Math 2016.05
LeungWL

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Exercise 5. Kenneth had a total of 576 black and red pens in the ratio 9:7. After he had given away an equal number of each type of pens, the number of black and red pens left was in the ratio 7:4. How many pens did he give away altogether?

Answer 5. Given a total of 576 pens in the ratio of 9:7 black:red colors, the number of black and red pen breakdown is as follows:

Time	Black	Red	Units	Comments
Before	9	7	16	Total of 16 units
Before	(324)	(252)		Actual number of pens
Action	-x	-x		Gives away x number of both Black and Red pens
After	7	4	11	Ratio after giving away pens

Let's express the Before and After situation in algebraic terms-

(Black - x) ratio to (Red - x) must be equal to 7:4
324 - x : 252 - x = 7:4

Rearranging terms ...

$$\frac{324 - x}{252 - x} = \frac{7}{4}$$

$$4(324 - x) = 7(252 - x)$$

$$1296 - 4x = 1764 - 7x$$

$$7x - 4x = 1764 - 1296$$

$$3x = 468$$

$$x = 156$$

x is the number of pens given away.
Kenneth gave away 156 Black pens and 156 Red pens.

Doublecheck 5. What is the ratio of the number of Black to Red pens using x=156 in the After case?

Rearranging terms ...

$$\frac{324 - x}{252 - x}? = \frac{7}{4}$$

$$\frac{324 - 156}{252 - 156}? = \frac{7}{4}$$

$$\frac{168}{96}? = \frac{7}{4}$$

$$\frac{7}{4} = \frac{7}{4}$$

Checks!