

# Implication Equivalent Forms Worksheet 1

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## Question 1

The statement is: if  $x > 7$ , then  $x > 3$ .

Which of the following is equivalent to this statement?

- A  $x > 3$  is a sufficient condition for  $x > 7$ .
- B  $x > 7$  is a sufficient condition for  $x > 3$ .
- C  $x > 7$  is a necessary condition for  $x > 3$ .
- D  $x > 3$  only if  $x > 7$ .

## Question 2

A door opens only if the silver key is inserted.

Which statement says the same thing?

- A If the door opens, then the silver key is inserted.
- B If the silver key is inserted, then the door opens.
- C The door opening is necessary for the silver key being inserted.
- D The silver key being inserted is sufficient for the door opening.

## Question 3

A quadrilateral being a square is a sufficient condition for it to be a rectangle.

Which of the following is equivalent?

- A Being a square is necessary for being a rectangle.
- B Being a rectangle is sufficient for being a square.
- C Being a rectangle is necessary for being a square.
- D A quadrilateral is a rectangle only if it is a square.

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## Question 4

For an integer  $n$ , if  $n$  is a multiple of 30, then  $n$  is a multiple of 5.

Which of the following is **not** equivalent to this statement?

- A Being a multiple of 30 is sufficient for being a multiple of 5.
- B Being a multiple of 5 is necessary for being a multiple of 30.
- C  $n$  is a multiple of 30 only if  $n$  is a multiple of 5.
- D Being a multiple of 5 is sufficient for being a multiple of 30.

## Question 5

The machine beeping is an inevitable consequence of pressing the red button.

Which statement is equivalent?

- A If the red button is pressed, then the machine beeps.
- B If the machine beeps, then the red button was pressed.
- C The red button being pressed is necessary for the machine beeping.
- D The machine beeping is sufficient for the red button being pressed.

## Question 6

A creature being a zorple is sufficient for it to have two moons tattooed on its shell.

Which statement says the same thing?

- A Having two moons tattooed on its shell is sufficient for being a zorple.
- B Being a zorple is necessary for having two moons tattooed on its shell.
- C Having two moons tattooed on its shell is necessary for being a zorple.
- D A creature has two moons tattooed on its shell only if it is a zorple.

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## Question 7

For real numbers  $a$  and  $b$ ,  $a = b$  only if  $a^2 = b^2$ .

Which statement is equivalent?

- A If  $a^2 = b^2$ , then  $a = b$ .
- B  $a^2 = b^2$  is sufficient for  $a = b$ .
- C If  $a = b$ , then  $a^2 = b^2$ .
- D  $a = b$  is necessary for  $a^2 = b^2$ .

## Question 8

Being on List A is necessary for receiving the blue stamp.

Which of the following says the same thing?

- A If a form is on List A, then it receives the blue stamp.
- B If a form receives the blue stamp, then it is on List A.
- C Receiving the blue stamp is necessary for being on List A.
- D Being on List A is sufficient for receiving the blue stamp.

## Question 9

If a cake contains almond flour, then it is labelled nut-containing.

Which of the following is **not** equivalent to this statement?

- A Containing almond flour is sufficient for being labelled nut-containing.
- B Being labelled nut-containing is necessary for containing almond flour.
- C A cake contains almond flour only if it is labelled nut-containing.
- D A cake is labelled nut-containing only if it contains almond flour.

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## Question 10

The shadow turning purple is an inevitable consequence of a glim being asleep.  
Which statement is equivalent?

- A The shadow turning purple is necessary for a glim being asleep.
- B The shadow turning purple is sufficient for a glim being asleep.
- C A glim being asleep is necessary for the shadow turning purple.
- D If the shadow turns purple, then the glim is asleep.

## Question 11

For a real number  $x$ ,  $x > 10$  is sufficient for  $x^2 > 25$ .  
Which statement says the same thing?

- A If  $x^2 > 25$ , then  $x > 10$ .
- B If  $x > 10$ , then  $x^2 > 25$ .
- C  $x > 10$  is necessary for  $x^2 > 25$ .
- D  $x^2 > 25$  only if  $x > 10$ .

## Question 12

If a student has a gold badge, then the student may enter Room 4.  
Which statement is equivalent?

- A Being allowed to enter Room 4 is necessary for having a gold badge.
- B Having a gold badge is necessary for being allowed to enter Room 4.
- C Being allowed to enter Room 4 is sufficient for having a gold badge.
- D A student may enter Room 4 only if the student has a gold badge.

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### Question 13

A passport being valid is necessary for joining the trip.

Which statement is equivalent?

- A If someone joins the trip, then their passport is valid.
- B If someone has a valid passport, then they join the trip.
- C Joining the trip is necessary for having a valid passport.
- D A passport is valid only if the person joins the trip.

### Question 14

For an integer  $n$ , if  $n$  is a multiple of 8, then  $n$  is even.

Which of the following is **not** equivalent to this statement?

- A Being a multiple of 8 is sufficient for being even.
- B Being even is necessary for being a multiple of 8.
- C  $n$  is a multiple of 8 only if  $n$  is even.
- D Being a multiple of 8 is necessary for being even.

### Question 15

Let  $P$  be “the robot says BEEP”, and let  $Q$  be “the robot’s left antenna is raised”.

Which option is equivalent to  $P$  only if  $Q$ ?

- A If the robot says BEEP, then its left antenna is raised.
- B If the robot’s left antenna is raised, then it says BEEP.
- C  $P$  is a necessary condition for  $Q$ .
- D  $Q$  is a sufficient condition for  $P$ .

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### Question 16

A line having equation  $y = mx$  is sufficient for the line to pass through the origin.

Which statement is equivalent?

- A If a line passes through the origin, then it has equation  $y = mx$ .
- B Passing through the origin is necessary for having equation  $y = mx$ .
- C Having equation  $y = mx$  is necessary for passing through the origin.
- D A line passes through the origin only if it has equation  $y = mx$ .

### Question 17

If a parcel weighs more than 20 kg, then it needs two labels.

Which statement says the same thing?

- A Needing two labels is necessary for weighing more than 20 kg.
- B Weighing more than 20 kg is necessary for needing two labels.
- C Needing two labels is sufficient for weighing more than 20 kg.
- D A parcel needs two labels only if it weighs more than 20 kg.

### Question 18

For an integer  $n$ ,  $n$  is divisible by 4 only if  $n$  is not odd.

Which statement is equivalent?

- A If  $n$  is not odd, then  $n$  is divisible by 4.
- B Being divisible by 4 is necessary for not being odd.
- C If  $n$  is divisible by 4, then  $n$  is not odd.
- D Not being odd is sufficient for being divisible by 4.

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### Question 19

If a prism is made entirely from crystal, then it reflects blue light.

Which of the following is **not** equivalent to this statement?

- A Reflecting blue light is necessary for being made entirely from crystal.
- B Being made entirely from crystal is sufficient for reflecting blue light.
- C If a prism reflects blue light, then it is made entirely from crystal.
- D Reflecting blue light is an inevitable consequence of being made entirely from crystal.

### Question 20

The archive door unlocking is necessary for entering the lower archive.

Which statement is equivalent?

- A If someone enters the lower archive, then the archive door unlocks.
- B If the archive door unlocks, then someone enters the lower archive.
- C Entering the lower archive is necessary for the archive door unlocking.
- D The archive door unlocking is sufficient for entering the lower archive.