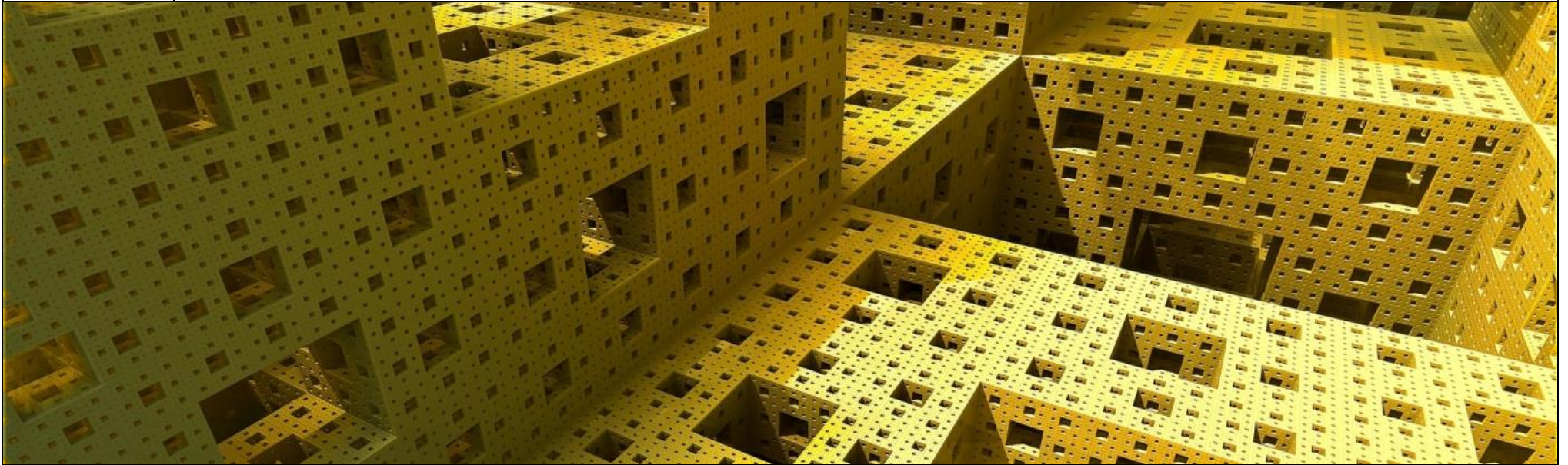




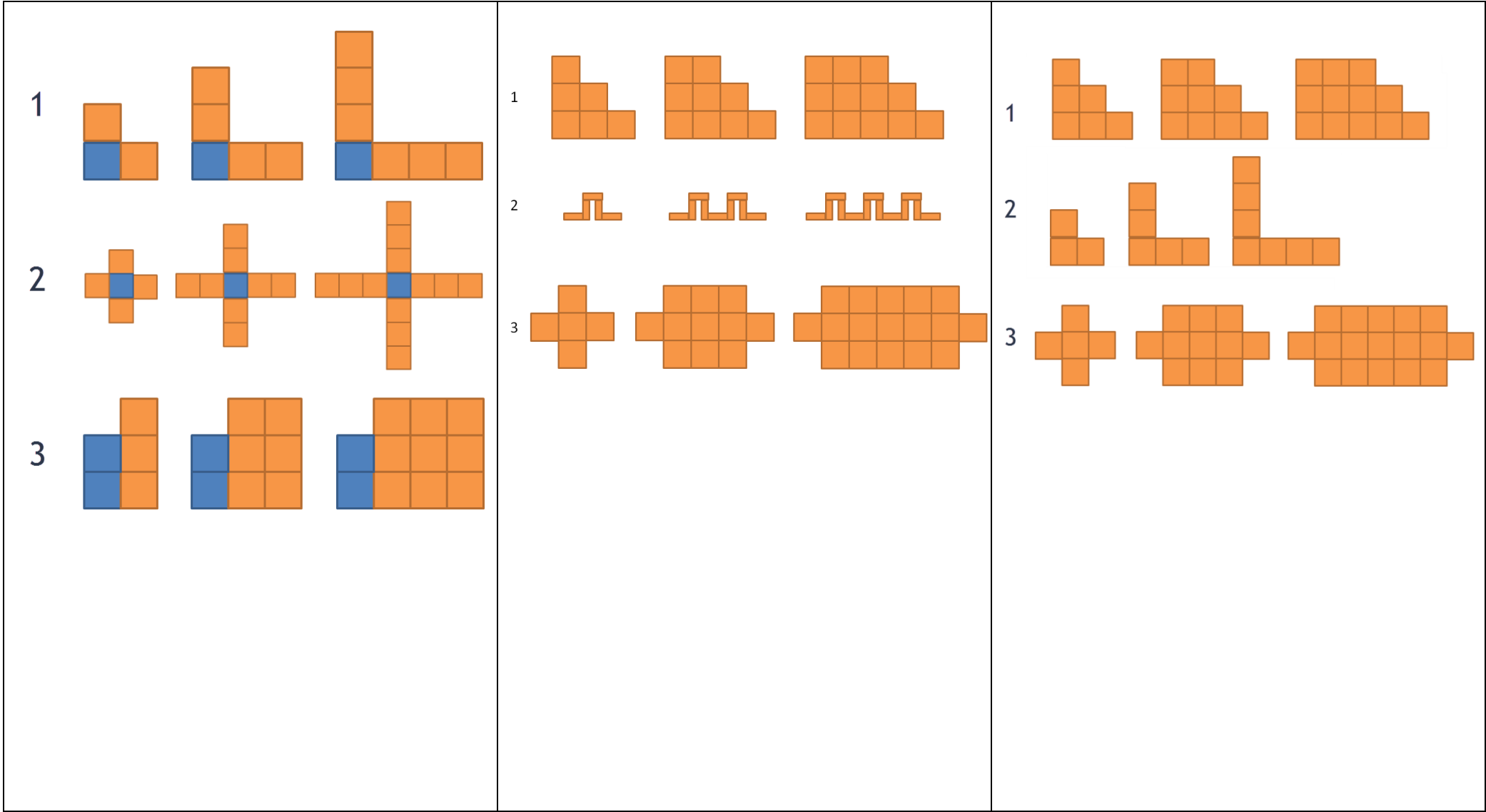
Year 8 Maths – Algebraic Understanding



Level 1 Questions	Level 2 Questions	Level 3 Questions	Challenge Questions
<p>These question types represent the minimum requirements of the course. They are easier questions, normally with only one rule being applied at any time, they are mostly single step questions. These question types represent the minimum passing level for the course, a C level.</p>	<p>These questions represent a level of understanding above the minimum and often require more than one rule to be applied in a multi-step approach. The starting point or the approach to the question is not as clear. These question types represent a level of understanding at about the B level.</p>	<p>These questions represent of understanding well above what is required. They are questions with multiple steps and often with a range of different skills and thought processes embedded. The starting point is generally not given and may not even be clear as is the approach. These question types represent a level of understanding at about the A level.</p>	<p>Challenge questions appear at the end of the booklet. These questions can be very difficult and often require a range of different skills and thinking. They are questions where you need to think “out of the box” Other than knowing the questions are based on the current terms work you are given no indication of where to start or how to approach it.</p>

Patterns and Construction of Algebraic Statements (Any 3)

Level 1	Level 2	Level 3																																										
<p>The patterns below show the first three members of a series. There is a pattern for each that continues in relation to the total number of blocks. For each of the patterns below complete the following questions.</p> <p>a) Draw the next step in the pattern b) Draw a quick sketch of the 27th step in the pattern. c) Complete the table below</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #cccccc;"> <th style="padding: 2px 10px;">Step (n)</th> <th style="padding: 2px 10px;">Number of blocks</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">1</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">3</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">4</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">27</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">54</td><td style="padding: 2px 10px;"></td></tr> </tbody> </table> <p>d) Represent this relationship as a graph. e) Describe in words how you see each of the patterns growing. f) Construct a rule using algebraic notation that connects the step number to the total number of blocks</p>	Step (n)	Number of blocks	1		2		3		4		27		54		<p>The patterns below show the first three members of a series. There is a pattern for each that continues in relation to the total number of blocks. For each of the patterns below complete the following questions.</p> <p>a) Draw the next step in the pattern b) Draw a quick sketch of the 27th step in the pattern. c) Complete the table below</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #cccccc;"> <th style="padding: 2px 10px;">Step (n)</th> <th style="padding: 2px 10px;">Number of blocks</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">1</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">3</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">4</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">27</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">54</td><td style="padding: 2px 10px;"></td></tr> </tbody> </table> <p>d) Represent this relationship as a graph. e) Describe in words how you see each of the patterns growing. f) Construct a rule using algebraic notation that connects the step number to the total number of blocks</p>	Step (n)	Number of blocks	1		2		3		4		27		54		<p>The patterns below show the first three members of a series. There is a pattern for each that continues in relation to the total perimeter of the shape. For each of the patterns below complete the following questions.</p> <p>a) Draw the next step in the pattern b) Draw a quick sketch of the 27th step in the pattern. c) Complete the table below</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #cccccc;"> <th style="padding: 2px 10px;">Step (n)</th> <th style="padding: 2px 10px;">Perimeter</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">1</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">3</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">4</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">27</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">54</td><td style="padding: 2px 10px;"></td></tr> </tbody> </table> <p>d) Represent this relationship as a graph. e) Describe in words how you see each of the patterns growing. f) Construct a rule using algebraic notation that connects the step number to the total perimeter.</p>	Step (n)	Perimeter	1		2		3		4		27		54	
Step (n)	Number of blocks																																											
1																																												
2																																												
3																																												
4																																												
27																																												
54																																												
Step (n)	Number of blocks																																											
1																																												
2																																												
3																																												
4																																												
27																																												
54																																												
Step (n)	Perimeter																																											
1																																												
2																																												
3																																												
4																																												
27																																												
54																																												



Manipulating Algebraic Statements (Any 6 – Level 1 requires 2 from each section)

Level 1	Level 2	Level 3
<p>Simply the following algebraic statements by collecting like terms.</p> <ol style="list-style-type: none"> 1. $5a + 6b + 7a - 2b$ 2. $4x + 7y + 2 + 2y + 6 - x$ 3. $4s + 6t - 11s + 5s - 8t$ 4. $7ab - 3ac - 4bc + ac - 2bc + 5ab$ <p>Expand the following algebraic statements</p> <ol style="list-style-type: none"> 5. $3(a - 9)$ 6. $2(3n - 4)$ 7. $t(r + 8)$ 8. $2j(j - 6)$ <p>Factorise the following algebraic statements</p> <ol style="list-style-type: none"> 9. $5x + 10$ 10. $6a - 15$ 11. $14q - 35r + 21s$ 12. $3x^2 - 8x$ 	<p>Simply the following algebraic statements by selecting appropriate techniques.</p> <ol style="list-style-type: none"> 1. $2a(5a^2 - 7a + 4)$ 2. $2(n + 7) - 5(3 + 8n)$ 3. $\frac{6u+21}{33-9u}$ 4. $15 + 9h - 2(3h - 13)$ 5. $\frac{7x}{3} + \frac{3x}{12} - \frac{12}{4}$ 6. $\frac{3}{f} + \frac{5}{f^2} - \frac{2f}{f}$ 7. $\frac{3x-1}{2} + 4$ 8. $\frac{5v}{2} \times \frac{8}{10v}$ 9. $c(3c - 5) - 2(1 + 4c^2)$ 10. $9 - \frac{3h}{6h-2}$ 	<p>Simply the following algebraic statements by selecting appropriate techniques.</p> <ol style="list-style-type: none"> 1. $\frac{d+7}{2} + \frac{4d-1}{3}$ 2. $\frac{8}{2(p+1)} \times \frac{4p-5}{2}$ 3. $\frac{2h+6}{2} \div \frac{4h-16}{12}$ 4. $\frac{3y^2(3-y)}{2y-6} - \frac{4y^3-7}{y-3}$ 5. $\frac{6m}{3m-7} \times \frac{m+4}{m^2} \times \frac{3m^3}{4}$ 6. $2s(3 + 4(7s - 9)) + 11$ 7. $3\left(\frac{21q+84}{35q-14}\right) + 3$ 8. $\frac{7(6x+4)-3(4x+6)}{5x+20}$

Solving Linear Equations (Any 6 from Page 1 and 4 from Page 2)

Level 1	Level 2	Level 3
<p>Solve the following 1-step linear equations to find the value of the unknown.</p> <ol style="list-style-type: none"> 1. $x + 3 = 8$ 2. $7a = 56$ 3. $g - 2 = 49$ 4. $\frac{k}{4} = 9$ 5. $x - 9 = 54$ 6. $4t = 40$ <p>Solve the following 2 step linear equations to find the value of the unknown.</p> <ol style="list-style-type: none"> 7. $5x - 3 = 42$ 8. $\frac{j+11}{4} = 8$ 9. $\frac{r}{5} + 2 = 5$ 10. $8h - 3 = 32$ 11. $13f + 67 = 106$ 12. $\frac{e-4}{8} = 4$ 	<p>Solve the following linear equations to determine the value of the unknown.</p> <ol style="list-style-type: none"> 1. $3y - 7 = 9 - 5y$ 2. $\frac{4h-6}{11} = 2$ 3. $\frac{8g}{5} + 1 = 33$ 4. $\frac{x+1}{2} = \frac{7x}{5}$ 5. $5 + 7(2 - m) - 4m = -8.5$ 6. $4(6b - 5) - 5(3b - 9) = 24$ 7. $\frac{4f}{3} + \frac{9f}{5} = 94$ 8. $\frac{3c}{4} - \frac{7c}{15} = 120$ 9. $3(6i - 1) + 17 = 140$ 10. $7d + 6 = 5d - 2$ 	<p>Solve the following linear equations to determine the value of the unknown. Leave your answer in a fully simplified fractional form.</p> <ol style="list-style-type: none"> 1. $\frac{2x+7}{3} = \frac{8x-5}{5} + 2$ 2. $\frac{h^7}{5} \div \frac{h^4}{7} = \frac{189}{5}$ 3. $\frac{2d+3}{4} + \frac{5-7d}{3} = 7$ 4. $2(3b - 7) - 4(6b - 1) + 5(2b + 9) = 24$ 5. $\frac{2m}{5m} \times \frac{4}{m^2} \times \frac{3m^4}{4} = 35$ 6. $\frac{5(8e-3)}{4} = 5(3(7e - 6) + 1)$ 7. $5(3(2g - 7) + 4) = 7(6(9 - 5g) - 2)$ 8. $\frac{4n-1}{5} + \frac{2+n}{3} + \frac{7-3n}{2} = 17$

Level 1	Level 2	Level 3
<p>Given the following situations convert the text to an algebraic statement and then solve the problem by finding the unknown value.</p> <p>13. 15 is added to a number S and the result is 35.</p> <p>14. A number K is multiplied by 3 and then 7 is subtracted from the result. The final result is 8.</p> <p>15. A number T is subtracted from 15 and the result multiplied by 4, the final result of this is 28.</p> <p>16. A number R is divided by 3 and then 7 is added to the result. The final result of this is 13.</p> <p>17. 8 is added to a number N and the result is divided by 5. The final result of this is 3</p>	<p>Given the following situations convert the text to an algebraic statement and then solve the problem by finding the unknown value.</p> <p>11. Multiplying a number by 3 and then adding 8 gives the same result as multiplying the same number by 2 and subtracting 8.</p> <p>12. Chloe buys x kg of bananas for \$3 a kilogram, and x kg of apples for \$2 a kilogram. The total cost is \$15.50. Find the value of x.</p> <p>13. The length of a rectangle is twice its width. The perimeter is 13 cm. Let x cm be the width. Write an equation for x and find the width and length.</p> <p>14. In class tests this year, Juan has so far scored 75, 69, 81 and 87. If he wants to get an average of 80 after his next test, what score does Juan need to get?</p> <p>15. The a football match cups of soft drink are sold in small, medium and large containers. The small size costs \$1 less than the medium size, and the large size costs twice as much as the medium size. If all together the sizes cost \$13 how much does the medium-size drink cost?</p>	<p>Given the following situations convert the text to an algebraic statement and then solve the problem by finding the unknown value.</p> <p>9. When one-third of a number is added to three-quarters of a number, the result is 10 more than the number.</p> <p>10. Anthony is twice as old as Julian. Five years ago, he was three times as old. Let x be Julian's present age. Write an equation for x and find the present ages of both Anthony and Julian.</p> <p>11. Georgia cycles to school every day. She manages to go half the distance at 4 m/s but slows to 3 m/s for the second half of her trip. She takes 35minutes to complete the trip. Find the distance she travels, to the nearest metre.</p> <p>12. The sum of eight numbers is x, and the sum of a different set of nine numbers is $2x$. The average of the smaller set of numbers is one more than the average of the larger set of numbers. Write an equation for x and solve it.</p> <p>13. Trevor invests \$10 000 for a year. He obtains 8% per annum for a part of the money and 10% per annum for the remainder. At the end of the year, he will receive \$950 in interest. How much does he invest at 10%?</p>

Challenge Questions

- a) Think of a number, add 30 to it, multiply the result by 5, add 5 times the number you first thought of, subtract 50, divide the result by 10 and subtract 10. Use algebra to show that you always get the number you first thought of.
- b) Think of any number x , add 3 to it, multiply the result by 9 and then subtract 2. Add the number you first started with then subtract 15 and divide the result by 10. Use algebra to show what result you should always get.
- c) I think of a number. I add one-third of that number and one quarter of the same number to get 5 more than the number I first thought of. What is the number?
- d) If x is subtracted from both the numerator and denominator of $\frac{3}{4}$ to give a result of $\frac{7}{10}$, what is the value of x ?
- e) Paul, Kate and Sarah's mother left a bowl of jellybeans on their kitchen counter. Paul took one-third of the jellybeans, but then threw back 4 because he didn't like the green ones. Sarah ate 6 jellybeans and then took one-quarter of what remained. Kate took one-third of what remained and then picked out the last 4 red ones because she really liked them. If there were 6 jellybeans left, how many were there to begin with? If there were x jelly beans left, how many were there to begin with?
- f) The towns Cunadilla and Frevnelle are 110 km apart. David lives in Cunadilla, and Lilly lives in Frevnelle. They decide to meet on the road between the two towns. Lilly cycle at 15 km/h and David cycles at 10 km/h. They both leave their towns at 11 a.m. Let D and L be the respective distances of David and Lilly from Cunadilla at time t hours after 11 a.m. At what time do they meet on the road and how far are they from Cunadilla at the time?
- g) Water flows from tank A to tank B at a rate of 2 litres per minute. Initially tank A has 200 litres in it and tank B has 100 litres in it. Water drains from tank B at 0.5 litres per minute. After how many minutes are there equal volumes of water in the two tanks?
- h) David buys $\$2x$ worth of grapes at $\$5$ a kilogram, and $\$x$ worth of peaches at $\$7$ a kilogram. He buys a total of 10 kg of peaches and grapes. How much of each fruit does he buy?
- i) Andrew and a group of his friends have decided they want to race go-karts on the weekend, and Andrew wants to work out which of the two local go-kart places will be cheaper. Kart-Kingdom charges $\$15$ per person to do safety training, and then 50 cents per lap that you do. Go-Mobile charges 80 cents per lap, and the safety training is free. After how many laps does Go-Mobile become more expensive than Kart-Kingdom?
- j) A two-digit number has the property that the sum of the number and its digits is 63. What is the original number?