

# AP STEM Practice Worksheet

Fifty survey questions spanning all eight AP STEM courses: Precalculus, Calculus AB/BC, Statistics, Biology, Chemistry, Physics 1, Physics C, and Computer Science A.

|           |    |                 |    |         |    |
|-----------|----|-----------------|----|---------|----|
| QUESTIONS | 50 | MULTIPLE CHOICE | 25 | WRITTEN | 25 |
|-----------|----|-----------------|----|---------|----|

## Instructions

Each course's dedicated review guide and 50-question worksheet covers its full exam depth — use this set as a cross-course check.

**1** Find  $\sin(30 \text{ degrees})$ .

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**2** Find the domain of  $f(x) = 1/(x-4)$ .

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**3** As  $x$  approaches infinity, which function grows fastest?

- A)  $x^2$
- B)  $2^x$
- C)  $\log(x)$
- D)  $x$

**4** Find  $\cos(60 \text{ degrees})$ .

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**5** Which best describes an even function?

- A)  $f(-x) = -f(x)$
- B)  $f(-x) = f(x)$
- C)  $f(x) = 0$  for all  $x$
- D)  $f(x)$  is always increasing

**6** If  $f(x) = 3x^2$ , find  $f'(x)$ .

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**7** Evaluate the definite integral of  $2x$  from 0 to 3 using the Fundamental Theorem of Calculus.

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**8** Which topic appears only on the AP Calculus BC exam, not AB?

- A) Derivatives of polynomials
- B) Definite integrals
- C) Taylor series
- D) The chain rule

**9** If  $s(t) = t^3$ , find the velocity function  $v(t) = s'(t)$ .

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**10** A function's derivative is positive on an interval. What does this indicate about the function on that interval?

- A) It is decreasing
- B) It is increasing
- C) It has a maximum
- D) It is constant

- 11** A data set is right-skewed with an outlier of 200 among values near 20. Which measure of center is less affected by the outlier: mean or median?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 12** A hypothesis test produces a p-value of 0.02 with  $\alpha = 0.05$ . What is the conclusion?
- A) Fail to reject the null hypothesis  
B) Reject the null hypothesis  
C) Accept the null hypothesis as true  
D) The test is inconclusive regardless of  $\alpha$
- 13** Which best describes what a p-value measures?
- A) The probability the null hypothesis is true  
B) The probability of observing data this extreme, assuming the null hypothesis is true  
C) The probability the alternative hypothesis is true  
D) The sample size needed for significance
- 14** Find the mean of: 5, 7, 9, 11, 13.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 15** Which sampling method gives every member of a population an equal chance of selection?
- A) Convenience sampling  
B) Simple random sampling  
C) Voluntary response sampling  
D) Judgment sampling
- 16** Which best describes the three requirements for natural selection to occur in a population?
- A) Heritable variation, differential survival/reproduction, and an environmental pressure  
B) A large population size only  
C) Random mutation with no selection pressure  
D) Identical genotypes across all individuals
- 17** Which molecule directly carries the code from DNA to the ribosome for protein synthesis?
- A) tRNA  
B) mRNA  
C) rRNA  
D) DNA polymerase
- 18** Which best describes homeostasis?
- A) Constant change in an organism's internal environment  
B) The maintenance of a stable internal environment despite external changes  
C) The process of cell division  
D) The transfer of energy between trophic levels
- 19** A population of 100 rabbits grows at 10% per generation with no limiting factors. Find the population after one generation.
- \_\_\_\_\_
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- 20** Which best describes the role of an enzyme in a biochemical reaction?
- A) It is consumed permanently by the reaction  
B) It lowers the activation energy required, speeding up the reaction without being consumed  
C) It only works at a single fixed temperature  
D) It changes the products of the reaction
- 21** Find the number of moles in 36 grams of water. (molar mass of water = 18 g/mol)
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- \_\_\_\_\_
- 22** According to Le Chatelier's principle, if a reaction at equilibrium has heat added, and the forward reaction is endothermic, the equilibrium will:
- A) Shift toward the reactants  
B) Shift toward the products  
C) Not shift at all  
D) Stop the reaction entirely

**23** Which best describes an acid according to the Bronsted-Lowry definition?

- A) A proton ( $H^+$ ) acceptor
- B) A proton ( $H^+$ ) donor
- C) An electron donor
- D) A substance that never reacts with water

**24** Find the pH of a solution with  $[H^+] = 1 \times 10^{-5} M$ .

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**25** Which best describes oxidation in a redox reaction?

- A) Gain of electrons
- B) Loss of electrons
- C) Gain of protons
- D) Loss of protons

**26** A 4 kg object accelerates at  $3 m/s^2$ . Find the net force applied.

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**27** An object falls from rest for 2 seconds. Find its speed, using  $g = 10 m/s^2$ .

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**28** Which best describes conservation of mechanical energy?

- A) Total energy always increases over time
- B) Kinetic plus potential energy stays constant absent non-conservative forces like friction
- C) Energy is only conserved in circular motion
- D) Mechanical energy is never conserved in real systems

**29** A spring with spring constant  $k = 200 N/m$  is compressed 0.1 m. Find the elastic potential energy stored.

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**30** Which best distinguishes AP Physics 1 from AP Physics C: Mechanics?

- A) Physics 1 is calculus-based; Physics C is algebra-based
- B) Physics C is calculus-based; Physics 1 is algebra/trig-based
- C) They cover entirely unrelated topics
- D) Physics 1 covers only electricity

**31** If position is given by  $x(t) = 4t^2$ , find the velocity function  $v(t) = dx/dt$ .

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**32** If velocity is given by  $v(t) = 6t$ , find the acceleration function  $a(t) = dv/dt$ .

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**33** Which AP Physics C exam covers charge, electric fields, and circuits?

- A) Physics C: Mechanics
- B) Physics C: Electricity and Magnetism
- C) Both exams equally
- D) Neither; this is Physics 1 content

**34** In Java, which data type would best store a single true/false value?

- A) int
- B) boolean
- C) String
- D) double

- 35** Which best describes the key difference between an array and an ArrayList in Java?
- A) Arrays can grow dynamically; ArrayLists have a fixed size
  - B) Arrays have a fixed size set at creation; ArrayLists can grow and shrink
  - C) They are functionally identical in every way
  - D) ArrayLists can only store integers

- 36** In Java, what is the index of the first element in an array?
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- \_\_\_\_\_
- \_\_\_\_\_

- 37** Which best describes a class in Java?
- A) A single stored value
  - B) A blueprint that defines the properties and behaviors of objects created from it
  - C) A loop structure
  - D) A comment in the code

- 38** Which best describes inheritance in object-oriented programming?
- A) A class copying another class's code manually
  - B) A subclass acquiring the properties and methods of a superclass
  - C) A method that calls itself
  - D) A variable that cannot change value

- 39** Which best describes a recursive method?
- A) A method that never terminates
  - B) A method that calls itself, with a base case to stop the recursion
  - C) A method that can only run once
  - D) A method with no parameters

- 40** An unsorted array has 8 elements. Using linear search, what is the maximum number of comparisons needed to find a target or determine it is absent?
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- \_\_\_\_\_
- \_\_\_\_\_

- 41** Which search algorithm requires the array to be sorted first?

- A) Linear search
- B) Binary search
- C) Both require sorting
- D) Neither requires sorting

- 42** Which best describes what 'public static void main(String[] args)' represents in a Java program?

- A) A comment describing the program
- B) The entry point where program execution begins
- C) A variable declaration
- D) An error message

- 43** Explain why AP Physics C: Mechanics and AP Physics C: Electricity and Magnetism are considered two separate exams rather than one combined test.
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- 44** Explain why the AP Statistics p-value is interpreted as a conditional probability (assuming the null hypothesis is true) rather than the probability that the null hypothesis itself is true.
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- 45** Explain why choosing between an array and an ArrayList in AP Computer Science A depends on whether the collection's size is known and fixed in advance.
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- 46** Explain why studying for several AP STEM exams in the same season benefits from a spaced study calendar rather than reviewing each subject only in the final week.
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- 47** Explain why the Fundamental Theorem of Calculus connects the concept of a derivative to the concept of a definite integral.

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- 48** Find  $\tan(45 \text{ degrees})$ .

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- 49** Which best describes a base case in a recursive method?

- A) The condition that causes the method to call itself again
- B) The condition that stops further recursive calls
- C) A syntax error
- D) A loop that never ends

- 50** A 2 kg object experiences a net force of 14 N. Find its acceleration.

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## Answer key

Direct answers only, in question order. Work the set first, then check.

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|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1. $1/2$                                                                                      | 2. All real numbers except $x = 4$                                                      | 3. B) $2^x$                                                                                      | 4. $1/2$                                                                  | 5. B) $f(-x) = f(x)$                                                                             |
| 6. $6x$                                                                                       | 7. 9                                                                                    | 8. C) Taylor series                                                                              | 9. $3t^2$                                                                 | 10. B) It is increasing                                                                          |
| 11. Median                                                                                    | 12. B) Reject the null hypothesis                                                       | 13. B) The probability of observing data this extreme, assuming the null hypothesis is true      | 14. 9                                                                     | 15. B) Simple random sampling                                                                    |
| 16. A) Heritable variation, differential survival/reproduction, and an environmental pressure | 17. B) mRNA                                                                             | 18. B) The maintenance of a stable internal environment despite external changes                 | 19. 110                                                                   | 20. B) It lowers the activation energy required, speeding up the reaction without being consumed |
| 21. 2                                                                                         | 22. B) Shift toward the products                                                        | 23. B) A proton ( $H^+$ ) donor                                                                  | 24. 5                                                                     | 25. B) Loss of electrons                                                                         |
| 26. 12                                                                                        | 27. 20                                                                                  | 28. B) Kinetic plus potential energy stays constant absent non-conservative forces like friction | 29. 1.0                                                                   | 30. B) Physics C is calculus-based; Physics 1 is algebra/trig-based                              |
| 31. $8t$                                                                                      | 32. 6                                                                                   | 33. B) Physics C: Electricity and Magnetism                                                      | 34. B) boolean                                                            | 35. B) Arrays have a fixed size set at creation; ArrayLists can grow and shrink                  |
| 36. 0                                                                                         | 37. B) A blueprint that defines the properties and behaviors of objects created from it | 38. B) A subclass acquiring the properties and methods of a superclass                           | 39. B) A method that calls itself, with a base case to stop the recursion | 40. 8                                                                                            |

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|----------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 41. B) Binary search | 42. B) The entry point where program execution begins | 43. Each covers a distinct content area (motion and forces versus charge and circuits) in enough depth that College Board scores and reports them separately, so a student can take either or both depending on which content areas their coursework covered | 44. A p-value is calculated using a sampling distribution built under the assumption that the null hypothesis holds, so it measures how extreme the observed data would be in that assumed world, not the probability that the assumption itself is correct | 45. An array is more efficient when the number of elements is known and will not change, while an ArrayList's ability to grow and shrink makes it better suited to a collection whose size changes during program execution |
|----------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| 46. Spaced review across weeks builds stronger long-term retention than last-minute cramming for any single subject, and a shared calendar prevents two exam dates close together from being prepared for only in the final days before each one | 47. The theorem shows that integration and differentiation are inverse processes: the definite integral of a rate-of-change function over an interval equals the total change in the original function over that interval, linking the two central operations of calculus | 48. 1 | 49. B) The condition that stops further recursive calls | 50. 7 |
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## Error log

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Bring this page to your next session so the tutor can start from what actually blocked you.

**Questions I answered incorrectly:**

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**Which of the eight AP STEM courses was it in?**

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**Which subject's full 50-question worksheet should I start next?**

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