suppose the price of apples is $2 per pound, the price of oranges is $3 per pound, and Bob’s budget is $30 per week. What is Bob’s utility maximizing choice between these two
15. Assume that we have a demand curve of the form:

\[ \log(Q) = a - b \log(P) + c \log(I), \]

where \( Q = \) quantity, \( P = \) price, \( I = \) income, and \( a, b, \) and \( c \) are positive constants. The income and price elasticities for the demand curve represented above are always:

(a) equal to one.
(b) equal to zero.
(c) equal (i.e., income elasticity always equals price elasticity).
(d) constant but not necessarily equal to one another.

16. Let \( P \) denote the price of goods in the Taiwan, \( P^w \) denote the price of goods in the foreign country, and \( E \) the exchange rate, measured as the number of units of foreign currency that can be purchased with one NTD. According to the law of one price:

(a) \( P = E P^w \).
(b) \( P^w = E P \).
(c) \( E = P/P^w \).
(d) \( P^w = E + P \).

17. Purchasing-power parity describes the forces that determine:

(a) prices in the short run.
(b) prices in the long run.
(c) exchange rates in the short run.
(d) exchange rates in the long run.

18. If a McDonald's Big Mac cost $3.06 in the United States and 3.21 euros in the Euro area, then purchasing-power parity implies the nominal exchange rate is how many euros per dollar (approximately)?

(a) 1.05. If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
(b) 1.05. If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.
(c) .95 If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
(d) .95 If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.
19. Which of the following does the level of real GDP measure?
   (a) total real income
   (b) productivity
   (c) the standard of living
   (d) All of the above are correct.

20. “When workers have a relatively small quantity of capital to use in producing goods and services, giving them an additional unit of capital increases their productivity by a relatively large amount.” This statement
   (a) is an assertion that production functions have the property of constant returns to scale.
   (b) is consistent with the view that capital is subject to diminishing returns.
   (c) is inconsistent with the view that it is easier for a country to grow fast if it starts out relatively poor.
   (d) All of the above are correct.

21. If an unemployed person quits looking for work, then, other things the same, the unemployment rate
   (a) decreases and the labor-force participation rate is unaffected.
   (b) and the labor-force participation rate both decrease.
   (c) is unaffected and the labor-force participation rate decreases.
   (d) and the labor-force participation rate are both unaffected.

22. Suppose that efficiency wages become more common in the economy. Economists would predict that this would
   (a) increase the quantity demanded and decrease the quantity supplied of labor, thereby decreasing the natural rate of unemployment.
   (b) decrease the quantity demanded and increase the quantity supplied of labor, thereby increasing the natural rate of unemployment.
   (c) increase the quantity demanded and decrease the quantity supplied of labor, thereby increasing the natural rate of unemployment.
   (d) decrease the quantity demanded and increase the quantity supplied of labor, thereby decreasing the natural rate of unemployment.

23. An increase in the money supply
   (a) and an investment tax credit both cause aggregate demand to shift right.
   (b) and an investment tax credit both cause aggregate demand to shift left.
   (c) causes aggregate demand to shift right, while an investment tax credit causes aggregate demand to shift left.
(d) causes aggregate demand to shift left, while an investment tax credit causes aggregate demand to shift right.

24. Sticky nominal wages can result in
   (a) lower profits for firms when the price level is lower than expected.
   (b) a decrease in real wages when the price level is lower than expected.
   (c) a short-run aggregate-supply curve that is vertical.
   (d) a long-run aggregate-supply curve that is upward-sloping.

25. Which of the following would cause prices and real GDP to rise in the short run?
   (a) an increase in the expected price level
   (b) an increase in the money supply
   (c) a decrease in the capital stock
   (d) None of the above is correct.

26. Which of the following monetary policy violates Taylor principle?
   (a) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 2.5%.
   (b) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 3%.
   (c) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 3%.
   (d) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 2.5%.

27. The M1 money multiplier will shrink due to
   (a) smaller excess reserves ratio.
   (b) smaller currency ratio.
   (c) greater time deposits ratio.
   (d) greater required reserves ratio.

28. A higher growth rate of money supply causes
   (a) lower interest rates if liquidity effect is larger than income and expected inflation effects.
   (b) higher interest rates if liquidity effect is larger than income and expected inflation effects.
   (c) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is slow.
   (d) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is fast.

29. Nowadays, most countries do not adopt monetary targeting since
   (a) the public do not understand how monetary targeting works.
   (b) the velocity of money is unstable and quite volatile.
(c) the relationship of output and money aggregates is weak.
(d) inflation and money aggregates have inverse relationship.

30. Which of the following statements is true?
(a) The conventional Phillips curve has microeconomic foundation.
(b) The New Keynesian Phillips curve is merely a statistical relation.
(c) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and unemployment.
(d) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and real marginal cost.

Numerical/algebraic problems and short-essay questions
Please answer the following questions IN SEQUENCE. All questions may be answered in EITHER Chinese OR English.

1. A video game producer has costs of $25,000 per month that are fixed with regard to output. The firm has a flat marginal cost at $5 per unit of output, for output between 1 and 16,000 units. The firm cannot produce more than 16,000 units. Information from the market research group indicates that the demand for the video game can be represented by the following $P = 9.8 - 0.0002Q$.

(a) (3 points) What price should be set to maximize profit? How many units of the game are sold? What are the profits of the firm?

The firm has the opportunity to sell in a second market that is separated from the first. For the second market, the market research group has estimated the demand relationship to be $P_2 = 7 - 0.0001Q_2$.

(b) (5 points) The firm believes that this second market offers an opportunity for additional profit. Should it sell only units that would not be absorbed in the primary market at the profit-maximizing price or should it divert some units from the primary to the secondary market? What price would you set in each market? What is the profit of the firm?

2. Suppose there is a country producing two goods with the following technology

$$Q_x = L_x$$
$$Q_y = K_y$$

Suppose that the labor supply is fixed at 50 units and the capital supply is fixed at 100 units. Consumers spend
half of their income on good X and the rest of income on good Y. All markets are perfectly competitive. Let good Y be the numeraire. Answer the following questions
(a) (3 points) Derive the equilibrium price of X relative to Y.
(b) (3 points) Suppose there is another country producing two goods with the same technology and consumers in that country also evenly spend their income on both goods. In this country, the supply of labor is fixed at 100 units and the supply of capital is fixed at 50 units. Derive the equilibrium price of X relative to Y if two countries trade freely.
(c) (3 points) What is the good the capital abundant country exports? How many quantities of that good does it export?

3. Chester lives in a dormitory that offers soft drinks and chips for sale in vending machines. His utility function is \( U = 3SC \) (where \( S \) is the number of soft drinks per week and \( C \) the number of bags of chips per week), so his marginal utility of \( S \) is \( 3C \) and his marginal utility of \( C \) is \( 3S \). Soft drinks are priced at $0.50 each, chips $0.25 per bag.
(a) (3 points) Write an expression for Chester’s marginal rate of substitution between soft drinks and chips.
(b) (3 points) Use the expression generated in part (a) to determine Chester’s optimal mix of soft drinks and chips.
(c) (2 points) If Chester has $5.00 per week to spend on chips and soft drinks, how many of each should he purchase per week?

4. To catch up with the living standard of the US,
(a) (4 points) Can a sufficiently poorer country achieve this goal by simply receiving more capital donated by the United Nation on a per-capita basis? Why or why not?
(b) (4 points) Can a sufficiently poorer country achieve this goal by simply increase her saving rate? Why or why not?

5. Use the model of aggregate demand and aggregate supply to illustrate each of the following event’s short-run and long-run impacts on the aggregate price level and aggregate output.
(a) (4 points) There is an increase in households’ wealth due a stock market boom.
(b) (4 points) The government lowers taxes, leaving households with more disposable income, with no corresponding reduction in government spending.

6. Consider a model that the central bank may have incentives to deviate from a monetary policy rule. The central bank’s objective is to maximize the expected value of
\[
U = \lambda (y - y_n) - \frac{1}{2} \pi^2,
\]
where $y$ is output, $y_n$ is the economy’s natural rate of output, $\pi$ is inflation rate, and $\lambda > 0$. The aggregate output is given by a Lucas-type supply function:

$$y = y_n + \alpha(\pi - \pi^e) + e,$$

where $\pi^e$ is expected inflation, $e$ is a supply shock ($e \sim N(0, \sigma_e^2)$), and $\alpha > 0$. The link between inflation and the monetary policy instrument is given by

$$\pi = \Delta m + \nu,$$

where $\Delta m$ is the growth rate of money and $\nu$ is a velocity disturbance ($\nu \sim N(0, \sigma_v^2)$). We assume that the central bank can observe $\pi^e$ and the realization of $e$ but not the realization of $\nu$ before its choice of $\Delta m$. We also assume that two disturbances $e$ and $\nu$ are uncorrelated.

(a) (4 points) What is the central bank’s optimal choice of $\Delta m$?

(b) (4 points) Compared to the case that the central bank commits to a rule $\Delta m = 0$, which policy makes the society better off (i.e. higher expected utility)? Show all your work.
### Areas under the Normal Curve

<table>
<thead>
<tr>
<th>$z$</th>
<th>0.00</th>
<th>0.01</th>
<th>0.02</th>
<th>0.03</th>
<th>0.04</th>
<th>0.05</th>
<th>0.06</th>
<th>0.07</th>
<th>0.08</th>
<th>0.09</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0000</td>
<td>0.0040</td>
<td>0.0080</td>
<td>0.0120</td>
<td>0.0160</td>
<td>0.0199</td>
<td>0.0239</td>
<td>0.0279</td>
<td>0.0319</td>
<td>0.0359</td>
</tr>
<tr>
<td>0.1</td>
<td>0.0398</td>
<td>0.0438</td>
<td>0.0478</td>
<td>0.0517</td>
<td>0.0557</td>
<td>0.0596</td>
<td>0.0636</td>
<td>0.0675</td>
<td>0.0714</td>
<td>0.0753</td>
</tr>
<tr>
<td>0.2</td>
<td>0.0793</td>
<td>0.0832</td>
<td>0.0871</td>
<td>0.0910</td>
<td>0.0945</td>
<td>0.0980</td>
<td>0.1016</td>
<td>0.1054</td>
<td>0.1093</td>
<td>0.1131</td>
</tr>
<tr>
<td>0.3</td>
<td>0.1179</td>
<td>0.1217</td>
<td>0.1255</td>
<td>0.1293</td>
<td>0.1329</td>
<td>0.1364</td>
<td>0.1399</td>
<td>0.1433</td>
<td>0.1466</td>
<td>0.1500</td>
</tr>
<tr>
<td>0.4</td>
<td>0.1554</td>
<td>0.1591</td>
<td>0.1628</td>
<td>0.1664</td>
<td>0.1700</td>
<td>0.1736</td>
<td>0.1772</td>
<td>0.1808</td>
<td>0.1844</td>
<td>0.1879</td>
</tr>
<tr>
<td>0.5</td>
<td>0.1915</td>
<td>0.1950</td>
<td>0.1985</td>
<td>0.2019</td>
<td>0.2054</td>
<td>0.2088</td>
<td>0.2123</td>
<td>0.2157</td>
<td>0.2190</td>
<td>0.2224</td>
</tr>
<tr>
<td>0.6</td>
<td>0.2257</td>
<td>0.2291</td>
<td>0.2324</td>
<td>0.2357</td>
<td>0.2389</td>
<td>0.2422</td>
<td>0.2454</td>
<td>0.2486</td>
<td>0.2517</td>
<td>0.2549</td>
</tr>
<tr>
<td>0.7</td>
<td>0.2580</td>
<td>0.2611</td>
<td>0.2642</td>
<td>0.2673</td>
<td>0.2704</td>
<td>0.2734</td>
<td>0.2764</td>
<td>0.2794</td>
<td>0.2823</td>
<td>0.2852</td>
</tr>
<tr>
<td>0.8</td>
<td>0.2881</td>
<td>0.2910</td>
<td>0.2939</td>
<td>0.2967</td>
<td>0.2995</td>
<td>0.3023</td>
<td>0.3051</td>
<td>0.3078</td>
<td>0.3106</td>
<td>0.3133</td>
</tr>
<tr>
<td>0.9</td>
<td>0.3159</td>
<td>0.3186</td>
<td>0.3212</td>
<td>0.3238</td>
<td>0.3264</td>
<td>0.3289</td>
<td>0.3315</td>
<td>0.3340</td>
<td>0.3365</td>
<td>0.3389</td>
</tr>
<tr>
<td>1.0</td>
<td>0.3413</td>
<td>0.3438</td>
<td>0.3461</td>
<td>0.3485</td>
<td>0.3508</td>
<td>0.3531</td>
<td>0.3554</td>
<td>0.3577</td>
<td>0.3599</td>
<td>0.3621</td>
</tr>
<tr>
<td>1.1</td>
<td>0.3643</td>
<td>0.3665</td>
<td>0.3686</td>
<td>0.3708</td>
<td>0.3729</td>
<td>0.3749</td>
<td>0.3770</td>
<td>0.3790</td>
<td>0.3810</td>
<td>0.3830</td>
</tr>
<tr>
<td>1.2</td>
<td>0.3849</td>
<td>0.3869</td>
<td>0.3888</td>
<td>0.3907</td>
<td>0.3925</td>
<td>0.3944</td>
<td>0.3962</td>
<td>0.3980</td>
<td>0.3997</td>
<td>0.4015</td>
</tr>
<tr>
<td>1.3</td>
<td>0.4032</td>
<td>0.4049</td>
<td>0.4066</td>
<td>0.4082</td>
<td>0.4099</td>
<td>0.4115</td>
<td>0.4131</td>
<td>0.4147</td>
<td>0.4162</td>
<td>0.4177</td>
</tr>
<tr>
<td>1.4</td>
<td>0.4192</td>
<td>0.4207</td>
<td>0.4222</td>
<td>0.4236</td>
<td>0.4251</td>
<td>0.4265</td>
<td>0.4279</td>
<td>0.4292</td>
<td>0.4306</td>
<td>0.4319</td>
</tr>
<tr>
<td>1.5</td>
<td>0.4332</td>
<td>0.4345</td>
<td>0.4357</td>
<td>0.4370</td>
<td>0.4382</td>
<td>0.4394</td>
<td>0.4406</td>
<td>0.4418</td>
<td>0.4429</td>
<td>0.4441</td>
</tr>
<tr>
<td>1.6</td>
<td>0.4452</td>
<td>0.4463</td>
<td>0.4474</td>
<td>0.4484</td>
<td>0.4495</td>
<td>0.4505</td>
<td>0.4515</td>
<td>0.4525</td>
<td>0.4535</td>
<td>0.4545</td>
</tr>
<tr>
<td>1.7</td>
<td>0.4554</td>
<td>0.4564</td>
<td>0.4573</td>
<td>0.4582</td>
<td>0.4591</td>
<td>0.4599</td>
<td>0.4608</td>
<td>0.4616</td>
<td>0.4625</td>
<td>0.4633</td>
</tr>
<tr>
<td>1.8</td>
<td>0.4641</td>
<td>0.4649</td>
<td>0.4656</td>
<td>0.4664</td>
<td>0.4671</td>
<td>0.4678</td>
<td>0.4686</td>
<td>0.4693</td>
<td>0.4699</td>
<td>0.4706</td>
</tr>
<tr>
<td>1.9</td>
<td>0.4713</td>
<td>0.4719</td>
<td>0.4726</td>
<td>0.4732</td>
<td>0.4738</td>
<td>0.4744</td>
<td>0.4750</td>
<td>0.4756</td>
<td>0.4761</td>
<td>0.4767</td>
</tr>
<tr>
<td>2.0</td>
<td>0.4772</td>
<td>0.4778</td>
<td>0.4783</td>
<td>0.4788</td>
<td>0.4793</td>
<td>0.4798</td>
<td>0.4803</td>
<td>0.4808</td>
<td>0.4812</td>
<td>0.4817</td>
</tr>
<tr>
<td>2.1</td>
<td>0.4821</td>
<td>0.4826</td>
<td>0.4830</td>
<td>0.4834</td>
<td>0.4838</td>
<td>0.4842</td>
<td>0.4846</td>
<td>0.4850</td>
<td>0.4854</td>
<td>0.4857</td>
</tr>
<tr>
<td>2.2</td>
<td>0.4861</td>
<td>0.4864</td>
<td>0.4868</td>
<td>0.4871</td>
<td>0.4875</td>
<td>0.4878</td>
<td>0.4881</td>
<td>0.4884</td>
<td>0.4887</td>
<td>0.4890</td>
</tr>
<tr>
<td>2.3</td>
<td>0.4893</td>
<td>0.4896</td>
<td>0.4898</td>
<td>0.4901</td>
<td>0.4904</td>
<td>0.4906</td>
<td>0.4909</td>
<td>0.4911</td>
<td>0.4913</td>
<td>0.4916</td>
</tr>
<tr>
<td>2.4</td>
<td>0.4918</td>
<td>0.4920</td>
<td>0.4922</td>
<td>0.4925</td>
<td>0.4927</td>
<td>0.4929</td>
<td>0.4931</td>
<td>0.4932</td>
<td>0.4934</td>
<td>0.4936</td>
</tr>
<tr>
<td>2.5</td>
<td>0.4938</td>
<td>0.4940</td>
<td>0.4941</td>
<td>0.4943</td>
<td>0.4945</td>
<td>0.4946</td>
<td>0.4948</td>
<td>0.4949</td>
<td>0.4951</td>
<td>0.4952</td>
</tr>
<tr>
<td>2.6</td>
<td>0.4953</td>
<td>0.4955</td>
<td>0.4956</td>
<td>0.4957</td>
<td>0.4959</td>
<td>0.4960</td>
<td>0.4961</td>
<td>0.4962</td>
<td>0.4963</td>
<td>0.4964</td>
</tr>
<tr>
<td>2.7</td>
<td>0.4965</td>
<td>0.4966</td>
<td>0.4967</td>
<td>0.4968</td>
<td>0.4969</td>
<td>0.4970</td>
<td>0.4971</td>
<td>0.4972</td>
<td>0.4973</td>
<td>0.4974</td>
</tr>
<tr>
<td>2.8</td>
<td>0.4974</td>
<td>0.4975</td>
<td>0.4976</td>
<td>0.4977</td>
<td>0.4977</td>
<td>0.4978</td>
<td>0.4979</td>
<td>0.4979</td>
<td>0.4980</td>
<td>0.4981</td>
</tr>
<tr>
<td>2.9</td>
<td>0.4981</td>
<td>0.4982</td>
<td>0.4982</td>
<td>0.4983</td>
<td>0.4984</td>
<td>0.4984</td>
<td>0.4985</td>
<td>0.4985</td>
<td>0.4986</td>
<td>0.4986</td>
</tr>
<tr>
<td>3.0</td>
<td>0.4987</td>
<td>0.4987</td>
<td>0.4987</td>
<td>0.4988</td>
<td>0.4988</td>
<td>0.4989</td>
<td>0.4989</td>
<td>0.4989</td>
<td>0.4990</td>
<td>0.4990</td>
</tr>
</tbody>
</table>
1. (15pts). For each of the following statements, determine whether it is true or false. Do not give explanation.

(a) The mode of a categorical variable is the category with the most items.

(b) If a test rejects the null hypothesis ($H_0$) with the significance level set to $\alpha = 0.05$, then it would also reject $H_0$ with $\alpha = 0.01$.

(c) Using $X$-bar chart and $S$-chart that set control limits at $\pm 3$ standard errors, when the process is under control, we are more likely to signal a problem falsely if we are using both the $X$-bar chart and $S$-charts than using only $X$-bar chart.

(d) A market research assistant watches the next five customer as they leave the store. He records whether the customer is carrying a store bag that indicates the customer made a purchase. He writes down a 'yes' or a 'no' for each. Then the sample space for this experiment has 10 elements.

(e) Refer to (d). The assumption of independence means that each shopper has the same probability for carrying a bag.

2. (9pts). Multiple-choice questions. Do not give explanation. Note for each of the following questions, there is only one correct answer.

(a) Thirty randomly selected statistics students were given 12 multiple-choice questions and 12 open-ended questions - all on the same material. The professor was interested in determining which type (multiple-choice or open-ended) of questions the students scored higher. Then this experiment is an example of

(A) a one-sample $t$ test of means.
(B) a two-sample $t$ test of means.
(C) a two-sample test of proportions.
(D) a paired $t$-test.

(b) Refer to (a). This experiment an example of

(A) a one-tailed test.
(B) a two-tailed test.

(c) If the rate of change from one period to the next is a constant percent, then which one of the following statements is correct?

(A) A log transformation is used.
(B) A linear trend equation is used.
(C) The slope of the trend line will be negative.
(D) The episodic variation will always be less than 1.00.
3. The following boxplot summarize the distribution of income for 1,000 households in Colorado.

```
    * * * * *
```

```
0   1,000  2,000  3,000  4,000  5,000  6,000  7,000  8,000  9,000  10,000
```

Number of Newspapers

(a) (3pts). What percent of households have income less than 1,500?

(b) (5pts). Which is larger, the IQR (inter quartile range) or the SD (standard deviation)? Why?

4. (5pts). Every now and then even a good diamond cutter has a problem and the diamond breaks. For one cutter, the rate of break is 0.15% If the cutter works on 60 stones, what probability model (binomial distribution, hypergeometric distribution, or Poisson distribution) seems well suited to this problem? Why?

5. (6pts). Japanese environment researchers studied the performance of truss-and-frame structures subjected to uncertain loads. The load was assumed to have a normal distribution with a mean of 20 pounds. Also, the probability that the load is smaller than 30 pounds is 67%. Please find the standard deviation of the load distribution. Show your work.

6. (8pts). A political candidate is anxious about the outcome of the election. To have his next survey result produce a 95% confidence interval with margin of error of no more than 0.025, how many eligible voters are needed in the sample? Show your work.
7. Development Psychology published an article that examined toddlers's ability to learn from reading picture books. The experiment involved 24 children at each of three different ages: 18, 24, and 30 months. The children were randomly assigned into one of four different reading book conditions. After a book-reading session, the children were scored on their ability to reenact the target actions in the book. A two-way ANOVA model with interaction is performed.

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>(i)</td>
<td>13.2248</td>
<td>6.6124</td>
<td>(v)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Book</td>
<td>3</td>
<td>44.2512</td>
<td></td>
<td>23.6423</td>
<td>0.0000</td>
</tr>
<tr>
<td>Age*Book</td>
<td>6</td>
<td>7.6074</td>
<td>1.2679</td>
<td>2.0322</td>
<td>0.0751</td>
</tr>
<tr>
<td>Error</td>
<td>60</td>
<td></td>
<td>0.6239</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>(ii)</td>
<td>102.5175</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) (15pts). Please fill in the missing values in the table.

(b) (7pts). What does the F in the third row (Age*Book of Ride) of the ANOVA table test? Please give the null and alternative hypotheses, and your conclusion. Take $\alpha = 0.05$.

8. Suppose a fire insurance company wants to relate the amount ($X$) of the fire damage in major residential fires to the distance ($Y$) between the burning house and the nearest fire station. Consider the simple linear regression model $Y = \beta_0 + \beta_1 X + \epsilon$ and obtain the analysis output in the following:

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.27793</td>
<td>1.42023</td>
<td>7.24</td>
<td>0.0000</td>
</tr>
<tr>
<td>Distance</td>
<td>4.91933</td>
<td>0.39275</td>
<td>12.53</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analysis of Variance</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>1</td>
<td>841.76636</td>
<td>841.76636</td>
<td>156.89</td>
<td>0.0000</td>
</tr>
<tr>
<td>Error</td>
<td>13</td>
<td>69.75097</td>
<td>5.36546</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>911.51733</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) (6pts). Please predict the amount of damage if a major residential fire were to occur 3.5 miles from the nearest fire station. Show your work.

(b) (6pts). Please calculate the Pearson's correlation between the damage ($x$) and the distance ($y$). Show your work.
9. The National Opinion Research Center at the University of Chicago reported the following results of a survey in fall of 2004. The survey asked 2820 adults to state how much they trust different figures in the news. The table below summarizes the percentages.

<table>
<thead>
<tr>
<th>Group</th>
<th>Great trust</th>
<th>Some trust</th>
<th>Hardly any trust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientists</td>
<td>11%</td>
<td>12%</td>
<td>1%</td>
</tr>
<tr>
<td>Banks</td>
<td>7%</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>Organized religion</td>
<td>7%</td>
<td>13%</td>
<td>5%</td>
</tr>
<tr>
<td>Executive branch of government</td>
<td>6%</td>
<td>12%</td>
<td>8%</td>
</tr>
</tbody>
</table>

It is interested if the table shows any association between the group and the amount of trust?

(a) (6pts). Under the null hypothesis that there is no association between the group and the amount of trust, please calculate the expected count for the cell in group scientist and some trust. Show your work.

(b) (3pts). Suppose a Chi-Squared test is performed. What is the degrees of the freedom for the test of the null hypothesis of independence?

10. (6pts). Hudson Corporation is considering three options for managing its data processing operation: continue with its own staff, hire an outside vendor to do the managing, or use a combination of its own staff and an outside vendor. The “cost” of operation depends on future demand. The annual “cost” of each option (in thousands of dollars) depends on demands as follows.

<table>
<thead>
<tr>
<th>Staffing Options</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td>Own Staff</td>
<td>650</td>
</tr>
<tr>
<td>Outside Vendor</td>
<td>950</td>
</tr>
<tr>
<td>Combination</td>
<td>800</td>
</tr>
</tbody>
</table>

If the demand probability are 0.3, 0.5, and 0.2, which option will be made based on the expected cost of the data processing operation? Show your work.
<table>
<thead>
<tr>
<th>考試科目</th>
<th>商事法</th>
<th>所別</th>
<th>國際經營與貿易學系／國際經貿法組</th>
<th>考試時間</th>
<th>2月27日(日)第三節</th>
</tr>
</thead>
</table>

1. 喬治與瑪麗童裝公司向高雄成衣廠黑天鵝公司訂購一個貨櫃的童裝，並開發信用狀乙紙金額新台幣八十萬元給黑天鵝公司，黑天鵝公司竟以碎布蒙混交貨，並以不實單據領取信用狀之貨款。事後喬治與瑪麗公司以黑天鵝公司及其董事之一：顧客名媛陳仙女為共同被告請求賠償，陳仙女以其只是掛名董事，因為黑天鵝公司想借重其形象，宣傳黑天鵝服飾產品高貴出眾，但其事實上從未參與公司事務執行，故主張其不負賠償責任。問陳仙女之抗辯有無理由？試從學說與實務見解分別加以說明。 (25%)  

2. 請說明何謂平行線支票？平行線支票如何取款？平行線得否撤銷？又何謂保付支票？支票經保付後，發票人及背書人之責任是否因此免除？ (每小題 5%，共 25%)  

3. 金星輪船公司之過失以致船舶於基隆外海觸礁，為防止海水滲入損壞託運貨物，船長令船員儘速將船上貨物移往乾燥未滲水處，不料在搬運過程中，督遠健身器材公司託運的高價按摩椅受損。於是督遠依照商法第 63 條規定請求金星輪船損害賠償責任。但金星輪船所有負責人則以同法第 69 條第 1 款規定做為抗辯，認為毋庸負責，請問何者合理？ (25%)  

(海商法參考條文)  

第 63 條  運送人對於承運貨物之裝載、卸載、搬移、堆存、保管、運送及看守，應為必要之注意及處置。  

第 69 條  因下列事由所發生之損失或滅失，運送人或船舶所有人不負賠償責任：  
一、船長、海員、引水人或運送人之受僱人，於航行或管理船舶之行為而有過失。  
二、海上或航路上之危險、災難或意外事故。  
三、非由於運送人本人之故意或過失所生之火災。  
四、天災。  
五、戰爭行為。  
六、暴力。  
七、公共敵人之行為。  
八、有權力者之拘捕、限制或依司法程序之扣押。  
九、检疫限制。  
十、罷工或其他勞動事故。  
十一、救助或意圖救助海上人命或財產。  
十二、包裝不固。  
十三、標誌不足或不符。  
十四、因貨物之固有瑕疵、品質或特性所致之耗損或其他損壞滅失。
<table>
<thead>
<tr>
<th>考試科目</th>
<th>商事法</th>
<th>所屬</th>
<th>國際經營與貿易學系／國際經貿法組</th>
<th>考試時間</th>
<th>2 月 27 日(日)第三節</th>
</tr>
</thead>
</table>

十五、貨物所有人、託運人或其代理人代表人之行為或不行為。

十六、船舶及經注意仍不能發現之隱有瑕疵。

十七、其他非因運送人或船舶所有人本人之故意或過失及非因其代理人、受僱人之過失所致者。

4. 何小菲與王小媛預計過年前結婚，去年底購置 20 年公寓的三樓為居所，並以該物件為抵押品向富邦銀行申請貸款，銀行要求借款人何小菲為該公寓向富邦產險投保火災保險，並以富邦銀行為受益人。另一方面，何小菲擔心萬一自己有所不測，王小媛將必須獨力負擔房貸，故亦在婚後為自己向國泰人壽投保人壽保險，並以王小媛為受益人。結果何小菲因為忙著婚禮、過年，居然忘了繳保費予富邦及國泰，試問兩保險契約是否生效。請參考下列法條分述學理與實務見解。(25%)

**《保險法參考條文》**

第 1 條 本法所稱保險，謂當事人約定，一方交付保險費於他方，他方對於因不可預料或不可抗力之事故所致之損害，負擔賠償財物之行為。

根據前項所訂之契約，稱為保險契約。

第 21 條 保險費分一次交付，及分期交付兩種。保險契約規定一次交付，或分期交付之第一期保險費，應於契約生效前交付之；但保險契約簽訂時，保險費未能確定者，不在此限。

第 22 條 保險費應由要保人依契約規定交付。信託業依信託契約有交付保險費義務者，保險費應由信託業代為交付之。

要保人為他人利益訂立之保險契約，保險人對於要保人所得為之抗辯，亦得以之對抗受益人。

施行細則

第 4 條 依本法第四十三條規定簽發保險單或暫保單，須賠付保險費全部或一部分同時為之。

財產保險之要保人在保險人簽發保險單或暫保單前，先交付保險費而發生應予賠償之保險事故時，保險人應負保險責任。

人壽保險人於同意承保前，得預收相當於第一期保險費之金額。保險人應負之保險責任，以保險人同意承保時，自預收相當於第一期保險費金額時開始。