

C1.13 Percentages

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS interest 利息 • simple interest 单利 • compound interest 复利 • multiplier 乘数
 • percentage 百分比

Objective

Use percentages to solve Core IGCSE Mathematics problems.

You must be able to:

- Calculate percentage changes and interpret their base quantities
- Use simple and compound interest correctly
- Compare successive percentage changes

1 Key knowledge and worked examples

■ Key knowledge: Percentages

To find a percentage, multiply by $p/100$. To express one amount as a percentage of another, divide by the comparison amount then multiply by 100. Percentage change uses the original amount as denominator. An increase of $r\%$ uses multiplier $1 + r/100$; a decrease uses $1 - r/100$. Simple interest is $I = Prt/100$; compound interest uses $A = P(1 + r/100)^n$.

■ Worked example: Percentages

year 0: 800	year 1: 840	year 2: 882
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Invest 800 yuan at 5% per year for two years.

- Simple interest: $I = Prt/100 = 800(5)(2)/100 = 80$ yuan; total $A = P + I = 880$ yuan.
- Compound total: $A = P(1 + r/100)^n = 800(1.05)^2 = 882$ yuan.
- The second compound year earns interest on the first year's interest too.

■ Method check

Successive percentages act on the current amount. Equal percentage increases and decreases therefore need not cancel.

2 Practice

2.1 Find 18% of 250 yuan. [2]

2.2 Express 42 as a percentage of 60. [2]

2.3 A price falls from 80 to 68 yuan. Find the percentage decrease. [2]

2.4 An item costs 160 yuan to buy and sells for 200 yuan. Find the profit percentage on cost. [2]

3 Exam-style questions

3.1 Apply the percentages methods below. Show working and include units where appropriate.

- (a) A 1200-yuan bicycle is discounted by 15%. Find its sale price. [2]

- (b) The buyer pays a deposit of 30% of the sale price. Find the deposit. [2]

- (c) Instead, 1200 yuan earns 4% compound interest for two years. Find the interest earned. [2]

3.2 A bicycle costs 800 yuan. Its price rises by 10% and the new price is then reduced by 10%.

- (a) Find the final price and the overall percentage change from the original price. [3]

- (b) Compare the interest on 800 yuan after two years at 5% per year under simple interest and annual compound interest. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- $Q = (18/100) \times 250 = \mathbf{45}$ yuan.

2.2

- $p = (42/60) \times 100 = \mathbf{70\%}$.

2.3

- $p = ((80 - 68)/80) \times 100 = \mathbf{15\%}$.

2.4

- Profit $G = 200 - 160 = 40$; $p = (40/160) \times 100 = \mathbf{25\%}$.

3.1

(a)

- $S = P(1 - r/100) = 1200(0.85) = \mathbf{1020}$ yuan.

(b)

- $D = 0.30S = 0.30(1020) = \mathbf{306}$ yuan.

(c)

- $A = 1200(1.04)^2 = 1297.92$; $I = A - P = \mathbf{97.92}$ yuan.

3.2

(a)

- Use multipliers: $P = 800(1.10)(0.90) = \mathbf{792}$ yuan.
- Overall change $p = (792 - 800)100/800 = -1\%$, a 1% decrease.

(b)

- Simple interest $I_s = Prt = 800(0.05)(2) = \mathbf{80}$ yuan.
- Compound interest $I_c = P(1 + r)^2 - P = 800(1.05)^2 - 800 = \mathbf{82}$ yuan.
- Compound gives **2 yuan more**.