Proportional reasoning project essay sample

Proportional reasoning –It is a form of mathematical reasoning which involves a sense of co-variation and comparison between two or more quantities.[1]

Ratio– Ratio denotes the magnitude of one quantity with respect to another. In simple words it is a comparison of two numbers. For any two numbers ‘ a’ and ‘ b’ its ratio can be written asa: bora/b(read as a is to b).

For example – Ratio of hydrogen atoms to oxygen atoms in water (H_2O) is 2: 1 which means for every oxygen atom there are two hydrogen atoms.

a: b = c: d or a/b = c/d

Proportion–A proportion is an equation with a ratio on each side. It is expressed as equality of ratios. For numbers a, b, c and d it could be written as

For example – Relation between height and weight of ‘ x’ and ‘ y’. Heights of x and y are 6 and 8 and weights are 60 and 80 respectively. Ratios of their respective height: weight are equal.

6: 60 = 8: 80 = 1: 10. This means their height and weight are proportional to each other.

Percentage– It is way of expressing numbers as a fraction of 100. It is denoted by the sign%.

For example – 30% of balls in bag containing 60 balls are white. Find the number of white balls. This means we have to find 30/100*60 = 18 white balls in the bag.

Cross product algorithm– It is used to find the value of the unknown variable in a given proportion by multiplying the denominator and the numerator on each side. For a proportiona: b = c: dit is written asad= bc.

For example – The ratio of Sam’s earning to Jam’s earning is 3: 5 while their expenses are in the ratio 1: 2. Ratio of their savings is 2: 3. Sam is able to save $3000. So find earnings and expenses of both and savings of Jam.

Step 1 – Assign variablesx – is the earning, y is expenses.

Step 2 – Find the earnings and expenses of each in the variable form

Sam’s earnings = 3x Sam’s expenses = y

Jam’s earnings = 5x Jam’s expenses = 2y

Step 3 – Find the savings = earning – expenses

Sam’s savings = 3x-y = 3000……(1)

Jam’s savings = 5x-2y

Step 4 –Ratio of savings= 2: 3 implies

(3x-y) / (5x-2y) = 2 / 3 implies

3000 / (5x- 2y) = 2/3

Step 5 –Use of cross product algorithm

3000 * 3 = 2* (5x-2y) implies

5x-2y = 4500 ……..(2)

Step 6 – Solution

Solving (1) and (2) we get

x = 1500 y= 1500

Sam’s earning = 4500 Sam’s expenses = 1500

Jam’s earning = 7500 Jam’s expenses = 3000

Questions

1) Can ratios and proportions be negative?

A-Ratios can be negative. For eg- ratio of -3 to 5 is -3/5. But proportions can’t be negative as the minus sign on both sides would cancel each other. For eg- -3: 4 = -6: 8 here both ratios are equal as minus signs cancel each other.

2) What happens if a number is added or subtracted from both denominator and numerator in a ratio?

A- Suppose a ratio a: b is given. We have 2×2 matrix here.

	a> b	a
Addition of a number (x) (a+x)/ (b+x)	Ratio decreases. For eg. Adding 1 to the ratio 5/2	Ratio increases. For eg. Adding 2 to the ratio 1/2

	(both d &n) decreases its value from 2. 5 to 2	(both d & n) increases its value from 0. 5 to 0. 6
Subtraction of a number (x)	Ratio increases. For eg. Subtracting 1 from 3/2(both d &n) increases its value from 1. 5 to 2.	Ratio decreases. For eg. Subtracting 1 from 4/5 (both d & n) decreases its value from 0. 8 to 0. 6
(a-x)/(b-x)		

*d means denominator; n means numerator

3) How does a proportionality between 3 or more ratios denoted?

A-Suppose ratios a: b, c: d , e: f are proportional. They are denoted as a/b= c/d= e/f.

4) Can fractions be expressed as ratios?

A-Yes. For eg- 3/5: 7/15. Solving it we get 3/5*15/7 = 9/7.

5) What is percentage increase or decrease?

A-An increase or decrease of ‘ x%’ in a given quantity ‘ a’ results in a new value of a(1+x/100) or a(1-x/100). For eg a 30% increase in 200 gives new value as 200(1+30/100) = 260.

Note: There are no outside references other than the footnote in the first page.

[1] Richard Lesh, Thomas Post & Merlyn Northern. *Proportional Reasoning.* http://cehd. umn. edu/