Earning Money

Curriculum Ready

Mathletics

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EARNING MONEY

Different jobs pay different amounts of moneys in different ways. A salary isn't paid once in a year. It is paid in equal parts each month or week or fortnight or even per hour. It's important to know how this works.

Answer these questions, *before* working through the chapter.

I used to think:

What does it mean if somebody is paid an hourly rate?

Jonathan is paid double time on Sunday. What does this mean?

What is profit? How is it calculated?

Answer these questions, *after* working through the chapter.

But now I think:

What does it mean if somebody is paid an hourly rate?

Jonathan is paid double time on Sunday. What does this mean?

What is profit? How is it calculated?

What do I know now that I didn't know before?

Salaries

People who work earn money as *salaries* or *wages*. A *salary* is a fixed amount paid over a year in parts every week, fortnight or month. We write 'pa' which stands for 'per annum' or per year.

Ivan earns a salary of $\$48\,000$ pa (per annum). If his salary is paid monthly, what is Ivan's monthly pay?

$$\begin{aligned}\text{Monthly pay} &= \frac{\text{Salary}}{12} \\ &= \frac{\$48\,000}{12} \\ &= \$4000\end{aligned}$$

We assume that there are $365\frac{1}{4}$ days in a year. So there are $365\frac{1}{4} \div 7 = 52.179$ weeks in a year.

Your friend would like to know what her weekly pay would be, if she earns $\$78\,000$ pa at her new job?

$$\begin{aligned}\text{Weekly pay} &= \frac{\text{Salary}}{\text{Weeks in a year}} \\ &= \frac{\$78\,000}{52.179} \\ &= \$1494.854...\end{aligned}$$

This can be rounded to the nearest cent: $\$1494.85$

A fortnight is two weeks.

What will your friends fortnightly salary be if she earns $\$78\,000$ pa?

$$\begin{aligned}\text{Fortnightly salary} &= 2 \times \text{Weekly pay} \\ &= 2 \times \$1494.85 \\ &= \$2989.70\end{aligned}$$

Wages

A *wage* is an hourly rate which changes depending on certain conditions, like working overtime or working on holidays.

If you worked at a shop earning $\$8.80$ an hour, how much would you earn after working a $4\frac{1}{2}$ hour shift?

$$\begin{aligned}\text{Total earned} &= 4\frac{1}{2} \times \$8.80 \\ &= \$39.60\end{aligned}$$

Common Terms

Some common terms when dealing with salaries and wages are:

a **Piecework** – people are paid according to how many tasks they complete.

A clothing company is paid $\$4.29$ per t-shirt they print. How much will the company earn for 250 t-shirts?

$$\begin{aligned}\text{Income} &= 250 \times \$4.29 \\ &= \$1072.50\end{aligned}$$

b **Double Time** – the value of a wage doubles under certain conditions.

A shop pays a wage of $\$7.75$ per hour during the week, and *double time* after 4pm. How much would you earn if you worked from 2 pm to 8 pm?

$$\begin{aligned}\text{Earnings from } 14{:}00 \text{ to } 16{:}00 &= 2 \text{ hrs} \times \$7.75 \\ &= \$15.50\end{aligned}$$

$$\begin{aligned}\text{Earnings from } 16{:}00 \text{ to } 20{:}00 &= 4 \text{ hrs} \times (\text{Double } \$7.75) \\ &= 4 \times (2 \times \$7.75) \\ &= \$62.00\end{aligned}$$

$$\begin{aligned}\text{Total Earnings} &= \$15.50 + \$62.00 \\ &= \$77.50\end{aligned}$$

c **Time and a half** – the value of the rate is multiplied by $1\frac{1}{2}$ under certain conditions.

A restaurant pays its waiters $\$6.80$ per hour and *time and a half* on weekends. How much would a waiter earn working on a Saturday for 6 hours?

$$\begin{aligned}\text{Earning} &= \text{Hours} \times \left(1\tfrac{1}{2} \times \text{Rate}\right) \\ &= 6 \times \left(1\tfrac{1}{2} \times \$6.80\right) \\ &= \$61.20\end{aligned}$$

Round your answers the nearest cent where appropriate. Assume a year is $365\frac{1}{4}$ days or 52.179 weeks.

1. A musician earns $\$41\,600$ pa. Find their weekly pay.

2. A physiotherapist earns $\$1192.31$ each week.

a Find their annual salary.

b Find their monthly pay.

3. You are offered two jobs. The first pays $\$18.73$ per hour for a 44 hour week, the second pays $\$20.43$ per hour for a 41 hour week.

a What is the difference in weekly earnings?

b Which job is the better job?

c How much more would you earn in a year working in the better job?

4. A fisherman charges $\$13$ per kg of fish. How much will he charge for:

a 12.2 kg

b 16.8 kg

5. If you work for a normal rate of $\$19.70$ per hour, how much would you earn for working 8 hours at time and a half?

6. If you work for $\$12.80$ per hour for 4 hours a day for a week, how much will you earn if you earn time and a half on Saturdays and double time on Sundays?

7. Which of the following earns the highest pay in a year?

a $48 204 pa.

b $3965.00 per month.

c $1880 per fortnight.

d $24.69 per hour for a 38 hour week.

Commission

Commission is a percentage of sales. For example, a car salesman may earn 15% *commission* on any car they sell.

How much will a car salesman earn if she sells a car for $\$65\,000$ and earns 15% commission?

Pay $= 15\%$ of $\$65\,000.00 = \frac{15}{100} \times \$65\,000 = \$9750$

Sometimes, commission is paid on top of a *base salary* (also called a 'retainer').

A real estate agent earns a base salary of $\$950$ per week and 5% commission of what they sell. How much will the agent earn in a week where they sell a property for $\$132\,000$?

Pay $=$ Base salary $+$ Commision

$= \$950 + (5\%$ of $\$132\,000) = \$950 + (\frac{5}{100} \times \$132\,000) = \$7550$

Loading

A percentage of the salary is added on top of a salary. This is usually done during holidays and called *holiday loading*. The loading is combined with the original salary to form a new pay amount.

Leroy earns a salary of $\$808$ per week. Over a 4 week holiday period, Leroy earns 12% holiday loading. Find:

a The amount which is loaded per week.

Loading $= 12\%$ of Weekly salary $= \frac{12}{100} \times \$808 = \$96.96$

b Leroy's total salary per week.

Total salary per week $=$ Base salary $+$ Loading $= \$808 + \$96.96 = \$904.96$

Allowances

These are bonus amounts used to compensate for difficult working conditions.

A builder earns $\$15.20$ per hour and an allowance of $\$1.80$ per hour if it is raining. He also earns a clothing allowance of $\$19.00$ per week. How much does the builder earn in a 28 hour week, if it rains for 10 hours?

Normal pay $= 28 \times \$15.20 = \$425.60$ (Since he works for 28 Hours)

Rain allowance $= 10 \times \$1.80 = \$18.00$ (Since he receives rain allowance for 10 hours)

Clothing allowance $= \$19.00$

Total weekly pay $= \$425.60 + \$18.00 + \$19.00 = \$462.60$ (Total of all income)

Round to the nearest cent or nearest percentage where appropriate.

1. Let's say you work on a casual basis earning $12.80 per hour on weekends and $8.50 per hour during the week.

a How much money would you earn if you worked 8 hours on the weekend and 10 hours during the week?

b If you were aiming to save $208.70, and you could only work for 11 hours during the week, how many hours would you have to work on the weekend?

2. A painter works for $11.40 per hour, when he is alone he earns a bonus of $2.20 per hour. He has a clothing allowance of $14.50 per week. How much does he earn in a week where he works with a partner for 20 hours and alone for 12 hours?

3. A satellite dish salesman earns a retainer of $\$400$ per week and 17% commission of his sales. Calculate:

a His weekly salary if he sells satellite dishes to the value of $\$8750.00$.

b To what value does he need to sell in a single week (nearest cent) in order to earn a total pay of $\$2400.00$.

4. A farmer is paid $\$7.80$ for each box of oranges he produces.

a If this farmer is paid a total of $\$413.40$ for one day, how many boxes of oranges were produced on this day?

b If the farmer also earns 6% commission on all the oranges, how much will he earn, in total, if he sells an average of 55 boxes a day for a week?

5. To go travelling you need to save $\$5000$. You currently earn $\$1000$ per week.

a Will you be able to go travelling in four weeks under these conditions?

b During a 4 week period, you also earn a weekly loading of 15%, are you able to go travelling after these four weeks?

c What percent of loading do you need should you require $\$6000$ to travel after 4 weeks?

6. Mac works in sales and earns a retainer of $\$800$ as well commission on his sales each week. If his sales totaled $\$5300$, and his total pay for the week was $\$1542$, then what is his rate of commission?

Budgeting

Benji earns a net pay of $\$32\,750$ pa, in weekly payments. He shares an apartment with a friend and they share the following expenses evenly:

$\$400$ each week for rent

$\$120$ each week for food

$\$100$ each month for utilities

Benji also has his own personal expenses which he is completely responsible for, they are:

- $\$50$ each month for internet
- $\$70$ each week for entertainment
- $\$40$ each month for his mobile phone

Convert all Benji's monthly expenses into weekly expenses (nearest cent).

To convert a monthly expense to weekly, multiply the amount by 12 (months), then divide by 52.179 (weeks)

Utilities $= \$100 \times 12 \div 52.179 = \$22.997... \approx \$23.00$ each week

Internet $= \$50 \times 12 \div 52.179 = \$11.498... \approx \$11.50$ each week

Mobile Phone $= \$40 \times 12 \div 52.179 = \$9.199... \approx \$9.20$ each week

What are Benji's total expenses each week?

$$\overbrace{(\$400 \div 2)}^{\text{Half the rent}} + \underbrace{(\$120 \div 2)}_{\text{Half the food}} + \overbrace{(\$23 \div 2)}^{\text{Half the utilities}} + \underbrace{\$11.50}_{\text{Internet}} + \overbrace{\$70}^{\text{Entertainment}} + \underbrace{\$9.20}_{\text{Phone}} = \$362.20$$

How much money does Benji have left over each week (to nearest cent)?

$$\begin{aligned}\text{Money left over each week} &= \text{Total weekly pay} - \text{Total weekly expenses} \\ &= (\$32\,750 \div 52.179) - \$362.20 \\ &= \$265.447... \approx \$265.45\end{aligned}$$

If Benji saves this left over money each week, how many weeks will it take him to be able to buy a TV for $\$950$?

$$\text{Amount of weeks} = \frac{\text{Cost of TV}}{\text{Money saved each week}} = \frac{\$950}{\$265.45} = 3.57...$$

It will take Benji 4 weeks to save the money for the TV.

Let's say you earn a net salary of $\$43\,002$. The total of your expenses each month is $\$2000$. These expenses are made up of $\$500$ for food; $\$80$ for your mobile phone; $\$210$ for entertainment; $\$60$ for internet and $\$250$ for utilities. Each month you also pay for rent, and repayments on a loan for a car.

If the rent each month is double what you pay each month on the car loan, then how much do you spend on each?

Let the amount spent on the car loan equal x. Then the amount spent on rent is $2x$.

$$\begin{aligned}\text{Total Monthly Expenses} = \$2000 &= \$500 + \$80 + \$210 + \$60 + \$250 + x + 2x \\ 3x &= \$2000 - \$1100 \\ 3x &= \$900 \\ x &= \$300\end{aligned}$$

Each month $\$300$ is spent on the car loan and $\$600$ is spent on rent.

What percentage of the total expenses is the car loan repayment?

$$\frac{\$300}{\$2000} \times 100\% = 15\%$$

Profit and Loss

Profit = Total Income – Total Expenses. If the profit is negative, then it is called a ***loss***.

What is the profit made on a computer if I bought it for $\$650$ and sell it for $\$780$?

$$\begin{aligned}\text{Profit} &= \text{Total income} - \text{Total expense} \\ &= \$780 - \$650 \\ &= \$130\end{aligned}$$

The following formula is used to calculate percentage profit mark up: $\text{Mark up} = \dfrac{\text{Profit}}{\text{Cost Price}} \times 100\%$

If there is a loss, then we calculate the percentage loss with the formula: $\text{Percentage Loss} = \dfrac{\text{Loss}}{\text{Cost Price}} \times 100\%$

Find the profit mark up of the computer in the previous question.

$$\text{Mark up} = \frac{\text{Profit}}{\text{Cost Price}} \times 100\%$$

$$= \frac{\$130}{\$650} \times 100\% = 20\%$$

1. Let's say your friend Onur earns a net salary of $39 135pa. The table below shows his monthly expenses.

Expense	Cost
Rent	$1600
Transport	$117
Food	$360
Internet	$50
Mobile Phone	$59
Utilities	$209

a What are Onur's total expenses each month?

b What percentage of Onur's expenses is his rent?

c How much does Onur save each month?

d If Onur wants to invest at least $500 each month in a savings account, what is the maximum amount Onur can spend on entertainment in any month?

2. A shop sells a computer for $\$810$. However it must mark the price up by 10%.

a How much money will the mark up add to the price of the computer?

b What is the computer's new price?

3. A shop buys an item for $\$180$ and sells it for $\$280.80$.

a What profit does the shop make?

b Find the profit mark up on this item.

c Find the selling price if it the item is marked up 77%.

4. If Jenna buys her car for $\$8400$ and sells it to her friend Jesse for $\$6132$ then:

a Calculate the amount of money she lost through the sale.

b Find the percentage loss.

5. A toy shop buys a box of 24 water guns for $\$384$. It then sells each water gun with a profit margin of 77%.

a What is the selling price of a single gun?

b How many water guns does the shop need to sell in order to make a profit on the entire box?

c At what price does each gun have to be sold at to make a profit of 100%?

Say you get a job where you are paid an hourly wage. In a normal week you would work 22 hours and earn $\$330$. One week you decide to work a little overtime and earn $\$510$.

a What is the usual hourly wage?

Usual hourly wage $= \$330 \div 22$

$= \$15$ per hour

b How much overtime did you work if you earn double time for hours worked in overtime?

Total overtime paid $= \$510 - \$330 = \$180$

Wage in double time $= 2 \times \$15 = \$30$

Amount of hours worked = Amount earned double time ÷ Double time wage

$= \$180 \div \$30 = 6$ hours

c How much overtime did you work if you earn time and a half for hours worked in overtime?

Wage in time and a half $= 1.5 \times \$15 = \$22.50$

Amount of hours worked = Amount earned double time ÷ Time and a half wage

$= \$180 \div \$22.50 = 8$ hours

Say you were just hired as a wedding cake baker. Which of the following ways to be paid is better?

① $\$7.40$ per cake averaging 2 cakes each hour.

② Working 30 hours a week for $\$459$.

Find the weekly rate of pay in method ①.

After 30 hours the earnings would be $(2 \times \$7.40) \times 30 = \$444$.
Comparing the two options shows that method ② is better.

OR, USING AN ALTERNATIVE METHOD

Find the hourly rates in each method.

Method ①: Hourly rate $= \$7.40 \times 2 = \$14.80$

Method ②: Hourly rate $= \$459 \div 30 = \$15.30$

Victor works at a ski resort where he earns $\$720$ each week. He is offered 2 options of how he could be paid over each week in holiday season. Which option is better?

① He is paid his normal salary and additional $\$330$ each week.

② He receives 16.5% loading in each week.

In option ① his total earnings each week would be: $\$720 + \$330 = \$850$

In option ② his total earnings would be: $= \$720 + (16.5\% \text{ of } \$720)$

$$= \$720 + \frac{16.5}{100} \times \$720$$

$$= \$846$$

Comparing these 2 options shows that option ① is the better payment.

A tennis racquet costs, $\$392.28$. This is only 84% of the selling price.

a How much more is the cost price than the selling price?

$\$392.28 = 84\%$ of Selling price $= 0.84 \times$ Selling price

$\therefore$ Selling Price $= \dfrac{\$392.28}{0.84} = \$467$

b Find the profit mark up of the tennis racquet.

Profit $= \$467 - \$392.28 = \$74.72$

Use the formula: Mark up $= \dfrac{\text{Profit}}{\text{Cost Price}} \times 100$

$$= \frac{\$74.72}{\$392.28} \times 100 = 19.047...\% \approx 19\%$$

c What is the profit mark up, if the racquet is sold at double the cost price?

Find the new selling price $= 2 \times$ cost price $= 2 \times \$392.28 = \$784.56$

Find the new profit $= \$784.56 - \$392.28 = \$392.28$

Use the formula: Mark up $= \dfrac{\text{Profit}}{\text{Cost Price}} \times 100$

$$= \frac{\$392.28}{\$392.28} \times 100 = 100\%$$

Nikki's monthly expenses are paid in the following proportions:

- $\frac{1}{6}$ of her expenses is utilities
- $\frac{5}{9}$ of her expenses is rent
- $\frac{1}{18}$ of her expenses is transport
- $\frac{2}{9}$ of her expenses is food

a If her utilities cost her $\$108$ each month, then what is the total of her expenses each month?

From the question we know: $\frac{1}{6} \times$ Total expenses $=$ Utilities

Multiply both sides by 6 to obtain: Total expenses $= 6 \times$ Utilities $= 6 \times \$108 = \$648$

b How much do her other 3 expenses cost her each month?

$$\text{Rent} = \frac{5}{9} \times \text{Total expenses} = \frac{5}{9} \times \$648$$
$$= \$360$$

$$\text{Transport} = \frac{1}{18} \times \text{Total expenses} = \frac{1}{18} \times \$648$$
$$= \$36$$

$$\text{Food} = \frac{2}{9} \times \text{Total expenses} = \frac{2}{9} \times \$648$$
$$= \$144$$

c If she saves $\$152$ after she has paid all her expenses, what percentage are her savings of her total salary?

$$\text{Total salary} = \text{Expenses} + \text{Savings}$$
$$= \$648 + \$152$$
$$= \$800$$

$$\text{Savings percentage of salary} = \frac{\text{Savings}}{\text{Salary}} \times 100$$
$$= \frac{\$152}{\$800} \times 100 = 19\%$$

1. In budgeting, an example of a fixed expense is rent, and an example of a variable expense is food and clothing. What do you think the difference is between a fixed and variable expense?

2. In profit, what percentage mark up would be required to sell an item at double the cost price?

3. A freelance lifeguard earns $\$10.10$ per hour. She earns an allowance of each hour she works alone. In a 40 hour week she earned $\$456.70$. If she was alone for 17 hours during that week, what is her allowance per hour for working alone?

4. An electronics store buys a stereo system. The system is then assigned the selling price of an 80% mark up on the cost price. The store owner notices that after a few weeks, no one has bought the stereo and discounts the selling price by 20%.

a If the cost price was $\$270$, then what was the original selling price before the discount?

b What is the new selling price after the discount?

c What is the profit mark up of the selling price after the discount to the original cost price?

d The same electronics store has a profit mark up of 62% on its televisions (which it buys for $\$195$ each) to create the selling price. The store manager notices that no one has bought a television and discounts the selling price by 30%, what is the new profit mark up?

5. You are offered a job in sales and they give you 3 options for fortnightly payment.

① A retainer of $\$420$ and 21% commission on your sales.

② A retainer of $\$500$ and 18% commission on your sales.

③ An hourly rate of $\$19.50$ for 57 hours over the fortnight.

If you work 30 hours each week, and your average sales are $\$3\,550$ each fortnight, then which is the best pay option?

6. The following table shows the monthly breakdown of how Julia uses her salary.

Description	Amount	Percentage
Rent	(b)	38%
Transport	$381.00	10%
Food	$495.30	13%
Electricity	$190.50	(c)
Water	(e)	(d)
Savings	$1028.70	27%
Salary (Total)	(a)	

Find the missing values (a), (b), (c), (d) and (e) in the above table.

Earning Money

Notes

Basics:

1. $797.26 (nearest cent)

2. a $62 192.37 (nearest cent)

b $5183.11 (nearest cent)

3. a The difference in earning is $13.51

b The second job pays more.

c The annual difference is $704.94

4. a $158.60 b $218.40

5. $236.40

6. $435.20

7. Option c pays the most in a year.

Knowing More:

1. a $187.40 b 9 hours

2. $405.70

3. a $1887.50 b $11 764.71

4. a 53 boxes b $3183.18

5. a Total after 4 weeks = $4000, therefore not enough to go travel.

b Total after 4 weeks = $4600, therefore not enough to go travel.

Knowing More:

5. c Require loading of 50% to go travelling after 4 weeks.

6. Rate of commission is 14%.

Using Our Knowledge:

1. a $2395

b 66.81% (2 decimal places)

c $866.25

d $366.25

2. a $81

b $891

3. a $100.80

b 56%

c $318.60

4. a The loss is $2268

b 27%

5. a $16

b Need to sell 14 water guns to make a profit on the entire box.

c $32

Thinking More:

1.
- A variable expense is any expense whose value varies from payment to payment. Examples are water or electricity.
- A fixed expense is any expense whose value is the fixed constant from payment to payment. Any kind of repayment is a fixed expense.

2. An item is sold for double its cost price if the percentage mark up is 100%.

3. $\$3.10$

4. (a) $\$486$

(b) $\$388.80$

(c) 44%

(d) 13.4%

5. Option (1) is the best.

6. (a) $\$3810$

(b) $\$1447.80$

(c) 5%

(d) 7%

(e) $\$266.70$

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