

1a) 243, 81, 27, 9, - - - -

This is a geometric sequence
with :-

first term - 243

Common ratio $\frac{81}{243} = \frac{1}{3}$

and n number of terms.

b) 1, 4, 9, 16, 25, 36, - - -

This is neither a geometric nor
an arithmetic series but it
is a pattern of square numbers.
The difference between consecutive
squares is an odd number.

Hence, the difference between
the square of n and the square
of the next natural number, $n+1$
is $2n+1$. They are consecutive perfect

9) 5, 1, -3, -7, ---

This is an arithmetic sequence with the first term 5.

The common difference of the sequence is

$$1 - 5 = -3 - 1 = -7 - (-3) = -4$$

2a) Maria noticed on her 1st day of work, that it took her 23 minutes to get to the bank. She noticed that it took her 23 minutes the next day as well. She reasons that it will always take her 23 minutes to get to her new job.

— This statement is inductive reasoning. Since it's relying on

drawing
inductive conclusions. It's a generalised
reasoning.

b) In a visit to England, Noah discovered that England still has a King and a queen although they serve a largely symbolic role. Noah also reads that Denmark has a Monarchy. When he also hears about the Monarchy in Spain, Noah determines that all of the European countries still have Monarchies.

- This statement is inductive as it is based on generalization. Noah is not certain on his conclusion. Conclusion seems to be true at one point ~~but~~ but not completely certain.

c) Chaquille finds the temperature in degrees Fahrenheit and converts the temperature to degrees Celsius using the formula

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

The next day, he again uses the formula to convert from Fahrenheit to Celsius.

This statement is deductive reasoning. This is because it starts with a broad truth i.e.

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

The conclusion is therefore true.

(3)

$$x - 2y = 0$$

$$x + y + z = 19$$

$$\frac{3}{2}x + \frac{9}{4}y + \frac{5}{2}z = 43$$

$$D = \begin{vmatrix} 1 & -2 & 0 \\ 1 & 1 & 1 \\ \frac{3}{2} & \frac{9}{4} & \frac{5}{2} \end{vmatrix} = \frac{9}{4}$$

$$D_x = \begin{vmatrix} 0 & -2 & 0 \\ 19 & 1 & 1 \\ 43 & \frac{9}{4} & \frac{5}{2} \end{vmatrix} = 9$$

$$D_y = \begin{vmatrix} 1 & 0 & 0 \\ 1 & 19 & 1 \\ \frac{3}{2} & 43 & \frac{5}{2} \end{vmatrix} = \frac{9}{2}$$

$$D_z = \begin{vmatrix} 1 & -2 & 0 \\ 1 & 1 & 19 \\ \frac{3}{2} & \frac{9}{4} & 43 \end{vmatrix} = \frac{117}{4}$$

$$x = \frac{D_x}{D} \quad y = \frac{D_y}{D} \quad z = \frac{D_z}{D}$$

$$x = 9 \div \frac{9}{4} = 9 \times \frac{4}{9} = 4 \text{ Xtrass}$$

$$y = 9 \frac{1}{2} \times \frac{4}{9} = 2 \text{ Tumbar}$$

$$z = \frac{117}{4} \times \frac{4}{9} = 13 \text{ Xtrass.}$$

4) a) Show that the following statements are equivalent

$$\sim (p \Rightarrow q) \equiv p \wedge \sim q$$

This means that

$$5 < 3 \text{ and } \sim ((-5)^2 < (-3)^2).$$

Not less than means the same thing as "greater than or equal to".

hence $5 < 3 \text{ and } (-5)^2 > (-3)^2$

Therefore the conjunction is true since each of the individual statements in the conjunction is true.

4b) Explain why this equivalence shows you ~~how~~ how to negate a conditional statement.

$p \rightarrow q$ is false if, and only if, its hypothesis, p , is true and its conclusion, q , is false. Therefore,

the negation of "if p then q " is logically equivalent to " p and not q ".

c) Use the equivalence to negate the statement: "If you build it, they will come." (from the movie "Field of Dreams")
The negation of the statement is:

You build it and he will not come.

5) Determine whether the following arguments are valid or invalid.

a) (Premise) $P \vee (q \supset r)$
(Premise) $P \wedge \neg q$
(Conclusion) P

Invalid argument.

b) (Premise) $P \vee r$
(Premise) $q \Leftrightarrow r$

(Premise) q

(Conclusion) $P \wedge r$

The argument is valid.