

Computerized Pre-Professional Skills Test: Mathematics (5730)

Test at a Glance

Test Name	Computerized Pre-Professional Skills Test: Mathematics		
Test Code	5730		
Time	75 minutes		
Number of Questions	46		
Format	Multiple-choice questions (Calculators prohibited)		
	Content Categories	Approximate Number of Questions	Approximate Percentage of Examination
	I. Conceptual Knowledge and Procedural Knowledge	21	45%
	II. Representations of Quantitative Information	13	30%
	III. Measurement and Informal Geometry, Formal Mathematical Reasoning	12	25%

About This Test

The Computerized Pre-Professional Skills Test in Mathematics measures those mathematical skills and concepts that an educated adult might need. It focuses on the key concepts of mathematics and on the ability to solve problems and to reason in a quantitative context. Many of the problems require the integration of multiple skills to achieve a solution.

The test questions are from three content categories: conceptual and procedural knowledge, representations of quantitative information, and measurement and informal geometry and formal mathematical reasoning.

Computation is held to a minimum, and few technical words are used. Terms such as area, perimeter, ratio, integer, factor, and prime number are used, because it is assumed that these are commonly encountered in the mathematics all examinees have studied. Figures are drawn as accurately as possible and lie in a plane unless otherwise noted.

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Topics Covered

Representative descriptions of topics covered in each category are provided below.

I. Conceptual Knowledge and Procedural Knowledge

Conceptual Knowledge

Demonstrate number sense and operation sense—that is, an understanding of the foundational ideas of numbers, number properties, and operations defined on numbers (whole numbers, fractions, and decimals).

- Order: demonstrate an understanding of order among whole numbers, fractions, and decimals
- Equivalence: demonstrate an understanding that a number can be represented in more than one way
- Numeration and place value: demonstrate an understanding of how numbers are named, place value, and order of magnitude of numbers
- Number properties: demonstrate an understanding of the properties of whole numbers without necessarily knowing the names of the properties
- Operation properties: demonstrate an understanding of the properties (commutative, associative, and distributive) of the basic operations (addition, subtraction, multiplication, and division); recognize equivalent computational procedures

Procedural Knowledge

Demonstrate an understanding of the procedures required to represent quantitative relationships and the ability to plan, execute, interpret, or complete operations to solve problems.

- Computation: perform computations; adjust the result of a computation to fit the context of a problem; identify numbers or information or operations needed to solve a problem
- Estimation: estimate the result of a calculation; determine the reasonableness of an estimate
- Ratio, proportion, and percent: solve problems involving ratio, proportion, and percent
- Probability: interpret numbers used to express simple probability; assign a probability to a possible outcome
- Equations: solve simple equations and inequalities; predict the outcome of changing some number or condition in a problem
- Algorithmic thinking: demonstrate an understanding of the algorithmic point of view—that is, follow a given procedure; recognize various ways to solve a problem; identify, complete, or analyze a procedure; discover patterns in a procedure

II. Representations of Quantitative Information

Demonstrate an ability to interpret visual displays of quantitative information, to retrieve information from data, to determine if statements based on data are true or false, to recognize relationships in and make inferences from data, and to represent a given set of data graphically.

- Interpretation: read and interpret visual displays of quantitative information, such as bar graphs, line graphs, pie charts, pictographs, tables, stemplots, scatterplots, schedules, simple flowcharts, and diagrams; recognize relationships in data; determine an average, a range, a mode, or a median
- Trends: given a data display, observe groupings, make comparisons, and make predictions or extrapolations
- Inferences: given a data display, draw conclusions or make inferences from the data
- Patterns: identify and recognize patterns in data, such as variation
- Connections: demonstrate an understanding of the relationship between numerical values in a table, the symbolic rule relating table values, and the corresponding graphical representation of the table and the rule; choose a graph appropriate to represent a given set of data; recognize quantitative relationships in symbols or in words

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III. Measurement and Informal Geometry and Formal Mathematical Reasoning

Measurement and Informal Geometry

Demonstrate a basic understanding of measurement, of the U.S. customary and metric systems of measurement, and of geometric properties and relationships. At least half the questions will focus on informal geometry.

- Systems of measurement: demonstrate basic literacy in the U.S. customary and metric systems of measurement; convert from one unit to another within the same system and between different systems; recognize and use appropriate units for making measurements; read a calibrated scale

- Measurement: determine the measurements needed to solve a problem; recognize and use geometric concepts in making linear, area, and volume measurements; solve measurement problems by using a formula, estimating, employing indirect measurement, using rates as measures, making visual comparisons, using scaling/proportional reasoning, or using a nonstandard unit
- Geometric properties: recognize and use geometric properties and relationships in both pure and real-world situations, such as recognizing a symmetrical design or determining a distance using the Pythagorean relationship

Formal Mathematical Reasoning

Demonstrate an ability to use the basics of logic in a quantitative context.

- Logical connectives and quantifiers: interpret statements that use logical connectives (and, or, if – then) as well as quantifiers (some, all, none)
- Validity of arguments: use deductive reasoning to determine whether an argument (a series of statements leading to a conclusion) is valid or invalid
- Generalization: identify an appropriate generalization, an example that disproves an inappropriate generalization, or a hidden assumption

Sample Test Questions

The sample questions that follow illustrate the types of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.

There are additional sample test questions found in the *Pre-Professional Skills Test: Mathematics (0730) Test at a Glance*.

Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then click on the oval to the left of your choice.

Remember, try to answer every question.

1. On the computer screen you will see the following:

Click on the oval next to your choice.

Special Note: Figures that accompany problems in this test are intended to provide information useful in solving the problem. The figures are drawn as accurately as possible except when it is stated in a specific problem that its figure is not drawn to scale. Figures can be assumed to lie in a plane unless otherwise indicated. Position of points can be assumed to be in the order shown, and lines shown as straight can be assumed to be straight. The symbol \square denotes a right angle.

Which of the following is equal to a quarter of a million?

- 40,000
- 250,000
- 2,500,000
- $\frac{1}{4,000,000}$
- $\frac{4}{1,000,000}$

Click on your choice.

Since one million is 1,000,000, a quarter of a million is $\frac{1}{4}$ of 1,000,000 or 250,000.

The correct answer is 250,000.

Which of the following is equal to a quarter of a million?

- 40,000
- 250,000
- 2,500,000
- $\frac{1}{4,000,000}$
- $\frac{4}{1,000,000}$

Click on your choice.

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2. On the computer screen you will see the following:

Click on the oval next to your choice.

Which of the following fractions is least?

$\frac{11}{10}$

$\frac{99}{100}$

$\frac{25}{24}$

$\frac{3}{2}$

$\frac{301}{500}$

Click on your choice.

Of the five fractions, four are greater than 1; that is, the numerators are greater than the denominators. Only one of the fractions, $\frac{99}{100}$, is less than 1, so it must be the least.

The correct answer is $\frac{99}{100}$.

Which of the following fractions is least?

$\frac{11}{10}$

$\frac{99}{100}$

$\frac{25}{24}$

$\frac{3}{2}$

$\frac{301}{500}$

Click on your choice.

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3. On the computer screen you will see the following:

Click on the oval next to your choice.

Which of the sales commissions shown is greatest?

- 1% of \$1,000
- 10% of \$200
- 12.5% of \$100
- 15% of \$100
- 25% of \$40

Click on your choice.

Since 15% of \$100 is greater than 12.5% of \$100, 12.5% of \$100 is not the correct choice.

Of the remaining four choices, 1% of \$1,000 is \$10, 10% of \$200 is \$20, 15% of \$100 is \$15, and 25% of \$40 is \$10. Of these \$20 is greatest.

The correct answer is 10% of \$200.

Which of the sales commissions shown is greatest?

- 1% of \$1,000
- 10% of \$200
- 12.5% of \$100
- 15% of \$100
- 25% of \$40

Click on your choice.

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4. On the computer screen you will see the following:

Click on the oval next to your choice.

Men	12
Women	18
Boys	10
Girls	8

The table above shows the distribution of men, women, boys, and girls in a group of 48 individuals. If one individual is to be randomly selected from the group, what is the probability that the individual selected will be a woman?

$\frac{1}{18}$

$\frac{1}{4}$

$\frac{2}{15}$

$\frac{3}{8}$

$\frac{1}{2}$

Click on your choice.

Since there are 48 individuals in the group and 18 are women, the probability of a woman being selected is 18 out of 48 or $\frac{18}{48} = \frac{3}{8}$.

The answer is D.

Men	12
Women	18
Boys	10
Girls	8

The table above shows the distribution of men, women, boys, and girls in a group of 48 individuals. If one individual is to be randomly selected from the group, what is the probability that the individual selected will be a woman?

$\frac{1}{18}$

$\frac{1}{4}$

$\frac{2}{15}$

$\frac{3}{8}$

$\frac{1}{2}$

Click on your choice.

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5. On the computer screen you will see the following:

Click on the oval next to your choice.

If $P \div 5 = Q$, then $P \div 10 =$

$10Q$
 $2Q$
 $Q \div 2$
 $Q \div 10$
 $Q \div 20$

Click on your choice.

There are several ways to solve this problem.

One way is to express $P \div 5 = Q$ as $\frac{P}{5} = Q$.

Then $P = 5Q$, and $\frac{P}{10} = \frac{5Q}{10} = \frac{Q}{2}$ or $Q \div 2$.

Alternatively, $\frac{P}{5} = Q$, $\frac{1}{2}\left(\frac{P}{5}\right) = \frac{1}{2}Q$, and $\frac{P}{10} = \frac{Q}{2}$.

Another way is to divide a few numbers, such as 30 or 100, by both 5 and 10 and compare results. All of these examples illustrate the fact that if $P \div 5 = Q$, then $P \div 10$ must be $1/2$ of Q , or $Q \div 2$.

$Q \div 2$ is the correct answer.

If $P \div 5 = Q$, then $P \div 10 =$

$10Q$
 $2Q$
 $Q \div 2$
 $Q \div 10$
 $Q \div 20$

Click on your choice.

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6. On the computer screen you will see the following:

Click on the oval next to your choice.

Car Model	Frequency
K	7
X	9
W	7
J	8

The chart above gives data about the distribution of four compact-car models in a company parking lot. Which of the following figures best represents the given data?

Click on your choice.

The chart shows that one frequency is greater than the others and two frequencies are equal. A quick look at the choices shows that only C, D, and E have both one bar that is taller than the others and two bars of equal height. According to the chart, the frequency of model X is greatest, which eliminates choice C. Only choice E shows that the relative heights of all the bars agree with the information in the chart; that is, J is less than X and greater than K and W.

The best answer is E.

Car Model	Frequency
K	7
X	9
W	7
J	8

The chart above gives data about the distribution of four compact-car models in a company parking lot. Which of the following figures best represents the given data?

Click on your choice.

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7. On the computer screen you will see the following:

Click on the oval next to your choice.

x	y
0	5
2	11
6	23
7	26
10	35

Which of the following equations expresses the relationship between x and y in the table above?

$y = x + 5$
 $y = x + 6$
 $y = 3x + 5$
 $y = 4x - 1$
 $y = 4x - 5$

Click on your choice.

The correct equation must hold when each of the pairs of values from the table is substituted for x and y . Choice A holds for $x = 0, y = 5$, but not for $x = 2, y = 11$. Choices B, D, and E do not hold for $x = 0$. Choice C holds for all of the values given:

$$\text{if } x = 0, \text{ then } y = 3(0) + 5 = 5,$$

$$\text{if } x = 2, \text{ then } y = 3(2) + 5 = 11,$$

$$\text{if } x = 6, \text{ then } y = 3(6) + 5 = 23, \text{ and so forth.}$$

The answer is C.

x	y
0	5
2	11
6	23
7	26
10	35

Which of the following equations expresses the relationship between x and y in the table above?

$y = x + 5$
 $y = x + 6$
 $y = 3x + 5$
 $y = 4x - 1$
 $y = 4x - 5$

Click on your choice.

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8. On the computer screen you will see the following:

Click on the oval next to your choice.

WIND-CHILL CHART					
Temp. (°F)	Wind Speed (m.p.h.)				
	10	15	20	25	30
40°	28	22	18	16	13
30°	16	9	4	0	-2
20°	4	-5	-10	-15	-18
10°	-9	-18	-25	-29	-33
0°	-21	-36	-39	-44	-48
-10°	-33	-45	-53	-59	-63
-20°	-46	-58	-67	-74	-79
-30°	-58	-72	-82	-88	-94

The temperature today is 10°F, but it feels as cold as it did last week when the temperature was -10°F and the wind speed was 10 miles per hour. According to the chart above, what is the wind speed today?

10 m.p.h.
 15 m.p.h.
 20 m.p.h.
 25 m.p.h.
 30 m.p.h.

Click on your choice.

According to the chart, if the temperature is -10°F and the wind speed is 10 miles per hour, the wind-chill factor is -33. The problem states that it feels this cold today although the temperature is 10°F. To solve this problem, look at the row of the chart for 10°F and find the wind-chill factor -33. This factor corresponds to a wind speed of 30 miles per hour.

The answer is E.

WIND-CHILL CHART					
Temp. (°F)	Wind Speed (m.p.h.)				
	10	15	20	25	30
40°	28	22	18	16	13
30°	16	9	4	0	-2
20°	4	-5	-10	-15	-18
10°	-9	-18	-25	-29	-33
0°	-21	-36	-39	-44	-48
-10°	-33	-45	-53	-59	-63
-20°	-46	-58	-67	-74	-79
-30°	-58	-72	-82	-88	-94

The temperature today is 10°F, but it feels as cold as it did last week when the temperature was -10°F and the wind speed was 10 miles per hour. According to the chart above, what is the wind speed today?

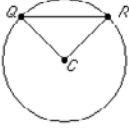
10 m.p.h.
 15 m.p.h.
 20 m.p.h.
 25 m.p.h.
 30 m.p.h.

Click on your choice.

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9. On the computer screen you will see the following:

Click on the oval next to your choice.



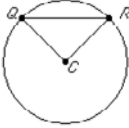
In the figure above, C is the center of the circle. Which of the following must be true?

- QC and RC have the same length
- QR and RC have the same length
- QC is perpendicular to QR
- QR is perpendicular to RC
- $\triangle QCR$ is equilateral

Click on your choice.

Since C is the center of the circle, QC and RC are both radii of the circle and therefore have the same length.

The answer is A.



In the figure above, C is the center of the circle. Which of the following must be true?

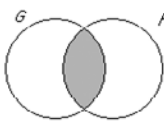
- QC and RC have the same length
- QR and RC have the same length
- QC is perpendicular to QR
- QR is perpendicular to RC
- $\triangle QCR$ is equilateral

Click on your choice.

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10. On the computer screen you will see the following:

Click on the oval next to your choice.



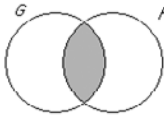
In the Venn diagram above, circle G represents the integers 2 to 10, inclusive, and circle H represents the integers 6 to 12, inclusive. How many integers are represented by the shaded region?

- Two
- Three
- Four
- Five
- Six

Click on your choice.

In the Venn diagram, the shaded region represents the integers that are in both G and H ; that is, the integers 6, 7, 8, 9, and 10, which amount to five integers.

The answer is D.



In the Venn diagram above, circle G represents the integers 2 to 10, inclusive, and circle H represents the integers 6 to 12, inclusive. How many integers are represented by the shaded region?

- Two
- Three
- Four
- Five
- Six

Click on your choice.