

# Substation Math and Reading Test (SMART) Preparation Guide

## **About the Test**

There are 46 questions with a maximum time limit of 120 minutes. This is a closed book test and calculators are allowed. You will be provided with a **Texas Instruments TI-30XIIS** calculator which must be used at the test session. It is imperative that you are proficient with this model. A YouTube online tutorial can be found at the link: [Ti-30XIIS](#)

## **Reference Materials**

The SMART test contains questions on the following:

- Math with decimals, fractions and rounding off
- Basic Algebra with a given equation
- Reading comprehension of math-based scenarios
- Ratios, proportions and reciprocals
- Basic trigonometry
- Powers of 10
- Pythagorean theorem

The Khan Academy online ([www.khanacademy.org](http://www.khanacademy.org)) has tutorial and practice videos that can help you prepare for the test. Below you will find some helpful links.

### 1. Whole Numbers

- Khan Academy Course: [Arithmetic](#)
- Topics Covered: Addition, subtraction, multiplication, and division of whole numbers, including multi-digit operations.

### 2. Common Fractions

- Khan Academy Course: [Fractions](#)
- Topics Covered: Understanding fractions, improper fractions, mixed numbers, and operations with fractions (addition, subtraction, multiplication, and division).

### 3. Decimal Fractions

- Khan Academy Course: [Decimals](#)
- Topics Covered: Adding, subtracting, multiplying, and dividing decimal numbers, as well as converting between decimals and fractions.

### 4. Ratios and Proportions

- Khan Academy Course: [Ratios and Proportions](#)
- Topics Covered: Understanding ratios, how to write and calculate ratios, and solving proportion problems.

### 5. Powers and Roots

- Khan Academy Course: [Exponents and Radicals](#)
- Topics Covered: Introduction to exponents, calculating powers and roots, and understanding fractional and negative exponents.

### 6. Calculators

- Khan Academy Course: While there isn't a specific course on calculators, students can benefit from the general math courses that include calculator usage for problem-solving.

### 7. Geometry

- Khan Academy Course: [Geometry](#)
- Topics Covered: Basics of lines, angles, triangles, and polygons, as well as constructions and properties of shapes.

### 8. Algebra

- Khan Academy Course: [Algebra Basics](#)
- Topics Covered: Understanding algebraic expressions, equations, and basic operations.

### 9. Using Formulas

- Khan Academy Course: [Geometry](#)
- Topics Covered: Surface area, volume calculations, and practical applications of geometry.

### 10. Trigonometry

- Khan Academy Course: [Trigonometry](#)
- Topics Covered: Properties of triangles, trigonometric functions, and their applications in solving geometric problems.

A general reference book is always invaluable as a supplement to other textbooks from classes or specific subjects, and as an instrument for general review in preparing for qualifying tests. Additional resources for improving understanding of the concepts listed above may be found at your local libraries and bookstores.

We hope you find this information helpful. Make sure that when you are scheduled to take the test you are physically and mentally alert and ready to do your best, or you should reschedule your appointment.

Pacific Gas and Electric Company wishes you the best of luck in qualifying on our test.

### **Sample Questions**

Appendix 1 contains sample questions for the person to have some idea of what to expect. It, by no means, is a complete test and is only a tool for the person to determine how much preparation is needed.

### **Materials covered on the test**

Math with decimals, fractions and rounding off-

- Writing numbers in decimal form
- Rounding off decimals
- Convert fractions to decimals
- Add, subtract, multiply and divide fractions and decimals

Powers of 10-

- Add, subtract, multiply and divide powers of 10
- Understand order of functions

Basic Algebra with a given equation-

- Solve with a given equation for the missing component

Reading comprehension of math-based scenarios-

- Understanding how to convert a scenario to a mathematic problem and solve

#### Ratios, proportions and reciprocals-

- Convert ratios to ratios of one
- Solve proportions
- Write the reciprocal of a given number ( $x = 1/x$ )
  - example:  $10 = 1/10$

#### Basic trigonometry-

- Solve for missing components of a right triangle using Sine, Cosine, and Tangent functions

#### Pythagorean theorem-

- Calculate missing components using Pythagorean Theorem
- Determine if a triangle is a right triangle

## Appendix 1- Sample Questions

### **Rounding Decimals**

Round the following number to the hundredths place:

1)  $3.14159 = \underline{\hspace{2cm}}$

2)  $1.07812536 = \underline{\hspace{2cm}}$

Round the following number to the thousandths place:

3)  $3.14159 = \underline{\hspace{2cm}}$

4)  $1.07812536 = \underline{\hspace{2cm}}$

### **Basic Math Functions**

Solve the following and round your answer to the nearest hundredths:

5)  $15.43 \times 17.92 \times 22.165 = \underline{\hspace{2cm}}$

6)  $89.674 - 23.827 + 34.295 = \underline{\hspace{2cm}}$

### **Powers of 10**

Convert the powers of ten numbers to whole numbers:

7)  $65 \times 10^4 = \underline{\hspace{2cm}}$

8)  $0.05 \times 10^{-4} = \underline{\hspace{2cm}}$

9)  $(133 \times 10^3) \times (1.2 \times 10^3) = \underline{\hspace{2cm}}$

### **Order of Operations**

Given:  $a = 3$ ;  $b = 7$ ;  $c = 5.5$ , solve the following:

10)  $3a + 2b - 2c = \underline{\hspace{2cm}}$

11)  $3b \times 4c - 9a = \underline{\hspace{2cm}}$

### **Solving Algebraic Problems**

Given:  $V = I \times R$ , solve the following:

12)  $I = 10$ ,  $R = 20$      $V = \underline{\hspace{2cm}}$

13)  $V = 120$ ,  $I = 10$      $R = \underline{\hspace{2cm}}$

Given:  $P = I \times V$ , solve the following:

14)  $I = 600$ ,  $V = 12$        $P =$  \_\_\_\_\_

15)  $P = 6 \times 10^3$ ,  $I = 50$        $V =$  \_\_\_\_\_

Given:  $V = I \times R$ ;  $P = I \times V$ , solve the following:

16)  $R = 35$ ,  $I = 20$        $P =$  \_\_\_\_\_

### **Reading Comprehension**

17) There is a pallet holding cases of water bottles. That pallet holds 4 cases wide, 6 cases deep and 6 cases high with each case containing thirty-two bottles. Each bottle weighs 16.9 ounces. What is the total weight in pounds of the full pallet of water? (Round your answer to the nearest pound)      = \_\_\_\_\_

18) A combination lock has 3 dials, and each dial contains the digits zero through five. How many different possible combinations are there?      = \_\_\_\_\_

19) If a consumer averaged 250 kWh per month and they had a flat rate of \$0.40 per kWh, how much would they pay for electricity in an 18-month period?      = \_\_\_\_\_

20) A city that contains 250,000 residents has 73.3% of its population that lives above the poverty line, how many residents are living below the poverty line?      = \_\_\_\_\_

### **Right Triangles Using Pythagorean Theorem**

Given  $A^2 + B^2 = C^2$ , solve the following problems (label answers with specified unit and round to the nearest hundredth)

21)  $A = 10$  inches,  $B = 20$  inches       $C =$  \_\_\_\_\_

22)  $A = 3$  feet,  $B = 4$  feet       $C =$  \_\_\_\_\_

23)  $C = 25$  Volts,  $A = 15$  Volts       $B =$  \_\_\_\_\_

### **Ratios, Proportions and Reciprocals**

Convert the following to ratios of 1

24)  $2000:5 = \underline{\hspace{2cm}}:1$

25)  $240:6 = \underline{\hspace{2cm}}:1$

Solve the following proportions

26)  $200:1 = \underline{\hspace{2cm}}:4$

27)  $120:1 = \underline{\hspace{2cm}}:5$

Write the reciprocal in decimal form rounded to the nearest thousandth for the following:

28)  $40 = \underline{\hspace{2cm}}$

29)  $1.35 = \underline{\hspace{2cm}}$

### **Trigonometry Functions**

Identify the following trigonometry functions:

30) opposite / hypotenuse is the  $\underline{\hspace{2cm}}$  function.

31) opposite / adjacent is the  $\underline{\hspace{2cm}}$  function.

32) adjacent / hypotenuse is the  $\underline{\hspace{2cm}}$  function.

### **Solving Right Triangles**

Solve the sides of the right triangle or angle theta ( $\Theta$ ) for the following problems and round your answer to the nearest hundredths:

33) adjacent = 5,  $\Theta = 60^\circ$       opposite =  $\underline{\hspace{2cm}}$       hypotenuse =  $\underline{\hspace{2cm}}$

34) opposite = 50,  $\Theta = 45^\circ$       adjacent =  $\underline{\hspace{2cm}}$       hypotenuse =  $\underline{\hspace{2cm}}$

## Answer Key

- 1) 3.14
- 2) 1.08
- 3) 3.142
- 4) 1.078
- 5) 6,128.75
- 6) 100.14
- 7) 650,000
- 8) .000005
- 9) 159,600,000
- 10) 12
- 11) 435
- 12) 200
- 13) 12
- 14) 7,200
- 15) 120
- 16) 14,000
- 17) 4,867 pounds
- 18)  $6^3 = 216$
- 19)  $250 \times 18 \times \$0.40 = \$1,800.00$
- 20)  $(100 - 73.3)\% \times 250,000 = 66,750$
- 21) 22.36 inches
- 22) 5 feet
- 23) 20 Volts
- 24) 400
- 25) 40
- 26) 800
- 27) 600
- 28) .025
- 29) .741
- 30) sine
- 31) tangent
- 32) cosine
- 33) 8.66, 10
- 34) 50, 70.71