I.G.C.S.E. Standard Form, Ratio & Proportion

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You can access the solutions from the end of each question

Question 1

Write the following numbers in standard form

a. 5000 **b.** 80 000 **c.** 0.000456 **d.** 0.02 **e.** 60 million

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Solution to question 1

Remember that a number $a \times 10^n$ is in standard form when $1 \leq a < 10$ and that $n \in \mathbb{Z}$ (positive or negative integer).

a. $5000 = 5 \times 1000 = 5 \times 10^3$

b. $80\,000 = 8 \times 10\,000 = 8 \times 10^4$

c. $0.000456 = 4.56 \times \frac{1}{10\,000} = 4.56 \times 10^{-4}$

d. $0.02 = 2 \times \frac{1}{100} = 2 \times 10^{-2}$

e. $60 \text{ million} = 60\,000\,000 = 6 \times 10\,000\,000 = 6 \times 10^7$

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Question 2

Work out the following, giving your answers in standard form.

a. $80\,000 \times 34\,000$ **b.** $\dfrac{0.0045}{900}$ **c.** $(0.04)^3$ **d.** 0.0003×0.001

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Solution to question 2

a. $80\,000 \times 34\,000 = 8 \times 10^4 \times 3.4 \times 10^4 = 27.2 \times 10^8 = 2.72 \times 10^9$

b. $\dfrac{0.0045}{900} = \dfrac{4.5 \times 10^{-3}}{9 \times 10^2} = 0.5 \times 10^{-5} = 5 \times 10^{-6}$

c. $(0.04)^3 = \left(4 \times 10^{-2}\right)^3 = 64 \times 10^{-6} = 6.4 \times 10^{-5}$

d. $0.0003 \times 0.001 = 3 \times 10^{-4} \times 1 \times 10^{-3} = 3 \times 10^{-7}$

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Question 3

Write the ratio 3 : 7 into the form

a. 1 : n **b.** n : 1

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Solution to question 3

a. $3 : 7 = \frac{3}{3} : \frac{7}{3} = 1 : \frac{7}{3}$

b. $3 : 7 = \frac{3}{7} : \frac{7}{7} = \frac{3}{7} : 1$

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Question 4

Divide 2400 kg in the ratio 1 : 2 : 3.

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Solution to question 4

To divide 2400 kg in the ratio 1 : 2 : 3.

There are $1+2+3=6$ shares altogether

Therefore one share is $=\frac{2400}{6}=400\,\text{kg}$

two shares $=2\times 400=800\,\text{kg}$

three shares $=3\times 400=1200\,\text{kg}$

Therefore 2400 kg in the ratio 1 : 2 : 3 is 400 kg : 800 kg : 1200 kg

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Question 5

A sum of money is divided between three people José, Pedro and César
If the ratio of José's share to Pedro's share is 3 : 2 and the ratio of Pedro's share to César's share is 4 : 7, what was the ratio of José's share to César's share?

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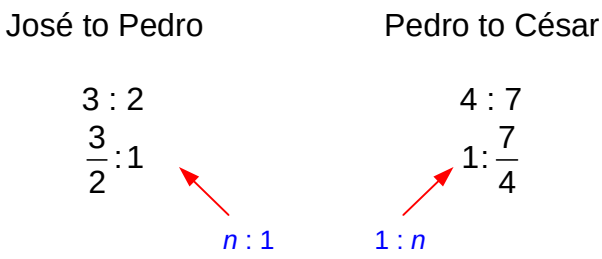
Solution to question 5



Therefore the ratio of José's share to César's share is $\frac{3}{2} : \frac{7}{4} = 6 : 7$

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Question 6

Six cans of paint cost $1.80. How much does eight cans of paint cost?

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Solution to question 6

The ratio of cans of paint to cost is

If the number of cans of paint goes up then the cost will increase.

The cost of 8 cans of paint is $= \frac{4}{\cancel{3}^{1}} \times \frac{\cancel{1.80}^{0.6}}{1} = \$2.40$

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Question 7

Ten bottles of coca cola contain 15 litres. How much does seven bottles contain?

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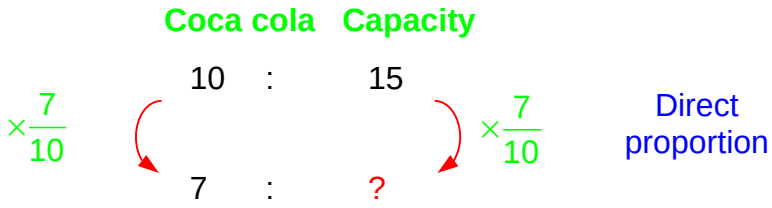
Solution to question 7

The ratio of bottles of coca cola to capacity is



If the number of bottles of coca cola goes down then the capacity will decrease.

The capacity of 7 bottles of coca cola is $= \frac{7}{\cancel{10}^{2}} \times \frac{\cancel{15}^{3}}{1} = \frac{21}{2} = 10\frac{1}{2}$ litres

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Question 8

It takes sixteen men three days to build a wall. How long will it take nine men to build the same wall?

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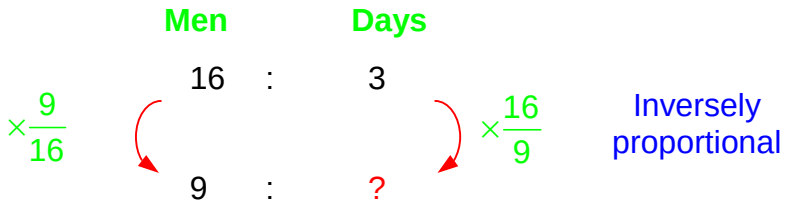
Solution to question 8

The ratio of men to days is



If the number of men goes down then the number of days will increase.

The number of days for nine men to build the wall is

$$= \frac{16}{\cancel{9}^{3}} \times \frac{\cancel{3}^{1}}{1} = \frac{16}{3} = 5\frac{1}{3} \text{ days}$$

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Question 9

A ship has enough food to last 600 passengers nine days. How many passengers can the ship take on if it is on a twelve-day cruise?

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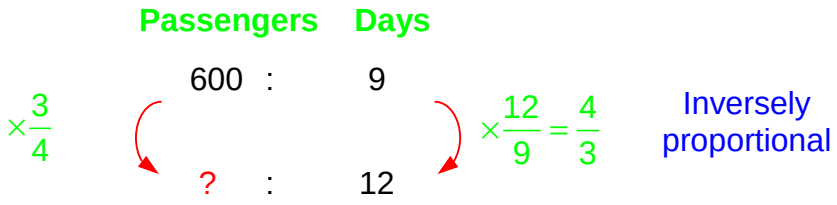
Solution to question 9

The ratio of passengers' food to days is



If the number of days increases the number of passengers has to decrease.

The capacity of 7 bottles of coke is $= \frac{3}{\cancel{4}^{1}} \times \frac{\cancel{600}^{150}}{1} = 450$ passengers.

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Question 10

A bottle of wine costs S/.14.50 in an airport duty free shop. How much will it cost him in

a. U.S. (dollars) if $1 = S/. 3.45

b. U.K. (pounds) if $1 = £0.69

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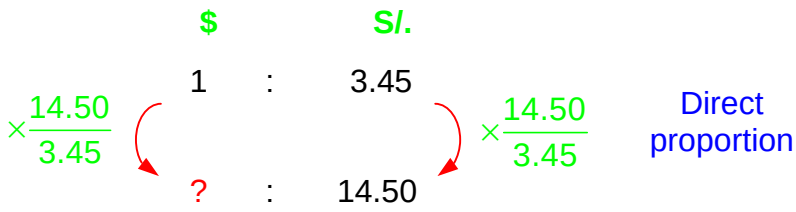
Solution to question 10

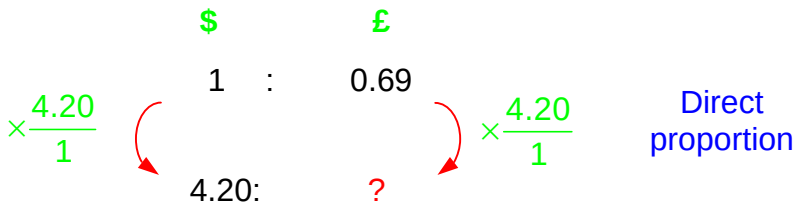
a. The ratio of U.S. (dollars) to Peruvian (soles)



If the number of Peruvian soles increases so will the number of U.S. dollars.

The cost in U.S. dollars $= \frac{14.50}{3.45} \times \frac{1}{1} =$ \$4.20

b. The ratio of U.S. (dollars) to English pounds



If the number of Peruvian soles increases so will the number of U.S. dollars.

The cost in U.K. pounds $= 4.20 \times 0.69 =$ £2.90

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Question 11

A man goes to Japan for his holiday form the U.S.A. and changes $1000 in to yen at the rate of $1 to ¥ 130. Whilst in Japan he spends ¥ 43000. On his return to the U.S.A. the exchange rate has changed to $1 to ¥ 125. How much money in $ will he have left?

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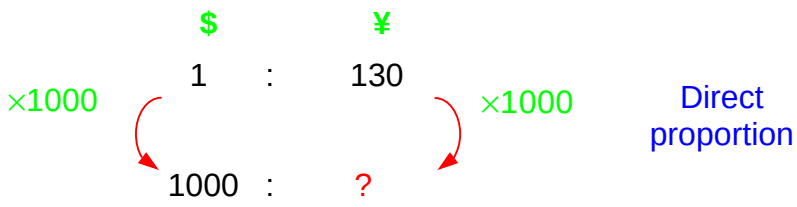
Solution to question 11

The ratio of U.S. (dollars) to Japanese (yen) is



If the number of U.S. dollars increases so will the number of Japanese yen.

The amount of money he has in Japanese yen $= 1000 \times 130 = ¥130\,000$

He then spends ¥ 43000 and therefore he has
¥ 130 000 - ¥ 43 000 = ¥ 87 000 to change back into U.S. dollars

The ratio of U.S. (dollars) to Japanese (yen) is

If the number of Japanese yen increases so will the number of U.S. dollars.

The amount left cost in U.S. dollars $= \frac{87\,000}{125} = \$696$

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Question 12

If the scale of a map is 1 : 50 000, calculate

a. the length of a lake which appears 2.5 cm long on the map in km,

b. the length on the map of a road that appears as 8 km long in cm,

c. the area of a forest which a appears as $5\,cm^2$ on the map in km^2 .

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Solution to question 12

a. The scale of the map is 1 cm to 50 000 cm

	Map		Earth		
	1	:	50 000		
$\times 2.5$				$\times 2.5$	Direct proportion
	2.5	:	?		

The length of the lake on the earth is $2.5 \times 50000 = 125000\,\text{cm}$

$$125000\,\text{cm} = \frac{125000}{100} = 1250\,\text{m} = \frac{1250}{1000} = 1.25\,\text{km}$$

Note: $1\text{km} = 1000\,\text{m}$

$1\text{m} = 100\,\text{cm}$

b. $8\text{ km} = 8 \times 1000 = 8000\,\text{m} = 8000 \times 100 = 800000\,\text{cm}$

	Map		Earth		
	1	:	50 000		
$\times 16$				$\times \frac{800000}{50000} = 16$	Direct proportion
	?	:	800 000		

The length of the road on the map is $1 \times 16 = 16\,\text{cm}$

c. Now consider the area ratio which is $1 : 50\,000^2$

	Map		Earth		
	1	:	$50\,000^2$		
$\times 5$				$\times 5$	Direct proportion
	5	:	?		

The area of a forest on the earth is $5 \times 50000^2 = 1.25 \times 10^{10}\,\text{cm}^2$

Now $1.25 \times 10^{10}\,\text{cm}^2 = \frac{1.25 \times 10^{10}}{10000} = 1250000\,\text{m}^2 = \frac{1250000}{1000000} = 1.25\,\text{km}^2$

Note: $1\text{km}^2 = 1000\,\text{m} \times 1000\,\text{m} = 1000000\,\text{m}^2$

$1\text{m}^2 = 100\,\text{cm} \times 100\,\text{cm} = 10000\,\text{cm}^2$

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