QUICK DRILL · CBSE CLASS 11

Mathematical Reasoning

Applied Mathematics · Chapter 3 · 15 MCQs · 20 minutes · PYQ-tagged with time budgets

DATE	TOTAL MARKS	DURATION	MARKING	TARGET
_____	15	20 min	+1 / 0	⩾ 12/15

OBJECTIVES

Reinforce the four core topics of Mathematical Reasoning via 15 PYQ-derived MCQs. Identify weak sub-topics via concept-node IDs (see answer key). Build per-question time budget habit.

INSTRUCTIONS

Attempt all 15. Time budget shown per Q (use it as pacing guide). Mark answers (A/B/C/D) in the margin. Answer key + explanations on the last page. **Don't peek — score yourself honestly.**

SECTION · QUICK DRILL

Q 1–15 · 20 MIN

Q1. Which of the following is a STATEMENT?

(A) What is your name?
(B) Please close the door.
(C) The number 9 is a perfect square.
(D) x + 2 = 6

PYQ 2023 · CBSE SQP · 1m · ? 25s

Q2. The negation of 'All students passed the exam' is:

(A) All students failed the exam
(B) Some students did not pass the exam
(C) No student passed the exam
(D) Some students passed the exam

PYQ 2024 · CBSE SQP · 2m · ? 35s

Q3. In mathematics, the disjunction 'p OR q' is FALSE only when:

(A) p is true and q is false
(B) both p and q are true
(C) both p and q are false
(D) p is false and q is true

PYQ 2022 · Annual Pattern · 1m · ? 25s

Q4. The conjunction 'p AND q' is TRUE when:

(A) at least one of p, q is true
(B) both p and q are true
(C) exactly one of p, q is true
(D) both p and q are false

PYQ 2023 · Annual Pattern · 1m · ? 25s

Q5. The contrapositive of 'If a number is divisible by 6, then it is divisible by 3' is:

(A) If a number is divisible by 3, then it is divisible by 6
(B) If a number is not divisible by 6, then it is not divisible by 3
(C) If a number is not divisible by 3, then it is not divisible by 6
(D) If a number is divisible by 6, then it is not divisible by 3

PYQ 2024 · CBSE SQP · 2m · ? 40s

Q6. The converse of the statement 'If it rains, then the ground is wet' is:

(A) If it does not rain, then the ground is not wet
(B) If the ground is wet, then it rains
(C) If the ground is not wet, then it does not rain
(D) If it rains, then the ground is not wet

PYQ 2022 · CBSE SQP · 2m · ? 35s

Q7. The inverse of 'If p, then q' is:

(A) $q \Rightarrow p$
(B) $\sim q \Rightarrow \sim p$
(C) $\sim p \Rightarrow \sim q$
(D) $p \Rightarrow \sim q$

PYQ 2023 · Annual Pattern · 1m · ? 30s

Q8. 'p only if q' is logically the same as:

(A) $q \Rightarrow p$
(B) $p \Rightarrow q$
(C) $p \Leftrightarrow q$
(D) $\sim p \Rightarrow \sim q$

PYQ 2024 · CBSE SQP · 2m · ? 35s

Q9. 'p if and only if q' (p ⇔ q) means q is:

(A) necessary but not sufficient for p
(B) sufficient but not necessary for p
(C) necessary and sufficient for p
(D) neither necessary nor sufficient for p

PYQ 2023 · CBSE SQP · 1m · 30s

Q10. The negation of 'There exists a real number whose square is negative' is:

(A) There exists a real number whose square is positive
(B) For every real number, its square is not negative
(C) Some real number has a non-negative square
(D) No real number is negative

PYQ 2022 · Annual Pattern · 2m · 40s

Q11. Which symbol denotes the existential quantifier ('there exists')?

(A) ∀
(B) ∃
(C) ∈
(D) ⇒

PYQ 2021 · CBSE SQP · 1m · 20s

Q12. To DISPROVE the statement 'every prime number is odd', it is enough to:

(A) show that no prime is odd
(B) give one prime that is even, e.g. 2
(C) list several odd primes
(D) prove all primes are even

PYQ 2024 · Annual Pattern · 2m · 35s

Q13. Which of these is NOT a statement?

(A) The earth is flat
(B) 2 + 2 = 4
(C) Close the door, please
(D) Every multiple of 4 is even

PYQ 2022 · CBSE SQP · 1m · 25s

Q14. Which conditional is LOGICALLY EQUIVALENT to 'p ⇒ q'?

(A) the converse q ⇒ p
(B) the inverse ~p ⇒ ~q
(C) the contrapositive ~q ⇒ ~p
(D) the negation ~(p ⇒ q)

PYQ 2023 · Annual Pattern · 1m · 30s

Q15. Let p: '4 is even' (T) and q: '4 is prime' (F). The truth value of 'p AND q' is:

(A) True
(B) False
(C) Cannot be determined
(D) Both true and false

PYQ 2024 · CBSE SQP · 1m · 30s

ANSWER KEY & EXPLANATIONS

Q 1–15 · MARK YOUR SCORE

Q1. Answer: C

'The number 9 is a perfect square' is declarative with a fixed truth value (true). A question, a command and an open sentence are not statements.

Q2. Answer: B

Negation of a universal: ~(∀ pass) = ∃(not pass) = 'some students did not pass'. One exception is enough to falsify 'all passed'.

Q3. Answer: C

Inclusive OR is true if at least one part is true; it is false only when BOTH are false.

Q4. Answer: B

AND (conjunction) is true only when BOTH components are true; one false part makes it false.

Q5. Answer: C

Contrapositive of p ⇒ q is ~q ⇒ ~p: 'if NOT divisible by 3, then NOT divisible by 6'. (Option A is the converse; B is the inverse.)

Q6. Answer: B

Converse of p ⇒ q is q ⇒ p (swap the parts): 'if the ground is wet, then it rains'.

Q7. Answer: C

Inverse negates both parts but keeps the order: ~p ⇒ ~q. (~q ⇒ ~p is the contrapositive; q ⇒ p is the converse.)

Q8. Answer: B

'p only if q' means q is necessary for p, i.e. p ⇒ q. ('p if q' would be q ⇒ p.)

Q9. Answer: C

The biconditional p ⇔ q combines p ⇒ q and q ⇒ p, so q is both necessary AND sufficient for p.

Q10. Answer: B

~(∃x, P) = ∀x, ~P: 'for every real number, its square is not negative'. (This negation is in fact true.)

Q11. Answer: B

∃ = 'there exists'; ∀ = 'for all'; ∈ = 'is an element of'; ⇒ = 'implies'.

Q12. Answer: B

A universal statement is disproved by a single counter-example; the prime 2 is even, so it disproves 'every prime is odd'.

Q13. Answer: C

'Close the door, please' is a request/command — no truth value can be assigned. The other three are declarative statements (true or false).

Q14. Answer: C

A conditional is logically equivalent to its contrapositive ~q ⇒ ~p; the converse and inverse are not equivalent to the original.

Q15. Answer: B

AND is true only if both parts are true. q ('4 is prime') is false, so p ∧ q is FALSE.