

# MATHEMATICS AND STATISTICS 1.1

Internally assessed  
4 credits

## Achievement Standard 91026

### Apply numeric reasoning in solving problems

When Anna and Ben's British grandmother died two years ago, she left them an inheritance of UK £5 000 to be divided between them.

- This money was to be shared by Anna and Ben, in the ratio 3:2
- The exchange rate at the time the money was sent was NZ\$1 = UK£0.53

Anna used part of her inheritance to buy a cell phone which cost \$680 plus GST at 15%. She then invested the rest of the money for 2 years. The bank is offering an interest rate of 4.5% per annum, compounding yearly. (After the first year was up, the interest was added to the amount invested and the total amount was re-invested at 4.5% per annum for another year.)

Ben used part of his inheritance to buy a laptop which usually cost \$967, but which was in a 20% off sale. Ben's cousin Luke wanted to buy a car, so Ben then lent Luke the rest of his money at 6% per annum simple interest for two years. At the end of the two years, Luke repaid Ben the amount he had borrowed, plus the interest.

Investigate the following aspects:

- How much money Anna and Ben each receive. Who has more? What percentage more?
- What percentage of their inheritances Anna and Ben spent. Who spent more? Who spent the greater percentage of their inheritance?
- Find how much money Anna and Ben each have at the end of the two years. Who has more? What percentage more?

Compare these percentages, and explain any differences you see.



Getty Images - track5



## Solution

Anna's share of the money is  $\frac{3}{5}$  of £5 000 = £3 000

Ben's share of the money is  $\frac{2}{5}$  of £5 000 = £2 000

### Anna

Anna's share in New Zealand dollars is

$3\,000 \div 0.53 = \$5\,660.38$  (rounding to the nearest cent)

Cost of cell phone is

$\$680 \times 1.15 = \$782$  adding GST

Anna spent

$\frac{782}{5\,660.38} \times 100 = 13.8\%$  (1 d.p.) of her inheritance.

### Ben

Ben's share in New Zealand dollars

$= 2\,000 \div 0.53$

$= \$3\,773.58$  (2 d.p.) rounding to the nearest cent

Cost of laptop is

$\$967 \times 0.8 = \$773.60$  reducing price by 20%

Ben spent  $\frac{773.60}{3\,773.58} \times 100 = 20.5\%$  (1 d.p.) of his inheritance.

### Anna

After spending, the balance to invest was

$\$5\,660.38 - \$782.00 = \$4\,878.38$

Interest after first year was

$\$4\,878.38 \times 0.045 = \$219.53$  (2 d.p.)

Balance after first year was

$\$4\,878.38 + \$219.53 = \$5\,097.91$

Interest after second year was

$\$5\,097.91 \times 0.045 = \$229.41$  (2 d.p.)

Balance after two years was

$\$5\,097.91 + \$229.41 = \$5\,327.32$

Note: Alternatively, balance after two years was  $\$4\,878.38 \times 1.045^2 = \$5\,327.32$  (2 d.p.)

### Ben

Balance to lend to cousin was

$\$3\,773.58 - \$773.60 = \$2\,999.98$

Rounding sensibly (as this is private lending to a cousin), balance to lend is \$3 000

Simple interest after two years was

$\$3\,000 \times 0.06 \times 2 = \$360.00$  principal  $\times$  rate  $\times$  time

Total amount repaid to Ben after two years was

$\$3\,000 + \$360.00 = \$3\,360$  (A)

- Anna originally had £1 000 more money than Ben. Comparing this £1 000 extra with Ben's money, Anna had  $\frac{1\,000}{2\,000} \times 100 = 50\%$  more money than Ben. This would be expected from the ratio 3:2, as 3 is 50% greater than 2. **Note:** This calculation in New Zealand dollars would give the same result. (A/M)
- Anna spent  $\$782 - \$773.60 = \$8.40$  more than Ben. But Anna spent a lower percentage of her inheritance than Ben did of his inheritance (Anna spent 13.8% compared with Ben who spent 20.5%). Anna then had  $\$4\,878.38$  to invest, compared with Ben who had \$3 000. So at that stage Anna had \$1 878.40 more than Ben, which was  $\frac{1\,878.40}{3\,000} \times 100 = 62.6\%$  (1 d.p.) more than Ben. (A/M)
- After the investment, Anna has  $\$5\,327.32 - \$3\,360 = \$1\,967.32$  more than Ben. This is  $\frac{1\,967.32}{3\,360} \times 100\% = 58.6\%$  (1 d.p.) more money than Ben. Ben's interest rate was more favourable than Anna's so at the end of the two years Anna had reduced from having 62.6% more money than Ben to having 58.6% more money than Ben. (A/M)

Other factors could be considered, for example: if the money had been exchanged on a different day, the exchange rate could have been different, giving a greater or lesser inheritance for each person. This would change the proportion of the money each person spent, as a fraction of their inheritance.

Interest rates can change from year to year, so that could have affected Anna's investment unless the interest rate was a fixed-term investment for the two years. Ben's arrangement was fixed, so providing he gets his money plus interest as arranged with his cousin, the value of his investment after two years will not change from the initial arrangement. (E)