

### N3: Percentage (Common Questions w/ Real-World Applications)

- Expressing one quantity as percentage of another
- Reverse percentages

1. In a particular school, the enrolment in 2016 is 900 students. In 2015, there were 20% more students than in 2016. There were 20% less students in 2016 as compared to 2017. Calculate the enrolment in	
(a) 2015	[1]
(b) 2017	[1]
2. A shopkeeper bought a pair of shoes for \$56. He still made a percentage profit of 15% even though he offered a 20% discount to his customer. Calculate the normal selling price of this pair of shoes.	[2]
3. (a) Of the 195 countries in the world, Ryan has visited 20. What percentage of the countries in the world has Ryan visited?	[1]
3. (b) At a sale, all prices are reduced by 22.5%. The price of a set of waterproof headphones during the sale is \$139.50. Find its original price.	[1]
4. Express $8\frac{3}{4}\%$ as a	
(a) decimal	[1]
(b) fraction in its simplest form	[1]
5. The hire-purchase price of the refrigerator is 116% of the cash price. The hire-purchase price is a deposit of 12% of the cash price plus 24 monthly payments of \$195. Find the cash price of the refrigerator.	[3]
6. Paul sold a painting for \$15680. He made a profit of 12% on the sale. How much did he pay for the painting?	[1]

<p>7. The cash price of a sofa set is \$8600.</p> <p>Caroline decided to pay by hire purchase with the following terms:</p> <ul style="list-style-type: none"> <li>• A deposit of \$500 and the balance amount of monthly instalments over a period of 3 years at a simple interest at 2.5% per annum.</li> </ul> <p>Calculate the monthly instalments that Caroline has to pay.</p>	[3]
<p>8. Bacteria in a petri dish multiply at a rate of 9.5% per hour.</p> <p>At 1 pm, the population of bacteria in the petri dish was 3800.</p> <p>Find the population of bacteria at 2 pm.</p>	[2]
<p>9. The marked price of a watch is \$8000.</p> <p>If the watch is sold at the marked price, the retailer gains a profit of 60%.</p> <p>Find the retailer's profit if he sells it at a discount of 20% of the marked price.</p>	[2]
<p>10. A group of students sat for an examination.</p> <p>50% of the boys and 40% of the girls passed the examination.</p> <p>Megan commented that 45% of the students passed the examination.</p> <p>Explain why Megan may be wrong.</p>	[1]

### N3: Percentage (Marking Scheme)

1. In a particular school, the enrolment in 2016 is 900 students. In 2015, there were 20% more students than in 2016. There were 20% less students in 2016 as compared to 2017. Calculate the enrolment in	
<p>(a) 2015</p> <p>2016 → 900 students</p> <p>2015 → <math>\frac{900}{100} \times 120\%</math> students</p> <p>2015 → 1080 students</p> <p>∴ 1080 students</p>	[1]
<p>(b) 2017</p> <p>2016 → 900 students</p> <p>2017 → <math>\frac{900}{80} \times 100\%</math> students</p> <p>2017 → 1125 students</p> <p>∴ 1125 students</p>	[1]
<p>2. A shopkeeper bought a pair of shoes for \$56. He still made a percentage profit of 15% even though he offered a 20% discount to his customer. Calculate the normal selling price of this pair of shoes.</p> <p>Let the normal selling price be N</p> <p>Discounted price = <math>N - 0.20 N = 0.80 N</math></p> <p>Shopkeeper made a 15% profit on cost price = <math>\frac{56}{100} \times 115\% = 64.40</math></p> <p>Discounted price = <math>0.80 N = 64.40</math></p> <p><math>N = \frac{64.40}{0.80} \times 100\% = 80.50</math></p> <p>∴ \$80.50</p>	[2]
<p>3. (a) Of the 195 countries in the world, Ryan has visited 20. What percentage of the countries in the world has Ryan visited?</p> <p><math>\frac{20}{195} \times 100\% = 10.256</math></p> <p>Percentage = 10.3% (3 s.f.)</p> <p>∴ 10.3%</p>	[1]
<p>3. (b) At a sale, all prices are reduced by 22.5%. The price of a set of waterproof headphones during the sale is \$139.50. Find its original price.</p> <p><math>\frac{139.50}{77.5} \times 100\% = 180</math></p> <p>∴ \$180</p>	[1]

4. Express $8\frac{3}{4}\%$ as a	
<p>(a) decimal</p> $\frac{8\frac{3}{4}}{100} = 0.0875$ $\therefore 0.0875$	[1]
<p>(b) fraction in its simplest form</p> $\frac{8\frac{3}{4}}{100} = \frac{7}{80}$ $\therefore \frac{7}{80}$	[1]
<p>5. The hire-purchase price of the refrigerator is 116% of the cash price. The hire-purchase price is a deposit of 12% of the cash price plus 24 monthly payments of \$195. Find the cash price of the refrigerator.</p> $116\% = 12\% + 24 \text{ monthly payments of } \$195$ $116\% - 12\% = 4680$ $104\% = 4680$ $100\% = 4500$ $\therefore \$4500$	[3]
<p>6. Paul sold a painting for \$15680. He made a profit of 12% on the sale. How much did he pay for the painting?</p> $\frac{15680}{112} \times 100\% = 14\,000$ $\therefore \$14\,000$	[1]
<p>7. The cash price of a sofa set is \$8600. Caroline decided to pay by hire purchase with the following terms:</p> <ul style="list-style-type: none"> <li>A deposit of \$500 and the balance amount of monthly instalments over a period of 3 years at a simple interest at 2.5% per annum.</li> </ul> <p>Calculate the monthly instalments that Caroline has to pay.</p> $\text{Balance after deposit} = 8600 - 500$ $\text{Balance after deposit} = 8100$ $\text{Interest} \rightarrow \frac{8100(2.5)(3)}{100} = 607.5$ $\text{Total amount to be paid (Balance + Interest)} \rightarrow 8100 + 607.5 = 8707.5$ $\text{Monthly instalment over 3 years (36 months)} = \frac{8707.5}{36}$ $\text{Monthly instalment over 3 years (36 months)} = 241.875$ $\text{Monthly instalment over 3 years (36 months)} = 241.88 \text{ (nearest cent)}$ $\therefore \$241.88$	[3]

<p>8. Bacteria in a petri dish multiply at a rate of 9.5% per hour. At 1 pm, the population of bacteria in the petri dish was 3800. Find the population of bacteria at 2 pm.</p> $\frac{3800}{100} \times 109.5 = 4161$ <p><math>\therefore 4161</math></p>	[2]
<p>9. The marked price of a watch is \$8000. If the watch is sold at the marked price, the retailer gains a profit of 60%. Find the retailer's profit if he sells it at a discount of 20% of the marked price.</p> <p>Profit = selling price – cost price</p> <p>Since profit is 60%, selling price is 160% (100% + 60% profit)</p> $\text{Cost price} = \frac{8000}{160} \times 100\% = 5000$ $\text{Discounted selling price} = \frac{8000}{100} \times 80\% = 6400$ <p>Profit = 6400 – 5000</p> <p>Profit = 1400</p> <p><math>\therefore \\$1500</math></p> <p>NOTE: you do not need to say everything you're doing, this marking scheme is to guide and help you understand the steps.</p>	[2]
<p>10. A group of students sat for an examination. 50% of the boys and 40% of the girls passed the examination. Megan commented that 45% of the students passed the examination. Explain why Megan may be wrong.</p> <p><math>\therefore</math> The number of boys and girls in the school may not be equal.</p>	[1]