Logic and proof worksheet – Grade 11

Grade 11 · Mixed level · 20 questions · **Version X2333**

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1. Work out the inverse of "If a student has a ticket, then the student can enter.".
   A. If the student can enter, then a student has a ticket.
   B. If a student has no ticket, then the student cannot enter.
   C. If a student has a ticket, then the student can enter.
   D. If the student cannot enter, then a student has no ticket.

2. Work out the inverse of "If a shape is a square, then it is a rectangle.".
   A. If a shape is a square, then it is a rectangle.
   B. If it is not a rectangle, then a shape is not a square.
   C. If it is a rectangle, then a shape is a square.
   D. If a shape is not a square, then it is not a rectangle.

3. What is the converse of "If a shape is a square, then it is a rectangle."?
   A. If it is not a rectangle, then a shape is not a square.
   B. If it is a rectangle, then a shape is a square.
   C. If a shape is a square, then it is a rectangle.
   D. If a shape is not a square, then it is not a rectangle.

4. Work out the converse of "If it is raining, then the ground is wet.".
   A. If it is raining, then the ground is wet. **B.** If the ground is wet, then it is raining.
   C. If the ground is not wet, then it is not raining.
   D. If it is not raining, then the ground is not wet.

5. Find the contrapositive of "If a shape is a square, then it is a rectangle.".
   A. If a shape is a square, then it is a rectangle.
   B. If it is not a rectangle, then a shape is not a square.
   C. If a shape is not a square, then it is not a rectangle.
   D. If it is a rectangle, then a shape is a square.

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6. Find the inverse of "If a number ends in 0, then it is even.".

   A. If a number does not end in 0, then it is not even.

   B. If it is even, then a number ends in 0. **C.** If a number ends in 0, then it is even.

   D. If it is not even, then a number does not end in 0.

7. Find the inverse of "If it is raining, then the ground is wet.".

   A. If it is raining, then the ground is wet. **B.** If it is not raining, then the ground is not wet.

   C. If the ground is wet, then it is raining. **D.** If the ground is not wet, then it is not raining.

8. The sum of two odd numbers is written (2a + 1) + (2b + 1). What does it equal?

   A. 2(a + b + 1), which is even **B.** 2(a + b) + 1, which is odd **C.** a + b **D.** 4ab

9. Which number is a counterexample to "every prime number is odd"?

   A. 2 **B.** 3 **C.** 5 **D.** 9

10. Which value of n from 1 to 5 is the smallest counterexample to "$n^2 > n$"?

    Answer: _____

11. Use $1 + 2 + \ldots + n = n(n + 1) \div 2$ to find the sum when n = 27.

    Answer: _____

12. To prove a statement about all even numbers, how do you write one?

    A. 2n, where n is an integer **B.** n + 2 **C.** n^2 **D.** 2n + 1

13. Use $1 + 3 + 5 + \ldots + (2n - 1) = n^2$ to find the sum of the first 35 odd numbers.

    Answer: _____

14. Use $1 + 2 + \ldots + n = n(n + 1) \div 2$ to find the sum when n = 33.

    Answer: _____

15. Use $1^2 + 2^2 + \ldots + n^2 = n(n + 1)(2n + 1) \div 6$ to find the sum when n = 7.

    Answer: _____

16. A statement P(n) has P(1) true, and P(k) true means P(k + 1) is true. For how many of the first 8 whole numbers is it true?

    Answer: _____

17. In a proof by induction, what are the two main steps?

    A. Show it is true for the first case, then show case k leads to case k + 1

    B. Try three examples **C.** Assume the result, then stop **D.** Show it is false, then true

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18. In proving $n^3 - n$ is divisible by 6, what is the value when $n = 9$, divided by 6?

    Answer: _____

19. To prove $\sqrt{2}$ is irrational, what do you assume first?

    A. $\sqrt{2} = a/b$ in lowest terms **B.** $\sqrt{2} = 1.41$ **C.** $\sqrt{2}$ is even **D.** $\sqrt{2}$ is negative

20. "All swans I have seen are white, so all swans are white." What is the flaw?

    A. Examples do not prove a general rule **B.** Swans are not birds

    C. The logic is a valid proof **D.** It uses numbers

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Answer key · Version X2333

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1. **B (If a student has no ticket, then the student cannot enter.)**
2. **D (If a shape is not a square, then it is not a rectangle.)**
3. **B (If it is a rectangle, then a shape is a square.)**
4. **B (If the ground is wet, then it is raining.)**
5. **B (If it is not a rectangle, then a shape is not a square.)**
6. **A (If a number does not end in 0, then it is not even.)**
7. **B (If it is not raining, then the ground is not wet.)**
8. **A (2(a + b + 1), which is even)**
9. **A (2)**
10. **1**
11. **378**
12. **A (2n, where n is an integer)**
13. **1225**
14. **561**
15. **140**
16. **8**
17. **A (Show it is true for the first case, then show case k leads to case k + 1)**
18. **120**
19. **A ($\sqrt{2}$ = a/b in lowest terms)**
20. **A (Examples do not prove a general rule)**

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