**1.2 Compound interest—the general formula**

### Need to Know

Compound interest formula (general case):

\[ A = P(1 + r)^n \]

where:
- \( A \) = amount owing or earned at the end of the complete process
- \( P \) = principal (original amount borrowed or loaned)
- \( r \) = interest rate for the period, expressed as a decimal
- \( n \) = number of compounding periods

### Worked Example 4

Clive borrowed $12,000 to buy a lathe for his factory. He agreed to pay interest at a rate of 15% p.a. and to repay the loan in full in 3 years. Calculate the amount to be repaid if the interest is compounded:

(a) annually  
(b) half-yearly  
(c) quarterly.

### Working

(a) \[ A = P(1 + r)^n \]

\[ P = 12,000 \]
\[ r = 0.15 \]
\[ n = 3 \times 1 = 3 \]
\[ A = 12,000 \times (1.15)^3 \]
\[ = $18,250.50 \]

(b) \[ A = P(1 + r)^n \]

\[ P = 12,000 \]
\[ r = \frac{0.15}{2} = 0.075 \]
\[ n = 3 \times 2 = 6 \]
\[ A = 12,000 \times (1.075)^6 \]
\[ = $18,519.62 \]

(c) \[ A = P(1 + r)^n \]

\[ P = 12,000 \]
\[ r = \frac{0.15}{4} = 0.0375 \]
\[ n = 3 \times 4 = 12 \]
\[ A = 12,000 \times (1.0375)^{12} \]
\[ = $18,665.45 \]

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**1.2 Compound interest—the general formula**

### Fluency

1. Calculate the amount to be repaid after 2 years on a loan of $16,000 if the 14% interest p.a. is compounded:

(a) annually  
(b) half-yearly  
(c) quarterly.