

Physics 30S Pre-Assessment Instructions

- This assessment contains a total of 30 multiple choice questions (MCQs).
- You are allowed to use a calculator during the assessment.
- The instructor will provide a formula sheet. You do not need to bring your own cheat sheet or formula sheet.
- You will have a maximum of 2 hours to complete all 30 MCQs.
- You do not need to show any work. Just tick the correct answer for each question.
- Scrap paper will be provided for rough work if needed.
- Please read each question carefully and mark your answers clearly.
- No additional materials are allowed other than the calculator and the provided formula sheet.
- Learners must score at least 70% on this assessment. If they do not achieve this score, they will need to complete basic preparation first. Once they are ready for the course, they can retake the assessment and then start the regular course.

Physics 30S Pre-Assessment Topics with Examples

Exponents and Powers

Example:

- $2^4 = 16$
- $5^2 = 25$
- Which is NOT equal to 3^3 ? Options: $3 \times 3 \times 3$, 27, $3+3+3$

Basic Arithmetic Operations

Example:

- $8 \times 5 - 20 = 20$
- $(6 + 2) \times 3 = 24$
- $100 \div 4 + 6 = 31$

Fractions and Mixed Numbers

Example:

- $1\frac{1}{2} + 2\frac{1}{4} = 3\frac{3}{4}$
- Convert $9/12 \rightarrow 3/4$
- $2\frac{4}{12} = 2\frac{1}{3}$

Solving Linear Equations

Example:

- $3x - 5 = 10 \rightarrow x = 5$
- $2x + 7 = 21 \rightarrow x = 7$
- $x/2 = 6 \rightarrow x = 12$

Substitution in Algebraic Expressions

Example:

- $x = 4, \quad x^2 + 2x = 24$
- $a = 3, b = 2, \quad ab + b^2 = 10$
- $x = 5, \quad 2x - 3 = 7$

Area Calculation of Geometric Shapes

Example:

- Rectangle: $5 \times 6 = 30 \text{ cm}^2$
- Triangle: $1/2 \times 10 \times 4 = 20 \text{ cm}^2$
- Circle: $\pi \times 3^2 \approx 28.27 \text{ cm}^2$

Pythagorean Theorem

Example:

A right triangle has one side of **6 cm** and another side of **8 cm**. What is the length of the hypotenuse?

Step-by-step:

1. Use the formula:

$$c^2 = a^2 + b^2$$

2. Plug in the values:

$$c^2 = 6^2 + 8^2 = 36 + 64 = 100$$

3. Take the square root:

$$c = \sqrt{100} = 10$$

Answer: The hypotenuse is **10 cm**.

Trigonometry Basics

Example:

- $\tan(\theta) = 4/3 \rightarrow \theta \approx 53^\circ$
- $\sin(\theta) = 5/13 \rightarrow \theta \approx 22.6^\circ$
- $\cos(\theta) = 12/13 \rightarrow \theta \approx 22.6^\circ$

Unit Conversions

Example:

- 25 m \rightarrow 82.5 ft
- 15 days \rightarrow 1,296,000 s
- 980 km/h \rightarrow 272 m/s

Scientific Notation

Example:

- $721,000,000,000 = 7.21 \times 10^{11}$
- $0.000000000000000036 = 3.6 \times 10^{-16}$
- $5,000 = 5 \times 10^3$

Significant Figures

Example:

- $6.020 \times 10^{23} \rightarrow 4$ sig figs
- $1.010000 \rightarrow 7$ sig figs
- $0.0000101 \rightarrow 3$ sig figs

Distance vs. Displacement

Example:

- 2 km north then 2 km south \rightarrow Distance = 4 km, Displacement = 0 km
- 3 km east, 4 km north \rightarrow Displacement = 5 km
- Square path return \rightarrow Displacement = 0

Speed, Velocity, and Acceleration

Example:

- Speed: $100 \text{ km} / 2 \text{ hr} = 50 \text{ km/hr}$
- Velocity: $60 \text{ km east} / 2 \text{ hr} = 30 \text{ km/hr east}$
- Acceleration: $0 \rightarrow 20 \text{ m/s in } 4 \text{ s} = 5 \text{ m/s}^2$

Graph Interpretation

Example:

- Flat line \rightarrow Stationary
- Steep slope \rightarrow Fast
- Curved \rightarrow Acceleration

Forces and Newton's Laws

Example:

- Equal and opposite forces \rightarrow No movement
- Unbalanced force \rightarrow Accelerates
- Net force = mass \times acceleration

Friction

Example:

- Ice → Low friction
- Braking → High friction
- Lubricated → Reduced friction

Linear Equations

Example:

- Graph of $y = 2x + 3$

Calculations:

1. **When $x = 1$:**

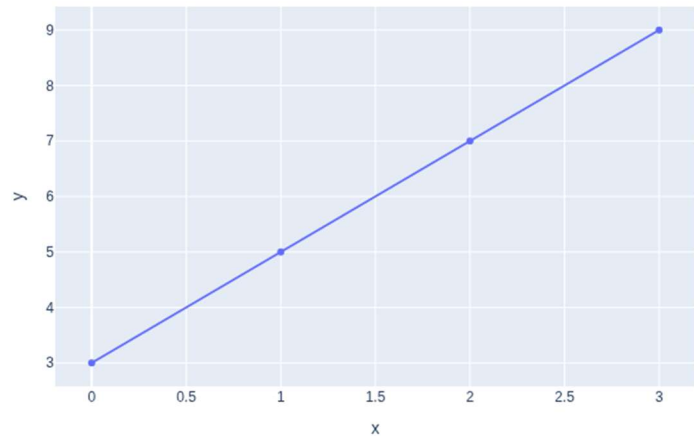
$$y = 2(1) + 3 = 2 + 3 = 5$$

When $x = 2$:

$$y = 2(2) + 3 = 4 + 3 = 7$$

When $x = 3$:

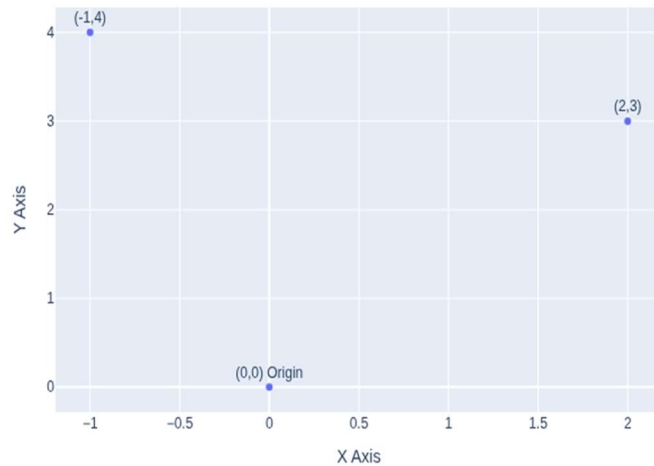
$$y = 2(3) + 3 = 6 + 3 = 9$$



Graphing Coordinates

Example:

- Plot (2,3): 2 right, 3 up
- Plot (-1,4): 1 left, 4 up
- Plot (0,0): Origin



Slope Interpretation

Example:

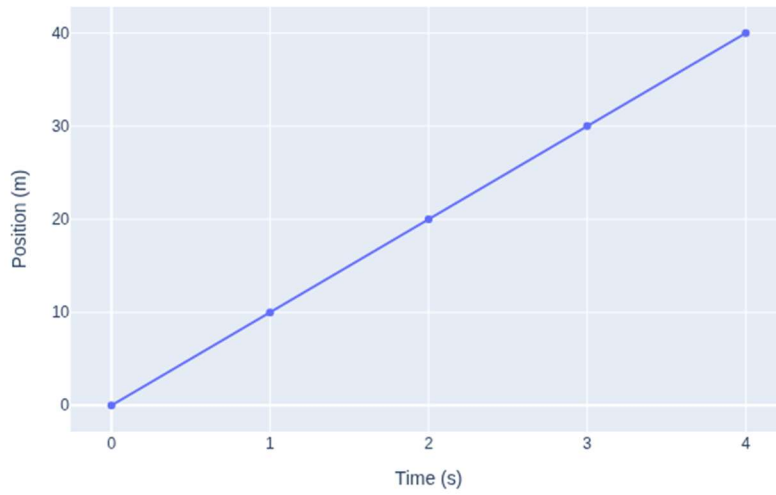
- (0,0) to (2,4): slope = 2
- Negative slope → Downward
- Zero slope → Horizontal

Reading Motion Graphs

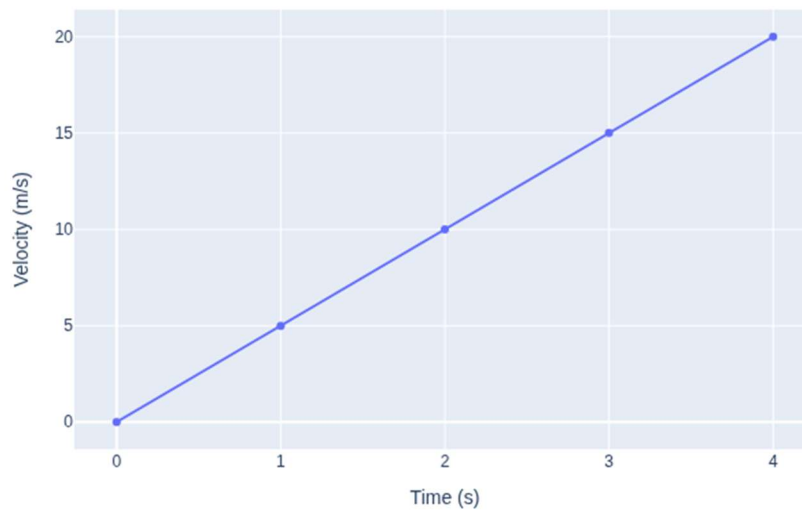
Example:

- Position-Time Graph (Constant Speed)
- Velocity-Time Graph (Acceleration)

Position-Time Graph (Constant Speed)



Velocity-Time Graph (Acceleration)



Temperature Conversion

Example:

Celsius to Fahrenheit:

To convert Celsius ($^{\circ}\text{C}$) to Fahrenheit ($^{\circ}\text{F}$):

$$^{\circ}\text{F} = (^{\circ}\text{C} \times \frac{9}{5}) + 32$$

Example:

If it's 20°C :

$$^{\circ}\text{F} = (20 \times \frac{9}{5}) + 32 = 68^{\circ}\text{F}$$

Fahrenheit to Celsius:

To convert Fahrenheit ($^{\circ}\text{F}$) to Celsius ($^{\circ}\text{C}$):

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times \frac{5}{9}$$

Example:

If it's 77°F :

$$^{\circ}\text{C} = (77 - 32) \times \frac{5}{9} = 25^{\circ}\text{C}$$

Understanding Units and Dimensions

Example:

- Speed \rightarrow m/s
- Area \rightarrow m²
- Volume \rightarrow L or m³