

Year 8 Term 1 Math Homework

Student Name: _____	Grade: _____
Date: _____	Score: _____

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3 Year 8 Term 1 Week 3 Homework

3.1 Percentages

3.1.1 Commissions

- A commission is a method by which employees are paid for the work they do.
- It is usually expressed as a percentage of the value of goods sold.

Example 3.1.1 Linda has a part-time job selling health products door-by-door. She is paid weekly retainer of \$100 plus a commission of 12% on the value of her sales. Find her total pay for a week in which her sales totalled \$2280.

Solution:

$$\begin{aligned} \text{Total pay} &= \$100 + (\$2280 \times 12\%) \\ &= \$100 + (\$2280 \times 0.12) \\ &= \$373.60 \end{aligned}$$

Exercise 3.1.1 Find the following commissions:

1. 3% on sales of \$24,000 _____
2. $8\frac{1}{2}\%$ on sales of \$5280 _____
3. 7.6% on sales of \$8820 _____
4. 0.52% on sales of \$520,000 _____

Exercise 3.1.2 Consolidation

1. A sales assistant is paid a commission of 11% on her weekly sales. Find her commission for a week in which she sells products to the value of \$5680.

2. Ben and Charles are casual salesmen at an appliance store. Ben is paid a commission of 15% on his weekly sales while Charles is paid a weekly salary of \$420. In a week in which Ben sold goods to the value of \$2200, who received the greater pay and by how much?

Exercise 3.1.3 Further Applications

1. A real-estate agent charges a commission of 3.5% on the first \$250,000 of the value of a property and 2% on the remaining balance. Find the total commission payable on the sale of a house costing \$560,000.

2. A salesman is paid a commission of 5% on his weekly sales. If his total pay for a week was \$485, find the value of his sales for that week.

3. Last week George earned \$548, which included a weekly retainer of \$82.40 plus a 12% commission on his sales. Find the value of his sales for that week.

4. Michael is a pay TV sales representative. He is paid a weekly retainer of \$100 plus a commission based in the value of contracts to new subscribers. In a week in which Michael's new customers sign contracts to the value of \$7500, he is paid \$520. Find his rate of commission as a percentage.

3.1.2 Discounts

A discount is a reduction on the price of an item. It usually expressed as a percentage of the marked price.

Example 3.1.2 A LCD TV with a marked price of \$2900 is discounted by 15%.

1. Find the discount.

$$\begin{aligned} \text{Discount} &= \$2900 \times 15\% \\ &= \$2900 \times 0.15 \\ &= \$435 \end{aligned}$$

2. Find the new retail price.

$$\begin{aligned} \text{New retail price} &= \text{marked price} - \text{discount} \\ &= \$2900 - \$435 \\ &= \$2465 \end{aligned}$$

Example 3.1.3 A tablecloth has a marked price of \$36. Find the sale price if a discount of 12% is given.

Solution:

If the price is discounted by 12%, then the tablecloth is to be sold for 88% of the marked price.
therefore the sales price = $\$36 \times 88\%$

$$\begin{aligned} &= \$36 \times 0.88 \\ &= \$31.68 \end{aligned}$$

Exercise 3.1.4 Calculate the discount and the sale price for:

1. a \$980 refrigerator, discounted by 20% _____
2. a \$260 outdoor setting, discounted by 25% _____
3. a \$620 DVD recorder, discounted by 15% _____
4. a \$520 desk, discounted by 25% _____

Exercise 3.1.5 Daniel paid \$126 for a MP3 player after a 30% discount was given. Find the marked price of the MP3 player before the discount.

Exercise 3.1.6 Consolidation

1. A holiday resort in Tasmania reduced its overnight rate from \$125 to \$105. Find the percentage of discount.

2. A bookshop offers a $15\frac{1}{2}\%$ discount on all books purchased in Boxing Day. Find the total saving on the purchase of two cookbooks each priced at \$26 and two gardening books priced at \$24 each.

3. Find the sale price on a wetsuit which normally costs \$350, but is being reduced by $33\frac{1}{3}\%$ in order to make room for new stock.

4. A car was discounted by 12% and sold for \$12,500. How much did the car cost before the discount?

5. Dicksmith Power House discounted its LCD TVs by 10% during its annual sale. A further 5% discount is given on all display models. Find the cost of a displayed LCD TV before the discount if it was sold for \$3334.50.

3.1.3 Profit and Loss

The term 'profit' and 'loss' both refer to the difference between the selling price and the cost price of an item.

$$\text{Profit} = \text{selling price} - \text{cost price}$$

$$\text{Loss} = \text{cost price} - \text{selling price}$$

Note: the percentage profit or loss is calculated on the cost price, unless otherwise stated.

To express the profit or loss as a percentage of the cost or selling price:

- Divide the profit or loss by the cost price or selling price.
- Multiply by $\frac{100}{1}\%$

Example 3.1.4 Luke bought a bicycle for \$120 to sell in his shop. He marked up the price by 35%, then sold the bicycle to a customer.

1. Find the profit he would make.

$$\begin{aligned} \text{Profit} &= \$120 \times 35\% \\ &= \$120 \times 0.35 \\ &= \$42 \end{aligned}$$

2. What was the retail price?

$$\begin{aligned} \text{Retail price} &= \text{cost} + \text{profit} \\ &= \$120 + \$42 \\ &= \$162 \end{aligned}$$

Example 3.1.5 Martin bought a new car for \$21,000 and sold it 5 years later for \$12,000. Find the percentage loss. (correct to 1 decimal place)

Solution:

$$\begin{aligned} \text{Loss} &= \$21,000 - \$12,000 = \$9000 \\ \text{Percentage loss} &= \frac{\text{loss}}{\text{cost}} \times 100\% \\ &= \frac{\$9,000}{\$21,000} \times \frac{100}{1}\% \\ &= 42.9\% \end{aligned}$$

Exercise 3.1.7 Find the profit or loss on an item that was:

- 1. bought for \$200 and sold for \$230 _____
- 2. bought for \$390 and sold for \$450 _____
- 3. bought for \$300 and sold for \$210 _____
- 4. bought for \$140 and sold for \$126 _____

Exercise 3.1.8 Consolidation

1. A retailer purchased a set of leather sofas for \$1400 from a wholesaler, then put them on sale at a price that would allow for a profit of 30% per set.

(a) How much profit will be made per set?

(b) Find the retail price of each set of leather sofa.

2. A owner of a newsagent bought 20 boxes of birthday cards at \$4 per box. He sold all of the cards and made a profit of 35%.

(a) Calculate his total profit.

(b) What was the retail price of each box of cards?

3. A stockbroker bought 5000 shares at \$2.25 per share and later sold the shares for a total of \$15,750. Calculate the percentage profit.

3.2 Algebra

3.2.1 The Index Laws

The index law for multiplication

- Multiply any co-efficients.
- Keep the same base and add the indices.

Example 3.2.1

1. $3^2 \times 3^5 = 3^{(2+5)} = 3^7$
2. $x^2 \times x^3 = x^{(2+3)} = x^5$
3. $2y^2 \times 5y^3 = 10y^{(2+3)} = 10y^5$

The index law for division

- Divide any co-efficients.
- Keep the same base and subtract the indices.

Example 3.2.2

1. $2^6 \div 2^3 = 2^{(6-3)} = 2^3$
2. $15x^3 \div 3x^2 = 5x^{(3-2)} = 5x$
3. $a^4 \div a^6 = a^{4-6} = a^{-2} = \frac{1}{a^2}$

The index law for further powers

- Raise any co-efficients to the power outside the grouping symbols.
- Keep the same base and multiply the indices.

Example 3.2.3

1. $(5^3)^2 = 5^{(3 \times 2)} = 5^6$
2. $(x^2)^4 = x^{(2 \times 4)} = x^8$
3. $(2a^2)^3 = 8a^{(2 \times 3)} = 8a^6$

Exercise 3.2.1 Simplify each expression by adding or subtracting the indices.

1. $m^2 \times m^3 \times m^4 =$ _____

2. $k^5 \times k^6 \times k^7 =$ _____

3. $x^4 \div x^2 \div x =$ _____

4. $y^5 \div y^4 \times y^2 =$ _____

5. $a^2b^3 \times a^2b^2 =$ _____

Exercise 3.2.2 Simplify each of these expressions:

1. $2n^3 \times 4n^2 \times n^4 =$ _____

2. $3p^3 \times 4p^5 \times 2p^2 =$ _____

3. $3ab^2 \times 4a^2b =$ _____

4. $5m^2n \times 3m^3n^2 =$ _____

5. $12p^2q^2 \times 2pq^3 \div 4p^2q =$ _____

6. $20m^8 \div 5m^3 \div 2m^2 =$ _____

7. $36t^{12} \div 2t^3 \div 3t =$ _____

8. $42x^4y^9 \div 6xy^5 \div x^2y =$ _____

9. $(x^2y^4)^3 =$ _____

10. $(5m^3n^5)^2 =$ _____

11. $(3x^3)^3 \times 5x^2 =$ _____

12. $\frac{m^5 \times 4m^2}{2m^3} =$ _____

13. $\frac{(3m^2)^3 \times 4m^4}{6m^6} =$ _____

14. $\frac{(3y^4)^2 \times 6y^8}{y^4 \times (3y^2)^3 \times y^2} =$ _____

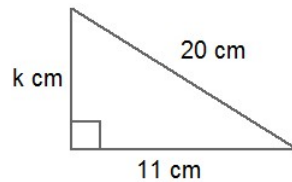
15. $\frac{20(pq)^2 \times 10p^{10}q^{12}}{(2p^6q^3)^2 \times 5p^5q} =$ _____

3.3 Pythagoras' Theorem

3.3.1 Finding a short side

Pythagoras' Theorem can be used to find the length of one of the short sides when the lengths of the hypotenuse and the other side are known,

Example 3.3.1 Find the length of the unknown side of the right-angled triangle. (correct to 1 decimal place)



$$k^2 + 11^2 = 20^2$$

$$k^2 + 121 = 400$$

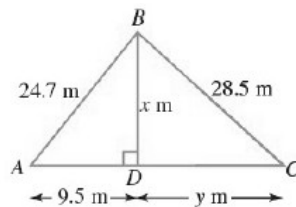
$$k^2 = 279$$

$$k = \sqrt{279} = 16.7 \quad \therefore \text{the length of the side is } 16.7 \text{ cm.}$$

Exercise 3.3.1 Find the length of the third side of a triangle correct to one decimal place, if the lengths of the hypotenuse and a shorter side are:

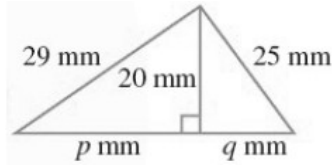
1. 35 cm and 27 cm _____
2. 21 cm and 16 cm _____
3. 9.4 cm and 6.6 cm _____
4. 11.9 cm and 2.3 cm _____

Exercise 3.3.2 Find the value of x and y in the figure shown below:

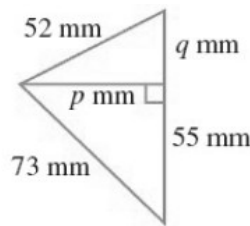


Exercise 3.3.3 Find the value of p and q in each of these figures shown below:

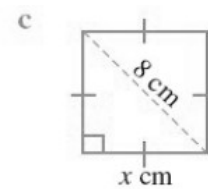
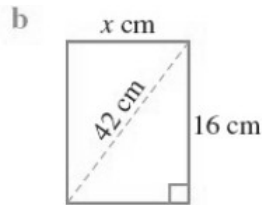
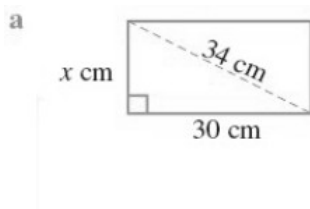
1. $p =$ _____ , $q =$ _____



2. $p =$ _____ , $q =$ _____



Exercise 3.3.4 Find the value of x in each of these figures (correct to 1 decimal place).



a. $x =$ _____

b. $x =$ _____

c. $x =$ _____

3.4 Topic 4 — Miscellaneous exercises

Exercise 3.4.1 Find the commission earned:

1. \$13,967 at 7% _____
2. \$4,936 at 18% _____
3. \$19,377 at $5\frac{3}{4}\%$ _____
4. \$33,996 at 3.6% _____

Exercise 3.4.2 Calculate the profit or loss as a percentage of cost price:

1. CP \$96, SP \$115 _____
2. CP \$4360, SP \$5100 _____
3. CP \$122, SP \$58 _____
4. CP \$1320, SP \$1410 _____
5. CP \$180, SP \$155 _____

Exercise 3.4.3 Find the size of the quantity if: (correct to 2 decimal places)

1. 3% is 43 kg _____
2. 18.5% is 3.6 kg _____
3. 42% is 0.39 km _____
4. 34% is 95 mL _____
5. $93\frac{1}{2}\%$ is 9.7kg _____

Exercise 3.4.4 Simplify the following expressions:

1. $15x^5y^6 \div 3x^3y^4 =$ _____
2. $(3x^6)^3 \div 9x^5 =$ _____
3. $\frac{6x^4 \times 5x^5}{10x^6} =$ _____
4. $\frac{4a}{3} + \frac{2a}{5} =$ _____
5. $\frac{4a}{5} - \frac{2a}{3} =$ _____

Exercise 3.4.5 Further percentages

1. 22% of the fruit at a fruit stall are apples. 18% of them are oranges. 32% are pears and the remaining 210 fruits are mangoes. Find the total of fruits at the stall.

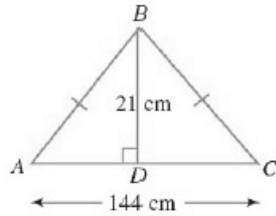
2. A bottle of mineral water has the following content analysis on the label. Chloride 200mg/L, Sodium 95 mg/L, Calcium 50 mg/L, Magnesium 45 mg/L and Potassium 6 mg/L. What is the percentage composition of the mineral water?

3. Interest of \$25.32 was earned in 3 months on a balance of \$1688. What is the interest rate per annum earned on the account?

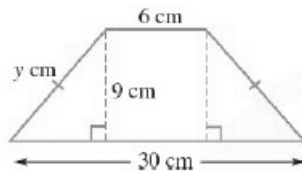
4. Bonnie earns $5\frac{1}{4}\%$ commission on her total sales. If she earns \$65.42 in commission, what is the amount of her total sales?

Exercise 3.4.6 Consolidation

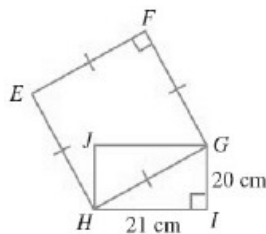
1. $\triangle ABC$ is an isosceles triangle with a base of length 144 cm and perpendicular height of 21 cm. Find the length of the equal sides.



2. Find the value of y in the isosceles trapezium, then calculate the perimeter.



3. $EFGH$ is a square and $JGIH$ is a rectangle. Find the perimeter of $EFGH$.



Exercise 3.4.7 Further applications

1. After a 20% reduction in sale price, a mountain bike cost \$230. How much did it cost before the reduction?

2. 10% of the spectators at a football stadium are women. 20% are girls, 30% are boys and the remaining 4200 spectators are men. Find the total number of spectators at the football stadium.

3. The area of a rectangle is 27 cm^2 and its length is 6 cm. Find the length of the diagonal.

4. The average age of Tony and Bonnie is 8p years. Bob is 2p years old. What is the average age of the 3 children?

5. A motorist travels 24p km in 3 hours. Travelling at this rate, how long will he take to complete a journey of 56p km?

6. A rhombus ABCD has a diagonals of length 12 cm and 16 cm. Find its perimeter.

3.4.1 Math challenge

Exercise 3.4.8

1. The population in town A is 7350. If 2400 of people in town A move to town B, the population of Town B will increase by 160%. Find the difference in population between the two towns.

2. Peter is four years older than twice his brother's age. In four years' time he will be eleven years older than him. How old is Peter now?

3. If A is a multiple of 12 and B is a multiple of 8, what is the largest number which A+B is necessarily a multiple of?

4. The probability it rains while Bob is walking home from school is $\frac{1}{5}$. The probability that Bob remembers to take his umbrella is $\frac{3}{5}$. If these events are independent, what is the probability that Bob gets wet while walking home?
