CHAPTER 16

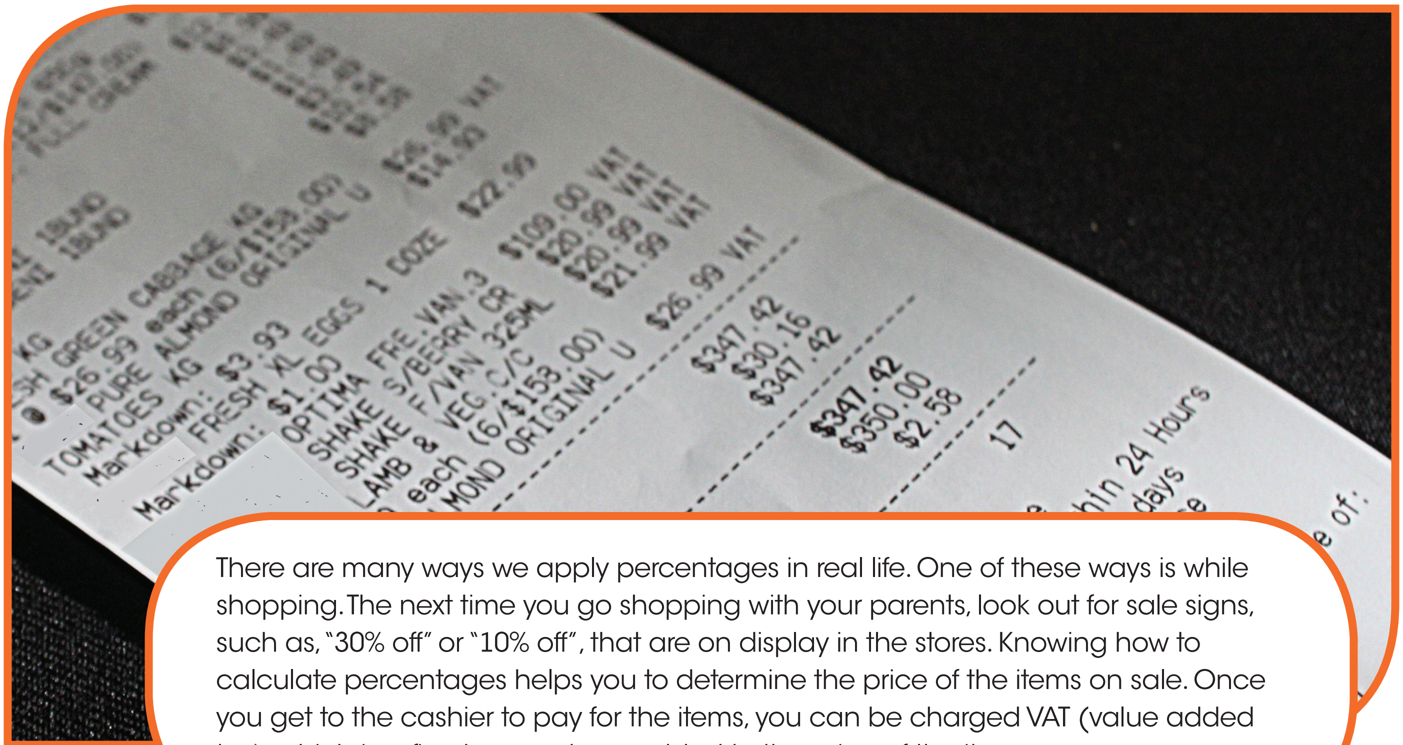
Applying Percentages

Vocabulary:

discount
commission
sale price
savings
loans
simple interest
principal
rate
VAT - Value Added Tax
tax
vat inclusive
vat exclusive
per annum

Chapter Outcomes:

- Create and solve one-step and multi-step problems involving whole numbers, fractions, mixed numbers, decimal, percents including money using algorithms, mental strategies and other problem solving strategies.
- Apply understanding of fractions, decimals and percents to solve problems.



There are many ways we apply percentages in real life. One of these ways is while shopping. The next time you go shopping with your parents, look out for sale signs, such as, "30% off" or "10% off", that are on display in the stores. Knowing how to calculate percentages helps you to determine the price of the items on sale. Once you get to the cashier to pay for the items, you can be charged VAT (value added tax), which is a fixed percentage added to the price of the items.

Getting Ready for Chapter 16

1. Write the total amount as a decimal fraction.

2. One shirt costs $25. How much do 5 shirts cost?

Estimate. Then solve.

3.	$2.35 \times 10 =$	**4.**	$2.18 + 3.32 =$
5.	$9.34 - 4.89 =$	**6.**	$3.9 \div 3 =$

Discount

Teaching Point 1:

How can you find discounts and selling price?

The original price of a shirt is $40. The **discount** is 20%. What is the sale price?

A **discount** is a decrease in the original price of an item.

Method 1:

1. Find the discount.

$$20\% \text{ of } \$40 = \frac{20}{100} \times \$40$$
$$= \$8$$

2. Next, find the sale price.

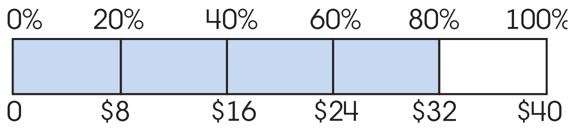
Sale Price = Original Price – Discount

$= \$40 - \$8$

$= \$32$

So, the sale price is $32.

Method 2:



1. Find the discounted percent.

$$100\% - 20\% = 80\%$$

2. Next, find the sale price.

$$80\% \text{ of } \$40 = \frac{80}{100} \times \$40$$
$$= \$32$$

So, the sale price is $32.

Activity 1:

Copy and complete the table.

	Original Price	Discount	Sale Price
1.	$80.00	20%	
2.	$120.00	10%	
3.	$112.00	50%	
4.	$82.00	5%	
5.	$75.00	15%	

6.	\$52.60	30%	
7.	\$95.00	25%	

8. What will I pay for an item marked \$5.50 if I get a 10% discount?

9. A clothing store gives a discount of $12\frac{1}{2}$%. How much will you pay for a pants marked \$84.80?

10. What will I pay for a pen that has an original price of \$18.60, if I get a 25% discount?

11. David bought a table for \$1 200 in March. In June, Mark bought the same kind of table at a discount of 25%. How much did Mark pay for the table?

12. A soca CD that has a marked price of \$125.50 is on sale at a 20% discount. What is the sale price of the CD?

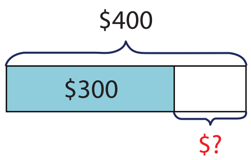
13. A discount of 16% was given for each cash purchase at a book store. How much will Vanna pay for a Mathematics text marked at \$64.00?

Teaching Point 2:

How can you find discounts and selling price?

A suit with a marked price of \$400, is marked down to \$300 in a sale.

(a) What was the amount of discount on the suit?



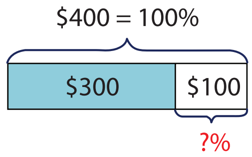
Marked Price → \$400

Discount → \$400 – \$300 = \$100

So, the amount of discount is \$100.

(b) What was the percentage discount on the suit?

Method 1: Use a model.



$\$400 \rightarrow 100\%$

$\$1 \rightarrow \frac{100}{400}\%$

$$\$100 \rightarrow 100 \times \frac{100}{400} = \frac{100}{1} \times \frac{100 \div 100}{400 \div 100}$$

$$= \frac{100 \div 4}{1} \times \frac{1}{4 \div 4}$$

$$= 25\%$$

So, the percentage discount is 25%.

Method 2: Use mental strategies.

Marked Price → \$400 or 100%.

Discount → \$100 or $\frac{1}{4}$ of Marked Price.

Percentage → $\frac{1}{4}$ of 100% = 25%.

So, the percentage discount is 25%.

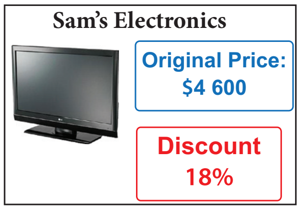
Activity 2:

Copy and complete the table.

	Original Price	Sale Price	Discount	Discount Percent
1.	$200	$150	$50	25%
2.	$400	$240	___	___
3.	$920	$782	___	___
4.	$1 000	$900	___	___
5.	$1 500	___	$750	___
6.	$360	$306	___	___
7.	$3 500	$2 800	___	___
8.	$890	___	$89	___
9.	$3 000	___	$150	___

Solve the problems below.

10. The regular price of a cell phone was $1 200. Vienna paid $900 for the phone during a sale. Calculate the **PERCENT DISCOUNT** that Vienna received.



11. **(a)** At which of the stores above will the television be cheaper?

(b) What will be the difference between both sale prices for the television?

Commission

Teaching Point 1:

How can you find commission on sales?

A salesman gets 3% commission on all the furniture he sells. If he sells an armchair for $6 000.00, how much commission will he receive on this sale?

A **commission** is a percent of total sales earned by a salesperson.

Method 1:

1. **Find the commission.**

3% of $\$6\ 000 = \frac{3}{100} \times \$6\ 000$

$= \$180$

So, his commission is $180.

Activity 1:

Copy and complete the table.

	Sales	Percent	Commission
1.	$2 400.00	2%	
2.	$1 830.00	3%	
3.	$4 800.00	4%	
4.	$8 245.00	5%	
5.	$7 650.00	3%	
6.	$5 600.00	2%	
7.	$9 000.00	3%	

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8. Sarah sold a total of $4 684.00 in sports products and received 4% commission. How much money did she earn?

9. A salesperson receives 10% commission on the sale of appliances. If he sells a refrigerator for $4 598.00, what is his commission?

10. Mrs. Smith earns a 3% commission based on the vacation packages she sells. On one day she sold 3 vacation packages. What was her total commission?

Vacation Package #1	Vacation Package #2	Vacation Package #3
$2 375	$3 950	$2 725

11. Peter earns $3 000 a month plus some money by commission. He gets a commission of 5% on everything he sells. If Peter sold $7 500 worth of items this month, what is his salary for the month?

12. Jack works in a sport store for a salary of $450 per week, plus 6% commission on his total sales. One week his sales were $3 390. What was his income for that week?

13. Mr. James makes money by commission sales. He gets 15% of everything he sells. If he sells $2 300 in goods each week, what will be his monthly salary?

Taxes

Teaching Point 1:

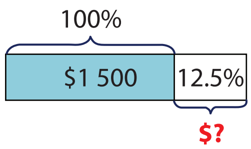
How can solve problems involving taxes?

VAT (Value Added Tax) is a type of sales tax that is added to the price of a product at the time of purchase. In Trinidad and Tobago VAT is a fixed rate of $12\frac{1}{2}$% or 12.5%.

The cost price of a chair is $1 500. VAT is calculated at 12.5% of the cost price. Calculate the amount of VAT.

Find 12.5% *of $1 500*.

Method 1:



100% → $1 500

1% → $1 500 ÷ 100 = $15

12.5% → $15 × 12.5

= $187.50

So, the VAT is $187.50.

Method 2:

$$12.5\% \text{ of } \$1\,500 = \frac{12\frac{1}{2}}{100} \times 1\,500$$

$$= \frac{\frac{25}{2}}{100} \times 1\,500$$

$$= \frac{25}{200} \times 1\,500$$

$$= \frac{25 \div 25}{200 \div 25} \times \frac{1\,500}{1}$$

$$= \frac{1}{8 \div 8} \times \frac{1\,500 \div 8}{1}$$

$$= 187.5$$

So, the VAT is \$187.50.

Activity 1:

Copy and complete the table.

	Cost of Item before VAT	VAT at a rate of 12.5%	Cost of Item with VAT
1.	\$20	\$2.50	\$22.50
2.	\$100	___	___
3.	\$50	___	___
4.	\$170	___	___
5.	\$2 300	___	___
6.	\$5 460	___	___
7.	\$9 000	___	___
8.	\$420	___	___
9.	\$256	___	___
10.	\$894	___	___

Solve the problems.

11. Shanice and her family had lunch at a restaurant. The total cost of the food bill was \$98.00. If VAT is 12.5%, calculate the VAT to be paid?

12. A television set valued at \$4 800 was taxed at 12.5% VAT. Calculate the amount that would have to be paid.

13. A stove was advertised as shown below.

(a) How much will be the VAT?

(b) What will be the total cost of the stove?

14. Daddy's salary for the month of January was \$10 400. He paid 25% of this as income tax. Calculate daddy's salary after the income-tax deduction.

15. Mr. Peters bought a camera that costs \$450. In addition, he had to pay 12.5% VAT. How much did Mr. Peters pay for the camera?

16. The price of a cell phone is \$1 600 subject to 12.5% VAT

(a) Calculate the amount of VAT.

(b) Calculate the VAT inclusive price of the cell phone.

17. What is the difference between the VAT that will be paid for a pants bought at Abel's Men Store and one bought at The Barn, if VAT is 12.5%?

18. Mother bought baby car seat at an online store for $200. She shipped it to Trinidad and was charged 12.5% VAT and an online purchase tax of 7%.

(a) Calculate how much VAT she paid on the baby car seat.

(b) The online purchase tax of 7% is charged after the VAT is added to the cost of the item. Calculate the amount of the online purchase tax.

19. The price of a sofa, VAT exclusive, is $3 600. How much will a customer pay for the sofa if she gets a 20% discount but pays a 12.5% VAT?

20. A customer buys the following items at the grocery.

(a) What is the total VAT that he has to pay on the three items if VAT is 12.5%

(b) Calculate the total cost of the three items.

Simple Interest

Teaching Point 1:

How does simple interest relate to percentage problems?

Simple Interest ($) = Principal ($) × Interest Rate (*% per year*) × Time (years)

Principal (P) is the initial amount of money deposited or borrowed.

Simple Interest (SI) is the amount of money paid or earned for the use of money.

The interest rate (R) is a percent used to calculate interest on the principal.

Arnez has $500 in a savings account that pays 5% simple interest. (a) How much interest will he earn in 3 years? (b) What is the balance after 3 years?

Finding Interest Earned

Method 1:

(a) $$\text{SI} = \frac{\text{PRINCIPAL}}{1} \times \frac{\text{RATE}}{100} \times \frac{\text{TIME}}{1}$$

$$= \frac{500}{1} \times \frac{5}{100} \times \frac{3}{1}$$

$$= \frac{500 \times 5 \times 3}{100}$$

$$= \$75$$

(b) Balance = Principal + Simple Interest

= $500 + $75

= $575

Method 2:

SI = $500 × 0.05 × 3 ← Change the rate to a decimal.

= $75

Balance = Principal + Simple Interest

= $500 + $75

= $575

Finding the Interest Rate

Maya put $1 000 in an account. The account earns $160 in simple interest in 4 years. What is the annual interest rate?

$$\textbf{Rate} = \frac{\textit{Simple Interest} \times 100}{\textit{Principal} \times \textit{Time}}$$

$$= \frac{160 \times 100}{1\,000 \times 4}$$

$$= 4$$

So, the annual interest rate is 4%

Finding the Amount of Time

How long will it take an account with a principal of $800 to earn $240 interest if the annual interest rate is 6%?

$$\textbf{Time} = \frac{\textit{Simple Interest} \times 100}{\textit{Principal} \times \textit{Rate}}$$

$$= \frac{240 \times 100}{800 \times 6}$$

$$= 5$$

So, the time is 5 years.

Finding the Principal

Peter took a loan from the bank for 3 years at an annual interest rate of 10%. After 3 years he had repaid the bank $1 800 in interest. What was the initial sum of money that he had borrowed?

$$\textbf{Principal} = \frac{\textit{Simple Interest} \times 100}{\textit{Rate} \times \textit{Time}}$$

$$= \frac{1\,800 \times 100}{10 \times 3}$$

$$= \$6\,000$$

So, the principal is $6 000.

Activity 1:

Copy and complete the table.

	Principal	Rate	Time	Simple Interest
1.	$200	5%	1 year	
2.	$600	2%	5 years	
3.	$350	3%	10 years	
4.	$900	3%	3 years	
5.	$500	4%	12 months	
6.	$800	2%	6 years	
7.	$1 000	4%	6 months	
8.	$1 500	10%	18 months	

Find the annual interest rate.

9. Interest = $60, Principal = $400, Time = 3 years

10. Interest = $20, Principal = $1 000, Time = 6 months

11. Interest = $225, Principal = $2 500, Time = 18 months

Find the amount of time.

12. Interest = $30, Principal = $500, Rate = 3%

13. Interest = $720, Principal = $1 000, Rate = 9%

Find the amount of Principal.

14. Interest = $18, Rate = 4%, Time = 6 months

15. Interest = $54, Rate = 3%, Time = 2 years

Activity 2:

Solve the problems below.

1. A savings account earns a 5% simple interest per year. If the principal is $2 000, what is the balance after 3 years?

2. You put $1 200 in an account. The account earns $54 simple interest in 18 months. What is the annual interest rate?

3. A family used a credit card to pay for their $5 000 vacation in Tobago. The simple interest rate on the credit card is 15%. The charge was paid after 1 year. What is the total amount paid for the vacation?

4. Mr. Peters borrowed $9 000 from the bank to pay for tuition. He paid simple interest at a rate of 10% for a period of 4 years.

   (a) How much simple interest did Mr. Peters pay?

   (b) How much money must Mr. Peters repay the bank at the end of 4 years?

5. Mr. Gaya borrows $3 500 from his bank to buy a refrigerator. The loan has a 7% annual simple interest rate. If it takes Mr. Gaya two years to pay back the loan, what is the total amount he would be paying?

6. Isaiah invests $5 000 for 3 years and earns $750.

   (a) What was the simple interest rate?

   (b) How much money will he have after the 3 years?

   (c) If Isaiah's goal is to earn $2 000 after 5 years, at the same interest rate, how much money should he have invested?

7. Andell took a loan of $5 000 from the bank at a rate of 10% per annum for 2 years.

   (a) What is the simple interest on the loan?

   (b) What is the total amount he repaid?

   (c) If he repaid 24 equal monthly instalments, what was his monthly instalment?

Chapter Review

Solve the problems below.

1. Calculate the simple interest on $820 at a rate of 5% per annum for 2 years.

2. A television bought during a sale had a sale price of $4 500. At the end of

the sale the same television costs $5 000. What was the discount percent during the sale?

3. A laptop computer displayed at a store costs $3 000. A VAT of 12.5% is added to the price. What is the total cost of the laptop computer?

4. A digital camera costs $2 300. The camera is on sale for 30% off, and you have a discount card for an additional 5% off the sale price. What is the final price?

5. A salesman weekly wage is $1 500 plus a 4% commission on all sales. If his sales for the week was $2 000, what is his wage?

6. Mrs. Moore borrows $9 000 for 5 years from the bank. She pays 8% interest annually.

(a) Calculate the interest per year.

(b) Calculate the interest for 5 years.

(c) Calculate the total amount she has to repay the bank.

7. Marvin wants to buy shoes for school. Three stores have the brand that he wants as advertised. What is the sale price of the shoes at:

(a) Shoe Factory?

(b) Shoez?

(c) Which of the three stores will give Marvin the **best buy**?

8. Mother bought some items at the book store. Her bill is shown below.

Jerome's Book Store

Quantity	**Item**	**Unit Cost**	**Cost**
4 pairs	Socks	$10.00	$ 40.00
2	Shirts	$30.00	$ 60.00
2	Pants	$80.00	$160.00
		Total before VAT	$260.00
		VAT 12.5%	
		Total Cost after VAT	

(a) Calculate the VAT on her total bill.

(b) Calculate the total cost after VAT.