# AfL Checkpoint 5.03: Mark Scheme

## Task 1: Robbie’s Dilemma

Set monthly income of £25 and he needs to raise £350.

| **Method A** | **Method B** | **Method C** |
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| **January:** Robbie gets 10% extra for referring a new customer. | | |
| 25 ÷ 10 = 2.50  25 + 2.50 = £27.50 | 25 × 1.1 = £27.50 | 25 × 0.1 = 2.50  25 + 2.50 = £27.50 |
| Did you get £2.50?  Common error – working out 10%, but not adding it to the original. | | |
| **February:** Robbie is sick and loses 20% of his pay. | | |
| 25 ÷ 10 = 2.50  2.50 × 2 = 5.00  25 – 5.00 = £20 | 25 × 0.8 = £20 | 25 × 0.2 = 5.00  25 – 5.00 = £20 |
| Did you get £5.00?  Common error – working out 20%, but not subtracting it from the original. | | |
| Did you get £23.75?  Common error – finding 20% by dividing by 20, which gives 25 ÷ 20 = £1.25. | | |
| **March:** Robbie spends 15% of his pay on a birthday present. | | |
| 25 ÷ 10 = 2.50  2.50 ÷ 2 = 1.25  2.50 + 1.25 = 3.75  25 – 3.75 = £21.25 | 25 × 0.85 = £21.25 | 25 × 0.15 = 3.75  25 – 3.75 = £21.25 |
| Did you get £3.75?  Common error – working out 15%, but not subtracting it from the original. | | |
| Did you get £28.75?  Common error – adding the 15% instead of subtracting. Robbie spent the money so he would have less leftover. | | |
| Did you get £23.33 (or if incorrectly rounded, 23.34)?  Common error – finding 15% by dividing by 15, which gives 25 ÷ 15 = £1.6666. | | |
| **April:** Robbie picks up extra hours and earns 35% more. | | |
| 25 ÷ 10 = 2.50  2.50 × 3 = 7.50  2.50 ÷ 2 = 1.25  7.50 + 1.25 = 8.75  25 + 8.75 = £33.75 | 25 × 1.35 = £33.75 | 25 × 0.35 = 8.75  25 + 8.75 = £33.75 |
| Did you get £8.75?  Common error – working out 35%, but not adding it to the original. | | |
| Did you get £24.29?  Common error – finding 35% by dividing by 35, which gives 25 ÷ 35 = £0.71. | | |
| **May:** Robbie gets a permanent 20% pay rise. | | |
| 25 ÷ 10 = 2.50  2.50 × 2 = 5.00  25 + 5.00 = £30.00 | 25 × 1.2 = £30.00 | 25 × 0.2 = 5.00  25 + 5.00 = £30.00 |
| Did you get £5.00?  Common error – working out 20%, but not adding it to the original. | | |
| Did you get £26.25?  Common error – finding 20% by dividing by 20, which gives 25 ÷ 20 = £1.25. | | |
| *All calculations from now on should be based on* ***£30*** *a month as the pay rise is permanent. If you made errors in* ***finding a percentage*** *in the preceding months (Jan to May), it is likely you need to go back and revise your answers to June to December before checking.* | | |
| **June:** Robbie spends 8% of his pay on downloading music. | | |
| 30 ÷ 100 = 0.3  0.3 × 8 = 2.40  30 – 2.40 = £27.60 | 30 × 0.92 = £27.60 | 30 × 0.08 = 2.40  30 – 2.40 = £27.60 |
| Did you get £2.40?  Common error – working out 8%, but not subtracting it from the original. | | |
| Did you get £23?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £2?  Common error – using £25 to work out 8%, but not subtracting it from the original. | | |
| **July:** Robbie gets a 13% bonus for delivering extra leaflets. | | |
| 30 ÷ 100 = 0.3  0.3 × 13 = 3.90  30 + 3.90 = £33.90 | 30 × 1.13 = £33.90 | 30 × 0.13 = 3.90  30 + 3.90 = £33.90 |
| Did you get £3.90?  Common error – working out 13%, but not adding it to the original. | | |
| Did you get £28.25?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £3.25?  Common error – using £25 to work out 13%, but not adding it to the original. | | |
| **August:** Robbie earns 45% more for extra hours, but then spends 15% of his pay on clothes. | | |
| 30 ÷ 100 = 0.3  0.3 × 45 = 13.50  30 + 13.50 = £43.50  43.50 ÷ 100 = 0.435  0.435 × 15 = 6.525  43.50 – 6.525 = 36.975  = £36.98 | 30 × 1.45 = 43.50  43.50 × 0.85 = £36.98 | 30 × 0.45 = 13.50  30 + 13.50 = £43.50  43.50 × 0.15 = 6.525  43.50 – 6.525 = 36.975  = £36.98 |
| Did you get £39.00?  Common error – calculating a 30% gain because 45% more and then 15% decrease = 30% gain in total. However, you cannot combine the percentages as the 15% loss is calculated from a new total, not the original value.  Did you get £9?  Common error – calculating a 30% gain and not adding it to the original. | | |
| Did you get £30.81?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £32.50?  Common error – using £25 and working out a 30% gain.  Did you get £7.50?  Common error – using £25 to work out a 30% gain and not adding it to the original. | | |
| Did you get £36.97 or £36.975?  Common error – not rounding money correctly to 2dp for the final answer, or, rounding 6.525 to 6.53 before subtracting from 43.50. You should not round until the final answer. | | |
| **September:** Robbie spends 8% on downloads, then 18% of what is left on a present. | | |
| 30 ÷ 100 = 0.3  0.3 × 8 = 2.40  30 - 2.40 = £27.60  27.60 ÷ 100 = 0.276  0.276 × 18 = 4.968  27.60 – 4.968 = 22.632  = £22.63 | 30 × 0.92 = 27.60  27.60 × 0.82 = £22.63 | 30 × 0.08 = 2.40  30 – 2.40 = £27.60  27.60 × 0.18 = 4.968  27.60 – 4.968 = 22.632  = £22.63 |
| Did you get £22.20?  Common error – calculating a 26% loss because 8% spent and then a further 18% decrease = 26% loss in total. However, you cannot combine the percentages as the 18% loss is calculated from a new total, not the original value.  Did you get £7.80?  Common error – calculating a 26% loss and not subtracting it from the original. | | |
| Did you get £18.86?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £18.50?  Common error – using £25 and working out a 26% loss.  Did you get £6.50?  Common error – using £25 to work out a 26% loss andnot subtracting it from the original. | | |
| Did you get £22.64 or £22.632?  Common error – not rounding money correctly to 2dp for the final answer, or, rounding 4.968 to 4.96 before subtracting from 27.60. You should not round until the final answer. | | |
| **October:** Robbie is getting worried so he does more hours to earn 37% more. | | |
| 30 ÷ 100 = 0.3  0.3 × 37 = 11.10  30 + 11.10 = £41.10 | 30 × 1.37 = £41.10 | 30 × 0.37 = 11.10  30 + 11.10 = £41.10 |
| Did you get £11.10?  Common error – working out 37%, but not adding it to the original. | | |
| Did you get £34.25?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £9.25?  Common error – using £25 to work out 37% and not adding it to the original. | | |
| **November:** Robbie spends 5% on his mum, 7% on his dad and 3% on his sister from his monthly pay for Christmas. | | |
| 30 ÷ 100 = 0.3  0.3 × 5 = 1.50  30 ÷ 100 = 0.3  0.3 × 7 = 2.10  30 ÷ 100 = 0.3  0.3 × 3 = 0.90  1.50 + 2.10 + 0.90 = 4.50  30.00 – 4.50 = £25.50 | 5% + 7% + 3% = 15%  30 × 0.85 = £25.50 | 30 × 0.05 = 1.50  30 × 0.07 = 2.10  30 × 0.03 = 0.90  1.50 + 2.10 + 0.90 = 4.50  30.00 – 4.50 = £25.50 |
| Did you get £25.71 (or if incorrectly rounded, 25.70)?  Common error – taking each % from the new value calculated, i.e. 5% on mum leaves you with £28.50, and then calculate the 7% from this. In this case each % should be calculated from his £30 monthly pay. | | |
| Did you get £4.50?  Common error – working out 15% and not subtracting it from the original. | | |
| Did you get £21.42?  Common error – using £25 and taking each % from the new value calculated. | | |
| Did you get £3.75?  Common error – using £25 to work out 15% and not subtracting it from the original. | | |
| **December:** Robbie gets a monthly pay rise of 3% and does extra hours at this new rate to earn 20% more. | | |
| 30 ÷ 100 = 0.3  0.3 × 3 = 0.90  30 + 0.90 = 30.90  30.90 ÷ 100 = 0.309  0.309 × 20 = 6.18  30.90 + 6.18 = £37.08 | 30 × 1.03 = 30.90  30.90 × 1.2 = £37.08 | 30 × 0.03 = 0.90  30 + 0.90 = 30.90  30.90 × 0.2 = 6.18  30.90 + 6.18 = £37.08 |
| Did you get £36.90?  Common error – calculating a 23% gain because 3% more followed by a 20% increase = 23% gain in total. However, you cannot combine the percentages as the 20% is calculated from the new total after the pay rise and not the original value.  Did you get £6.90?  Common error – calculating a 23% gain and not adding it to the original. | | |
| Did you get £30.90?  Common error – using the original £25 monthly pay rather than £30. | | |
| Did you get £30.75?  Common error – using £25 and working out a 23% gain.  Did you get £5.75?  Common error – using £25 to work out a 23% gain and not adding it to the original. | | |
| Calculate the total:  27.50 + 20 + 21.25 + 33.75 + 30 + 27.60 + 33.90 + 36.98 + 22.63 + 41.10 + 25.50 + 37.08 = £357.29 | | |
| **Robbie has raised the £350 and has £7.29 in hand.** | | |

# AfL Checkpoint task – 5.03: Mark Scheme

## Task 2: Mary’s Investment

Mary has recently inherited £12 340.

She wants to invest the money for five years and is considering her investment options.

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| Bank of Pi: Invest at an interest rate of 4.3%. | |
| 12 340 × 1.0435 = 15 231.29052  = £15 231.29 | |
| Did you get £14 993.10?  Common error: 4.3 × 5 = 21.5% interest, so 12 340 × 1.215 = £14 993.10.  You cannot combine the percentages as each 4.3% is calculated from a new total, not the original value. This is a compound interest calculation, not a simple interest one. | |
| Bank of Epsilon: Invest the first £10 000 at 4.5% and 3.7% thereafter. | |
| 10 000 × 1.0455 = 12 461.81938  2340 × 1.0375 = 2806.14197  12 461.81938 + 2806.14197 = 15 267.96135  = £15 267.96 | |
| Did you get £15 022.90?  Common error: 4.5 × 5 = 22.5% interest, so 10 000 × 1.225 = 12 250.  Similarly, 3.7 × 5 = 18.5% interest, so 2340 × 1.185 = 2772.9.  Total return is 2772.9 + 12 250 = £15 022.90.  You cannot combine the percentages as each % is calculated from a new total, not the original value. | |
| Alpha Bank: Invest for the first year at 5.6% and then at 3.8%. | |
| 12 340 × 1.056 = 13 031.04  13 031.04 × 1.0384 = 15 127.54634  = £15 127.55 | |
| Did you get £14 906.72?  Common error: 5.6 + 3.8 × 4 = 20.8% interest, so 12 340 × 1.208 = £14 906.72.  You cannot combine the percentages as each % is calculated from a new total, not the original value. | |
| Share Save: We promise to turn your £12 340 investment into £15 000 over five years. What set interest rate is required? | |
| 12 340 × *x*5 = 15 000  *x*5 = 15 000 ÷ 12 340  *x*5 = 1.215559  = 1.039812  = 3.98% interest rate | |
| Did you get 24.3%?  Common error: 1.215559 ÷ 5 = 0.243118 or 24.3%.  The inverse of the power of 5 is root 5, not divide by 5. | |
| TEMPTATION: Buy a new car!! Spend all the money but you would lose 8% on the value during the first year and 5% each year thereafter. | |
| 12 340 × 0.92 = 11 352.8  11 352.8 × 0.954 = 9246.926555  = £9246.93 | |
| Did you get £8884.80?  Common error: 8 + 5 × 4 = 28% loss. 12 340 × 0.72 = £8884.80.  You cannot combine the percentages as each % loss is calculated from a new total, not the original value. | |
| Beta Bank: Invest with us and we will give you a standard interest rate of 3.95% and a 3% lump sum bonus on your initial deposit at the end of year 5. | |
| 12 340 × 0.03 = 370.20  12 340 × 1.03955 = 14 977.44136  14 977.44136 + 370.20 = 15 347.64136  = £15 347.64 | |
| Did you get £15 426.76?  Common error: 12 340 × 1.03 = 12 710.2, followed by 12 710.2 × 1.03955 = £15 426.76.  The lump sum bonus is a one off payment at the end and is not eligible for any interest. | |
| Did you get £15 147.35?  Common error: 3.95 × 5 = 19.75% interest, so 12 340 × 1.1975 = 14 777.15.  Adding the lump sum of 12 340 × 0.03 = 370.20  gives a total return of 14 777.15 + 370.20 = £15 147.35.  You cannot combine the percentages as each 3.95% is calculated from a new total, not the original value. | |
| Diversify: Invest half in Alpha and half in Beta. | |
| 12 340 ÷ 2 = 6170 | |
| **BETA**  6170 × 0.03 = 185.1  6170 × 1.03955 = 7488.720682  7488.720682 + 185.1 = 7673.820682 | **ALPHA**  6170 × 1.056 = 6515.52  6515.52 × 1.0384 = 7563.773169 |
| Total return is: 7673.820682 + 7563.773169 = 15 237.59385  = £15 237.59 | |
| Did you get £15 277.16?  Common error – BETA BANK: 6170 × 1.03 = 6355.10, followed by 6355.10 × 1.03955 = 7713.382303. Total return is 7713.382 + 7563.773 = £15 277.16.  The lump sum bonus is a one off payment at the end and is not eligible for any interest. | |
| Did you get £15 137.45?  Common error – BETA BANK: 3.95 × 5 = 19.75% interest, so 6170 × 1.1975 = 7388.575. Adding the lump sum of 6170 × 0.03 = 185.10, gives 7388.575 + 185.1 = £7573.675.  Total return is 7573.675 + 7563.773 = £15 137.45.  You cannot combine the percentages as each 3.95% is calculated from a new total, not the original value. | |
| Did you get £15 127.18?  Common error – ALPHA BANK: 5.6 + 3.8 × 4 = 20.8% interest, so 6170 × 1.208 = 7453.36. Total return is 7453.36 + 7673.82 = £15 127.18.  You cannot combine the percentages as each % is calculated from a new total, not the original value. | |
| If you got £15 166.74 or £15 027.04, you made more than one error. | |
| Bank of Doubling: You can only invest here at 7.6% if you are willing to wait until your money has doubled before you withdraw it. Is this doable in the five year plan? | |
| 12 340 × 2 = 24 680  12 340 × 1.0765 = 17 798.21777  = £17 798.22  *No her investment has not doubled in five years.* | |
| Did you say no because you only got £17 029.20?  Common error: 7.6 × 5 = 38% interest, so 12 340 × 1.38 = £17 029.20.  You cannot combine the percentages as each 7.6% is calculated from a new total, not the original value. | |
| Bank of Rising %: Year 1 = 2%, Year 2 = 3%, Year 3 = 4%, Year 4 = 5% and Year 5 = 6%. | |
| 12 340 × 1.02 × 1.03 × 1.04 × 1.05 × 1.06 = 15 006.55692  = £15 006.56 | |
| Did you get £14 808?  Common error: 2 + 3 + 4 + 5 + 6 = 20% interest, so 12 340 × 1.2 = £14 808.  You cannot combine the percentages as each % is calculated from a new total, not the original value. | |
| **Beta Bank would give Mary the biggest return over five years.** | |