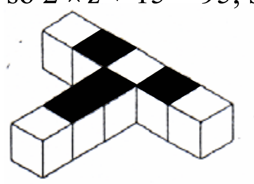
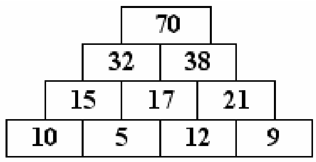
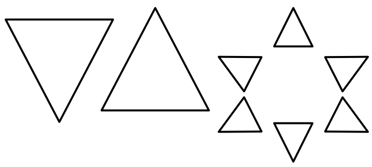
NOTES ON 2003 MEMORANDUM

These notes are necessarily brief and often formal and symbolic.
Many questions could be answered using primitive methods, e.g. "If today is Wednesday, what day of the week will it be 100 days from now?" can be done by counting. That would be laborious, time-consuming and error-prone. The essence of a mathematical approach is to work more smartly by using appropriate representations to model the situation and to exploit the inherent structures and patterns in the situation.

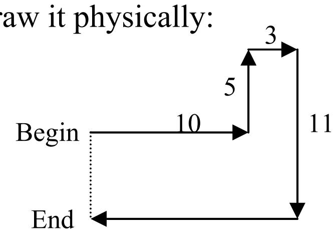
GRADE 4(1)

3. 1 km = 1000 × 1 m = 1000 × 1000 mm (a million!)
5. Every letter becomes the next letter in the alphabet. A → B, B → C etc.
7. January, February, March give 31 + 28 + 31 = 90 days. Another 10 days brings us to 10 April
8. 102 ÷7 = 14 rem 4, so to make rem 7, add 3 or 15 × 7 = 105, so 3 more marbles are needed
9. Test each of the given answers …
   Or, to do *equal* sharing, first put aside the 15 marbles that Zuki has more than Zinkle. So, together they have 95 – 15 = 80, so they each have 80 ÷ 2 = 40. Now give back Zuke her extra 15 marbles
   Or, if Zinkle has z marbles, $z + (z + 15) = 95$, so $2 \times z + 15 = 95$, so $z = (95 - 15)/2 = 40$
10. 50c + 20c + 10c + 2c = 82c
    20c + 10c + 2c = 32c
    50c + 10c + 2c = 62c
    50c + 2c = 52c
11. 
12. R2 + R2 = R4 at the market
    6 × 75c = R4,50 at the greengrocer
13. (5 × 63) ÷ 9 = 5 × (63 ÷ 9) = 5 × 7 = 35. He can fill 7 bags from one box, so 5 × 7 from 5 boxes
14. 15 min + 20 min + 35 min = 1 hour and 10 minutes. 1 hour and 10 minutes before 08:00 is 06:50
15. Try each number, e.g. 10 × 3 → 30 + 3 = 33. Or work backwards: 36 – 3 → 33 ÷ 3 → 11
16. 

17. 
18. There are 18 rows and 10 columns, so 10 × 18 = 180 tiles
19. 3 ✣ = ♡ , so 6 ✣ = 2♡ , so X = 2 ♡ = 4 Δ
20. Represent it on paper, e.g. as horizontal *measurement*. Fill in information bit by bit:
    Siva is shorter than Temba: Siva Temba
    Eby is taller than Temba: Siva Temba Eby
    Siva is taller than Oscar: Oscar Siva Temba Eby
    Siva is shorter than Ram, Eby is taller than Ram: Oscar Siva Ram/Temba Eby
21. Make a systematic representation of all the possibilities, e.g.:

white bread with:	egg	brown bread with:	egg	rye bread with	egg
	polony		polony		polony
	cheese		cheese		cheese
	jam		jam		jam
	fishpaste		fishpaste		fishpaste
	peanut butter		peanut butter		peanut butter

    So, number of sandwiches = 3 × 6
22. Draw it physically:



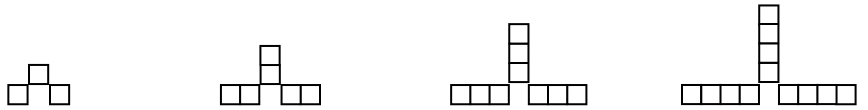
23. The smallest number is $1 + 1 = 2$ and the biggest $6 + 6 = 12$. From 2 to 12 is $12 - 2 + 1 = 11$ numbers

24. List all the possibilities systematically
Notice any patterns?
Out of the 36 possibilities, a sum of 7 occurs six times, a sum of 6 occurs five times, etc.
You can expect a sum of 7 to occur 6 out of 36 times
You can expect a sum of 2 to occur 1 out of 36 times

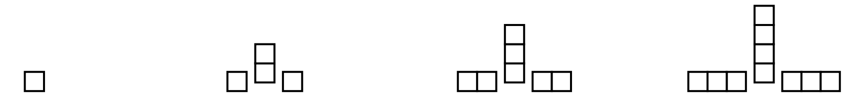
1 + 1	2 + 1	3 + 1	4 + 1	5 + 1	**6 + 1**
1 + 2	2 + 2	3 + 2	4 + 2	**5 + 2**	6 + 2
1 + 3	2 + 3	3 + 3	**4 + 3**	5 + 3	6 + 3
1 + 4	2 + 4	**3 + 4**	4 + 4	5 + 4	6 + 4
1 + 5	**2 + 5**	3 + 5	4 + 5	5 + 5	6 + 5
1 + 6	2 + 6	3 + 6	4 + 6	5 + 6	6 + 6

25. "See" some structure in the sketches for P_3 and P_4, then extend backwards and forwards, e.g.:

$P_1 = 3\times0 + 1 = 1$ $P_2 = 3\times1 + 1 = 4$ $P_3 = 3\times2 + 1 = 7$ $P_4 = 3\times3 + 1 = 10$ So $P_{100} = 3\times99 + 1$



$P_1 = 3\times1 - 2 = 1$ $P_2 = 3\times2 - 2 = 4$ $P_3 = 3\times3 - 2 = 7$ $P_4 = 3\times4 - 2 = 10$ So $P_{100} = 3\times100 - 2$



$P_1 = 1 + 2\times0 = 1$ $P_2 = 2 + 2\times1 = 4$ $P_3 = 3 + 2\times2 = 7$ $P_4 = 4 + 2\times3 = 10$ So $P_{100} = 100 + 2\times99$

GRADE 4 (F)

2. 147 mm – 103 mm = 44 mm
3. 9:15 + 1 hour = 10:15; 10:15 + 50 min = 11:05
5. R9,89 × 4 = R39,56; R42,37 – R39,56 = R2,81
6.

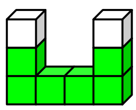
96000
160 600
8 20 30
2 4 5 6

7. R4 ÷ 5 = R0,80 for 1 apple. R9,60 ÷ R0,80 = 12 apples
8.

	Jim	Bongani
Round 1	125	100
Round 2	125	125
Round 3	150	100
Round 4	50	150
Total	450	475

475 – 450 = 25. Bongani won by 25 points

9. $\frac{2}{10} = 0{,}2$
10. $\frac{1}{3} = \frac{2}{6}$; $\frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$
11.



13. School A: 8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30
School B: 8:00 8:35 9:10 9:45 10:20 10:55 11:30
14. $100 \times 5 = 500$
$10 \times 5 = 50$
$10 \times 5 = 50$
$4 \times 5 = 20$; $500 + 50 + 50 + 20 = 620$
Or: $5\times(100 + 10 + 10 + 4) = 5 \times 124 = 620$

15. List the possibilities systematically. Notice the number patterns and let the patterns help you:

0 × 20c + 0 × 10c+10 × 5c	1 × 20c + 0 × 10c + 6 × 5c	2 × 20c + 0 × 10c + 2 × 5c
0 × 20c + 1 × 10c + 8 × 5c	1 × 20c + 1 × 10c + 4 × 5c	2 × 20c + 1 × 10c + 0 × 5c
0 × 20c + 2 × 10c + 6 × 5c	1 × 20c + 2 × 10c + 2 × 5c	
0 × 20c + 3 × 10c + 4 × 5c	1 × 20c + 3 × 10c + 0 × 5c	
0 × 20c + 4 × 10c + 2 × 5c		
0 × 20c + 5 × 10c + 0 × 5c		

16. 1 + 11 → difference too much
    2 + 10 → difference too much
    3 + 9 → difference too much
    4 + 8 → difference 4
    48 and not 84 because it must be less than 50
20. R15 + R6,75 = R21,75. R21,75 ÷ 3 × 4 = R29
21. 1100g – 680 g = 420 g. 420 g ÷ 12 = 35 g. 35 g × 30 = 1050g. 1100 g – 1050 g = 50 g
22. 100 – (4 × 5) = 80
23. 1, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 31, 41, 51, 61, 71, 81, 91, 100 → 21 ones
24. Pattern: 5 + 4*n* ; 6129 – 5 → 6124 ÷ 4 = 1531
25. Picture 1 = 1
    Picture 2 = 1 + 2
    Picture 3 = 1 + 2 + 3
    Picture 100 = 1 + 2 + 3 + 4 + ... + 98 + 99 + 100 = (1 + 100) ÷ 2

GRADE 5(1)

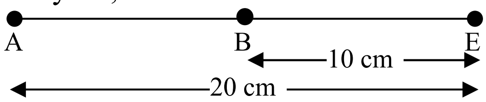
1. Three heaps of five blocks each = 15 blocks
3. R100 – (6 × R4,15 + 2 × R12,49)
4. You should recognise most *without* actual division!

360 ÷ 1 = 360	360 ÷ 4 = 90	360 ÷ 7 = 51,42857
360 ÷ 2 = 180	360 ÷ 5 = 72	360 ÷ 8 = 45
360 ÷ 3 = 120	360 ÷ 6 = 60	360 ÷ 9 = 40

5. 2 layers of 8 by 4 or 8 columns of 2 by 4 or 4 rows of 8 by 2
6. All the blocks of the bottom layer (32) and all the blocks round the side of the top layer (20)
7. 41000 g – 725 g = 40275 g = 40,275 kg
8. Half of the previous number = 1,7 ÷ 2 = 0,85
9. List all numbers containing a 9 systematically:
   9, 19, 29, 39, 49, 59, 69, 79, 89: 9 numbers
   90, 91, 92, 93, 94, 95, 96, 97, 98, 99: 10 numbers
   So the number of numbers without a 9 is 100 – (9 + 10) = 81
10. List them systematically: 101, 111, 121, 131, 141, 151, 161, 171, 181, 191
11. 100 ÷ 12 = 8 rem 4, i.e. 8 years bringing us to Sept., plus 4 more months, i.e. Oct., Nov., Dec., Jan.
    Or if September = 9, then 100 months further is 9 + 100 = 109. But
    January = 1, 13, 25, … *these leave a remainder of 1 if divided by 12*
    February = 2, 14, 26, … *these leave a remainder of 2 if divided by 12*
    March = 3, 15, 27, … *these leave a remainder of 3 if divided by 12,* etc.
    So 109 ÷ 12 = 9 rem 1, so January
12. 100 ÷ 7 = 14 rem 2, i.e. 14 full weeks bringing us to Wednesday, plus 2 more days, i.e. Friday
    Or if Monday = 1, Wednesday = 3, so 3 + 100 = 103, 103 ÷ 7 = 14 rem 5, and 5 is Friday
13. 100 ÷ 24 = 4 rem 4, i.e. 4 full days bringing us to 10:00, plus 4 more hours, i.e. 11, 12, 13, 14:00
    Or 10 + 100 = 110, 110 ÷ 24 = 6 rem 14
14. September has 30 days – so there are 20 days left in September. October has 31 days. November has 30 days. 20 + 31 + 30 = 81 days. 19 days to fill up 100 days, therefore 19 December

15. 3 for 5 = ? for 90. You can build it up, e.g. 30 for 50 and 24 for 40, so 54 for 90. Or 3×18 for 5×18 (90)

16. Put the information in a sketch, fill in the details bit by bit, and extend the information. e.g.:
The distance from A to E is 20 cm
The distance from B to E is 10 cm
You can deduce that AB = 10 cm!



18. 99 m = $\frac{9}{10}$, so 11 m = $\frac{1}{10}$. Therefore $\frac{10}{10}$ = $10 \times 11 = 110$ m

19. Make a sketch of the situation:
"2nd from front, 4th from back" means there are 5 rows. "3rd from left, 5th from right" means there are 7 learners per row. So 7 learners/row × 5 rows = 35 learners

20. Imagine yourself looking at the card from behind. Or tear the corner from a piece of paper, turn it around!

21.

		Z
8	6	X
		5

$8 + 6 + X = 18$, so $X = 4$
$5 + X + Z = 18$, so $5 + 4 + Z = 18$, so $Z = 9$

22. In second balance: 1B = 1A + 2C, so in first balance 5A = 3B =3A + 6C, so 2A = 6C, so 1A = 3C

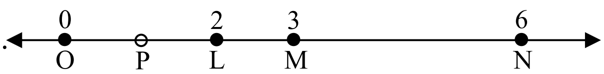
23. List systematically: 85 – 10, 86 – 11, 87 – 12, 88 – 13, … , 99 – 24. From 85 to 99 is 15 possibilities

24. 2 Small + 1 Large = 5 Small, so 1 Large = 3 Small, costing 3 × R11, 50

25. Let the cost of a chocolate, a gum and a juice be c, g and j respectively
Then $2g + 2j = 10$, so $1g + 1j = 5$. But $1c + 1g + 1j = 9$, so $1c + (1g + 1j) = 9$, so $1c + 5 = 9$, so $1c = 4$

GRADE 5 (F)

1. 2,06 m = 206 cm ; 2,06 m – 1 cm = 2,05m
3. 4 around the top, 4 around the bottom and 4 around the middle.
4. 1 on top, 4 around the middle and 1 at the bottom.
5. 4 at the bottom and 4 at the top.
6. 10 × 95c = R9,50
10 × R1,20 = R12,00
R9,50 + R12,00 = R21,50 ; R40,00 – R21,50 = R18,50
7. Half of target C is shaded and that is more than on any other target
9. $\frac{1}{6}$ = 4 slices, $\frac{1}{4}$ = 6 slices $\frac{1}{3}$ = 8 slices; 24 – 18 = 6
10. $150 \div 6 \times 5 = 125$
13.



14. $\frac{1}{2}$ of $\frac{1}{3}$ = $\frac{1}{6}$
15. Light: 6 12 18 24
Bell: 8 16 24
16. E(1) = 2 = 1×2 O(1) = 1= 1×2 – 1
E(2) = 4 = 2×2 O(2) = 3 = 2×2 – 1
E(3) = 6 = 3×2 O(3) = 5 = 3×2 – 1
E(4) = 8 = 4×2 O(4) = 3 = 4×2 – 1
⋮ ⋮
E(100) = 100×2 = 200 O(100) = 100×2 – 1 = 199
18. List the possibilities

1 + 14	not possible more than 9	1 + 16	not possible more than 9
2 + 13	not possible more than 9	2 + 15	not possible more than 9
3 + 12	not possible more than 9	3 + 14	not possible more than 9
4 + 11	not possible more than 9	4 + 13	not possible more than 9
5 + 10	not possible more than 9	5 + 12	not possible more than 9
6 + 9	Possible	6 + 11	not possible more than 9
7 + 8	not possible no card is a 7	7 + 10	not possible no card is a 7
		8 + 9	Possible

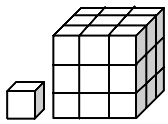
19. A = B + 2C, so A + C= B + 3C
    But in middle A + C = B + D, so D = 3C, so B = 4C
    But A = B + 2C, so A = 4C + 2C = 6C
20. The difference in age 40 – 16 = 24 remains the same
    So Mom – Me = 24 and Mom = 2 × Me
    So 2×Me – Me = 24, so Me = 24
21. 988, 898, 889, 997, 979, 799
22. 99 – 36 = 63; 98 – 35 = 63; 97 – 34 = 63; 96 – 34 = 63; .... ; 73 – 10 = 63, so ...
23. Make a table of information:

	10	11	Total
Boys	*18*	*13*	31
Girls	14	*5*	*19*
Total	*32*	18	50

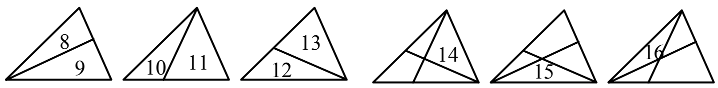
24. 10 × 10 = 100
25. $T_1 = 3 = 1\times3 = 1\times3$
    $T_2 = 9 = 3\times3 = (1 + 2)\times3$
    $T_3 = 18 = 6\times3 = (1 + 2 + 3)\times3$
    ⋮
    $T_{10} = (1 + 2 + 3 + ... + 9 + 10)\times3 = 55\times3$

GRADE 6(1)

2. 25 + 20 + 30 + 15 + 35 = 125
4. 0,13 – 0, 01 → 0,12 – 0, 01 → 0,11 – 0, 01 →0,10 – 0, 01 → 0,09
5. We know that $\frac{1}{5} > \frac{1}{6} > \frac{1}{7}$ and $\frac{7}{30} > \frac{7}{36}$. So compare $\frac{1}{5}$ and $\frac{7}{30}$: $\frac{1}{5} = \frac{6}{30} < \frac{7}{30}$
6. (15 × 12 – 20) × R2,40/8 – 15 × R2,40 = R12
   or (15 × 12 – 20) × 30c – 15 × 12 × 20c = 15 × 12 × 10c – 20 × 30c = R12
7. The watch gains 5 min in 6 hours, so 1 min in 6/5 h = 1 h 12 min, so it gains 2 min in 2 h 24 min
8. You can test them one by one, but it takes time! Clearly 11 ÷ 3 = leaves a remainder of 2.
   111 ÷ 3 = 37, so 111 111 ÷ 3 = 37 037 and 1111 = 1110 + 1 leaves a remainder of 1.
   Maybe you know, or discover, that if the digit sum is divisible by 3, then the number is divisible by 3
11. B, A, D, in that order, shows the line around the cube. C views B and D together
12. Imagine or draw the cube! If the side is 3 times as long, the big cube contains 27 of the small cubes! So its mass is 27 times as large!



13. The 6 small triangles (6), the one big one (7) and these:



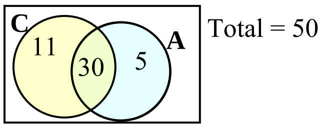
14. 10 × 10 × 10 × 10 = 10000   or   from 001 to 999 give 999 combinations, plus 000 give 10000
15. List all the possibilities systematically. Seeing the patterns also helps!

10 × 1c + 0 × 2c	1 × 5c + 2 × 2c + 1 × 1c	2 × 5c	1 × 10c
8 × 1c + 1 × 2c	1 × 5c + 1 × 2c + 3 × 1c		
6 × 1c + 2 × 2c	1 × 5c + 0 × 2c + 5 × 1c		
4 × 1c + 3 × 2c			
2 × 1c + 4 × 2c			
0 × 1c + 5 × 2c			

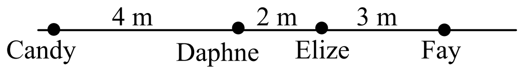
16. In the first balance: 3 circles = 6 squares, so 1 circle = 2 squares.
    In the second balance: 3 triangles = 2 circles, so 9 triangles = 6 circles = 12 squares

17. You should know from experience that (A) and (B) are true. For the others, test several different numbers trying to find one that is not true, and use your calculator for quick calculation, e.g.: (C): 112, 212, 5712 … are all divisible by 4; (D): 1232, 2232, 3232, 29232 … are all divisible by 8. In (C) and (D) we can't test *all* cases, so we can't be 100% sure, but it can be proved in other ways. (E): 163 is not divisible by 9, so the statement is false! *Some* numbers are divisible, but not *all!*
18. Corrie walks 60 m for every 45 of Denise, i.e. 4 m for every 3 of Denise. So Corrie walks 4 out of every 7 metres of the distance, i.e. $\frac{4}{7}$ of 3570 m

    Or: In 1 minute they come 60 + 45 = 105 m closer to one another. So they will cover 3570 m in 3570 m ÷ 105 m/min = 34 minutes. In 34 minutes Corrie walks 34 min× 60 m/min = 2040 m
20. Make a sketch, e.g.:

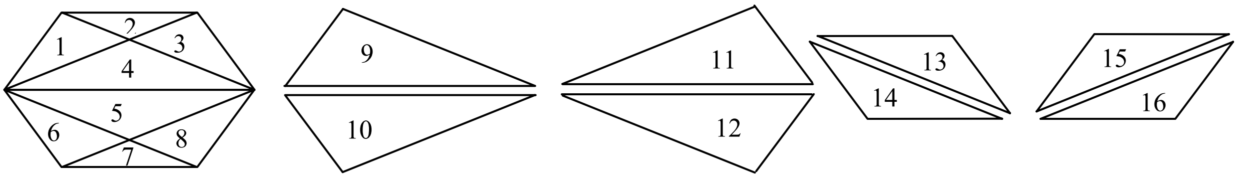
    41 – 30 = 11 children like only **C**omedy
    35 – 30 = 5 children like only **A**ction
    50 – (11 + 30 + 5) = 4 children don't like either
21. List the possibilities systematically: 300 | 210, 201 | 120, 102 | 111
22. If the middle number is m, then $(m - 1) + m + (m + 1) = 54$, so $3\times m = 54$, so $m = 18$
    So the consecutive numbers are 17, 18 and 19. So 17 × 18 × 19 = 5814
23. Put the information in a sketch like this. Use the information bit by bit, and extend the info, e.g.:
    Elize finished 2 m ahead of Daphne, but 3 m behind Fay
    Elize beat Candy by 6 metres, etc.

24. $P_n = 4\times n + 1$, so $P_{20} = 4\times 20 + 1$
25. If Zander caught x fish, then Vincent caught $x + 8$ fish, all together $x + (x + 8) + 20 + 24 + 18 = 100$. Or, Vincent and Zander together caught 100 – 62 = 38 fish. But Vincent caught 8 more than Zander

<u>GRADE 6 (F)</u>

2.



3. 1, 2, 4, 5, 10, 20, 25, 50, 100
8. $\frac{1}{8} = \frac{10}{80}$ and $\frac{1}{10} = \frac{8}{80}$, therefore $\frac{9}{80}$ will be in between
9. 100 ÷ 20 = 5; 3000 ÷ 20 = 150
10. 1 will be opposite 16, 2 opposite 17, 3 opposite 18, 4 opposite 19, 5 opposite 20, 6 opposite 21, 7 opposite 22
11.

2	3	
3	5	+2
4	?	+3
5	12	+4
6	17	+5

12. Dick is first, Peter is second, Tom is third and Harry is fourth.
13. Find the three numbers by trial and improvement. Use your calculator, e.g. 10×11×12 = 1320 is too small, etc. But 14×15×16 = 3360, so 14 + 15 + 16 = 45
14. $2p + 3$; 2(30) +3 = 63
15. 370 g – 290 g = 80 g; half of the milk weighs 80 g, so all the milk will weigh 160 g.
    370 g – 160 g = 210 g
16. 35 – 6 = 29 (29 children either has a cat, a dog or both); 29 – 24 = 5 (5 children has only dogs); 18 – 5 = 13
17. 60 ÷ 5 (1 part + 4 parts) = 12; 12 × 6 (1 part + 5 parts) = 72 glasses

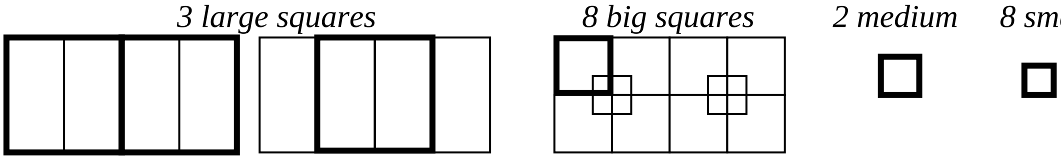
18. $(2000 - 1999) + (1998 - 1997) + \ldots + (2 - 1) = 1 + 1 + 1 + 1 + \ldots + 1$ (1000 times)
19. $(1 + 100) + (2 + 99) + (3 + 98) + (4 + 97) + \ldots + (50 + 51) = 101 \times 50 = 5050$
20. Use the repeated structure of the system, e.g. imagine writing down all the numbers from 0 to 99.
    Then the sum of the units digits is $10 \times (0 + 1 + 2 + \ldots + 8 + 9)$
    The sum of the tens-digits is $10\times1 + 10\times2 + \ldots + 10\times9 = 10 \times (1 + 2 + \ldots + 8 + 9)$
    So all together $2 \times 10 \times (1 + 2 + \ldots + 8 + 9) = 2 \times 10 \times 45 = 900$. Adding the 1 of 100 gives 901.
21. If the cheaper article costs Ra, the second article costs . Together they cost $a + a + 6 = 11$
    So $2\times a + 6 = 11$, so $2\times a = 5$. so $a = 2{,}50$
22. Make a table of the differences:

	1	**2**	**3**	**4**	**5**	**6**
1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

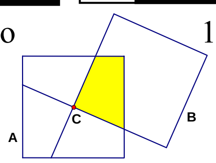
23. $1 + 3 + 5 + 7 + \ldots + 25 + 27 + 29 = 15 \times 15 = 225$
24. "All but six where white" means 6 were not white, so $b + y = 6$.
    Similarly $w + y = 6$
    and $w + b = 6$
    Add them together: $2w + 2b + 2y = 18$, so $w + b + y = 9$
25. $w + b + y = 9$
    So $w + (b + y) = 9$
    so $w + 6 = 9$, so $w = 3$

GRADE 7(1)

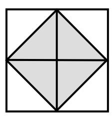
2. 114% = R36,15 so 1% is R36,15 ÷ 114 and 100% = R36,15 ÷ 114 × 100 = R31,71
3. $(3 \times 75) + (6 \times 66) = 621$ kg all together. So the average is 621 kg ÷ 9 children= 69 kg/child
4. The "vertical" formula is $2 \times a + 2$. Find a so that $2 \times a + 2 = 64$
   Or the "horizontal" formula is $4 + 2 \times (a - 1)$, so find a so that $4 + 2 \times (a - 1) = 64$
5. We do not know whether he has had his birthday in 1524. So he can be 64 or 63
6. $p + q + p + q = p + p + q + q = 2\times p + 2\times q = (p + q) \times 2 \neq p \times q + p \times q$
7. Let the width be w metres, then the length is $4\times w$ metres, so the area $= 4\times w\times w = 100$, so $w = 5$
   Then the perimeter is $2\times(4\times w + w) = 10\times w = 10 \times 5 = 50$ metres
8. $\dfrac{n}{6{,}34} = \dfrac{100 \times n}{634} = \dfrac{a}{1}$, so $\dfrac{n}{634} = \dfrac{a}{100}$
9. The number is a multiple of 7. So check which of 7, 14, 21, 28, 35, 42, 49, 56, … leave a remainder of 1 when divided by 3 or 5
   Quicker: the first two conditions means that the number is one more than a multiple of $3\times5 = 15$
   So the possible numbers are 16, 31, 46, 61, 76, 91. Of these, only 91 is also a multiple of 7
10. *3 large squares* *8 big squares* *2 medium* *8 small*



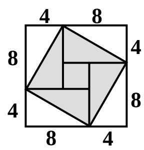
13. Divide square into 4 equal parts.
    So $\frac{1}{4}$ of 144 = 36



14. Divide square into 8 equal parts.
    So $\frac{1}{2}$ of 144 = 72



15. Dissect into rectangles.
    $4\times16 + 16$
    $= 80$



16. Represent and organise the info in a table:

Fill in what they are *not*:

	5	6	7	8
Ali				
Oli	**x**		**x**	
Uli	**x**	**x**		**x**
Eli		**x**		**x**

So Uli is 7, the others not:

	5	6	7	8
Ali			**x**	
Oli	x		x	
Uli	x	x	**yes**	x
Eli		x	**x**	x

So Eli is 5, Ali is not 5:

	5	6	7	8
Ali	**x**		x	
Oli	x		x	
Uli	x	x	yes	x
Eli	**yes**	x	x	x

17. See previous answer
18. $L_n = 3\times n + 2$, so $L_{15} = 3\times 15 + 2 = 47$
19. If April had x eggs, Peter had $x + 2$, Melanie had $x + 7$, Jack had $x + 1$
    Together: $x + (x + 2) + (x + 7) + (x + 1) = 38$, so $4\times x + 10 = 38$, so $x = 7$
20. If he bought x apples and y oranges, then the cost is $2\times x + 1\times y = 52$ and the total fruit is $x + y = 32$
    $2\times x + y = 52$ can be written as $x + x + y = 52$, so $x + (x + y) = 52$, so $x + 32 = 52$, so $x = 20$
21. $\dfrac{5^{14}}{5^{17}} = \dfrac{1}{5^3} = \dfrac{1}{125}$
22. List the units digits of the first few powers:

Exponent	1	2	3	4	5	6	7	8	9
Units digit	3	9	7	1	3	9	7	1	3

The last digits has a recurring pattern 3, 9, 7, 1

Reorganise the results like this and analyse the sequences:

Units digit	**Exponents giving the units digit**	
3	1, 5, 9, 13, …	These have a remainder of 1 when divided by 4
9	2, 6, 10, 14, …	These have a remainder of 2 when divided by 4
7	3, 7, 11, 15, …	These have a remainder of 3 when divided by 4
1	4, 8, 12, 16, …	These are multiples of 4

We simply have to decide in which sequence 2003 will be …

23. Look for *structure* in the denominator:

	F_1	**F_2**	**F_3**	**F_4**	**…**	**F_{10}**
Numbers	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{20}$		?
Structure	$\frac{1}{1\times 2}$	$\frac{1}{2\times 3}$	$\frac{1}{3\times 4}$	$\frac{1}{4\times 5}$		$\frac{1}{10\times 11}$

24. Calculate intermediate answers and look for *structure* and *patterns*:

    Sum of **1** fraction = $\dfrac{1}{2}$

    Sum of **2** fractions = $\dfrac{1}{2} + \dfrac{1}{6} = \dfrac{2}{3}$

    Sum of **3** fractions = $\dfrac{2}{3} + \dfrac{1}{12} = \dfrac{3}{4}$

    Sum of **4** fractions = $\dfrac{3}{4} + \dfrac{1}{20} = \dfrac{4}{5}$

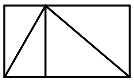
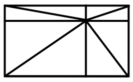
    So, Sum of **10** fractions = $\dfrac{10}{11}$

25. $(1 + 1) \times (1 + \frac{1}{2}) \times \ldots = \frac{2}{1} \times \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \ldots \times \frac{100}{99} \times \frac{101}{100}$

    $= \frac{2}{2} \times \frac{3}{3} \times \frac{4}{4} \times \frac{5}{5} \times \ldots \times \frac{100}{100} \times \frac{101}{1}$

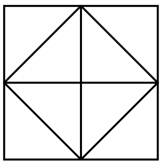
    $= 101$

GRADE 7 (F)

2. $23\times 25=\frac{46}{4}\times\frac{a}{2}=23\times\frac{a}{4}$, so $25=\frac{a}{4}$, so ...
4. $6\times 4 = 24\ cm^2$; $24\ cm^2 \div 2 = 12\ cm^2$
5. $6\times 4 = 24\ cm^2$
   $24\ cm^2 \div 2 = 12\ cm^2$ 
6. $6\times 4 = 24\ cm^2$
   $24\ cm^2 \div 2 = 12\ cm^2$ 
7. 24 is three-quarters of the marbles she had before giving anything to Sonny; 24 ÷ 3 × 4 = 32
   32 is two –thirds of the marbles she had before giving anything to Ronnie; 32 ÷ 2 × 3 = 48
8. Volume = 15 × 8 × x = 120, so x = 1 cm. So area is (15 cm + 2 cm) × (8 cm + 2 cm) = 170 cm^2
9. Divisible by 7 *and* 8 means it is divisible by 7×8 = 56.
   First multiple of 56 bigger than 800 is 15 × 56 = 840, then 896, then 952. So 3.
10.

width	Length	Perimeter
1	7	16
2	6	16
3	5	16
4	4	16

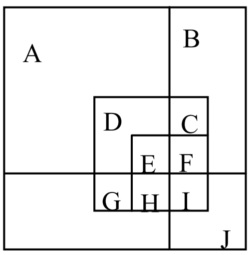
11. $\frac{1}{8}$



12. List the possibilities:

1	2	3	4
1	2	3	9
1	2	4	8
1	2	5	7
1	3	4	7
1	3	5	6
2	3	4	6

13. If A = 4 × 4 and B = 5 × 5, then E = 1 × 1 and C = 6 × 6 and D = 7 × 7. So the area is = 13 × 11
14.



   I “invent” a notation as either a single letter, or naming the top-left bottom-right vertices. So the squares are:
   C, E, F, G, H, I
   AE, AJ, DE, DI, EI, IJ
15. R1,50 for first km; 90c × 10 km; R1,50 + R9,00 = R10,50
16. R20 – R2 – R1,50 = R16,50; R16,50 ÷ R0,90 = 18; 18 + 1 = 19 km
17. 25 × 25 = 625 m^2

18. $(1-\frac{1}{2})\times(1-\frac{1}{3})\times(1-\frac{1}{4})\times\ \dots\ \times(1-\frac{1}{2003})$

$=\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\ \dots\ \times\frac{2001}{2002}\times\frac{2002}{2003}=\frac{1}{2003}$

21. 3 lines from two corners divide the triangle in 4 × 4 sections
    10 lines from two corners will divide the triangle in 11 × 11 sections = 121
22. 18 balls left to go into 7 boxes. If you put two balls in each box there are still four balls left over.
23. The sides of a square are equal. So list the possibilities of the rectangle until 4 times the width is equal to the length: 4(3) = 12; 12 × 4 = 48 cm
25. Record the information in a table (matrix):

says	**Ahmed**	**Bruce**	**Delia**	**Clare**	**Eldon**
Ahmed			yes		
Bruce				yes	
Delia		yes			
Clare				no	
Eldon					yes

Decide if Clare is lying or not:

If Clare is telling the truth, it means she did not do it, so Bruce and everyone else is lying, so nobody did it, which is not true. So Clare cannot be telling the truth!

So Clare is lying, which means she did it, so Bruce is the one telling the truth (Clare did it) and everyone else is lying.