

## UNIT 3: PROPORTION

### CLASS EXERCISES:

1) Determine if the following pairs of magnitudes are directly related, inversely related, or they have no relationship:

- a) The price of apples and the kilos I can buy with a ten euro bill
- b) The speed of a car and the time it takes it to cover a distance
- c) The weight I hang on a spring and the distance it stretches
- d) The number of people who paint a wall and the time it takes them to finish
- e) The age of a person and the number of their shoe
- f) The height of a building and the length of its shadow
- g) The temperature of air and the distance among molecules
- h) The volume of an object and its weight

2) Check if these tables correspond to directly or inversely related magnitudes:

a)

2	5	7	9	15
6	15	21	27	45

b)

4	7	8	10	20
20	35	39	50	100

c)

3	6	1	0.5	8
4	2	12	24	1.5

3) Fill in the gaps in the following tables knowing the relationship between the magnitudes, and find the value of the constant of proportion  $k$

a)

DP	8	5		4	
			21	12	27

b)

DP	2		3	7	10
		10			25

c)

DP	9			0.1		40
		56	16		30	5

d)

IP	10	4		5		
			2	12	20	1

e)

IP		1	7	21		
	14		6		10.5	84

- 4) A car needs eight liters of gas to cover a distance of one hundred kilometers.
- What distance could it cover with ten liters of gas?
  - They want to make a trip of 325 km. How much gas do they need?
- 5) A factory produces four hundred and eighty pieces every six minutes. How many pieces will the machine produce in thirty seconds?
- 6) A farmer has enough food to feed 7 ponies for 30 days. If he buys 3 more ponies, how long will the food last now?
- 7) Three faucets can fill a swimming pool in twenty-eight minutes. How long will it take seven faucets to fill the pool?
- 8) The gas increased 8% last year. If the price of a liter was 1.29€, what's the price now?
- 9) An insurance company charges a customer £320 for his car insurance. The price includes government insurance premium tax at 5%. What is the cost before tax was added?
- 10) A shop has reduced the cost of a sweater by 25% in a sale, so that the sale price is £37.50. What was the original cost of the sweater?
- 11) A car cost £12,000. After 3 years it is worth £8,000. What is the percentage decrease?
- 12) A visitor to this country buys a souvenir costing £27.50 including VAT at 17.5%. How much VAT can be reclaimed?
- 13) At the end of 1999 you bought shares in a company for £300. During 2000 the shares increased in value by 10%. During 2001 the shares decreased in value by 10%. How much were the shares worth at the end of 2001?
- 14) Kenny wants to buy a bicycle that costs \$200. At Sports R Us, there is a 10% discount, and an additional 10% off the sale price. Decathlon offers a 20% discount on all items. Which store has the best price?
- 15) An item costs \$100. Which store has the better price?
- Store A: 50% off
- Store B: 25% off, then an additional 25% off the sale price
- 16) I am investing my Christmas extra salary, €1800, to get a little more money. My bank offered me a 0.7% interest if I don't touch the money for five years. Do you think it's worth it?
- 17) One hundred and ninety five men working ten hours a day can finish a job in twenty days. How many men do we need to finish the job in fifteen days if they work thirteen hours a day?
- 18) A soap factory makes six hundred units in nine days with help of twenty machines. How many units can be made in twelve days with the help of eighteen machines?

19) Ten men can lay a road seventy five km long in five days. In how many days can fifteen men lay a road forty five km long?

20) The dorm charges \$6300, for 35 students for 24 days, in how many days will the dorm charges be \$3375 for 25 students?

21) Wheat costing \$480 is needed for 8 persons for 20 days. What is the cost of wheat required for 12 persons for 15 days?

22)

2	3	5	$2+3+5=10$
4	6	10	$4+6+10=20$

23) Rachel is 10 years old, Ben is 9 and Emma is 7. They are given 52 sugar-free sweets and they decide to share them according to their ages. How many sweets do they each receive?

24) Heidi and Bret get \$80 selling their old toys at a car boot sale. They divide the money in the ratio 2 : 3. How much money do they each receive?

25) Three friends create a company, investing 1500€, 2000€ and 3000€ respectively. After a year, they get a profit of 1300€. How should they divide the money?

26) I mix 10 liters of olive oil, 2.5€ each, with 7 liters of extra olive oil, 4€ each. What's the price of each liter in the mix?

27) A candy shop sells candy bags containing 175 grams of jellybeans, 8€ per kilo, 150 grams of marshmallows, 12€ per kilo, and 200 grams licorice, 13€ per kilo. What's the price of 100 grams of the mix?

28) Divide 186 into three parts, inversely proportional to 2, 3 and 5

29) Divide 354 into three parts, inversely proportional to 2, 5 and 7

30) The prize of a race is 100€, to divide in an inversely proportional way amongst the three first contestants to cross the finish line. How much money does each of them get?

**Exercise 1:** Fill in the gaps in the following tables knowing the relationship between the magnitudes, and find the value of the constant of proportion  $k$  or  $k'$

a)

DP	2			3		12	
		250	100		70	120	8

b)

IP	12	36		24			80
			8	3	72	4	

**Exercise 2:** How long would it take a plane travelling at a constant speed of 700km/h to cover the distance from Malaga to New York, which is estimated around 5890 km?

**Exercise 3:** A dragon needs two hours to cover the one hundred and forty km between Dragonstone and King's Landing. What speed would it need to reach to cover the distance in one hour and a half?

**Exercise 4:** It took five years and six months for Men and Children of the Forest to build the 300-miles-long Wall that defends Westeros. If they had built a 350-miles Wall further north, how long would they have needed?

**Exercise 5:** A light bulb will last for three hundred days if it glows for three and a half hours a day. How long will it last if it glows for five hours a day?

**Exercise 6:** Four years ago, a couple paid £180,000 for their house. It is now valued at £350,000. Calculate the percentage increase in the value of the house.

**Exercise 7:** The UK rainfall last summer was 23% above average. If the average rainfall is 250mm, work out the rainfall during that period.

**Exercise 8:** Cedarville had a population of 1800 people. During the last 2 years, its population increased by 15%, but this year it has decreased by 10%. What is the new population of Cedarville?

**Exercise 9:** The selling price of a DVD player is 35% more than its cost. It is sold at a discount of 20% off the selling price. How much does the store still gain?

**Exercise 10:** A seller increases the price of a jacket by 30% before he announces a discount of 25%. If the price of the jacket was 125€, what's the final price?

**Exercise 11:** I have invested 28000€ during three years with an annual rate of 2.5%. What's the final amount of money I get?

**Exercise 12:** The price of a house is €230 000.

- a) If the price of houses has increased by 18% this last year, what was the original price of the house?  
 b) If the original price was €250 000, what would the percentage of variation be?

**Exercise 13:** The price of a house has increased by 12% this last year, taxes excluded. If the price is €90.000

- a) What was the original price of the house?
- b) Besides, I have to pay 21% of VAT and then pay 7.5% of interest to the bank. What's the final price of the house?

**Exercise 14:** The price of a tablet was 225€. A certain store was accused of foul play.

- a) If before Black Friday they increased the price by 15%, what was the new price?
- b) What's the price after a 25% discount on Black Friday?
- c) What's the real percentage discount?

**Exercise 15:** The elves working at Santa Claus' workshop are thinking about going on a strike because, due to the economic instability, the immigrant crisis, and Trump's presidency, last year their salary was already decreased by 7%, and this year they are getting another decrease by 7% again. If an elf had a salary of 1200 gold coins, what's their new salary after these two decreases? Do you think the strike is justified?

**Exercise 16:** Seventeen workers need to work eight hours a day for a week in order to assemble eight hundred and fifty TV sets. How many hours a day will they have to work next week if we have an order for one thousand TV sets and we hire three more workers?

**Exercise 17:** A cruiser needs seven days to cover a distance of six hundred and fifty km when traveling eight hours a day. How many hours would the cruiser have to travel each day in order to cover a distance of five hundred and sixteen km in five days?

**Exercise 18:** Twenty workers need to work eight hours a day for nine days to finish a job. How many hours a day would fifteen workers have to work to finish the same job in twenty days?

**Exercise 19:** With twenty-four bags of fodder I can feed seventeen sheep during twenty days. How long can I feed thirty sheep with eighteen bags of fodder?

**Exercise 20:** Thirty-six teenagers assisted to a camp for twelve days and one thousand and eighty dollars were needed to feed them. How much money would be needed to feed twenty-four teenagers for thirteen days?

**Exercise 21:** Santa Claus' workshop is getting prepared for the busiest time of year. Last Christmas, with 250 elves working non-stop, they needed 9 days to wrap 42 millions of presents. This year they have 50 millions of presents and they have hired 10 more elves. If they start working the 14<sup>th</sup> of December at nine in the morning, will they be able to do it?

**Exercise 22:** In a chemistry lab, acid and water are mixed in the ratio 1 : 5. A bottle contains 216 ml of the mixture. How much acid and how much water are needed to make that amount of the mixture?

**Exercise 23:** Sam, Linda and Jo buy sandwiches for a party. Sam buys 5 sandwiches, Linda buys 6 and Jo 4. If they spend a total of 18€, how much money does each of them have to pay?

**Exercise 24:** Find the selling price per pound of a coffee mixture made from 8 pounds of coffee that sells for \$9.20 per pound and 12 pounds of coffee that costs \$5.50 per pound.

**Exercise 25:** Find the selling price per kilo of a nuts mixture made from 300 grams of hazelnuts that costs 12€/kg and 200 grams of almonds that costs 15€/kg.

**Exercise 26:** Twenty liters of a 35% alcohol solution are mixed with thirty liters of another solution. The resulting solution has 20% alcohol. Find the percent of alcohol in the second solution.

**Exercise 27:** How many pounds of almonds that cost \$6.3 per pound must be mixed with 8 pounds of peanuts that costs \$1.25 per pound to make a mixture of nuts that costs \$3.00 per pound?

**Exercise 28:** A candy shop sells candy bags containing 100 grams of jellybeans, 8€ per kilo, 80 grams of marshmallows, 9€ per kilo, and a certain amount of licorice, 12€ per kilo. How many grams of licorice do I need to make a mixture that costs 10€ per kilo?

**Exercise 29:** A technician has two solutions A and B. Solution A has a 50% sulphuric acid concentration, while solution B has a 75% sulphuric acid concentration. If the technician decides to mix the two solutions, how many liters of each one does the technician need to make 100 liters of the mixture with a 60% sulphuric acid concentration?

**Exercise 30:** Split €2790 in an inversely proportional way to 1, 3 and 7

**Exercise 31:** Three waiters split the tips in an inversely proportional way to the number of days that they skipped job. If they didn't go to work two, three and seven days respectively and the tips add up to an amount of 123€, how much money will each of them get?

**Exercise 32:** A will states that a fortune of 230000€ is to be divided in an inversely proportional way to the ages of the heirs. The brothers are 21, 30 and 35 years old. How much money does each of them receive?