



Undergraduate Mathematics Exam

STUDENT NAME: _____

EXAM DATE AND DURATION:

Date and Time of Exam: Sample Test
Exam Duration: 1.5 hours
Examiner: Kosmas O. Kosmopoulos

INSTRUCTIONS TO CANDIDATES:

- Use a black ball-point pen. Do **NOT** use pencil.
- Answer **ALL** questions
- Follow the instructions carefully and write your answers clearly in the space provided in **THIS** booklet.
- You can **ONLY** use a pre-approved calculator.
- Answers should normally be given to **THREE SIGNIFICANT FIGURES**

EXAM STRUCTURE:

Sections:	3
Exam Score & Pages	90 marks in 15 pages

For office use only:

Section:	Mark
1: Exercises	/41
2: Data	/38
3: Cases	/11
Total:	/90

Final Score (%):

Grade: PASS / FAIL

Marked by:

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Section 1: Basic Exercises

Arithmetic, Numbers & Algebra:

Questions 1- 4:

Write the final answers clearly on the line (1/2 mark each = 2 marks)

		Marks
1.	<i>The prime factors of 96 are 2, 2, 2, 2, and 3</i>	
Write the prime factorization of 96.		1

Calculate the following:

2. $(5/8) - (2/3)$	(In fraction form) <u>-1/24</u>	1
3. Evaluate: $-x 3x - 4y^2 $ when $x = -2$ and $y = -3$.	84	1
4. Convert 4.4% to fraction and decimal notation.	44/1000 or 11/250 and 0.044	1

Complete the following:

5. $6y^2 - y - 1 = (3y + 1)(\quad)$	<u> (2y-1) </u>	2
6. $4y^2 - 8y - 5 = (2y - 5)(\quad)$	<u> (2y+1) </u>	2

Simplify the following:

7. $\sqrt[3]{n^2}$	<u> $n^{2/3}$ </u>	1
8. $(n^3)^4$	<u> n^{12} </u>	1

Factor the following trinomials completely. Write "prime" if they do not factor.

9. $x^2 + 3x - 10$	<u> (x+5)(x-2) </u>	2
10. $6x^2 + 11x - 10$	<u> (3x-2)(2x+5) </u>	2
11. $6x^2 + 5xy - 21y^2$	<u> (2x-3y)(3x+7y) </u>	2

Show the working out and write the final answer clearly in the space provided.

12. $3x - 21 = x/2$

Answer:

 $x=42/5$ or $x=8.4$ **2**

13. $-8 = (3y + 1)/y$

Answer:

 $y=-1/11$ or $y=-0.091$ **2**

14. $12y - 11y = 18 - (-4)$

Answer:

 $y=22$ **2**

Determine if the pair of lines are parallel, perpendicular, or neither.

15. $2x - 3y = 6$

$3x + 2y = 8$

Slope $m=2/3$ and $m=-3/2$ (reverse and changed sign therefore perpendicular) **2**

16. $y = \frac{3}{5}x - 3$

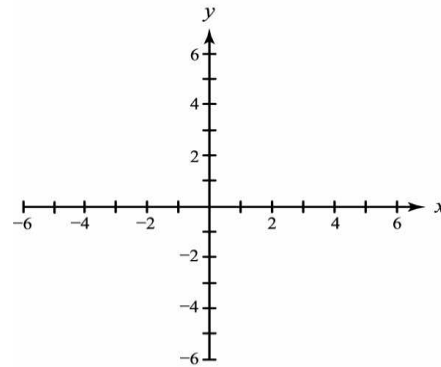
$3x + 5y = 8$

Slope is $m=-3/5$ in both therefore parallel **2**

Marks

17. Represent the following equation on the provided graph:

$$-3y + 4x = 3x - y$$



2

Show the working out and write the final answer clearly in the space provided.

18. $x^2 - 4x - 3 = 0$

Answer:

 $x=4.65$ and $x=-0.65$ 4

19. $2x^2 - x = 0.5$

Answer:

 no roots 4

Marks

Show the working out and write the final answer clearly in the space provided.

20. $[1/2 \log x^2 + 2 \log(x^{-2})] / [\log \sqrt{x} - 1/3 \log x]$

Answer:

_____ -18 _____

5

Total Marks for Section 1 41

Section 2: Statistics and Probability

Introduction to Data Analysis and Descriptive Statistics:

Choose the correct answer:

Marks

1. Which of the following statistics is not a measure of central tendency?
- a) Arithmetic mean.
 - b) Median.
 - c) Mode.
 - d) Standard Deviation.
- Answer : D 1
2. Which of the following statements about the median is not true?
- a) It is more affected by extreme values than the arithmetic mean.
 - b) It is a measure of central tendency.
 - c) It is equal to Q2.
 - d) It is equal to the mode in bell-shaped "normal" distributions.
- Answer: A 1
3. In a perfectly symmetrical bell-shaped "normal" distribution
- a) the arithmetic mean equals the median.
 - b) the median equals the mode.
 - c) the arithmetic mean equals the mode.
 - d) All the above.
- Answer: D 1
4. According to the empirical rule, if the data form a "bell-shaped" normal distribution, _____ percent of the observations will be contained within 2 standard deviations around the arithmetic mean.
- a) 68.26
 - b) 88.89
 - c) 93.75
 - d) 95.44
- Answer: D 1

Write your answer in the space provided:

Marks

TABLE 1:

The data below represent the amount of grams of carbohydrates in a serving of breakfast cereal in a sample of 11 different servings.

11 15 23 29 19 22 21 20 15 25 17

5. Referring to Table 1, the arithmetic mean carbohydrates in this sample is 19.73 grams. 2

6. Referring to Table 1, the median carbohydrate amount in the cereal is 20 grams. 2

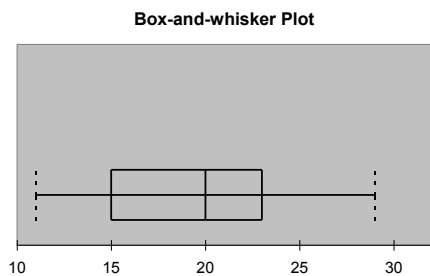
7. Referring to Table 1, the first quartile of the carbohydrate amounts is 17 grams. 2

8. Referring to Table 1, the range in the carbohydrate amounts is 18 grams. 2

9. Referring to Table 1, the inter-quartile range in the carbohydrate amounts is 6 grams. 2

10. Referring to Table 1, the standard deviation of the carbohydrate amounts is 5.1 grams. 3

11. Below is a box-plot (also known as: Box-and-whisker Plot) for the carbohydrate amounts.



What type of shape does the distribution of the sample appear to have? Why?

Answer: slightly Left -skewed

3

TABLE 2:

In the 2002–2003 academic year, many public universities in the United States raised tuition and fees due to a decrease in state subsidies. The change in the cost of tuition, a shared dormitory room, and the most popular meal plan from the 2001–02 academic year for a sample of 10 public universities were as follows:

\$1589 \$593 \$1223 \$869 \$423 \$1720 \$708 \$1425 \$922 \$308

12. Referring to Table 2, what is the variance (V) in the change in the cost? What does it mean?

Answer:

Two commonly used measures of variation that take into account how all the data values are distributed are the variance and the standard deviation. These statistics measure the “average” scatter around the mean—how larger values fluctuate above it and how smaller values fluctuate below it.

The average of the squared differences from the Mean.

$V=241865.11$

3

13. Referring to Table 2, are the data skewed? If so, how?

Answer:

Data are skewed right because the mean is greater than the median

3

Basic Probability:

Marks

14. The closing price of a company's stock tomorrow can be lower, higher or the same as today's closed. Without any prior information that may affect the price of the stock tomorrow, the probability that it will close higher than today's close is $1/3$. This is an example of using which of the following probability approach?
- a) A priori classical probability
 - b) Empirical classical probability
 - c) Subjective probability
 - d) Conditional probability
- Answer : A **1**
15. If the outcome of event A is not affected by event B , then events A and B are said to be
- a) mutually exclusive.
 - b) statistically independent.
 - c) collectively exhaustive.
 - d) None of the above.
- Answer : B **1**
16. The collection of all possible events is called
- a) a simple probability.
 - b) a sample space.
 - c) a joint probability.
 - d) the null set.
- Answer : B **1**
17. When using the general multiplication rule, $P(A$ and $B)$ is equal to
- a) $P(A|B)P(B)$.
 - b) $P(A)P(B)$.
 - c) $P(B)/P(A)$.
 - d) $P(A)/P(B)$.
- Answer : A **1**

Write your answer in the space provided:

18. Suppose that patrons of a restaurant were asked whether they preferred beer or whether they preferred wine. 70% said that they preferred beer. 60% of the patrons were male. 80% of the males preferred beer.
- What is the probability a randomly selected patron prefers wine? 30% **2**

Marks

19. The employees of a company were surveyed on questions regarding their educational background and marital status. Of the 600 employees, 400 had college degrees, 100 were single, and 60 were single college graduates. What is the probability that an employee of the company is single or has a college degree? 440/600=73.3% **3**

20. A survey is taken among customers of a fast-food restaurant to determine preference for hamburger or chicken. Of 200 respondents selected, 75 were children and 125 were adults. 120 preferred hamburger and 80 preferred chicken. 55 of the children preferred hamburger.

What is the probability that a randomly selected individual is a child and prefers chicken? 20/200=10% **3**

Total Marks for Section 2 38

Section 3: Cases and Stories – Mathematical Thinking

Marks

Show all the working out and write the final answer (with the correct unit) in the space provided:

1. A truck has 5600 pounds of apples to deliver to distribution centre. The truck can haul 350 pounds each trip. How many trips does it take?

Answer:

_____ 16 _____ 2

2. Eleven freshmen are to be assigned to eleven empty rooms in a student dormitory. Each room is considered unique so that it matters who is being assigned to which room. How many different ways can those eleven freshmen be allocated?

Answer:

_____ $n! - 11! = 39916800$ _____ 3

3. There are 47 contestants at a national dog show. How many different ways can contestants fill the first place, second place, and third place positions?

Answer:

_____ ${}_{47}C_3 = 47!/3!(47-3)! = 45 \cdot 46 \cdot 47/6 = 97290/6 = 16215$ _____ 3

Marks

4. According to the International Federation of the Phonographic Industry the global sales of music CDs and DVDs was worth £7.6 billion in the first six months of 2004 whilst in 2005 sales were worth £7.5 billion.

Calculate the percentage change in sales from 2004 to 2005 and give your answer to two decimal places.

Answer:

_____ -1.32% _____ 3

Total Marks for Section 3 11

This page is a designated worksheet.
Use if needed

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